Volume 3

Living Resources

DRIFTLESS AREA ASSESSMENT

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

About This Report

The Driftless Area Assessment examines an area in extreme northwestern Illinois formed by the Galena, Apple, and Plum River systems. Because significant natural community and species diversity is found in the area, it has been designated a state Resource Rich Area.[1]

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

Background

The Critical Trends Assessment Program (CTAP) documents changes in ecological conditions. In 1994, using existing information, the program provided a baseline of ecological conditions.[2] Three conclusions were drawn from the baseline investigation:

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

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

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

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

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

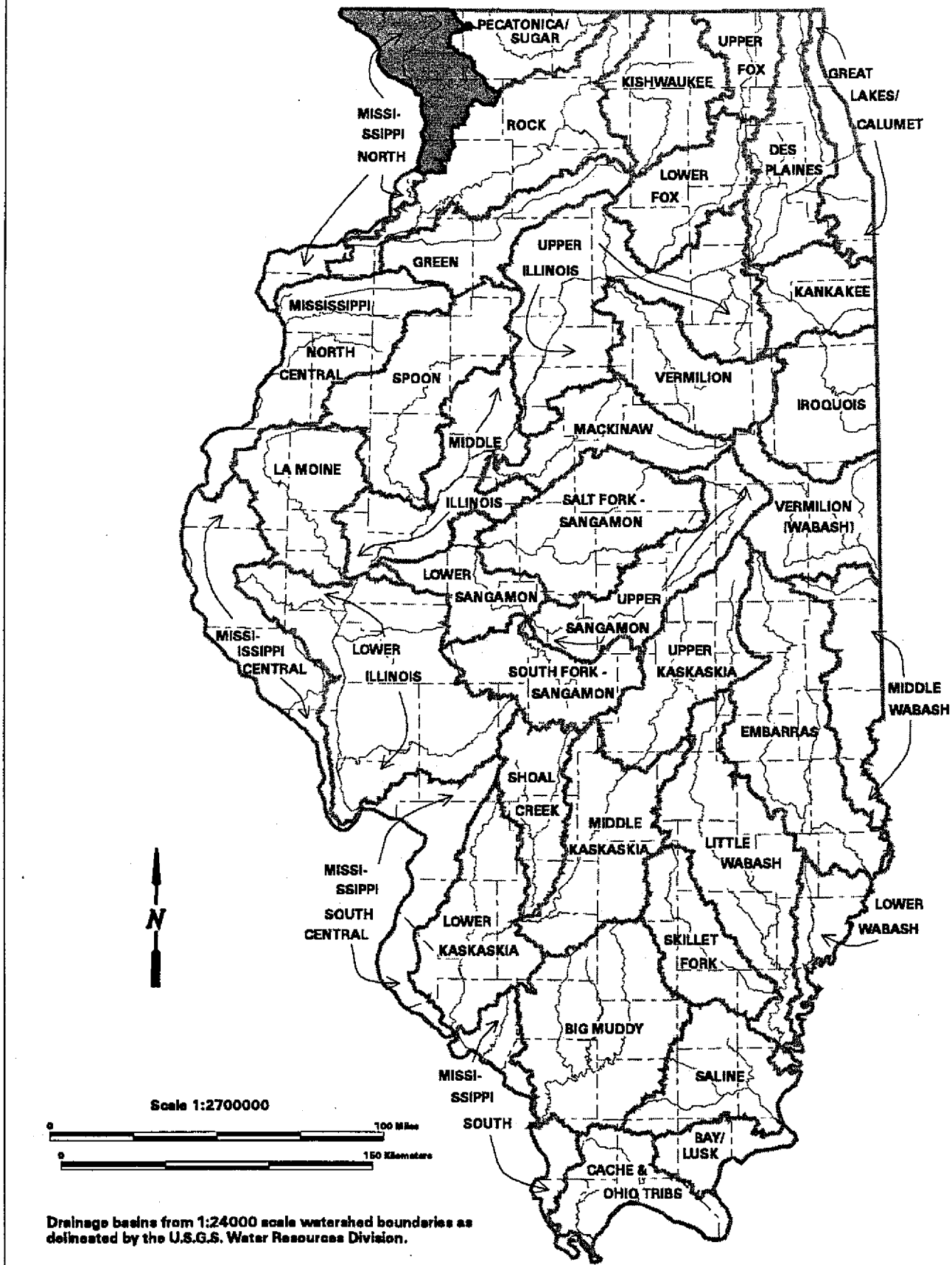
From the three initiatives was born Conservation 2000, a six-year program to begin reversing ecosystem degradation, primarily through the Ecosystems Program, a cooperative process of public-private partnerships that are intended to merge natural resource stewardship with economic and recreational development.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

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

The Driftless Area Assessment

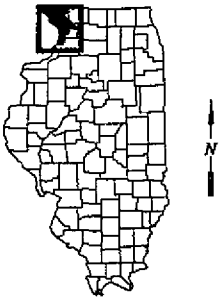
The Driftless Area Assessment covers an area of approximately 632,685 acres in the extreme northwestern part of the Illinois. It encompasses nearly all of Joe Daviess County, the western half and north-eastern quarter of Carroll County, the northwestern corner of Whiteside County, and a small portion of Stephenson County. The assessment area is formed by the Galena, Apple, and Plum River systems and occupies a unique part of the state that escaped Pleistocene glaciation. It is bordered by the Mississippi River on the west, Wisconsin on the north, and the Rock River Basin on the east and south. There are twenty-two sub-basins in the assessment area, as recognized by the Illinois Environmental Protection Agency. Of these, the Mississippi River Upper, the Apple River Lower, Rush Creek, and the Mississippi River Central sub-basins (a total area of 191,814 acres) have been designated as "Resource Rich Areas" because they contain significant natural community diversity. The Driftless Area 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



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

Major drainage basins of Illinois and location of the Driftless Assessment Area



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

contains three parts: Part I, *Socio-Economic Profile*, discusses the demographics, infrastructure, and economy of the area, focusing on the two counties with the greatest amount of land in the area — Carroll and Jo Daviess; 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 Paleoindian Prehistoric (B.C. 10,000) to the Historic (A.D. 1650), known in the assessment watershed. Volume 5, *Early Accounts of the Ecology of the Driftless Area*, describes the ecology of the area as recorded by historical writings of explorers, pioneers, early visitors and early historians.

Contributors

Principal Investigator.....William G. Ruesink

Project Coordinator.....Daniel K. Niven

Editors.....Daniel K. Niven, Douglas S.K. Chien

Page Layout.....Douglas S.K. Chien, Timothy J.S. Whitfeld

Figures.....Katherine J. Hunter, Liane B. Suloway

Introduction.....William C. Handel, Liane B. Suloway, Katherine J. Hunter, Douglas S.K. Chien

Natural Vegetation Communities.....William C. Handel

Tables for Natural Vegetation Communities.....Douglas S.K. Chien

Birds.....Steven D. Bailey, Scott K. Robinson

Mammals.....Edward J. Heske, Joyce E. Hofmann

Amphibians and Reptiles.....Christopher A. Phillips

Butterflies and Skippers.....John K. Bouseman

Aquatic Biota:

Fishes.....Larry M. Page, Kevin S. Cummings, Christine A. Mayer

Mussels and Crustaceans.....Larry M. Page, Kevin S. Cummings, Christine A. Mayer

Other Aquatic Macroinvertebrates.....Mark J. Wetzel, Donald W. Webb

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Introduction

Physiographic Characteristics

The Driftless Assessment Area (DAA) encompasses approximately 995.6 miles^2 (637,115 acres) in the northwestern corner of Illinois, including parts of Carroll, Jo Daviess, Stephenson, and Whiteside counties (Figures 1 and 2). The Mississippi, Sinsinawa, Menominee, Apple, Galena, and Plum River drainage's make up the majority of the watershed; Camp, Smallpox, Carroll, Mill, Rush, Straddle, Johnson, Otter, and Cattail creeks comprising the remainder (Figure 2). The DAA includes all 563.1 miles^2 (360,434.32 acres) of the Wisconsin Driftless Natural Division which comprises about 56.9% of the DAA. The Rock River Hill Country Division makes up 315.2 miles^2 (201,739.33 acres), 31.8%, along the eastern edge of the DAA. The Upper Mississippi and Illinois River Bottomland Division (Mississippi River Section) includes 55.9 miles^2 (35,759.16 acres), 5.6%, along the Mississippi River. The Mississippi and Illinois River Sand Division (Mississippi River Section) is the smallest division in the DAA with 20.7 miles^2 (13,224.78 acres), 2%, on the outwash plain of the Mississippi River (Schwegman 1973). The remaining 40.5 miles^2 (25,957.4 acres), 4%, includes the open water of the Mississippi River channel to the Iowa state border (Table 1, Figure 3).

Table 1. Natural divisions occurring in the Driftless Assessment Area.

Division and Section	Acres[1]	% of DAA
Wisconsin Driftless/Undifferentiated Section	360,434.3	57.0
Rock River Hill Country/Freeport Section	201,739.3	31.9
Upper Mississippi River & Illinois River Bottomlands/Mississippi Section	35,759.2	5.6
Illinois River and Mississippi River Sand Areas/Mississippi Section	13,224.8	2.1
Major Water Bodies/Mississippi River Section	21,527.5	3.4
Total:	**632,685.1**	**100.0**

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

The highest elevation in the DAA is 1,235 feet above sea level at Charles Mound on the border of Illinois and Wisconsin in the Wisconsin Driftless Division. This is the highest point in Illinois. The lowest elevation in the DAA, 583 feet above sea level, occurs on the Mississippi River surface at Lock and Dam 13 at the southern edge of the DAA yielding a total relief of 652 ft. Local relief is most pronounced along the Mississippi Palisades State Park where it is approximately 225 feet (Reinertsen 1989).

The DAA has a very diverse geologic history. The Wisconsin Driftless Division of the DAA apparently was not covered by an ice sheet during Pleistocene glaciation and is characterized by outstanding erosional features. Water has eroded the bedrock and windblown loess, creating a network of stream and river valleys. Dolomite rock outcrops and cliffs are common in many of the ravines and canyons within the interior of the DAA, as well as along the Mississippi River. In these areas are found many of the rare plant species not found elsewhere in the state. West of the Wisconsin Driftless Division lies the Mississippi River floodplain. During the past glacial periods, 1.6 million years ago to the Illinoian glaciation about 300,000 years ago, extensive ice sheets blocked the outlets of north flowing streams, so that they backed up into large glacial lakes. The lakes eventually spilled over the Galena-Dubuque divide and cut a channel through the resistant rock, thus forming the modern day Mississippi River channel (Wiggers 1997). This event had two major effects on the DAA. The Mississippi River was permanently altered, allowing it to flow in its present course; forming the western boundary of the DAA. The glacial meltwater torrents deposited the sand and other material that would later become the Upper Mississippi River Bottomland and the Mississippi River Sand Divisions as well as creating the large palisades along the river. As the glacial meltwaters periodically flowed down through the river valley they encountered two major types of bedrock, the erosion-resistant Silurian dolomite and easily weathered Ordovician Maquoketa dolomitic shale. The main area of Silurian dolomite occurs just south of Dubuque north of the Savanna Army Depot and at about Mill Hollow Road and continues the length of the Palisades State Park to Savanna. The softer Maquoketa shale eroded away, forming the broad river floodplain south of Hanover to the mouth of the Rush Creek and from Savanna southward to the end of the bluff line southeast of Thomson (Reinertsen 1989).

As the glacial meltwaters left the narrow canyons they could no longer carry a large sediment load; gravel and sandy material spilled out across the wide floodplain leaving stratified sand and gravel up to 200 feet thick, the Savanna Terrace (Grimley 1997). During dry periods, wind carried the lighter soil particles away leaving behind the sand and heavier material. This produced the sandy soils of the sand prairies and sand savannas of the Mississippi River Sand Areas Division, from the Savanna Army Depot south to Rush Creek and south of Savanna to the southern end of the DAA, an area that includes Ayers Sand Prairie and Thomson-Fulton Sand Prairie. Although these natural communities comprise a small land area of the DAA they contain a major component of the flora, including many threatened and endangered species. In the areas of finer soils through the Upper Mississippi Bottomland Division many diverse plant communities exist or existed during presettlement times, including marshes, oxbow lakes, floodplain forests, and mesic to wet prairies (Schwegman 1973). Wet sand prairie probably also existed in areas where hydrology and sandy soils prevailed.

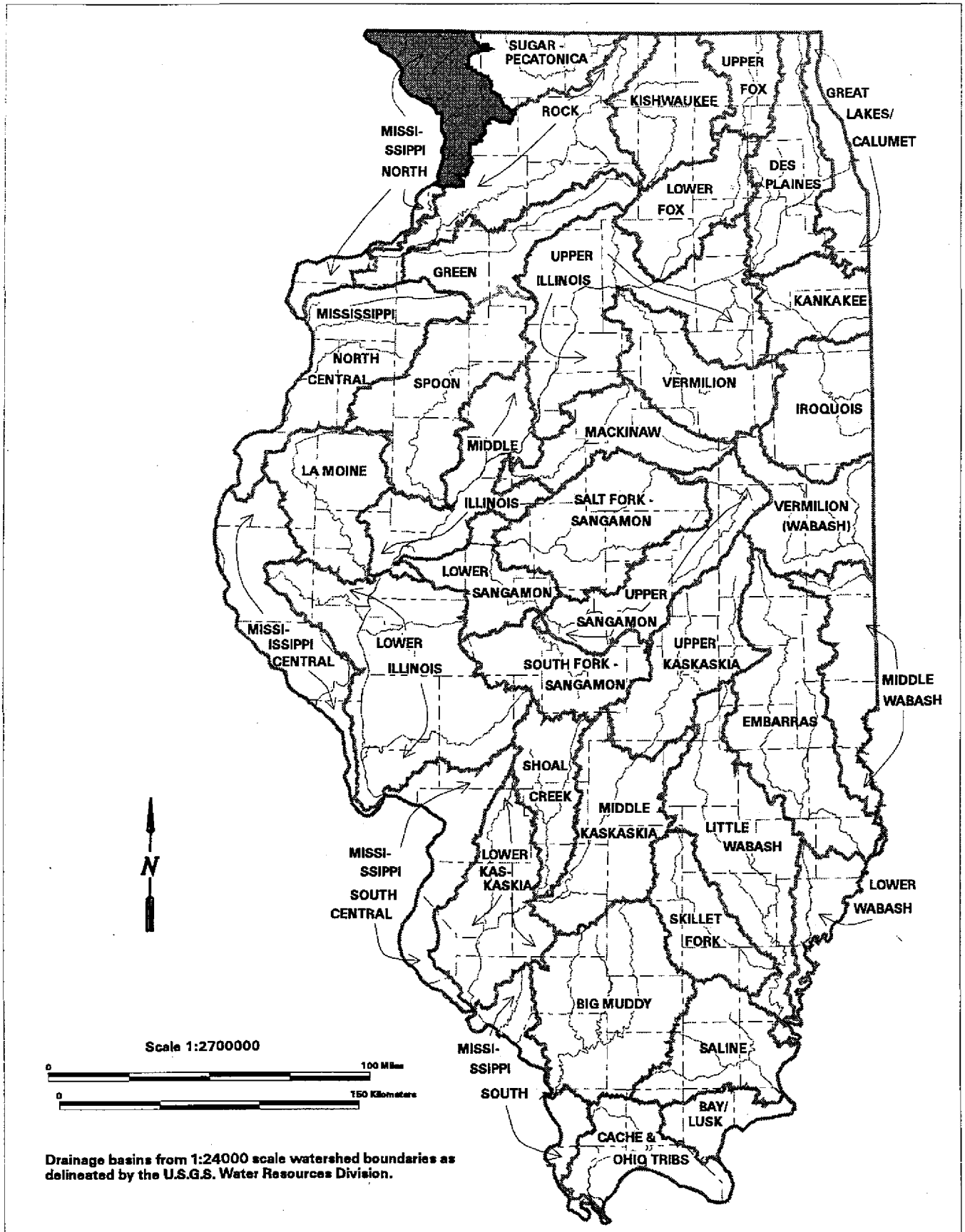

Figure 1. Major drainage basins of Illinois and location of the Driftless Assessment Area

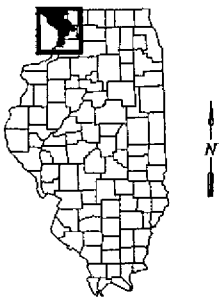

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Figure 2. Subbasins in the Driftless Assessment Area. Subbasin boundaries depicted are those determined by the Illinois Environmental Protection Agency.

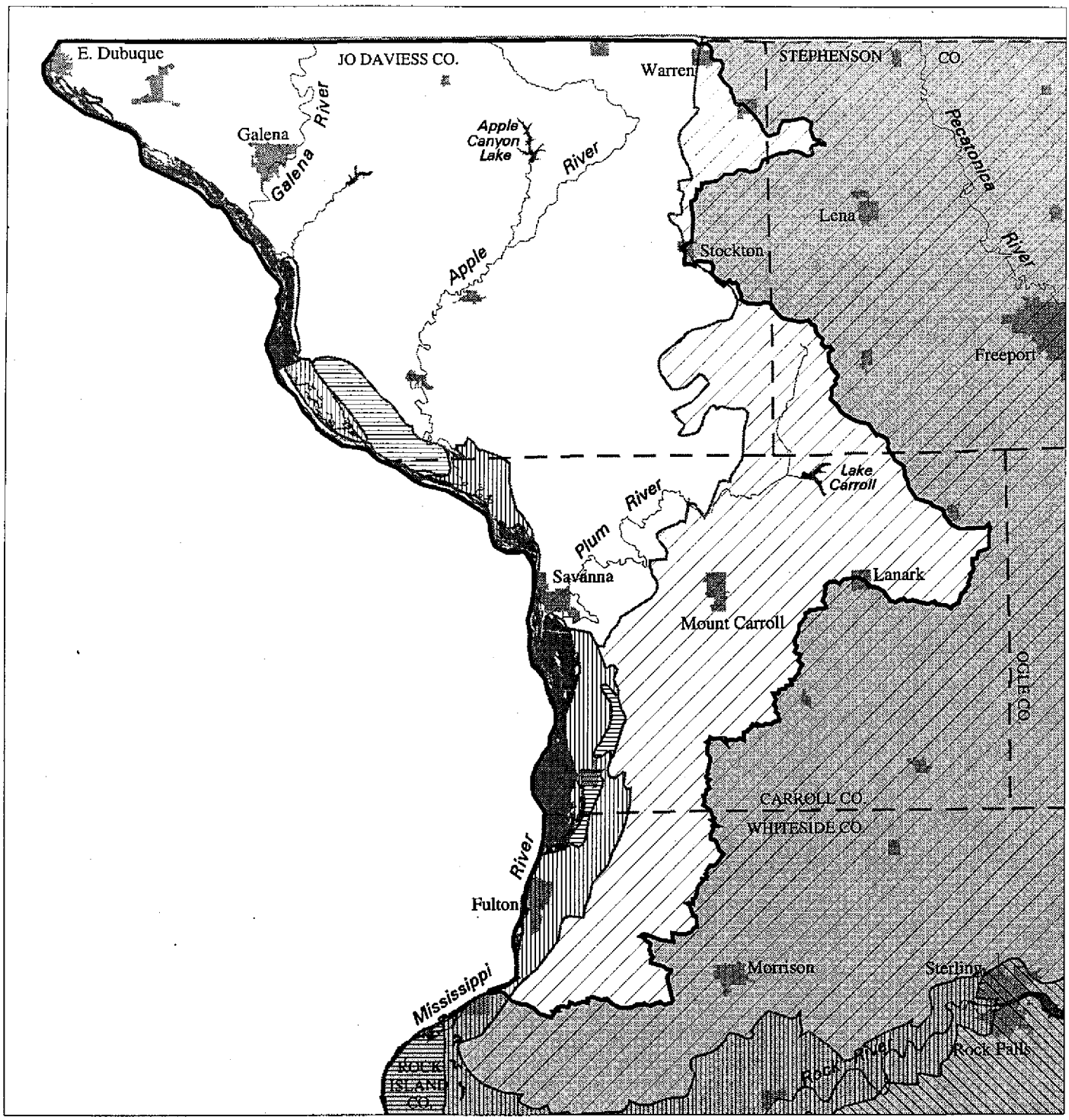

Figure 3. Natural Divisions in the Driftless Assessment Area based on the classification developed by Schwegman (1973).

The entire DAA is covered with windblown loess ranging between 100 to 300 inches in depth (Willman and Frye 1970). The Rock River Hill Country Division makes up the eastern portion of the DAA. This area was glaciated during the Illinoian glaciation. Loess thickness in the eastern side of the DAA ranges from 100 to 150 inches in depth. Because the Rock River Hill Division has been glaciated, time has not allowed the erosional features to develop and be as pronounced as in the Wisconsin Driftless Division. This section of the DAA generally has a more rolling landscape of hills and gently sloping valleys. Forest habitats are similar to those in the Wisconsin Driftless Division. Prairie habitat probably was a major component of the Rock River Hill Division of the DAA prior to European settlement. Mesic and wet prairie habitat also existed along the stream and river valleys (Schwegman 1973).

The wide range in soils in the DAA is a reflection of the geological history. In the western portion of the DAA, in the Mississippi River floodplain, are soils that were formed mainly from glacial outwash. They range from extremely dry sandy soils along the Savanna Terrace to poorly drained bottomland soils (Fehrenbacker et. al 1984). The uplands, away from the Mississippi River floodplain toward the eastern edge of the DAA, have a wide variety of soils that range in texture, permeability, and thickness depending on the position in the landscape. These soils are formed in windblown loess and eroded parent material, mostly dolomite and dolomitic shale (Willman and Frye 1970). At the eastern edge of the DAA soils are composed of a layer of Wisconsinan-aged loess deposited over Illinoian glacial till (Willman and Frye 1970).

Climate Patterns[1]

The climate in the Driftless Area Assessment (DAA) is typical of many continental locations, in that there are rather wide temperature fluctuations. The average high temperature (°F) in the summer is in the low 80s with average lows in the 50s. Winter highs are generally in the 20s and 30s with lows in the teens to near zero. Record temperature extremes range from -35° F to a high of 108° F. There is an average of five months without frost each year.

Precipitation is highest during April through September (averages of 3.67 to 4.45 inches per month) and lowest in January (1.30 inches) and February (1.21 inches), with a yearly average of 36.47 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, Iverson et al. 1989) consistently indicate prairie occupying about 60% and forest

[1] Information in this section has been taken from the Driftless Area Assessment, Volume 2 (Illinois Department of Natural Resources 1998). See that volume for a more detailed discussion of climate patterns and long term trends in the DAA.

about 40% of the State's total land area. The estimated acres and percentages of forest and prairie that occurred in the DAA in 1820 are: forest 73.5% (468,909 acres), including open woodland and savanna; prairie 22.3% (142,309 acres); and water 3.3% (21,449 acres) (Illinois Geographic Information System).

The above vegetation categories are an overly simplified description of the DAA. The DAA was, in fact, a complex mosaic of several different types of forest, savanna, prairie, wetland, and primary communities that will be discussed in greater detail in later sections of this report. The DAA is within the transition zone of prairie and forest (Anderson 1983). Fire is generally considered to have been a major ecological factor in the maintenance of prairie, savanna, and open woodland vegetation in the Midwest (Anderson 1970, 1983, 1990, Axelrod 1985). The term "savanna" was not used in early accounts by travelers or the General Land Officer surveyors or may have been misleading (Nuzzo 1986). The existence of the savanna community in the Driftless Area of Wisconsin, Iowa, Minnesota, and Illinois has been discussed by several sources. Examples include Curtis (1959), Kline and Cottam (1979), and Pruka et. al (1994) in Wisconsin, Wunderlin (1965) and Robertson et al. (1997) in Illinois, and Delong and Hooper (1996) in Iowa. In the DAA the larger tracts of savanna habitat probably were concentrated in the sand areas in the Mississippi River valley and on the eastern border of the Wisconsin Driftless and Rock River divisions where the larger expanses of prairie and forest were in contact. However, there is a great deal of evidence that savanna habitat existed throughout the interior of the DAA where the frequency of fire, topography, soil conditions, and aspect allowed the development of the savanna communities. This will be discussed in greater detail in the savanna community section of this report.

Total area of wetlands prior to European settlement in the DAA can be generally inferred from county-wide data on the amount of hydric soils. These values show there were approximately 26,900 wetland acres for Jo Daviess County (7% of the county), 19,000 wetland acres for Carroll County (7%), 20,400 wetland acres for Stephenson County (6%), and 65,900 wetland acres for Whiteside County (16%), totaling 132,200 wetland acres or 9% of the four county area prior to settlement (estimated wetland acres from Havera et al. [1994]; percent of county acreage from Illinois Geographic Information System). The high percentage of upland habitat and steep topography accounts for the low percentage of presettlement wetlands. The majority of the presettlement wetland habitats were the floodplain forest, marsh, and wet prairie associated with the Mississippi River floodplain. There are seep, sedge meadow, and other wetland communities that occur in the stream and river valleys throughout the DAA; these areas probably were more extensive prior to settlement (Tessene and Harrold 1995, Tessene and Keene 1996; Handel, personnel observation).

Current Land Cover

The characterization of the land cover of the DAA is based on information from the Land Cover of Illinois database (Illinois Geographic Information System), which was derived from Landsat Thematic satellite imagery acquired between 1991 and 1995. Figures given

for high quality acreages are based on the Illinois Natural Areas Inventory[1] Grade "A" and "B" land. They are meant only to reflect the areas that remain in an undegraded condition and to provide an opportunity to compare statewide trends of habitat destruction.

Currently the landscape of the DAA is dominated by grassland and cropland (about 74.7%). Based on data from the Illinois Geographic Information System, 40.5% of the region is grassland (Table 2, Figure 4), planted with mostly non-native plant species, e.g. hayfield and pasture). Although there are 257,883 acres of grassland in the DAA, only 48.3 acres of high-quality, undegraded prairie remain in the area. An unknown quantity of degraded prairie persists locally, some of which has resoration potential.

Table 2. Current land cover for the Driftless Assessment Area[1].

Land Cover	Acres	Percent
Grassland	257,883	40.5
Cropland	211,589	33.2
Upland forest	113,545	17.8
Water	28,868	4.5
Bottomland forest	13,972	2.2
Urban/Builtup	8,245	1.3
Nonforested wetlands	3,010	0.5
Total:	**637,115**	**100.0**

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

About one third (33.2%) of the DAA area is cropland (Table 2), mostly in the southern portion of the area (Figure 5). Only 1.3% is developed urban land (Table 2), mostly in East Dubuque, Galena, Warren, Savanna, Mount Carroll, and Fulton (Figure 6).

There are 127,517 forested acres (17.8% of the area, Table 2) in the DAA. Most of this area (17.8%) is upland forest, with the reminder (2.2%) being floodplain forest. As in the presettlement landscape, much of the forested area is concentrated on the slopes and bottomlands associated with the rivers and streams in the area (Figure 7). None of this area is considered by the Illinois Natural Areas Inventory to be high-quality, undegraded forest.

Wetlands have also declined dramatically in the DAA. Based on the Land Cover of Illinois Database, a current estimate of wetland area for the region (nonforested wetlands such as marshes, wet meadows, and ponds) is only about 3,010 acres (0.5% of the area, Table 2). Most of this wetland area is concentrated along the Mississippi River (Figure 8). In addition to this wetland area about 4.5% of the DAA is open water (Table 2, 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).

[1] For a more complete description of the Illinois Natural Area Inventory, see the section on "Biologically Significant Features of Natural Communities" later in this chapter.

For the DAA, IWI data area were derived from high-altitude photography taken in 1980 and 1981. IWI data are the most recent comprehensive wetlands data available for the state. Based on IWI data, wetlands occupy 2.6% of the DAA area compared to 3.5% of the total area of the state (Suloway and Hubbell 1994). In the DAA, wetlands occupy about 16,343 acres (Table 3). Nearly three-quarters of the wetland area is bottomland forest, compared to the statewide percentage of 60.5%. Shallow marsh/wet meadow wetlands account for 10.9% of the area, followed by open water wetlands (5.5%), scrub-shrub (4.5%), deep marsh (4.5%), intermittent riverine (1.1%), and small areas (each total less than 28 acres) of shallow lake, emergent lake, swamp, and perennial riverine.

The mean size of contiguous forested wetlands is 17.9 acres (range < 0.1 to 1326 acres); there are 663 separate forested wetlands in the DAA. The largest forested wetland tracts are located along the Mississippi River; the largest contiguous tract is at the old Savanna Army Depot.

Emergent wetlands range in size from less than 0.1 acre to 194 acres, with a mean size of 3.7 acres. There are 639 separate emergent wetlands in the DAA. The largest emergent wetland is located on the Mississippi River floodplain near the mouth of Apple River.

Table 3. Wetland habitat of the Driftless Assessment Area.[1]

Category	Acreage	% of Wetland Area	% of Assessment Area
Palustrine Wetlands			
Shrub Scrub Wetlands	738.30	4.5	0.1
Forested Wetlands			
Bottomland Forest	11,920.12	72.9	1.9
Swamp	19.64	0.1	0.0
Emergent Wetlands			
Shallow Marsh/Wet Meadow	1,787.88	10.9	0.3
Deep Marsh	735.35	4.5	0.1
Open Water Wetlands	893.68	5.5	0.1
Subtotal Palustrine	**16,094.97**	**98.5**	**2.5**
Lacustrine Wetlands			
Shallow Lake	25.05	0.2	0.0
Lake Shore	27.80	0.2	0.0
Emergent Lake	0.00	0.0	0.0
Subtotal Lacustrine	**52.85**	**0.3**	**0.0**
Riverine Wetlands			
Perennial Riverine	16.43	0.1	0.0
Intermittent Riverine	178.35	1.1	0.0
Subtotal Riverine	**194.78**	**1.2**	**0.0**
Total Wetlands:	**16,342.60**	**100.0**	**2.6**

[1] Adapted from Suloway and Hubbell 1994.

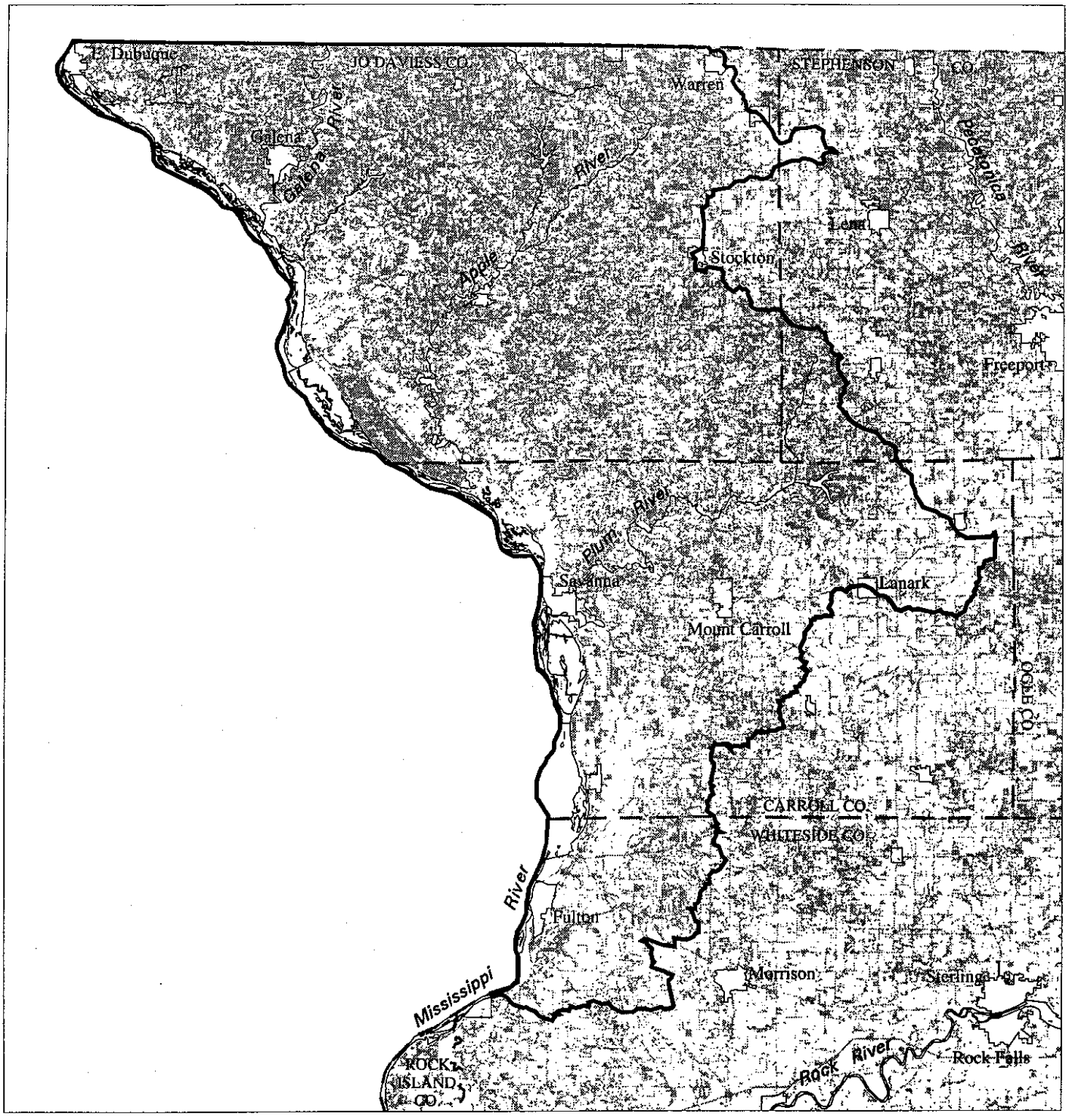

Figure 4. Grasslands in the Driftless Assessment Area. Grasslands depicted on this map are nonurban grasslands from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

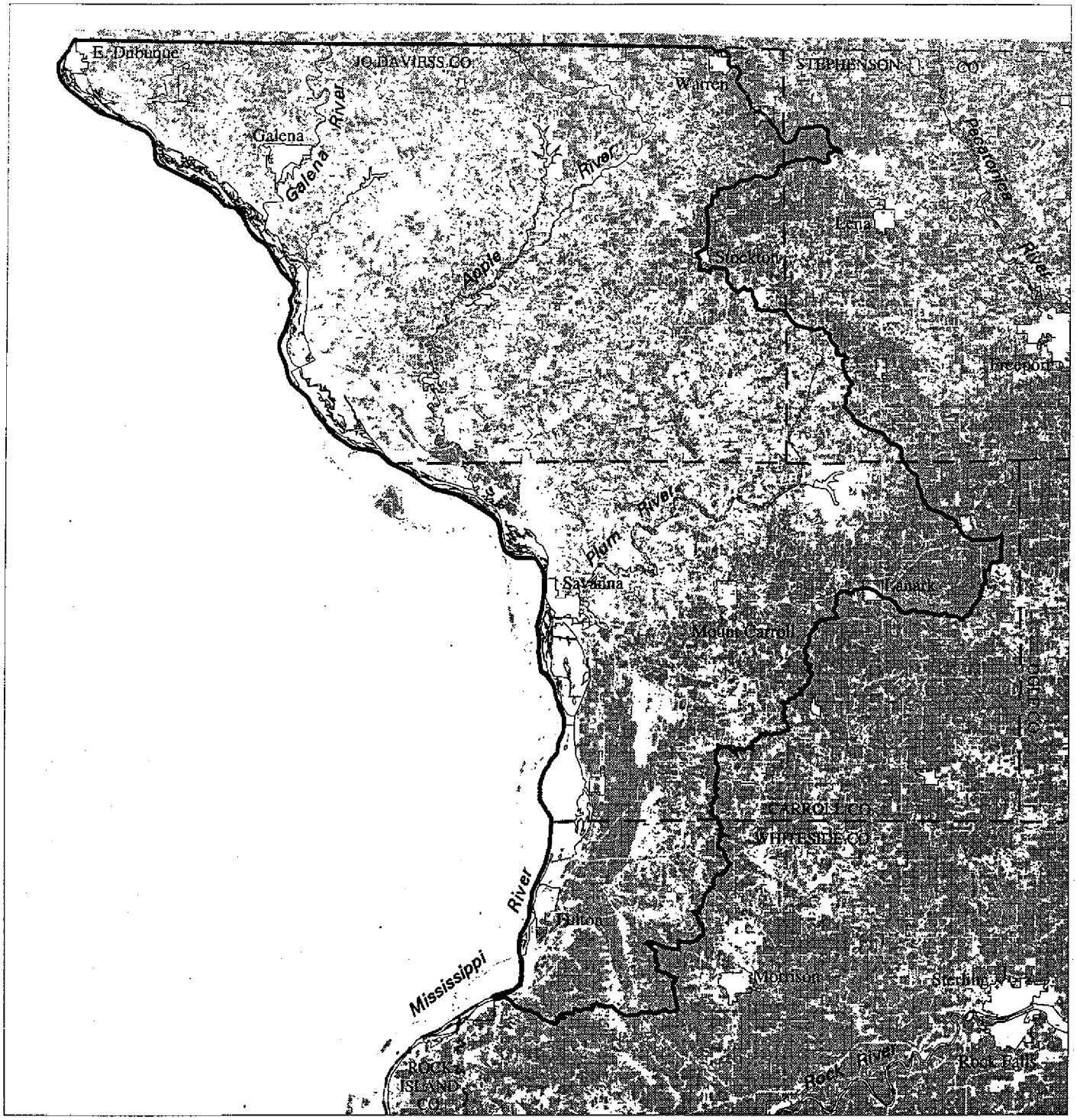

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Figure 5. Cropland in the Driftless Assessment Area. Cropland depicted on this map includes row crops and small grains from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

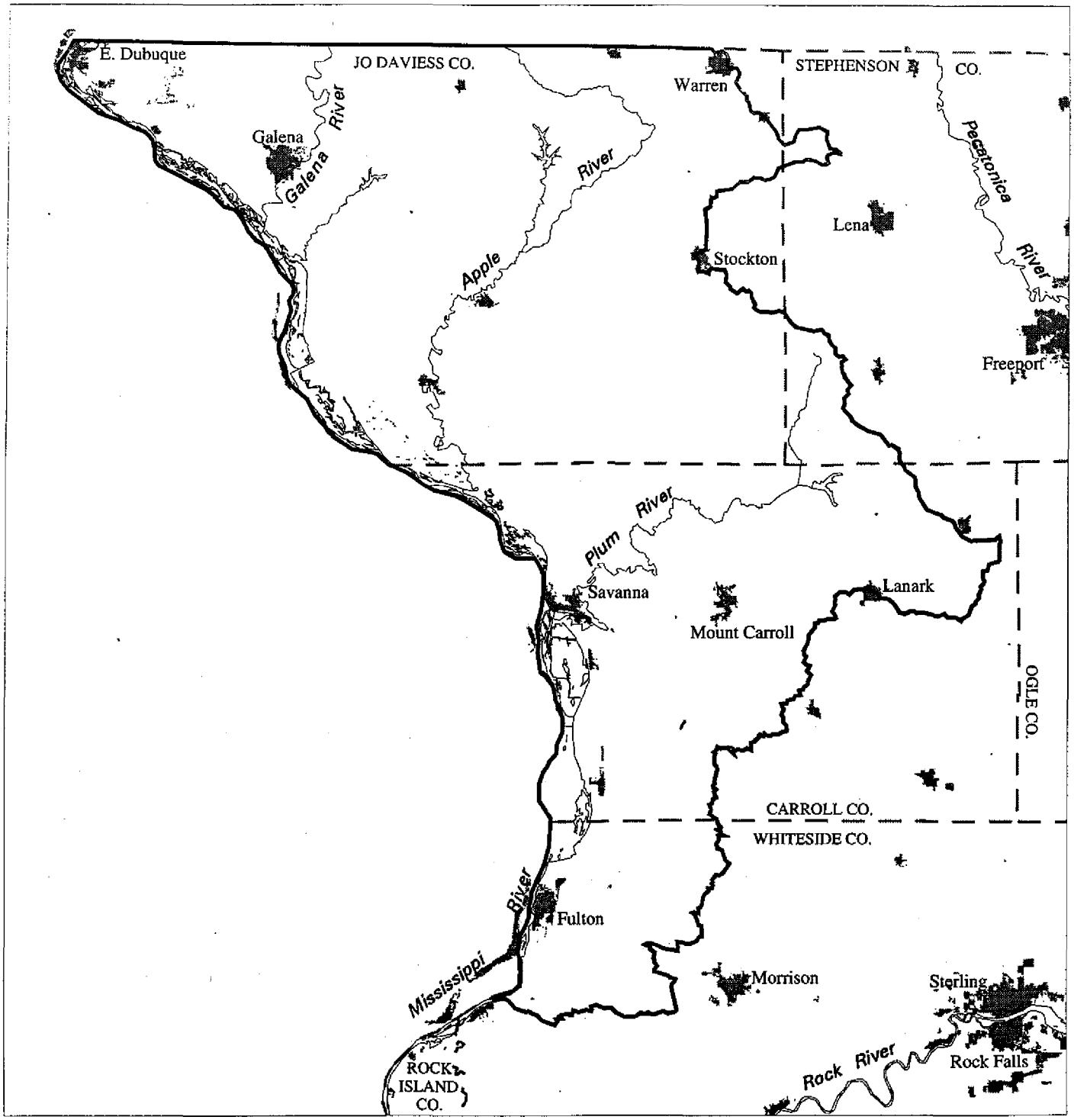


Figure 6. Urban land in the Driftless Assessment Area. Urban land depicted on this map includes urban/built-up land and urban grassland from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

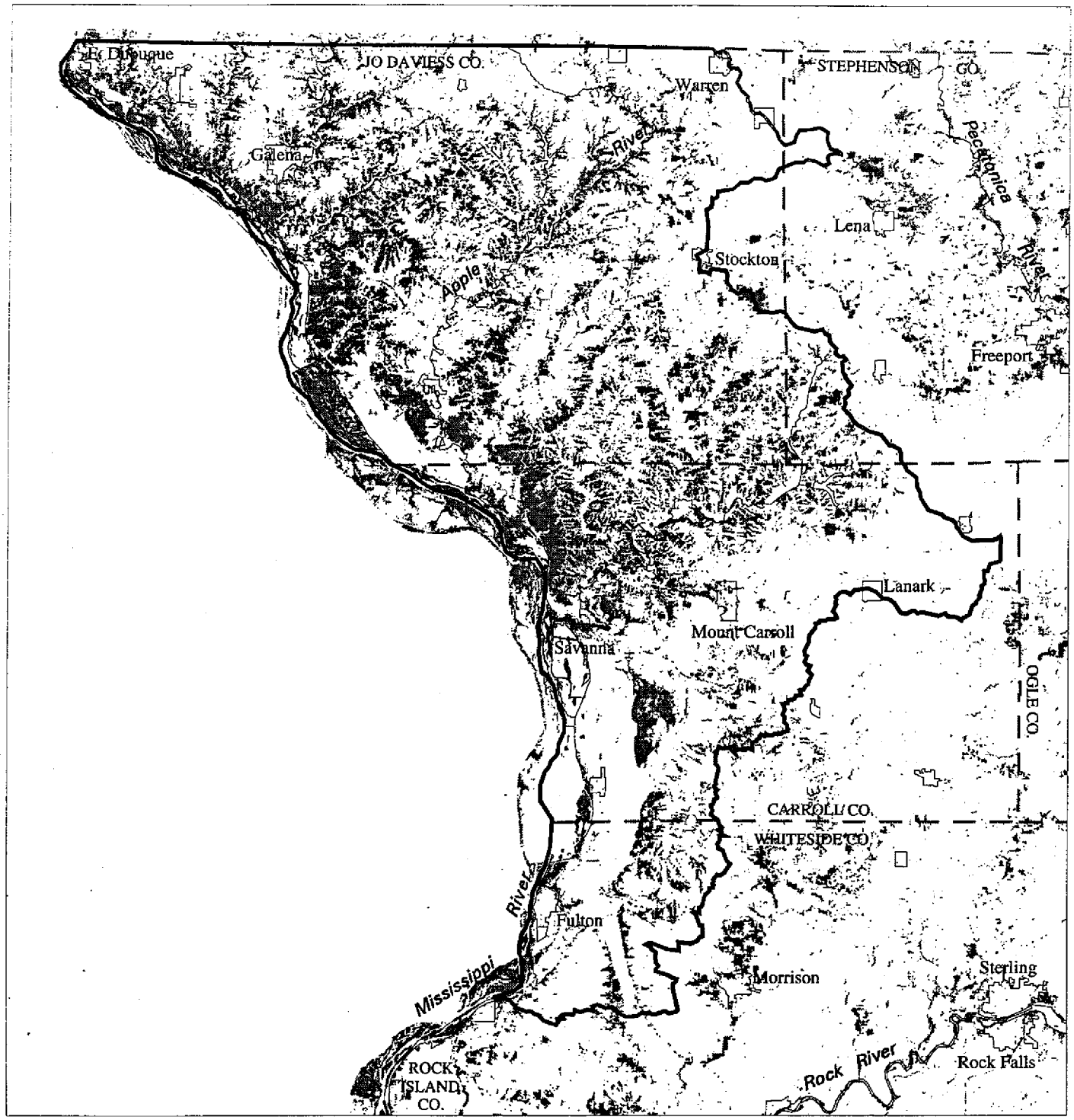


Figure 7. Forest in the Driftless Assessment Area. Forest depicted on this map includes upland and bottomland forest from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

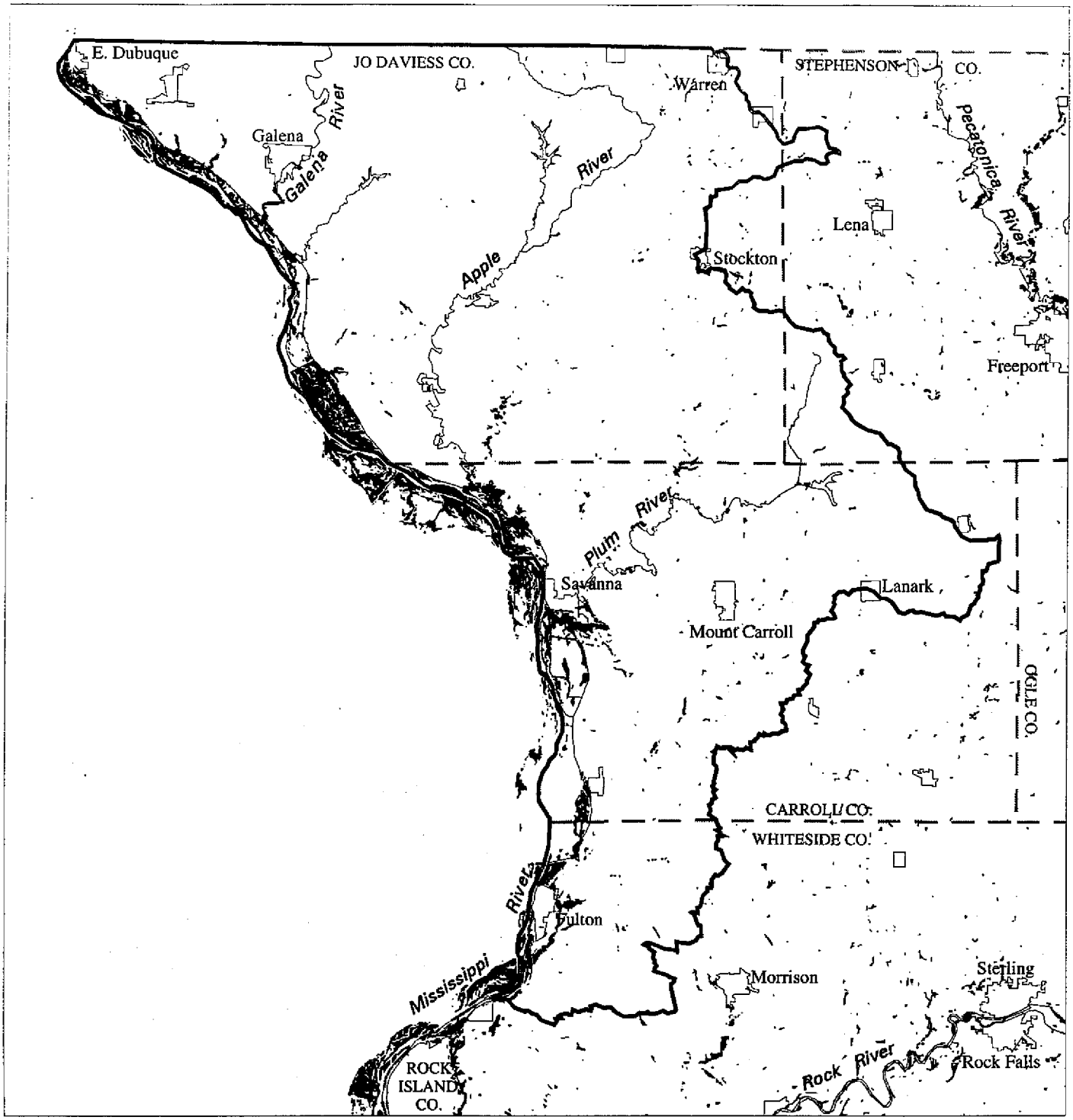
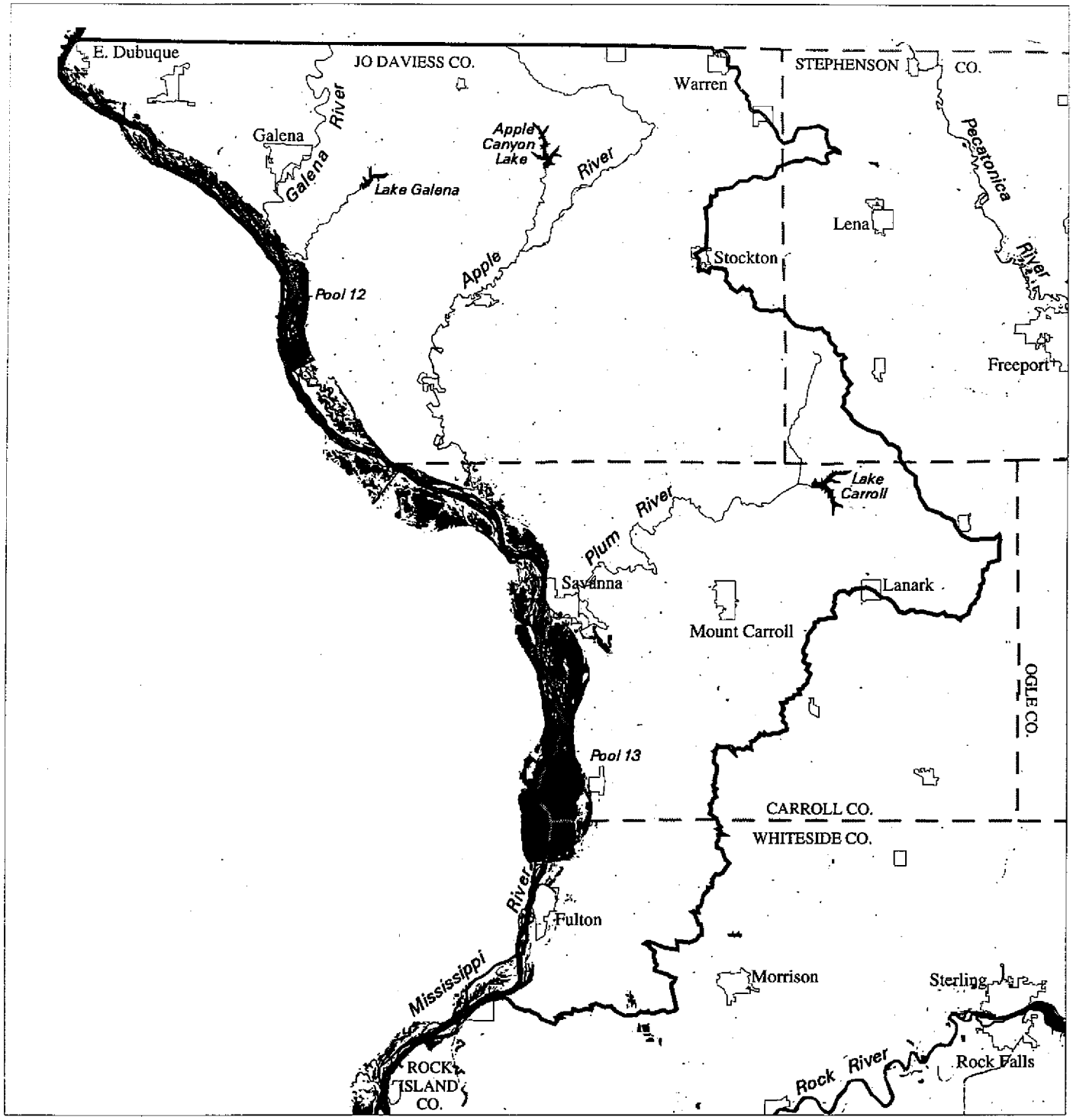


Figure 8. Wetlands in the Driftless Assessment Area. Wetlands depicted on this map include nonforested wetlands and bottomland forest from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.



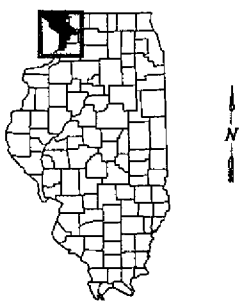


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Figure 9. Open water in the Driftless Assessment Area from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

Biologically Significant Features of Natural Communities

State and Federal Land

Although a large portion of the land in the DAA is used for agricultural purposes, 46,654 acres have been set aside by the state or federal government as state parks, fish and wildlife areas (Table 4, Figure 10). These areas give some level of protection to the natural communities in the area, and in some cases they are the only refuge for certain endangered species or natural communities. However, these areas do not always offer adequate protection, and they are not all situated in the most biologically important areas.

Table 4. State and federal land in the Driftless Assessment Area[1].

Name	Acres
State Land	
Apple River Canyon State Park and Amco Satellite Property	1291
Mississippi Palisades State Park	2,335
Witkowsky State Fish and Wildlife Area	995
Tapley Woods	259
Total State Land:	**4,880**
Federal Land	Acres
Savanna Army Depot	13,062
Upper Mississippi River Fish and Wildlife Refuge	27,867
Total Federal Land:	**40,929**

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

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).

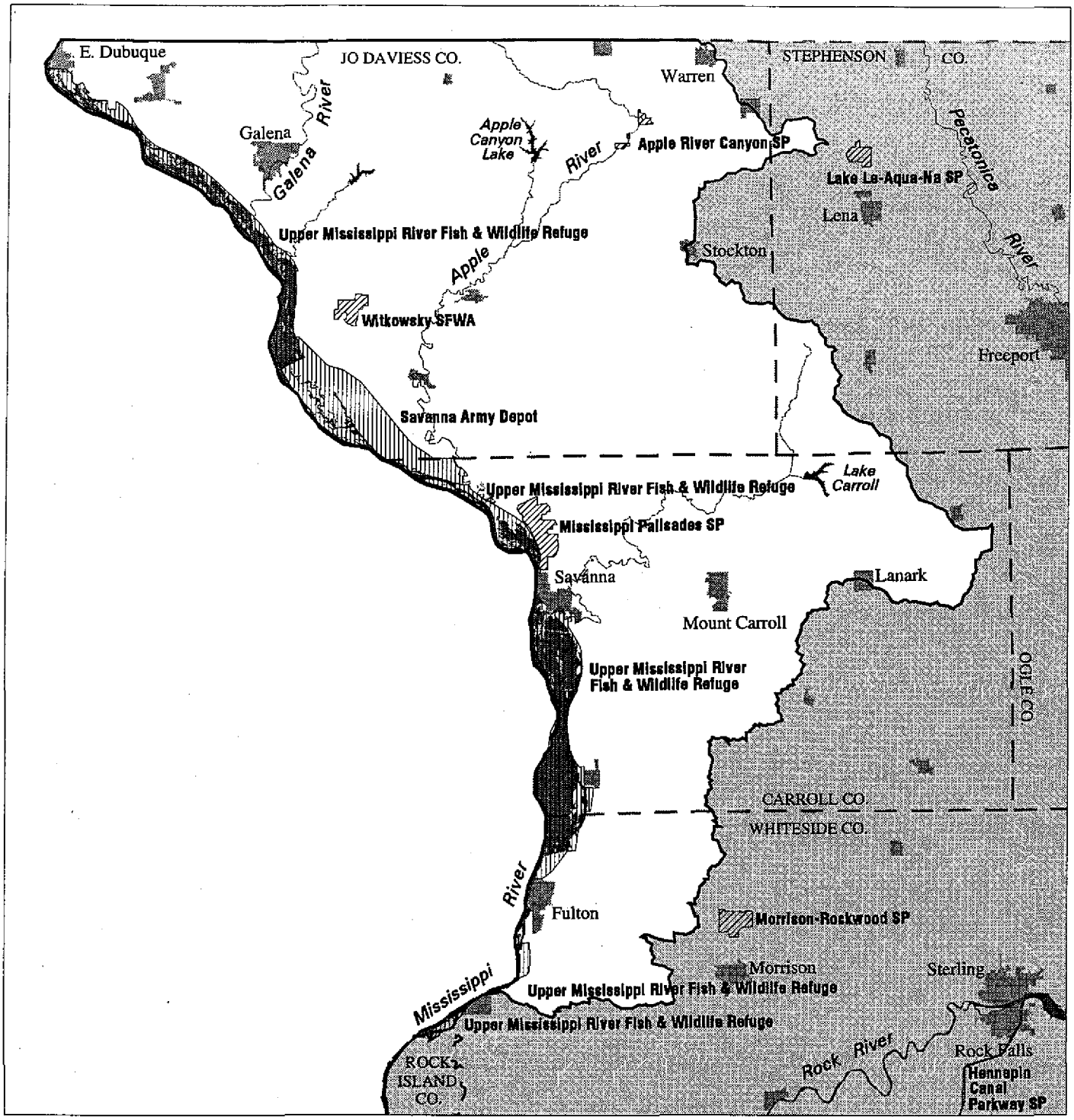

Figure 10. State and federal land in the Driftless Assessment Area. State land is limited to parks (SP), conservation areas (SCA), forests (SF), and fish and wildlife areas (SFWA).

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.

Table 5 provides a listing, by county and acreage, of all natural areas present in the DAA and surrounding area. The location of these sites is shown in Figure 11. The combined acerage for all natural areas in the DAA is approximately 33,310.9 acres or 5.2% of the assessment area. Within the DAA three community types qualify as high-quality, undegraded (Category I) natural areas for the INAI (Table 6). These include dry-mesic sand prairie (Grades A and B), loess hill prairie (Grade B), and algific talus slopes (no grade or acreage available). The total acreage for Category I natural areas is 48.3 acres, or about 0.0076% of the DAA. Several areas have been identified as Category I Natural Areas in the DAA but have not gone through the Illinois Natural Areas Inventory nomination process. In addition, a large portion of natural habitat is not actively being managed at the present time. Examples include the sand prairie and sand savanna habitat of the Savanna Army Depot. Active management; such as controlled burning, will probably add additional acreage of Category I Natural Areas to the DAA.

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

NA#[2]	County	Acres	Acres in DAA	Name
384	**Carroll**	**2.4**	**2.4**	**Mississippi Palisades Geological Area**
402	**Carroll**	**120.6**	**120.6**	**Ayers Sand Prairie**
410	**Carroll**	**407.8**	**407.8**	**Mississippi Palisades**
411	**Carroll**	**141.9**	**141.9**	**Camp Benson**
412	**Carroll**	**3,648.3**	**3,680.0**	**Blackhawk Otter Habitat**
414	Carroll	1.6		Brookville Lutheran Cemetery Prairie
416	**Carroll**	**37.1**	**37.1**	**Savanna South Railroad Prairie**
469	**Jo Daviess**	**5.5**	**5.5**	**East Dubuque Geological Area**
470	**Jo Daviess**	**1.0**	**1.0**	**Scales Mound Geological Area**
471	**Jo Daviess**	**1.7**	**1.7**	**Wise Lake Geological Area**
472	**Jo Daviess**	**2.5**	**2.5**	**Royal Princess Geological Area**
473	**Jo Daviess**	**1.2**	**1.2**	**Dixon Creek North Geological Area**
516	**Carroll**	**1.0**	**1.0**	**Savanna Geological Area**
517	**Carroll**	**12.7**	**12.7**	**Wacker Geological Area**
518	**Carroll**	**2.8**	**2.8**	**Mt. Carroll North Geological Area**
606	**Jo Daviess**	**6,899.0**	**6,899.0**	**Jo Daviess County Otter Habitat**
607	**Jo Daviess**	**5.0**	**5.0**	**Pilot Knob Geological Area**
608	**Jo Daviess**	**15.7**	**15.7**	**Horseshoe Mound Geological Area**
875	Whiteside	1.4		Clyde Cemetery Prairie
965	**Jo Daviess**	**13.062.0**	**13,062.0**	**Savanna Army Depot**
1023	**Whiteside**	**296.1**	**296.1**	**Thomson-Fulton Sand Prairie**
1058	**Jo Daviess**	**381.9**	**381.9**	**Hanover Bluff**
1069	**Jo Daviess**	**1,192.7**	**1,192.7**	**Apple River Canyon**
1075	Whiteside	49.5		Lyndon - Agnew Railroad Prairie

Table 5. Continued.

NA#[2]	County	Acres	Acres in DAA	Name
1100	**Jo Daviess**	**611.8**	**221.9**	**Ward's Grove**
1102	**Jo Daviess**	**152.5**	**152.5**	**Princess Mine Algific Slope**
1104	**Whiteside**	**58.9**	**58.9**	**Prairie Trails**
1288	**Carroll**	**1.8**	**1.8**	**Redroot Site**
1289	**Carroll**	**5996.0**	**5,397.4**	**Spring Lake**
1290	**Carroll**	**0.2**	**0.2**	**Argo Fay Site**
1291	**Carroll**	**0.3**	**0.3**	**Palisades Stickseed Site**
1296	Rock Island	1,643.2		Mississippi River - Cordova
1440	**Jo Daviess**	**26.7**	**26.7**	**Galena River Bluff**
1441	**Jo Daviess**	**48.1**	**48.1**	**Rice Algific Slope**
Total in DAA:			**32,177.4**	

[1] Bold type indicates natural area within the DAA.

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

Table 6. Catagory I natural communities represented in the Driftless Assessment Area.[1]

Community type	Grades in DAA	Acres of category I in the DAA			Acres of category I in Illinois			% of Illinois category I in the DAA		
		Grade A	Grade B	Total in DAA	Grade A	Grade B	Illinois Total	Grade A	Grade B	% of Illinois
Dry sand prairie	A,B	1.6	29.6	31.2	122.0	293.0	415.0	1.3	10.1	7.5
Dry-mesic sand prairie	A,B	10.0	4.1	14.1	256.0	81.0	337.0	3.9	5.1	4.2
Loess hill prairie	B	0.0	3.0	3.0	0.0	21.4	752.0	0.0	14.0	0.4
Algific talus slope										
Total:		11.6	36.7	48.3	378.0	395.4	1504.0			

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

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). Five Illinois Nature Preserves occur within the DAA (Table 7, Figure 11).

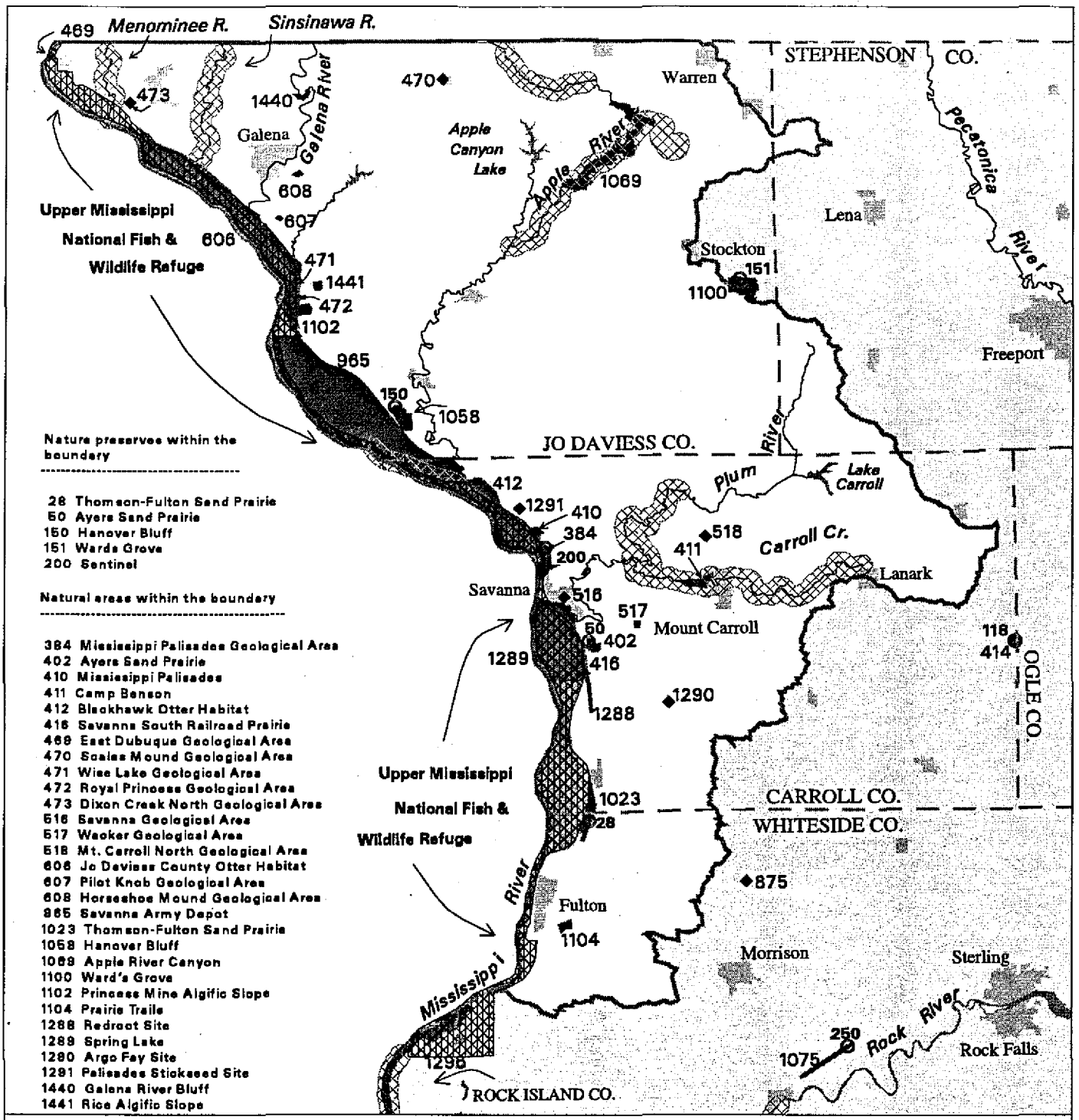

Figure 11. Natural areas, nature preserves and biologically significant stream segments in the Driftless Assessment Area.

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

NP#[2]	Corr-NA[3]	County	Acres	Acres in DAA	Name
28	**1023**	**Whiteside**	**85.9**	**85.9**	**Thomson-Fulton Sand Prairie**
50	**402**	**Carroll**	**118.1**	**118.1**	**Ayers Sand Prairie**
118	414	Carroll	4.9		Brookville Lutheran Cemetery Prairie
150	**1058**	**Jo Daviess**	**386.3**	**386.3**	**Hanover Bluff**
151	**1100**	**Jo Daviess**	**310.6**	**87.5**	**Wards Grove**
200	**410**	**Carroll**	**50.5**	**50.5**	**Sentinel**
250	1075	Whiteside	58.8		Lyndon Prairie
Total acres in DAA:				**723.3**	

[1] Bold type indicates nature preserve occurs within the assessment area.

[2] The nature preserve number (NP#) refers to the number designated in the Natural Heritage Database (Illinois Department of Natural Resources 1997) and in Figure 11.

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

Biological Stream Categorization and Biologically Significant Streams

Illinois streams have also been categorized based on their quality. One stream quality index used to identify high-quality streams is the Biological Stream Characterization (BSC). The BSC was developed by the Illinois Department of Conservation and the Illinois Environmental Protection Agency (Bertrand et al. 1995) and is derived from data on fish populations, water quality, and aquatic macroinvertebrates. In the BSC, stream segments are categorized from "A" (highest quality) to "E" (lowest quality). Twenty-four stream segments in Illinois currently are considered to be in the "A" category, and 50 in the "B" category.

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

Seven areas of theDAA were recognized as Biologically Significant Streams (BSS) (Page et al. 1992) because of their mussel and fish diversity (Table 8, Figure 11). These streams provide the best opportunities for in the basin for the protection of large numbers of native species.

Table 8. Biologically significacnt stream segments in the Driftless Assessment Area.

Site Description	Length (Miles)
Menominee River	5.1
Sinsinawa River	9.1
West Fork Apple River	6.5
Apple River, Wolf Creek to Mill Creek	15.7
Carroll Creek	10.9
Plum River, East Plum River to Carroll Creek	18.5
Mississippi River, rm 545-550, Carroll County	5.3
Total:	**71.1**

Threatened and Endangered Species

At least 100 species of threatened or endangered plants and animals occur in the DAA (Table 9). This number includes 2 that are federally threatened and 2 that are federally endangered. Only 21.5% of the state's 363 threatened or endangered plants are known to occur in the DAA. For other taxa, the percentage of the state's threatened or endangered species that occur in the area are as follows: mollusks (30.8%), crustaceans (16.7%), fishes (13.3%), amphibians (0%), reptiles (15.4%), birds (42.9%), and mammals (11.1%).

This list includes only those species that are known to breed in the DAA. Migrant bird species and those that only overwinter in the area are not listed in Table 9; these species will be mentioned in the chapter that describes bird communities.

Table 9. Threatened and endangered species occurring in the Driftless Assessement Area.
(ST = state threatened; SE = state endangered; FT = federally threatened; FE = federaly endangered)

Common Name	Scientific Name	Status
Plants:		
Moschatel	*Adoxa moschatellina*	SE
Bearded wheat grass	*Agropyron subsecundum*	SE
Shadbush	*Amelanchier interior*	SE
Woolly milkweed	*Asclepias lanuginosa*	SE
Forked aster	*Aster furcatus*	ST
Kitten tails	*Besseya bullii*	ST
Northern grape fern	*Botrychium multifidum*	SE
Grass pink orchid	*Calopogon tuberosa*	SE
Fiberous-rooted sedge	*Carex communis*	SE
Sedge	*Carex heliophyla*	SE
Spreading sedge	*Carex laxiculmis*	SE
Drooping sedge	*Carex prasina*	SE
Shaved sedge	*Carex tonsa*	SE
Pretty sedge	*Carex woodii*	SE

Table 9. Continued.

Common Name	Scientific Name	Status
Downy yellow painted cup	*Castilleja sessiliflora*	SE
Redroot	*Ceanothus ovatus*	SE
Pipsissewa	*Chimaphila unbellata*	SE
American bugbane	*Cimicifuga americana*	SE
Small encjanter's nightshade	*Circaea alpina*	SE
Hill's thistle	*Cirsium hillii*	ST
Mountain clematis	*Clematis occidentalis*	SE
Hemlock parsley	*Conioselinum chinense*	SE
Golden corydalis	*Corydalis aurea*	SE
Beaked hazelnut	*Corylus comuta*	SE
Umbrella sedge	*Cyperus grayioides*	ST
White lady's slipper	*Cypripedium candidum*	SE
Showy lady's slipper	*Cypripedium reginae*	SE
Meadow horsetail	*Equisetum pratense*	SE
Dwarf scouring rush	*Equisetum scirpoides*	SE
northern mana grass	*Glyceria borealis*	SE
Oak fern	*Gymnocarpium dryopteris*	SE
Scented oak fern	*Gymnocarpium robertianum*	SE
Stickseed	*Hackelia americana*	SE
False heather	*Hudsonia tomentosa*	SE
Western wild lettuce	*Lactuca ludoviciana*	SE
Pale vetchling	*Lathyrus ochroleucus*	ST
Pinweed	*Lechea intermedia*	SE
Hairy woodrush	*Luzula acuminata*	SE
Running pine	*Lycopodium clavatum*	SE
Ground pine	*Lycopodium dendroideum*	SE
Prairie dandelion	*Microseris cuspidata*	SE
Yellow monkey flower	*Mimulusglabratus*	SE
Hairy umbrella-wort	*Mirabilis hirsuta*	SE
Fragile prickly pear	*Opuntia fragilis*	SE
Clustered broomrape	*Orobanche fasciculata*	SE
Broomrape	*Orobanche ludoviciana*	SE
Rice grass	*Oryzopsis racemosa*	ST
Large-flowered beard tongue	*Penstemon grandiflorus*	SE
White prairie fringed orchid	*Platanthera luecophaea*	SE, FT
Weak bluegrass	*Poa languida*	SE
James' clammyweed	*Polanisia jamesii*	SE
Pink milkwort	*Polygala incarnata*	SE
Bird's eye primrose	*Primula mistassinica*	SE
Prairie buttercup	*Ranunculus rhomboideus*	ST
Rose	*Rosa acicularis*	SE
Blue sage	*Salvia azurea ssp. pitcheri*	ST
False melic grass	*Schizachne purpurascens*	SE
Cliff goldenrod	*Solidago sciaphila*	ST
Sullivantia	*Sullivantia renifolia*	ST

Table 9. Continued.

Common Name	Scientific Name	Status
Snowberry	*Symphoricarpos albus var. albus*	SE
Ear-leaved false foxglove	*Tomanthera auriculata*	ST
Ill-scented trillium	*Trillium erectum*	SE
Rock elm	*Ulmus thomasii*	SE
Canada violet	*Viola canadensis*	SE
Hairy white violet	*Viola incognita*	SE
White camass	*Zigadenus glaucus*	SE
Birds:		
Sharp-shinned Hawk	*Accipiter striatus*	SE
Henslow's Sparrow	*Ammodramus henslowii*	SE
Great Egret	*Ardea albus*	ST
Upland Sandpiper	*Bartramia longicauda*	SE
American Bittern	*Botaurus lentiginosus*	SE
Red-shouldered Hawk	*Buteo lineatus*	SE
Veery	*Catharus fuscescens*	ST
Brown Creeper	*Certhia americana*	ST
Northern Harrier	*Circus cyaneus*	SE
Common Moorhen	*Gallinula chloropus*	ST
Bald Eagle	*Haliaeetus leucocephalus*	SE,FT
Least Bittern	*Ixobrychus exilis*	SE
Loggerhead Shrike	*Lanius ludovicianus*	ST
Black-crowned Night-Heron	*Nycticorax nycticorax*	SE
Double-crested Cormorant	*Phalarocorax auritus*	ST
Pied-billed Grebe	*Podilymbus podiceps*	ST
Barn Owl	*Tyto alba*	SE
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	SE
Mammals:		
River otter	*Lontra canadensis*	SE
Reptiles:		
timber rattlesnake	*Crotalus horridus*	ST
western hognose snake	*Heterodon nasicus*	ST
Insects:		
Swamp Metalmark	*Calephelis mutica*	SE
Ottoe Skipper	*Hesperia ottoe*	ST
Melissa Blue	*Lycaeides melissa*	FE
Aquatic Biota:		
Fishes		
lake sturgeon	*Acipenser fulvescens*	SE
western sand darter	*Ammocrypta clara*	SE
pallid shiner	*Hybopsis amnis*	SE
blacknose shiner	*Notropis heterolepis*	SE
Freshwater mussels		
slippershell mussel	*Alasmidonta viridis*	SE
Iowa Pleistocene Snail	*Discus macclintocki*	SE,FE
butterfly	*Ellipsaria lineolata*	ST

Table 9. Continued.

Common Name	Scientific Name	Status
elephantear	*Elliptio crassidens*	ST
spike	*Elliptio dilatata*	ST
ebonyshell	*Fusconaia ebena*	ST
Higgins eye	*Lampsilis higginsii*	SE,FE
sheepnose	*Plethobasus cyphyus*	SE
Freshwater crustaceans		
Isopod	*Caecidotea spatulata*	SE
Amphipod	*Stygobromus iowae*	SE

Natural Vegetation Communities

The description of the vegetation for the Driftless Assessment Area (DAA) is organized into the following 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 and recommendations.

Comparisons of Biodiversity in DAA To Statewide Patterns

Prairie - It is estimated 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). On a statewide basis, Iverson (1988) and Iverson et al. (1989) estimated 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 DAA, there were an estimated 142,309 acres (22.3%) of prairie in 1820 (Illinois Geographic Information System). The Natural Areas Inventory identified a total of 48.3 acres of high-quality prairie, mostly sand prairie, which represents only 0.033% of the original 142,309 acres (Table 6). Recently, prairie habitat has been found in the DAA that may be of Category I quality but it has yet to go through the Natural Area Inventory nomination process. This includes dolomite hill prairie (Taft 1995), dry-mesic prairie (Handel & Marlin 1996a), and dry-mesic sand prairie (Handel 1997b). There is an undetermined amount of lower-quality prairie throughout the DAA. This includes prairie openings scattered in upland forests (Taft 1993; Rachuy 1994; Handel 1994, 1997a, unpublished data 1986 - 1997; Handel & Marlin 1996a, b) and loess, sand, and dolomite hill prairies along the Mississippi River and its tributaries (Taft 1993; Rachuy 1994; Handel 1994; Handel & Marlin 1996a, b), and sand prairies in the Mississippi River valley (Handel, unpublished data 1986 - 1997; Rosburg 1996; Roberston et. al 1997). There is vast potential for prairie restoration in the DAA. Several restoration and reconstruction projects are currently underway in the DAA at this time; this will be discussed in detail in the restoration section of this report.

Forest - About 30% of the presettlement acreage of forest remains statewide (Iverson et al. 1989), although only about 0.3% of the remaining forest (0.1% of presettlement forest area) remains in a high-quality condition. In the DAA, there was an estimated 468,909 acres (73.5%) of forest in 1820. Today, forest comprises about 17.8% of the total land area (127,517 acres), this is about 27.1% of the acreage that existed prior to European settlement. Most of the remaining forest is in degraded condition. No acres of high-quality

forest were identified by the Natural Areas Inventory. Recently, forested habitat has been found in the DAA that may be of Category I quality but it has yet to go through the Natural Area Inventory nomination process. The majority of this is mesic upland forest on north-facing slopes (Taft 1993, Handel 1994, Handel & Marlin 1996a).

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).

Today, savannas are one of the rarest habitats in Illinois and the Midwest (Nuzzo 1986). The Illinois Natural Areas Inventory (White 1978) identified only 1,299.2 acres of savanna in all of Illinois, mostly sand savanna. No areas of savanna of high quality were found in the DAA during the Illinois Natural Areas Inventory (White 1978). Savanna communities in the DAA include dry to dry-mesic sand savanna in the Savanna Army Depot (Robertson et. al 1997) and, to a lesser extent, in the river bluffs adjacent to large sand areas of the DAA (Handel, unpublished data 1986 - 1997). Plant species that are thought to be indicators of savanna communities in the Driftless Area (Pruka 1995) and throughout Illinois (Madany 1981) occur throughout the upland areas. Most of these species are now concentrated along roadsides or near existing prairie openings. These areas will be discussed in greater detail in the savanna community section of this report. The fate of savannas in the DAA has been the same as in many areas of the Midwest - once frequently occurring, but for the most part undocumented, and now rare and inadequately studied.

Wetlands - Natural wetlands in Illinois have declined from presettlement statewide estimates of about 23% of the land area (9,412,659 acres) to about 2.6%, or about 11% of the presettlement total (Havera and Suloway 1994). Only about 6,000 acres of wetland habitat remains in a high-quality condition (White 1978). This represents about 0.65% of the remaining wetland acreage and 0.07% of the presettlement wetland area.

The majority of the DAA is unglaciated uplands; therefore the percentage of wetland acres is relatively small compared to the glaciated areas to the east and south of the DAA. No high-quality wetlands were found in the DAA during the Illinois Natural Areas Inventory (White 1978). In 1820, wetlands and/or open water accounted for 21,449 acres (3.4%). Today wetlands 16,982 acres (2.7%) and open water 28,868 acres (4.5%) account for 62,832 acres (6.7%) of the DAA (IGIS database). This figure shows an increase of 3.3% of wetland habitat in the DAA. This is misleading because the lock and dam system that was established about 50 years ago flooded a large area of land in the DAA. This probably included floodplain forest, marsh, wet prairie, and other potential wetland habitats. Several of these areas adjacent to the river had already been converted to agricultural use (pers. comm. John Jachino and Bob Kunth). The damming of the river has probably increased deep water habitats as well as backwater marsh habitat. Several areas also have been augmented by the United States Fish and Wildlife Service within the Upper Mississippi River Fish and Wildlife Refuge for waterfowl and fish habitat. The artificial

Galena, Apple River Canyon, and Carroll lakes have increased the acreage of open water as well (Figure 9). Probably the biggest loss of presettlement wetland habitat has occurred along the bluffs between Savanna and Fulton. At one time there were a series of shallow lakes and marshes that extended almost the entire length of the bluff. This area was known as Dyson and Goose lakes (United States Geological Survey 15 Minute Topographic Maps: Savanna 1892 Illinois and Clinton, Iowa 1894). These wetlands covered an estimated 8,000 to 10,000 acres. This area was later drained and converted to agricultural crops. There probably has been some loss of wetlands in the interior of the DAA along stream and river drainages as well as on the eastern edge of the DAA where the topography has allowed conversion to agricultural crops. Judging from the existing wetland vegetation, most of these wetlands were probably sedge meadows, seeps, and wet prairie habitat.

Vascular Plants - The DAA is floristically rich, due in part to the area's geologic and climatic history. An incomplete species list is given in Appendix 1 and again, listed by scientific name, in Appendix 2; nomenclature follows Mohlenbrock (1986) and/or Gleason and Cronquist (1991). This list was compiled from various sources, including natural area files in the herbarium of the Illinois Natural History Survey as well as published and unpublished data from numerous sources that will be cited in descriptions of individual communities and locations.

Based on this information, the list in Appendix 1 contains 1,118 taxa (species, subspecies, and varieties). Of these, 915 plants (81.8%) are native to the DAA, while 203 (18.1%) have been introduced from other geographical areas and have become naturalized. Undoubtedly, more species occur in the DAA then are included in the list. Nevertheless, it is clear that the DAA has one of the richest floras of any area in Illinois. About 2,200 taxa of vascular plants 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 about 41.6% of all Illinois native flora occurs in the DAA, an area that only comprises only about 1.7% of the states total land area. Some of these species are in habitats that also are rare elsewhere in the state, such as prairies, savannas, wetlands, and cliffs, etc. A number of plant species are known in Illinois only from the DAA. These are in specialized habitats such as algific slope and dolomite cliff communities. Algific slopes are rare communities with species of plants that are disjunct from their northern range and are considered to be communities of special concern.

Illinois Threatened and Endangered Species

In Illinois, there are 306 plant species currently listed as endangered and 57 listed as threatened (Illinois Endangered Species Protection Board 1994). A total of 66 threatened and endangered (T & E) species (21.5%) are known to occur or to have occurred recently in the DAA (Herkert 1991, 1994). Of these, 55 are state endangered and 11 are state threatened; one state endangered species, the prairie white-fringed orchid (*Platanthera leucophaea*) is also listed as federally threatened. Today, 17 T & E species of plants are

found in Illinois only within the DAA. These occur mostly on algific slopes, sand prairies, and dolomite cliff communities. Species in all dedicated Illinois Nature Preserves and Illinois State Parks are legally protected; however, many natural areas are in private ownership and, under current Illinois law, T & E plant species have no legal protection on private property. The number of threatened and endangered species that occur in a particular habitat are as follows:

Forest		**Prairie**		**Savanna**		**Wetlands**		**Primary**	
upland	17	mesic	8	sand	13	seeps, springs	6	dry cliff	9
floodplain	1	sand	18	dry-mesic	2	marsh	0	mesic cliff	18
dry sand	5	hill	14			sedge meadow	1	glade	4
mesic sand	7							algific slopes	8

These habitat categories are not mutually exclusive since species can occur in more than one habitat. The entire list of threatened and endangered species in the DAA is given in Table 10. The majority of the threatened and endangered species in the DAA are found in prairie and forest communities with sandy soils and plant communities associated with dolomite cliffs. Many of the cliff species are species of northern distribution and glacial relicts. These are isolated on the cool microclimates of the north-facing dolomite cliffs and talus slopes (Hartley 1966). The sand and hill prairies have species that are of western and northwestern Great Plains origin and migrated into the DAA during the xerothermic period approximately 8,000 years ago when prairie became a dominant vegetation type in the Midwest (King 1983).

Table 10. Threatened and endangered plant species reported from the Driftless Assessment Area.

(SE = state endangered; ST = state threatened; FT = federally threatened)

Common Name	Scientific Name	Status	Habitat
American bugbane	*Cimicifuga americana*	SE	upland mesic forests
beaked hazelnut	*Corylus comuta*	SE	algific slopes
bearded wheat grass	*Agropyron subsecundum*	SE	mesic sand prairies and wet dolomite cliffs
bird's eye primrose	*Primula mistassinica*	SE	mesic dolomite cliffs
blue sage	*Salvia azurea ssp. pitcheri*	ST	sand hill prairies, sand prairies, and sand savannas
broomrape	*Orobanche ludoviciana*	SE	blowouts in dry sand prairies, hill prairies, and sand savannas
Canada violet	*Viola canadensis*	SE	algific slopes, limestone talus, cliffs
cliff goldenrod	*Solidago sciaphila*	ST	dolomite cliffs, cedar glades, and talus slopes in the DAA
clustered broomrape	*Orobanche fasciculata*	SE	sand prairies and sand savannas

Table 10. Continued.

Common Name	Scientific Name	Status	Habitat
downy yellow painted cup	*Castilleja sessiliflora*	SE	dry-mesic gravel and sand prairies
drooping sedge	*Carex prasina*	SE	springs and seeps in mesic upland forests
dwarf scouring rush	*Equisetum scirpoides*	SE	limestone cliffs / mesic sand forests and algific slopes in Iowa's Driftless Area (Nekola 1990), and (Pusateri et. al.1993)
ear-leaved false foxglove	*Tomanthera auriculata*	ST	Pepoon (1910) reported to mesic prairie openings associated with aspen thickets, savannas, mesic sand prarire
false heather	*Hudsonia tomentosa*	SE	sand prairies in sand blowout areas
false melic grass	*Schizachne purpurascens*	SE	dolomite outcrops and talus slopes
fiberous-rooted sedge	*Carex communis*	SE	mesic upland forests, rocky slopes
forked aster	*Aster furcatus*	ST	mesic forest, seeps, and eroding streambank.
fragile prickly pear	*Opuntia fragilis*	SE	dry sand prairies
golden corydalis	*Corydalis aurea*	SE	dry sand hill prairies and sand prairies
grass pink orchid	*Calopogon tuberosa*	SE	Pepoon (1909a) reported from dolomite cliff in Jo Daviess County
ground pine	*Lycopodium dendroideum*	SE	mesic sand forests in the Driftless (pers.comm. Randy Nyboer IDNR)
hairy umbrella-wort	*Mirabilis hirsuta*	SE	hill prairies, sand prairies, and sand savannas
hairy white violet	*Viola incognita*	SE	mesic sand forests
hairy woodrush	*Luzula acuminata*	SE	mesic sand forests in Driftless Area Illinois. Also found on Algic slopes in Iowa (Pusateri et. al. 1993)
hemlock parsley	*Conioselinum chinense*	SE	mesic dolomite cliffs
Hill's thistle	*Cirsium hillii*	ST	hill prairies and savannas
ill-scented trillium	*Trillium erectum*	SE	mesic upland forests
James' clammyweed	*Polanisia jamesii*	SE	dry open sand prairies and sand savannas
kitten tails	*Besseya bullii*	ST	sand savannas, dolomite cliffs, hill prairies, and cedar glades
large-flowered beard tongue	*Penstemon grandiflorus*	SE	dry sand and hill prairies

Table 10. Continued.

Common Name	Scientific Name	Status	Habitat
meadow horsetail	*Equisetum pratense*	SE	mesic sand forest, near seeps on sandy soil
moschatel	*Adoxa moschatellina*	SE	mesic forests/talus slopes. algific slopes in Iowa (Nekola 1990), and (Pusateri et. al. 1993)
mountain clematis	*Clematis occidentalis*	SE	algific slopes
northern grape fern	*Botrychium multifidum*	SE	dry sand forests and savannas mesic sand forest slopes in Iowa driftless (Pusateri et. al. 1993)
northern mana grass	*Glyceria borealis*	SE	Marsh and accocitated wetland habitats
oak fern	*Gymnocarpium dryopteris*	SE	dolomite cliffs and ledges; moist sand forests
pale vetchling	*Lathyrus ochroleucus*	ST	dolomite cliffs and savannas
pink milkwort	*Polygala incarnata*	SE	Peppoon (1927) reported from mesic prairie on eastern edge of DAA
pinweed	*Lechea intermedia*	SE	dry sand prairies usually in dry, sterile, sandy soils
pipsissewa	*Chimaphila unbellata*	SE	Pepoon (1909a) reported from dolomite cliff in Jo Daviess County)
prairie buttercup	*Ranunculus rhomboideus*	ST	dry gravel and dolomite prairies
prairie dandelion	*Microseris cuspidata*	SE	dry-mesic prairies and sand hill prairies
pretty sedge	*Carex woodii*	SE	mesic upland forests, dolomite talus slopes
redroot	*Ceanothus ovatus*	SE	sand prairies, savannas, and dolomite hill prairies
rice grass	*Oryzopsis racemosa*	ST	mesic forest slopes, dolomite cliffs and talus slopes, and algfic slopes
rock elm	*Ulmus thomasii*	SE	calcarous slopes of mesic forests; floodplain terraces
rose	*Rosa acicularis*	SE	algific slopes and mesic forest slopes
running pine	*Lycopodium clavatum*	SE	sand seeps, dry sandy areas
scented oak fern	*Gymnocarpium robertianum*	SE	north facing limestone bluffs/ Iowa algific slopes (Nekola 1990)
sedge	*Carex heliophyla*	SE	sand hill prairies (Schwegman 1995)
shadbush	*Amelanchier interior*	SE	sand or dolomite stream bluffs/ algific slopes (Schwegman 1982)
shaved sedge	*Carex tonsa*	SE	dry sand savanna, prairie, and blowouts

Table 10. Continued.

Common Name	Scientific Name	Status	Habitat
showy lady's slipper	*Cypripedium reginae*	SE	(Pepoon 1909a) mesic dolomite cliffs.
small encjanter's nightshade	*Circaea alpina*	SE	algific slopes, mesic dolomite cliffs
snowberry	*Symphoricarpos albus var. albus*	SE	dry sand hill prairie, sand forest, and reported by Pepoon (1909a) from dolomite cliffs
spreading sedge	*Carex laxiculmis*	SE	mesic upland forests
stickseed	*Hackelia americana*	SE	dolomite bluffs, cedar barrens
sullivantia	*Sullivantia renifolia*	ST	moist shaded dolomite cliffs
umbrella sedge	*Cyperus grayioides*	ST	dry sand prairie, blowouts
weak bluegrass	*Poa languida*	SE	mesic upland forest
western wild lettuce	*Lactuca ludoviciana*	SE	prairies and sand prairies
white camass	*Zigadenus glaucus*	SE	dolomite cliffs
white lady's slipper	*Cypripedium candidum*	SE	Pepoon reported from Apple River valley (Pepoon 1927)
white prairie fringed orchid	*Platanthera luecophaea*	SE/FT	Reported by Pepoon (1927) from mesic-prairie on eastern edge of DAA
woolly milkweed	*Asclepias lanuginosa*	SE	dry sand hill prairies
yellow monkey flower	*Mimulusglabratus*	SE	Reported by Hartley (1966) from spring seep area Apple River

Several factors are responsible for a plant species being threatened and endangered in Illinois (Taft 1995). (1) The species are naturally sparse or infrequently occurring, probably even prior to European settlement. Ear-leaved foxglove is an example in the DAA. (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 T & E species in the DAA. These species are common, often abundant, in areas to the north and west of Illinois, and they only occur in Illinois in the northwestern counties or in sand areas. (3) The populations that occur in Illinois are geographically separated, or disjunct, from the principal range of the species. Examples include scented hay fern and moschatel; these plants occur on cool, mesic habitats of north-facing cliffs. (4) Species are restricted or endemic to Illinois. Only two species are considered endemic to Illinois and they do not occur in the DAA. Cliff goldenrod is considered to be an endemic of the Driftless Area; it occurs on cliff communities in the DAA (Pusateri et al. 1993). (5) Habitat degradation caused by human activities such as gravel or peat mining, soil scraping, overgrazing by livestock; and the introduction of aggressive non-native species that often can replace native species. (6) Disruption of ecological processes,

including fires, 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. This is a major cause for rarity of native organisms in Illinois, and this impact will undoubtedly be an important factor within the DAA in the near future as the area currently is undergoing an increase in recreational and residential development.

Disturbance, Habitat Quality, and Restoration Potential

In addition to habitat loss through conversion to agricultural and urbanization, most remnant plant communities in the DAA have experienced other human-related 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 species into natural habitats are other consequences typical of intensive habitat conversion that have implications for habitat restoration potential. These issues are discussed below.

Plant communities (or ecosystems) are *degraded* when recovery to original condition is unlikely under normal circumstances. Degraded lands can be separated further into those that can be *restored* to a functional community 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 similar to the original but where compositional differences remain (Lovejoy 1975). Disturbance that exceeds 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. Common sources of degradation in Illinois plant communities overgrazing by livestock (Dennis 1997) or deer (Anderson 1997) and the introduction of exotic species; however, multiple factors often are interacting.

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. The absence of fire 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 or fire absence (Anderson 1982, Nuzzo 1986). In addition, if a fire-dependent community goes too long without fire, it may accumulate so much woody fuel that a fire would be catastrophic, killing adult trees and perhaps even sterilizing the soil. Prescribed fire, designed to mimic the natural fire regime, seems to offer the best hope of maintaining natural diversity in these communities (Noss & Cooperrider 1994).
According to Noss and Cooperrider (1994) **fragmentation** is one of the greatest threats to biodiversity worldwide. Fragmentation is often considered to have two components: (1) a decrease in some habitat type or perhaps all natural habitat in a landscape; and (2)

apportionment of the remaining habitat into smaller, more isolated pieces (Wilcove et al 1986). Besides the problem of small populations in small habitat patches being more likely to be extirpated, small isolated patches also are greatly affected by their surroundings. Sun, wind, rain, and other physical factors create an environment near the edge different from that of the interior, particularly in forested habitat (Noss & Cooperrider 1994). As surrounding vegetation decreases, native browsing animals, such as deer, concentrate in fragmented remnants causing increased impact (Anderson 1997).

Integrity is lowered not only by the loss of native species, but also by the introduction of **exotic species** (non-native, adventive). Adventive species may fill niches formerly occupied by native species. Because of a lack of natural predators and/or lack of competition from native species exotic species often overrun plant communities, causing a decrease in biodiversity. Degraded natural communities are particularly vulnerable to invasion of exotic species. In the DAA, purple loosestrife and garlic mustard are two outstanding examples of the negative effects of exotic species on native communities. Specific and general recommendations for restoration of natural communities in the DAA, including exotic species control measures, are offered in the Summary and Recommendations section following descriptions of natural communities.

Natural Areas and Nature Preserves

The Illinois Natural Areas Inventory (INAI) was conducted by the University of Illinois, the Natural Lands Institute, and the Illinois Department of Conservation (currently Illinois Department of Natural Resources) over a three-year period during the mid 1970's 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, 1981a, b, c). The natural quality of a natural community was graded from A (relatively stable or undisturbed) to D (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.

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). Five Illinois nature preserves occur within the DAA.

Ayers Sand Prairie (Carroll County) - is a relatively large preserve containing dry to dry-mesic sand prairie communities typical of the Mississippi River Section of the Illinois and Mississippi River Sand Division.

Sentinel (Carroll County) - is named for the large dolomite promontory. Many rare plant species are known in the surrounding upland forests and associated rock formations. The preserve also has a small loess hill prairie. The preserve is located in the Mississippi Palisades State Park.

Hanover Bluff (Jo Daviess County) - consists of several plant communities, including upland sand forest, sand hill prairie, dry-mesic and mesic upland forest, and dolomite cliffs. Many rare plants and animals exist in the preserve.

Ward's Grove (Jo Daviess County) - is a large dry-mesic and mesic upland forest located on a large dolomite ridge on the eastern edge of the Driftless Area. It is important for many forest sensitive birds that need large tracts of unbroken forest for nesting.

Thomson-Fulton Sand Prairie (Whiteside County) - is similar to Ayers Sand Prairie and within the same natural division. It has several unique plant and animal species.

Tables 5 and 7 provide a listing by county and acreage of all natural areas and nature preserves present in the DAA and surrounding area. The combined area for all natural areas in the DAA is approximately 33,280.15 acres or 5.2% of the assessment area. Within the DAA three community types qualify as high-quality, undegraded (Category I) natural communities for the INAI (Table 6). These include dry-mesic sand prairie (Grades A and B), loess hill prairie (Grade B), and algific talus slopes (no grade or acreage available). The total acreage for Category I natural areas is 48.3 acres, or about 0.0076% of the DAA. As stated earlier in the "Comparisons of Biodiversity Trends" section of this report, several areas in the DAA may be Category I natural areas but they have not gone through the Illinois Natural Areas Inventory nomination process. In addition, a large portion of natural habitat is not actively being managed at the present time. Examples include the sand prairie and sand savanna habitat of the Savanna Army Depot. Active management, such as controlled burning, will probably add additional acreage of Category I natural areas to the DAA.

Terrestrial Natural Community Descriptions

Although the definition of a community is rather straightforward (an assemblage of species occupying a given area), the nature of the community has been the object of study and dispute for years (Kent and Coker 1992). It is not necessary or practical to go into great detail on all aspects of community ecology in the DAA, but it is important to understand basic concepts of succession and factors that effect formation and perpetuation of a plant community. It is important to have this understanding especially when making decisions on the quality of a given community or determining

management strategies. The DAA has a diverse range of plant communities. A wide range of soil (edaphic), topographic (geomorphic), and biotic (human and animal) factors are responsible for the development of plant communities. The *Vegetation of Wisconsin* Curtis (1959) is a useful resource; and it is applicable to the DAA regarding plant communities, ecology, and history of the vegetation of the Upper Midwest.

The majority of natural communities described in this section follow the classification system developed by the Illinois Natural Areas Inventory (White and Madany 1978). There are specific cases in which classification was modified to discuss a particular plant community that was unique or not included in the INAI. The presence of natural communities within the DAA (Table 11) 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. Botanical nomenclature follows Mohlenbrock (1986) and/or Gleason and Cronquist (1991). Scientific names corresponding to the common names used in this text can be found in the summary species list for the DAA (Appendix 1). These taxa are sorted by scientific name in Appendix 2.

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

FOREST
- **Upland forest**
  - dry-mesic upland forest
  - mesic upland forest
- **Sand forest**
  - dry sand forest
  - dry-mesic sand forest
  - mesic sand forest
- **Floodplain Forest**
  - mesic floodplain
  - wet-mesic floodplain
  - wet floodplain

WETLAND
- **Marsh**
- **Seep (w/ sphagnum moss and peat)**
- **Seep (typical)**
- **Sedge Meadow**

LAKE AND POND
- **River lakes**
- **Sand ponds**

PRAIRIE
- **Prairie**
  - dry prairie
  - dry-mesic prairie
  - mesic prairie
  - wet-mesic prairie
  - wet prairie
- **Sand Prairie**
  - dry sand prairie
  - dry-mesic sand prairie
  - mesic sand prairie
- **Hill prairie**
  - loess hill prairie
  - sand hill prairie
  - dolomite hill prairie

CULTURAL
- prairie and wetland restorations
- hayfield pasture (e.g. areas with nonnative grasses)
- cropland (rowcrops)
- urban
- artificial lakes and ponds

SAVANNA
- **Savanna**
  - dry-mesic savanna
- **Sand savanna**
  - dry sand savanna
  - dry-mesic sand savanna

PRIMARY
- **Dolomite (cedar glades)**
- **Cliff**
  - dry cliff
  - mesic cliff (including talus)
  - algific talus slope

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

Specific data sources used include species lists from known community types found in INAI sites and descriptions of vegetation in publications and technical reports. Extensive floras for both state parks (Heim 1984, Wunderlin 1965), as well as a flora of the Driftless Area of Wisconsin, Minnesota, Iowa, and Illinois (Hartley 1966), were all extremely helpful when describing the different plant communities. The papers of Pepoon (1909a, 1909b, 1910, 1917, 1919, 1927) contain fascinating historical information as well as brief discussions and species lists for forest, prairie, and cliff communities. Pepoon's *The Forest Associations of Northwestern Illinois* (1910) includes a map depicting the forest associations through the Driftless Area of Jo Daviess and Carroll counties. Gleason (1910) discussed the sand prairie and savanna communities of the region. There was a gap in specific information about the DAA outside the state parks between the 1930's until about 1990. Fortunately, the DAA recently has been studied again for various reasons. Many technical reports and publications on the region have yielded valuable data on plant communities and threatened and endangered species, as well as trends concerning habitat changes in the DAA. These include Taft (1993, 1995), Rachuy (1994), Handel et al. (1995), Schwegman (1995), Handel (1994, 1996, 1997a, b), Handel & Marlin (1996a, b), Tessene and Harrold (1995), Tessene and Keene (1996), Rosburg (1996), and Roberston et. al (1997). These sources will be cited within the discussion of each community type. In the section on forest, savanna, and cliff communities plants are listed by the stratum they occupy: tree, shrub, vine, or herb layers. For the more open habitats (wetlands and prairies), plants are classified by physiognomy, such as shrubs, grasses, sedges, ferns, or forbs. Soil series that support a particular known community also are included from the soil surveys for Carroll County (Ray 1975), Jo Daviess County (Tegeler 1996) and the National Soils Data Base (Unites States Department of Agriculture 1998). Slope and aspect have a strong influence over the vegetation in the Driftless Area. Lacrescent soil is a common soil type in the DAA; on north to east-facing slopes mesic upland forest is the common vegetation, however on west to south-facing slopes dry-mesic forest, savanna, or even prairie are found on this soil type. The following community descriptions, while not comprehensive, are intended as guides for natural community inventory and restoration efforts in the DAA

Forest

Forests in the DAA are in the Maple-Basswood Forest Region (Braun 1950). The DAA borders the Oak-Hickory Forest Region, including the Mississippi Valley and Prairie Peninsula Sections, on the west and east and the Hemlock-White Pine-Northern Hardwood Region on the north. As Braun states, this has a strong influence on the Driftless Area since many elements from several regions occur throughout the Driftless Area. According to 1820 land data (Illinois Geographic Information System) 73.5% of the DAA was once forested. However, according to a description on a 1829 map (Chandler 1829), the area was described as being only about 10% timber; which occurred in detached groves, with the balance being prairie. This also included the area to the Rock River as well as north to the Wisconsin River. The surveyor's description concentrated on the area near Galena where most of the lead mines were located.

General ecological problems frequently associated with forest communities include habitat degradation, fragmentation, the introduction of non-native plant species, and, in regards to oak-hickory forests, fire suppression. A typical source of habitat degradation in forests is over grazing and browsing, not only by domestic livestock, but also by white-tailed deer which have increased substantially in numbers (Anderson 1997). This grazing often produces changes in forest species composition and structural characteristics. As in much of Illinois, grazing-sensitive species probably have been greatly reduced or eliminated from many forest remnants in the DAA. In contrast, species that increase with grazing often are abundant in overgrazed forest remnants (e.g. thorn-bearing taxa that are unpalatable to livestock such as red haw, honey locust, and Missouri gooseberry). Some non-native species increase in abundance with overgrazing, including Osage orange, multiflora rose, and bush honeysuckle, as well as certain weedy native species, such as coral berry and poison ivy. Recovery of these sites following cessation of grazing generally appears to be slow. However, some forests in the DAA that were grazed as recently as 30 years ago show remarkable recovery. In general, these are on north- to east-facing slopes. The fact that livestock tend to select grasses as forage could be a major factor. Livestock appear to graze on sunny west to south exposures where an open canopy perpetuates a mixture of grasses and open forest species, leaving the northern slopes relatively ungrazed (Handel, personnel observation). Fire absence in upland forest communities typically results in compositional and structural changes in more mesic sites (such as an increase in abundance of sugar maple) and primarily structural changes in drier sites (such as increases in stem density of woody plants. The result is often a reduction in cover and diversity of the herbaceous ground flora, typically the most diverse stratum in Illinois woodlands. In the DAA one of the major problems in forests is the invasion of garlic mustard, an exotic species. Garlic mustard is a problem in disturbed as well as high quality forest habitat where it often dominates to the point of exclusion of other species (Nuzzo 1991). Another exotic species that has become more common is dames' rocket. It is often planted in gardens for its showy white, pink, and purple flowers. During a biological survey in Jo Daviess County, dames' rocket was found growing in a wide range of habitats, including roadsides, floodplain forest, and upland mesic forests. Some populations were several acres in size (Handel 1996).

Forest subclasses in Illinois include **upland forest, sand forest, floodplain forest**, and **flatwoods**. All except flatwoods occur in the DAA. These forest types are characterized below. Around 127,517 acres (20%) of the DAA is forest habitat. No forest communities were classified as high quality, Category I (Grades A and B) (White 1978). As stated earlier under "Comparisons of Biodiversity Trends in DAA to Statewide Patterns," several forests may qualify as Category I natural areas in the DAA but have not gone through the Illinois Natural Areas Inventory nomination process.

Upland Forest

Upland forest communities can be further classified by soil-moisture characteristics. Dry, dry-mesic, mesic, and wet-mesic upland forest communities are recognized in Illinois in the

context of increasing available soil-moisture (White and Madany 1978). The following community types are known to occur in the DAA.

Dry-mesic upland forest - This forest type occurs throughout the uplands of the DAA and reaches its greatest abundance on west- to south-facing slopes, and on the level uplands along dry ridges. Several species of oaks and shagbark hickory are the most common trees encountered.

Mapped soil series: Seaton, Fayette, Timula, Lacrescent, Massbach, Derinda
Characteristic species:

American elm	*Ulmus americana*	tree
bitternut	*Carya cordiformis*	tree
black oak	*Quercus velutina*	tree
red oak	*Quercus rubra*	tree
yellow chestnut oak	*Quercus muhlenbergii*	tree
shagbark hickory	*Carya ovata*	tree
slippery elm	*Ulmus rubra*	tree
sugar maple	*Acer saccharum*	tree
walnut	*Juglans nigra*	tree
white ash	*Fraxinus americana*	tree
white oak	*Quercus alba*	tree
black raspberry	*Rubus occidentalis*	shrub
gooseberry	*Ribes missouriense*	shrub
gray dogwood	*Cornus racemosa*	shrub
hazelnut	*Corylus americana*	shrub
prickly ash	*Zanthoxylem americanum*	shrub
wild blackberry	*Rubus allegheniensis*	shrub
begger's tick	*Desmodium glutinosum*	herb
doll's-eyes	*Actaea pachypoda*	herb
elm-leaved goldenrod	*Solidago ulmifolia*	herb
hog peanut	*Amphicarpa bracteata*	herb
joe-pye weed	*Eupatorium purpureum*	herb
mayapple	*Podophyllum peltatum*	herb
Pennsylvania sedge	*Carex pensylvanica*	herb
white snakeroot	*Eupatorium rugosum*	herb

Mesic upland forest - This forest community has a dense canopy, an understory of shade-tolerant woody species, and a rich variety of spring woodland wildflowers. In the DAA this type of forest is found only in areas that are protected from frequent fires, usually on the north- to east-facing slopes. This forest type is often associated with steep talus slopes along river valleys. Examples of this community occur in Apple Canyon State Park and in the Galena River valleys (Heim 1984, Taft 1993, 1995; Handel and Marlin 1996a, b). In areas of shallow soil over bedrock or areas with extensive rock outcrops this community often contains several threatened and endangered species, as well as flora that are more common north of Illinois.

Mapped soil series: Lacrescent, Lamoille, Derinda

Characteristic species:

basswood	*Tilia americana*	tree
bitternut	*Carya cordiformis*	tree
hop hornbeam	*Ostrya virginiana*	tree
paper birch	*Betula papyrifera*	tree
red oak	*Quercus rubra*	tree
slippery elm	*Ulmus rubra*	tree
sugar maple	*Acer saccharum*	tree
walnut	*Juglans nigra*	tree
white oak	*Quercus alba*	tree
alternate leaved dogwood	*Cornus alternifolia*	shrub
black raspberry	*Rubus occidentalis*	shrub
bladdernut	*Staphylea trifolia*	shrub
chokecherry	*Prunus virginiana*	shrub
gooseberry	*Ribes missouriense*	shrub
honeysuckle	*Lonicera prolifera*	shrub
prickly ash	*Zanthoxylum americanum*	shrub
dwarf honeysuckle	*Diervilla lonicera*	shrub
American spikenard	*Aralia racemosa*	herb
begger's tick	*Desmodium glutinosum*	herb
bellwort	*Uvularia grandifolia*	herb
black-seeded rice grass	*Oryzopsis racemosa*	herb
broad-leaved goldenrod	*Solidago flexicaulis*	herb
declined trillium	*Trillium flexipes*	herb
Dutchman's breeches	*Dicentra cucullaria*	herb
fragile fern	*Cystopteris bulbifera*	herb
leafcup	*Polymnia canadense*	herb
maidenhair fern	*Adiantum pedatum*	herb
red baneberry	*Actaea rubra*	herb
sedge	*Carex albursina*	herb
hepatica	*Hepatica nobilis*	herb
Virginia creeper	*Parthenocissus quinguefolia*	herb
wild ginger	*Asarum canadense*	herb
yellow lady's slipper	*Cypripedium pubescens*	herb

Sand forests

Sand forests are confined to the Mississippi River Valley and upland bluffs adjacent to large sand areas in the DAA. They comprise only a small portion of the forested area in the DAA, but they are floristically diverse and have a unique flora that is rare in Illinois. There is no known acreage for sand forests. For the most part they have been lumped with other categories of forest communities. Like other forest communities in the DAA they share similar problems of over grazing and invasion of exotic species such as black locust, bush honeysuckle, and garlic mustard. In addition, sand forests are highly susceptible to erosion and, in areas of livestock or recreational use, erosion of forest slopes can be severe.

Dry sand forest - This community type is confined to the immediate river bluff terrace adjacent to the Mississippi River. The majority of this habitat occurs in the Savanna Army Depot (Robertson et al. 1997). Smaller areas occur along the river to the confluence of Rush Creek and the Mississippi River (Handel, unpublished data). There may be other small tracts from Riverview south to Fulton. These areas tend to be excessively dry at the surface, but are colonized by tree species that usually are found in more mesic habitats. River birch and green ash are highly adaptable species and probably can tap into the shallow water table adjacent to the river.

Mapped soil series: Plainfield, Bloomfield, Chelsea
Characteristic species:

American elm	*Ulmus americana*	tree
black oak	*Quercus velutina*	tree
burr oak	*Quercus macrocarpa*	tree
cottonwood	*Populus deltoides*	tree
green ash	*Fraxinus pennsylvanica*	tree
hackberry	*Celtis occidentalis*	tree
honey locust	*Gleditsia triacanthos*	tree
red cedar	*Juniperus virginiana*	tree
river birch	*Betula nigra*	tree
white oak	*Quercus alba*	tree
choke cherry	*Prunus virginiana*	shrub
hazelnut	*Corylus americana*	shrub
prickly ash	*Zanthoxylum americanum*	shrub
bittersweet	*Celastrus scandens*	vine
carrion flower	*Smilax lasioneuron*	vine
moonseed	*Menispermum canadense*	vine
poison ivy	*Toxicodendron radicans*	vine
Virginia creeper	*Parthenocissus quinquefolia*	vine
bloodroot	*Sanguinaria canadensis*	herb
enchanter's nightshade	*Circaea lutetiana*	herb
heart-leaved skullcap	*Scutellaria ovata*	herb
Jack-in-the-pulpit	*Arisaema triphyllum*	herb
kittentails	*Besseya bullii*	herb
pointed tick trefoil	*Desmodium glutinosum*	herb
wild sarsaparilla	*Aralia nudicaulis*	herb

Dry-mesic sand forest - This community occurs adjacent to dry sand forests near the Mississippi River (Robertson et al. 1997). This community also occurs on south- to west-facing slopes on the bluffs adjacent to the river. In the latter location these forests are closely associated with sand hill prairies and sand savannas. They range from Hanover Bluff Nature Preserve (Schwegman 1995) southward to the Palisades State Park (Handel 1994, 1997b) There is evidence that this community exists on the bluff south of Savanna as well. A report by Commonwealth Edison Company (1979) on a proposed nuclear power plant site described the vegetation as savanna and xeric upland forest following Curtis (1959). After checking the species list of this area it compares with Hanover Bluff and other dry mesic sand forests to the north vegetatively.

Mapped soil series: Lamont, Bloomfield, Tell
Characteristic species:

basswood	*Tilia americana*	tree
bitternut	*Carya cordiformis*	tree
black oak	*Quercus velutina*	tree
butternut	*Juglans cinerea*	tree
green ash	*Fraxinus pennsylvanica*	tree
hackberry	*Celtis occidentalis*	tree
honey locust	*Gleditsia tricanthos*	tree
red cedar	*Juniperus virginiana*	tree
red oak	*Quercus rubra*	tree
river birch	*Betula nigra*	tree
slippery elm	*Ulmus rubra*	tree
walnut	*Juglans nigra*	tree
white oak	*Quercus alba*	tree
gooseberry	*Ribes missouriense*	shrub
gray dogwood	*Cornus racemosa*	shrub
hazelnut	*Corylus americana*	shrub
prickly ash	*Zanthoxylem americanum*	shrub
wild blackberry	*Rubus allegheniensis*	shrub
begger's tick	*Desmodium glutinosum*	herb
hog peanut	*Amphicarpa bracteata*	herb
lady fern	*Athyrium filix-femina*	herb
lopseed	*Phryma leptostachya*	herb
sedge	*Carex pensylvanica*	herb
shinning bedstraw	*Galium concinnum*	herb
tall agrimony	*Agrimonia gryposepala*	herb
white snakeroot	*Eupatorium rugosum*	herb
wild sarsaparilla	*Aralia nudicaulis*	herb

Mesic sand forest - This community type occurs along the bluffs adjacent to the large sand areas from Hanover Bluff south to the northern forests of the Palisades State Park. There also are mesic sand forests south of Savanna in the bluffs toward Thomson (Randy Nyboer pers. comm., IDNR). Mesic sand forests are on east- to north-facing slopes on the lee side of the bluff line. This forest type rarely extends inland more than a mile from the Mississippi River; after this distance the loess is a finer silty loam. These forests usually have high floristic diversity, especially in regards to species of ferns and orchids. In many areas interrupted fern and Christmas fern form large beds that cover entire hillsides. Mesic sand forest is important habitat for several threatened and endangered state species (Appendix 1).

Mapped soil series: Seaton (sandy substratum), Chelsea, Tell, Lamont
Characteristic species:

basswood	*Tilia americana*	tree
paper birch	*Betula papyrifera*	tree
red oak	*Quercus rubra*	tree
river birch	*Betula nigra*	tree
slippery elm	*Ulmus rubra*	tree

Characteristic species. Continued.

white oak	*Quercus alba*	tree
alternate leaved dogwood	*Cornus alternifolia*	shrub
common ninebark	*Physocarpus opulifoiuis*	shrub
low shadbush	*Amelanchier laevis*	shrub
bracken fern	*Pteridium aquilinum*	herb
bronze fern	*Botrychium dissectum*	herb
Canada mayflower	*Maianthemum canadense*	herb
christmas fern	*Polystichum acrostichoides*	herb
fragile fern	*Cystopteris protrusa*	herb
goat's-beard	*Aruncus dioicus*	herb
green twayblade orchid	*Liparis loesellii*	herb
ground pine	*Lycopodium dendroideum*	herb
lady fern	*Athyrium filix-femina*	herb
meadow horsetail	*Equisteum pratense*	herb
putty root orhid	*Aplectrum hyemale*	herb
purple twayblade orchid	*Liparis liliifolia*	herb
rattlesnake plantain	*Goodyera pubescens*	herb
sedge	*Carex rosea*	herb
shining club-moss	*Lycopodium lucidulum*	herb
shinleaf	*Pyrola elliptica*	herb
sweet cicely	*Osmorhiza claytonii*	herb
wild sarsaparilla	*Aralia nudicaulis*	herb
wood anemone	*Anemone quinquefolia*	herb
wood fern	*Dryopteris carthusiana*	herb
yellow lady-slipper orchid	*Cypripedium pubescens*	herb

Early successional forest (birch-aspen woodland) - This community type is not considered in the Illinois Natural Areas Inventory; however, in adjoining states this community is considered an important component in their mapping of natural communities (Minnesota's Native Vegetation 1993). The Wisconsin Driftless Division has the coldest climate in the state and is characterized by a northern floral element within many of it community types. Because of the geologic, edaphic, and floristic similarities between the Driftless Area of neighboring states, community classification schemes used by neighboring states describe a plant community within the DAA with greater accuracy. Birch-aspen woodland is not included in Table 11 of terrestrial communities because it is considered a short lived transitional stage between many community types. This community is usually found adjacent to upland forest and prairie communities and often has many floristic components common to these communities. It has been included in the communities section because of the unique flora that often is associated with this habitat type in the DAA. Aspen-birch woodlands are short-lived communities that are formed from catastrophic disturbances, especially fire, clear-cutting, or wind throw. In presettlement times aspen-birch woodlands were probably maintained by fire (Minnesota's Native Vegetation 1993). In the DAA birch-aspen woodland can occur in a wide range of habitats. In the bluffs adjacent to the Mississippi River it occurs in dry upland habitat next to prairie openings, sand savannas, and sand forest in mesic ravines. In the remaining area of the DAA the birch-aspen woodland occurs in close proximity to other habitat types, including dry-mesic to mesic

forest, and also adjacent to burr oak savanna remnants and prairie openings. Fitzgerald & Bailey (1984) reported that heavy grazing of livestock practically eliminates aspen regeneration in pastures. At the present time in the DAA substantial acres that were once pastured are being taken out of livestock production for various reasons. In many of these areas river birch, paper birch, big tooth aspen, and quaking aspen colonize the abandoned pastures after 10 - 20 years. In areas of sandy loam soils big tooth aspen is often the dominant tree, frequently forming large stands (Handel, personnel observations). A wide variety of plants colonize these areas; usually they are a combination of different species from surrounding communities, including prairie or forest. A few species appear to reach their greatest abundance in these areas. It may be that the birch-aspen woodland provides an environment of reduced competition or favorable light conditions that make this habitat suitable for early successional species. Pepoon (1910) reported several of what he termed aspen-poplar forests, mostly in the Rush Creek drainage and near Apple River Canyon. These were probably a result of second growth from cut-over timber in the 1800's or, as he stated, "these areas are often in association with small prairie remnants and small circular ponds that were the remnants of old buffalo wallows." Fire suppression on the prairies in these areas probably allowed the aspen to colonize the adjacent land. Pepoon (1910) described several species that are now uncommon or absent in the DAA growing in this forest association; these include bracted green orchid and ear-leaved foxglove, a state threatened species. Recently, a rare sedge, *Carex debilis* var. *rudgei*, was collected from an aspen woodland, only the second collection known from Illinois. Several years ago fringed gentian, another rare species, was also seen in this area (Handel, personnel observation). Although birch-aspen woodland do not at this time make up a large portion of the DAA, it should not be overlooked when an area is inventoried or when making management decisions, especially when considering biodiversity at the landscape level.

Mapped soil series: Various soil types, Lacrescent, Lamont, Seaton, Fayette, Timula, Derinda

Characteristic species:

big-tooth aspen	*Populus grandidentata*	tree
paper birch	*Betula papyrifera*	tree
quaking aspen	*Populus tremuloides*	tree
river birch	*Betula nigra*	tree
black raspberry	*Rubus occidentalis*	shrub
gooseberry	*Ribes missouriense*	shrub
gray dogwood	*Cornus racemosa*	shrub
hazelnut	*Corylus americana*	shrub
Virginia creeper	*Parthenocissus quinguefolia*	vine
bottle gentian	*Gentiana andrewsii*	herb
bracken fern	*Pteridium aquilinum*	herb
bracted green orchid	*Coeloglossum viride*	herb
bronze fern	*Botrychium dissectum*	herb
graceful sedge	*Carex gracillima*	herb
common snakeroot	*Sanicula gregaria*	herb
doll's eyes	*Actaea pachypoda*	herb
ear-leaved foxglove	*Tomanthera auriculata*	herb
false foxglove	*Auerolaria grandiflora*	herb
field milkwort	*Polygala sanguinea*	herb

Characteristic species. Continued.

fringed gentian	*Gentianopsis crinita*	herb
goat's-beard	*Aruncus dioicus*	herb
green twayblade orchid	*Liparis loeselii*	herb
Indian paintbrush	*Castilleja coccinea*	herb
interrupted fern	*Osmunda claytoniana*	herb
lady fern	*Athyrium filix-femina*	herb
lion's foot	*Prenanthes alba*	herb
maidenhair fern	*Adiantum pedatum*	herb
Pennsylvania sedge	*Carex pensylvanica*	herb
purple twayblade orchid	*Liparis liliifolia*	herb
rattlesnake plantain	*Goodyera pubescens*	herb
sedge	*Carex debilis* var. *rudgei*	herb
sedge	*Carex rosea*	herb
sedge	*Carex blanda*	herb
shinleaf	*Pyrola elliptica*	herb
showy goldenrod	*Solidago speciosa*	herb
slender false foxglove	*Agalinis tenuifolia*	herb
sweet cicely	*Osmorhiza claytonii*	herb
tall agrimony	*Agrimonia gryposepala*	herb
wild geranium	*Geranium maculatum*	herb
wild sarsaparilla	*Aralia nudicaulis*	herb

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 DAA. Bottomland forests comprise about 13,972 acres (2.2%) of the assessment area. 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 nonnative plant species. Particularly troublesome nonactive plant species in floodplain forests within the DAA include white mulberry, garlic mustard, reed canary grass, and moneywort. Reed canary grass is one of the most invasive weeds in wetland habitats, especially in floodplain forests and marsh habitat. There are several places in the DAA where it has become a problem in upland habitat as well, usually invading from roadside ditches. Rock elm, a state endangered species, is found in mesic floodplain forest in Apple River Canyon.

Mesic floodplain forest- This community type occurs in the sand terrace areas along the Mississippi river. There also are small remnants on alluvial outwash soils in the interior

river drainages of the Galena, Apple, and Plum rivers, and smaller tributaries (Roberston et al. 1997, Heim 1984, Wunderlin 1965). They tend to have a mixture of floodplain and mesic upland tree species.

Mapped soil series: Beavercreek, Wakeland
Characteristic species:

American elm	*Ulmus americana*	tree
basswood	*Tilia americana*	tree
bitternut	*Carya cordiformis*	tree
black cherry	*Prunus serotina*	tree
burr oak	*Quercus macrocarpa*	tree
hackberry	*Celtis occidentalis*	tree
honey locust	*Gleditsia tricanthos*	tree
red oak	*Quercus rubra*	tree
slippery elm	*Ulmus rubra*	tree
walnut	*Juglans nigra*	tree
gray dogwood	*Cornus racemosa*	shrub
elderberry	*Sambucus canadensis*	shrub
gooseberry	*Ribes missouriense*	shrub
hazelnut	*Corylus americana*	shrub
American bellflower	*Campanula americana*	herb
anise-root	*Osmorhiza longistylis*	herb
bronze fern	*Botrychium dissectum*	herb
common wood sedge	*Carex blanda*	herb
green dragon	*Arisaema dracontium*	herb
joe-pye weed	*Eupatorium purpureum*	herb
large twayblade orchid	*Liparis liliifolia*	herb
rattlesnake fern	*Botrychium virginianum*	herb
sedge	*Carex grisea*	herb
stickseed	*Hackelia virginiana*	herb
virginia waterleaf	*Hydrophyllum virginianum*	herb
white snakeroot	*Eupatorium rugosum*	herb
wild ginger	*Asarum canadense*	herb

Wet-mesic to wet floodplain forest - These two communities are linked closely together; often the difference is a only a foot or so in elevation. Wet-mesic floodplain forest is most common along the major rivers, including the Mississippi. Wet floodplain forest occurs in small depressional areas within major floodplains or behind a natural levee. They usually have an open canopy and diversity is usually low due to frequent flooding. It is difficult to estimate how much of this habitat has been destroyed since presettlement. The lock and dam system has caused a shift in the hydrology of the Mississippi River valley. Areas that were a mosaic of wet prairie, marsh, and floodplain forest are now deep water habitats. However, it has also increased the amount of wetland habitat in areas that were marginal wetlands. The largest areas of these communities occur at the confluence of the Apple, Galena, and Plum rivers where they merge with the Mississippi River and on the river islands of the Mississippi River.

Mapped soil series: Beaucoup, Dorchester, Wakeland

Characteristic species:

American elm	*Ulmus americana*	tree
black willow	*Salix nigra*	tree
boxelder	*Acer negundo*	tree
cottonwood	*Populus deltoides*	tree
green ash	*Fraxinus pennsylvanica*	tree
honey locust	*Gleditsia traicanthos*	tree
pin oak	*Quercus palustris*	tree
silver maple	*Acer saccharinum*	tree
white mulberry	*Morus alba*	tree
button bush	*Cephalanthus occidentalis*	shrub
elderberry	*Sambucus canadensis*	shrub
bristly greenbrier	*Smilax hispida*	vine
river grape	*Vitis riparia*	vine
Virginia creeper	*Parthenocissus quinguefolia*	vine
bur-cucumber	*Sicyos angulatus*	herb
giant ragweed	*Ambrosia trifida*	herb
Gray's sedge	*Carex grayi*	herb
green coneflower	*Rudbeckia laciniata*	herb
late goldenrod	*Solidago gigantea*	herb
panicled aster	*Aster lateriflorus*	herb
redroot flatsedge	*Cyperus erythrorhizos*	herb
reed canary grass	*Phalaris arundinacea*	herb
rice cut-grass	*Leersia oryzoides*	herb
starved aster	*Aster puniceus*	herb
tooth-cup	*Ammannia coccinea*	herb
obedient plant	*Physostegia virginiana*	herb
wild rye	*Elymus virginicus*	herb
wild yam	*Dioscorea villosa*	herb

Prairie

Prairie is 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, sedges and wildflowers, the latter called forbs.

Prairies developed and were maintained under the influence of three major stresses: climate, grazing, and fire. Prairie plants have adapted to these stresses. They are largely herbaceous, long-lived 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 also are left unharmed by

browsing animals. During droughts, the deep roots of prairie plants are able to take up moisture from deep in the soil. Occurring in the central part of North America, prairies are subject to extreme ranges of temperatures, with hot summers and cold winters. There also are 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 lightning, were common before European settlement. Many plant communities burned frequently, perhaps every one to five years. These prairie fires moved rapidly across the landscape, so damaging heat from the fire did not penetrate the soil to any great extent. Fire kills most saplings of woody species, removes thatch (thereby 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 herbivorous animals, such as bison, elk, deer, rabbits, and grasshoppers. This grazing was an integral part of the prairie ecosystem, and of grasslands in general. Grazing increases growth in prairies and recycles nitrogen through animal wastes, and the trampling by herds opens up habitat for plant species that prefer some disturbance of the soil.

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 et al. 1988, Chapman et al. 1990, Noss & 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. The following prairie community types are present in the DAA: dry-mesic, wet-mesic, and wet prairie; dry, dry-mesic, and mesic sand prairie; loess, sand, and dolomite hill prairies.

In the DAA, there was an estimated 142,309 acres (22.5%) of prairie in 1820 (IGIS database). The Natural Areas Inventory (Illinois Department of Natural Resources 1997) identified a total of 48.3 acres of high-quality prairie, mostly sand prairie and a small amount of loess hill prairie, which represents only 0.034% of the original 142,309 acres (Table 6). As stated earlier in this report, there are other prairie remnants in the DAA that may be classified as Category I Natural Areas but they have not yet gone through the Illinois Natural Areas Inventory nomination process. Furthermore, there is a great deal of prairie habitat in the DAA that is in need of active management (Rachuy 1994, Handel 1997a).

Common ecological problems associated with prairies, in general, 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) that are too distant from other fragments 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. 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 lead to a severe invasion of exotic cool-season grasses such as meadow fescue, smooth brome, and Kentucky bluegrass. Overgrazing 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 factors, and combinations of factors, tend to result in the loss of species diversity and ecological integrity for all prairie community types. Moreover, 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 and/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 DAA the extant prairies are dry-mesic, mesic, wet-mesic, and wet.

Dry-mesic prairie - This habitat most often occurs 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. Dry-mesic prairie occurs throughout the Driftless Area. This is the most common type of prairie vegetation in the uplands of the DAA. In the upland situation it usually occurs on west- to south-facing slopes and along ridges. Adjacent to the Mississippi River, where sandy-loam soils occur in the bluffs, the prairies have both black soil and sand prairie elements and are very diverse. A few areas that have been inventoried have an average of 50 species of grasses and forbs after conducting a controlled burn (Handel 1997a). On the eastern side of the DAA, dry-mesic prairie remnants occupy dry ridges and around mounds; however, most of these remnants show signs of overgrazing and fire suppression.

Mapped soil series: Palsgrove, Seaton, Lacrescent, Fayette, Dunbarton-Dubuque
Characteristic species:

New Jersey tea	*Ceanothus americanus*	shrub
smooth sumac	*Rhus glabra*	shrub
sedge	*Carex bicknellii*	sedge
sedge	*Carex meadii*	sedge

Characteristic species. Continued.

sedge	*Carex brevior*	sedge
big bluestem	*Andropogon gerardii*	grass
Indian grass	*Sorghastrum nutans*	grass
little bluestem	*Schizachyrium scoparium*	grass
panic grass	*Panicum oligosanthes*	grass
American feverfew	*Parthenium integrifolium*	forb
black-eyed susan	*Rudbeckia hirta*	forb
butterfly weed	*Asclepias tuberosa*	forb
compass plant	*Silphium laciniatum*	forb
downy gentian	*Gentiana puberulenta*	forb
dyersweed	*Solidago nemoralis*	forb
early goldenrod	*Solidago juncea*	forb
flowering spurge	*Euphorbia corollata*	forb
hoary puccoon	*Lithospermum canescens*	forb
Illinois tick trefoil	*Desmodium illinoense*	forb
Indian paintbrush	*Castilleja coccinea*	forb
lead plant	*Amorpha canescens*	forb
New England aster	*Aster novae-angliae*	forb
purple prairie clover	*Dalea purpurea*	forb
rough blazing star	*Liatris aspera*	forb
showy goldenrod	*Solidago speciosa*	forb
showy tick trefoil	*Desmodium canadense*	forb
sky-blue aster	*Aster oolentangiensis*	forb
stiff goldenrod	*Solidago rigida*	forb
western sunflower	*Helianthus occidentalis*	forb
white prairie clover	*Dalea candida*	forb
wild bergamot	*Monarda fistulosa*	forb
wild strawberry	*Fragaria virginiana*	forb

Mesic prairie - The majority of this habitat occurred in the interior river valleys and on the eastern edge of the DAA in the Rock River Hill Country Division in the glaciated part of the Rock River Division. Examples of these extensive prairies in the DAA include Jule's and Frink's prairies in Jo Daviess County (Pepoon 1910). These probably contained mesic prairie along with several other prairie community types. They probably were converted to agriculture relatively soon after Pepoon described them. A few remnants occur in the eastern edge of the DAA where almost all occur along existing railroad lines. A few relatively high-quality remnants occur along an existing railroad line in the northern half of the DAA in the Galena River valley. Pepoon (1927) described an extensive mesic to wet-mesic prairie remnant in the area from Warren to Nora in which the pink milkwort and white prairie fringed orchid formed a sea of white, and although a few small remnants still are in this area, it is doubtful that these species have survived.

Mapped soil series: Dorchester, Loren, Littleton, Muscatine

Characteristic species:

big bluestem	*Andropogon gerardii*	grass
Indian grass	*Sorghastrum nutans*	grass
northern dropseed	*Sporobolus heterolepis*	grass

Characteristic species. Continued.

prairie cord grass	*Spartina pectinata*	grass
blazing star	*Liatris pycnostachya*	forb
blue-eyed grass	*Sisyrinchium albidum*	forb
bottle gentian	*Gentiana andrewsii*	forb
compass plant	*Silphium laciniatum*	forb
cream gentian	*Gentiana alba*	forb
hoary puccoon	*Lithospermum canescens*	forb
lead plant	*Amorpha canescens*	forb
Michigan lily	*Lilium michiganense*	forb
pale purple coneflower	*Echinacea pallida*	forb
prairie dock	*Silphium terebinthinaceum*	forb
prairie milkweed	*Asclepias sullivantii*	forb
prairie violet	*Viola pedatifida*	forb
rattlesnake master	*Erygnium yuccifolium*	forb
Virginia mountain mint	*Pycnanthemum virginianum*	forb
wild hyacinth	*Camassia scilloides*	forb
wild indigo	*Baptisia lactea*	forb
wood lily	*Lilium philadephicum*	forb
yellow coneflower	*Ratibida pinnata*	forb

Wet-mesic to *wet prairie* - These habitats are relatively rare in the DAA. Wet prairie probably occurred in the floodplain of the Mississippi River adjacent to the Mississippi Palisades State Park and where the soils were not sandy. Wunderlin (1965) described wet prairie habitat occurring along the Burlington Northern Railroad. Most of the wet prairie is now marsh or has been converted to cropland. Wet prairie habitat occurred scattered throughout river drainages and lower areas in the DAA. Pepoon (1927) described several areas that may have been wet prairies in the Galena and Apple river valleys. A few areas of wet prairie still remain, usually adjacent to sedge meadows and marshes that are difficult to drain. A few examples are in Irish Hollow Creek (Tessene and Harrold 1995) and in the Rush Creek drainage (Handel, personnel observation).

Mapped soil series: Lawson, Dorchester, Loran, Littleton

Characteristic species:

false indigo bush	*Amorpha fruticosa*	shrub
elderberry	*Sambucus canadensis*	shrub
fox sedge	*Carex annectens*	sedge
big bluestem	*Andropogon gerardii*	grass
bluejoint grass	*Calamagrostis canadensis*	grass
prairie cord grass	*Spartina pectinata*	grass
switch grass	*Panicum virgatum*	grass
tall manna grass	*Glyceria grandis*	grass
blue flag	*Iris virginica*	forb
boneset	*Eupatorium perfoliatum*	forb
bottle gentian	*Gentiana andrewsii*	forb
cup plant	*Silphium perfoliatum*	forb
Michigan lily	*Lilium michiganense*	forb
monkey flower	*Mimulus ringens*	forb

Characteristic species. Continued.

New England aster	*Aster novae-angliae*	forb
sawtooth sunflower	*Helianthus grosseserratus*	forb
swamp aster	*Aster puniceus*	forb
swamp milkweed	*Asclepias incarnata*	forb
tall meadow-rue	*Thalictrum dasycarpum*	forb
Virginia mountain mint	*Pycnanthemum virginianum*	forb
water parsnip	*Sium suave*	forb
winged loosestrife	*Lythrum alatum*	forb
wood lily	*Lilium philadelphicum*	forb

Sand prairie

Sand prairie is the most common prairie type remaining in the DAA, as well as one of the major natural communities remaining. An estimated 4,000 to 5,000 acres of sand prairie may still exist in the DAA. This accounts for a great deal of the remaining sand prairie left in Illinois. The majority of sand prairie is at the Savanna Army Depot. Several smaller sand prairies are found from just south of the mouth of the Apple River (Rosburg 1996) to the confluence of Rush Creek and the Mississippi River, where the sand prairie terminates in a bluff overlooking Rush Creek (Handel, personnel observation). In addition, several small sand prairies occur in the perched sand dunes north of the Palisades State Park about 200 to 300 feet above the Mississippi River floodplain (Handel, unpublished data). Other major sand areas are just south of Savanna, including Ayers and Thomson-Fulton sand prairies. The bluffs adjacent to this area appear to contain small sand prairies as well (Commonwealth Edison Company 1979). General descriptions and flora of sand prairie are from Robertson et al. (1997), Handel (1997b, unpublished species lists 1986-1997), and Rosburg (1996). Problems that occur in sand prairie are the same as in other prairie types. In addition, because they are disturbance-adapted communities, sand prairies tend to have increased problems with exotic vegetation. This adaptation to disturbance, however, makes sand prairie one of the more resilient community types in Illinois, and with proper management it can often be restored even after heavy disturbance. Erosion can also be a problem, especially on steep slopes.

Dry sand prairie - This community type occurs in the sand areas adjacent to the Mississippi River valley, usually on the terrace or at the peak of dune systems. Blowouts are common in this community type. This phenomenon caused by wind action creates open sand areas. Many of the plants in these areas are adapted to these harsh conditions and will recolonize the bare sand after a period of time. Several threatened and endangered species occur in these blowout areas.

Mapped soil series: Sparta, Bloomfield

Characteristic species:

aromatic sumac	*Rhus aromatica*	shrub
lead plant	*Amorpha canescens*	shrub
Grays sedge	*Cyperus grayiodies*	sedge
rough sand sedge	*Cyperus schweintzii*	sedge

Characteristic species. Continued.

sand sedge	*Carex muhlenbergii*	sedge
shaved sedge	*Carex tonsa*	sedge
slender sand sedge	*Cyperus filiculmis*	sedge
June grass	*Koeleria macrantha*	grass
little bluestem	*Schizachyrium scoparium*	grass
needle grass	*Stipa spartea*	grass
plains three awn grass	*Aristida oligantha*	grass
sand reed	*Calamovilfa longifolia*	grass
white-haired panic grass	*Panicum villosissimum*	grass
beach wormwood	*Artemisia campestris*	forb
blue toadfax	*Linaria canadensis*	forb
broomrape	*Orobanche ludoviciana*	forb
dwarf dandelion	*Krigia virginica*	forb
dyersweed	*Solidago nemoralis*	forb
false heather	*Hudsonia tomentosa*	forb
flax-leaved aster	*Aster linariifolius*	forb
goat's rue	*Tephrosia virginiana*	forb
green milkweed	*Asclepias virdiflora*	forb
hairy puccoon	*Lithospermum caroliniense*	forb
horsemint	*Monarda punctata*	forb
sand milkweed	*Asclepias amplexicaulis*	forb
western sunflower	*Helianthus occidentalis*	forb
yellow puccoon	*Lithospermum incisum*	forb
rock selaginella	*Selaginella rupestris*	fern ally
fragile prickly-pear	*Opuntia fragilis*	cactus
plains prickly-pear	*Opuntia macrorhiza*	cactus

Dry-mesic sand prairie - This community type occurs in association with dry sand prairie in the major sand areas of the DAA. In this situation it usually occurs on slopes or in swales of sand dunes where moisture is available. Dry-mesic sand prairie is often the successional stage after a blowout has stabilized and been recolonized by native vegetation. Moisture is held by the sod formed by roots of prairie grasses and forbs. As succession progresses the blowout encloses, forming a stable community until disturbances such as grazing or burrowing animals open up the soil and start the process all over again. In the upland this community is restricted to a small band from Hanover bluff to north of the Palisades State Park and south of Savanna in the adjacent bluffs. In this locality dry-mesic sand prairies occur in perched parallel sand dunes called "pahas" and are adjacent to sand forest and sand savanna communities within a mile of the river bluffline.

Mapped soil series: Joy, Lamont, Plainfield, Bloomfield, Tell

Characteristic species:

New Jersey tea	*Ceanothus americanus*	shrub
prairie willow	*Salix humilis*	shrub
redroot	*Ceanothus ovatus*	shrub
rough-leaved dogwood	*Cornus drummondii*	shrub
plains oval sedge	*Carex brevior*	sedge

Characteristic species. Continued.

sedge	*Carex bicknellii*	sedge
big bluestem	*Andropogon gerardii*	grass
Indian grass	*Sorghastrum nutans*	grass
northern dropseed	*Sporobolus heterolepis*	grass
side-oats gramma	*Bouteloua curtipendula*	grass
switch grass	*Panicum virgatum*	grass
tall dropseed	*Sporobolus asper*	grass
bastard toad-flax	*Commandra umbellata*	forb
cream wild indigo	*Baptisia leucophaea*	forb
downy gentian	*Gentiana puberulenta*	forb
false sunflower	*Heliopsis helianthoides*	forb
flowering spurge	*Euphorbia corollata*	forb
hairy petunia	*Ruellia humilis*	forb
lead plant	*Amorpha canescens*	forb
poppy mallow	*Callirhoe triangulata*	forb
prairie coreopsis	*Coreopsis palmata*	forb
purple prairie clover	*Dalea purpurea*	forb
silky aster	*Aster sericeus*	forb
western sunflower	*Helianthus occidentalis*	forb
yellow coneflower	*Ratibida pinnata*	forb

Mesic, wet-mesic and wet sand prairie - This community type probably occurred adjacent to other sand prairie communities in the Mississippi River valley where favorable hydrology and soil conditions existed. Many species that are known to occur in these types of habitat are present in the DAA (Illinois Natural History Survey herbarium data base). Most of the habitat for these community types was drained for agricultural purposes along the bluff line between Savanna and Thomson. There may be some small isolated areas south of Savanna in and around existing wetland habitats, especially around the Savanna Army Depot.

Mapped soil series: Gilford, Selma

Characteristic species:

willows	*Salix spp.*	shrubs
meadow-sweet	*Spiraea alba*	shrub
big bluestem	*Andropogon gerardii*	grass
bluejoint grass	*Calamagrostis canadensis*	grass
Indian grass	*Sorghastrum nutans*	grass
prairie cordgrass	*Spartina pectinata*	grass
switch grass	*Panicum virgatum*	grass
American feverfew	*Parthenium integrifolium*	forb
flattop aster	*Aster umbellatus*	forb
lance-leaved violet	*Viola lanceolata*	forb
tall nut grass	*Scleria triglomerata*	forb
Virginia mountain mint	*Pycnanthemum virginianum*	forb
marsh fern	*Thelypteris palustris*	fern
royal fern	*Osmunda regalis*	fern
sensitive fern	*Onoclea sensibilis*	fern

Hill prairie

Hill prairies are grass/forb communities that occur on slopes, typically with exposure to the south and/or southwest. Most of the hill prairie habitat in the DAA occurs along the bluffs of the Mississippi River. 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). In the DAA, loess, sand, and dolomite hill prairies have be described as communities. The dolomite hill prairie community was not described by the Illinois Natural Areas Inventory; this will be discussed later in the report. Hill prairies often occur as openings within forests. 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 1997a).

Sand hill prairie (sand substrate) - This community type is relatively rare in the DAA. It is confined to bluffs adjacent to the major sand areas of the DAA. The most noted sand hill prairie occurs at Hanover Bluff Nature Preserve adjacent to the Savanna Army Depot (Schwegman 1995). Sand hill prairies also occur along Airhart Road (Rachuy 1994). Bielema hill prairie southeast of Thomson may also be a sand hill prairie (Evers 1955). Sand hill prairie vegetation is similar to the dry-mesic sand prairie and loess hill prairie in the DAA. Threatened and endangered species also are similar between the two habitat types.

Mapped soil series: Bloomfield, Tell
Characteristic species:

gray dogwood	*Cornus racemosa*	shrub
smooth sumac	*Rhus glabra*	shrub
sedge	*Carex heliophyla*	sedge
sedge	*Carex muhlenbergii*	sedge
sedge	*Carex normalis*	sedge
umbrella sedge	*Carex umbellata*	sedge
big bluestem	*Andropogon gerardii*	grass
Canadian bluegrass	*Poa compressa*	grass
little bluestem	*Schizachyrium scoparium*	grass
northern dropseed	*Sporobolus heterolepis*	grass
panic grass	*Panicum oligosanthes*	grass
purpletop	*Tridens flavus*	grass
side-oats gramma	*Bouteloua curtipendula*	grass
hairy puccoon	*Lithospermum caroliniense*	forb
ladies' tresses	*Spiranthes magnicamporum*	forb
Ohio spiderwort	*Tradescantia ohiensis*	forb
pale purple coneflower	*Echinacea pallida*	forb
prairie Indian plantain	*Cacalia plantaginea*	forb
prairie dandelion	*Microseris cuspidata*	forb
purple prairie clover	*Dalea purpurea*	forb
sand milkweed	*Asclepias amplexicaulis*	forb
Sky-blue aster	*Aster oolentangiensis*	forb

Characteristic species. Continued.

woolly milkweed	*Asclepias lanuginosa*	forb
yellow puccoon	*Lithospermum incisum*	forb
bracken fern	*Pteridium aquilinum*	fern
plains prickly-pear	*Opuntia macrohiza*	cactus

Hill prairie (dolomite substrate)- This community occurs almost exclusively in Jo Daviess County in the northern section of the DAA along the Galena, Apple, and, probably, the Sinsinawa and Menominee rivers. Wind blown loess is relatively thin in these areas, either from past erosion or depositional patterns of wind blown loess. Although dolomite prairie was described in the Natural Areas Inventory by White (1978), this community was confined to the glaciated Rock River hill county and south of the Chicago area in the Des Plaines and Kankakee river valleys. Taft (1993) and Handel & Marlin (1996a, b) reported areas in the DAA as dolomite hill prairies, a community type that was not recognized by the Illinois Natural Areas Inventory. Usually these areas occupy a south- to west-facing slope; however, they also occur on north- to east-facing slopes where shallow soil (between 6 - 12 inches in depth) occurs over dolomite. This community type probably is restricted to the Wisconsin Driftless Division. The two soils on which dolomite hill prairies are commonly found, Lacrescent and Elizabeth soils, are confined to the Driftless Area of southeastern Minnesota, southwestern Wisconsin, northeast Iowa, and northwestern Illinois. Elizabeth soil series is especially rare, with only about 1,500 acres occurring only in Illinois (National Soils Data Base 1997). The dolomite hill prairies of the DAA closely resemble the definition given by Curtis (1959) for cedar glade communities of Wisconsin in regards to species composition, position in the landscape, and geology. This will be discussed in greater detail under primary communities. Red cedar probably has always been a component in dolomite hill prairies in the DAA. However, aerial photography of these prairie areas from 1975 shows the areas to be more open and dominated by grasses. Fire suppression in the area appears to have allowed the closure of the canopy by red cedar relatively quickly. Dolomite hill prairies have a flora that is rare throughout Illinois as well as in the DAA. Although occupying a small percentage of the DAA, preliminary searches of Apple and Galena river valleys in 1993 and 1997 concluded that many of the prairies possibly could be restored if the areas were actively managed (Rachuy 1994; Handel, personnel observations).

Mapped soil series: Lacrescent, Elizabeth

Characteristic species:

red cedar	*Juniperus virginiana*	tree
burr oak	*Quercus macrocarpa*	tree
redroot	*Ceanothus ovatus*	shrub
prickly ash	*Zanthoxylem americanum*	shrub
ivory sedge	*Carex eburnea*	sedge
Richardson's sedge	*Carex richardsonii*	sedge
June grass	*Koeleria macrantha*	grass
northern dropseed	*Sporobolus heterolepis*	grass
Indian grass	*Sorghastrum nutans*	grass
big bluestem	*Andropogon gerardii*	grass

Characteristic species. Continued.

little bluestem	*Schizachyrium scoparium*	grass
Kentucky bluegrass	*Poa pratense*	grass
lead plant	*Amorpha canescens*	forb
pasque flower	*Pulsatilla patens*	forb
rock cress	*Arabis lyrata*	forb
silky aster	*Aster sericeus*	forb
prairie coreopsis	*Coreopsis palmata*	forb
clyindrical blazing star	*Liatris cylindracea*	forb
yellow puccoon	*Lithospermum incisum*	forb
rock sandwort	*Minuartia stricta*	forb
small skullcap	*Scutellaria leonardii*	forb
ladies' tressess	*Spiranthes magnicamporum*	forb
prairie violet	*Viola pedatifida*	forb
western sunflower	*Helianthus occidentalis*	forb
purple prairie clover	*Dalea purpurea*	forb
prairie groundsel	*Senecio plattensis*	forb
shooting star	*Dodecatheon meadia*	forb

Loess hill prairie - This type of hill prairie occurs along the bluffs from East Dubuque south to the southern edge of the DAA in Whiteside County. Evers (1955) described a number of loess hill prairies in the DAA, including El Rancho, Menominee station, Sunset Trail, Hill Top, South Palisades, and Wiersma. Loess hill prairies have a finer silty loam soil instead of sandy soil. Usually loess hill prairies occur in areas near, but not directly west of, the major sand deposits. For example, the hill prairies in the Palisades State Park are all classified as loess hill prairies and occur southeast of a large sand deposit. Most of the windblown sand was deposited from just north of the Mississippi Palisades State Park to Hanover Bluff. Loess hill prairies also occur on the crest of hills and to a lesser extent in the smaller river and creek valleys of the DAA.

Mapped soil series: Sogn, Seaton, Fayette, Lacrescent

Characteristic species:

red cedar	*Juniperus virginiana*	tree
yellow chestnut oak	*Quercus muhlenbergii*	tree
New Jersey tea	*Ceanothus americanus*	shrub
smooth sumac	*Rhus glabra*	shrub
sedge	*Carex bicknellii*	sedge
sedge	*Carex meadii*	sedge
sedge	*Carex brevior*	sedge
big bluestem	*Andropogon gerardii*	grass
Indian grass	*Sorghastrum nutans*	grass
little bluestem	*Schizachyrium scoparium*	grass
panic grass	*Panicum oligosanthes*	grass
side oats gama	*Bouteloua curtipendula*	grass
aromatic aster	*Aster oblongifolius*	forb
black-eyed susan	*Rudbeckia hirta*	forb
butterfly weed	*Asclepias tuberosa*	forb
dyersweed	*Solidago nemoralis*	forb

Characteristic species. Continued.

early goldenrod	*Solidago juncea*	forb
flowering spurge	*Euphorbia corollata*	forb
hoary puccoon	*Lithospermum canescens*	forb
Illinois tick trefoil	*Desmodium illinoense*	forb
lead plant	*Amorpha canescens*	forb
purple prairie clover	*Dalea purpurea*	forb
rough blazing star	*Liatris aspera*	forb
showy goldenrod	*Solidago speciosa*	forb
stiff gentian	*Gentianella quinquefolia*	forb
stiff goldenrod	*Solidago rigida*	forb
white prairie clover	*Dalea candida*	forb
wild bergamot	*Monarda fistulosa*	forb
wild strawberry	*Fragaria virginiana*	forb

Savanna

Savanna communities occur throughout many parts of 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 (see discussion in Delong and Hooper 1996). Oak-dominated systems appear dependent on periodic fire for persistence (Lorimer 1985). In a period of a few decades of fire absence savannas in the Midwest were altered through vegetational changes and habitat destruction. 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.

Problems with savannas are similar to those of other communities in Illinois. Many have been overgrazed by livestock and in these instances the ground cover is floristically degraded and dominated by non-native species. Savanna communities that have been grazed but not overrun by woody exotics may be able to be restored by removal or reduction of livestock and controlled burning. Bonny (1989) described the restoration of a savanna remnant in western Illinois that had been severely overgrazed for years after cattle were removed and a controlled burn was conducted. A surprising number of prairie and savanna species returned to the area the first year. The second year more species appeared, including relatively conservative species such as turk's-cap lily, New Jersey tea, short green milkweed, and yellow star grass. 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 savanna include garlic

mustard, multilfora rose, and bush honeysuckle. Common buckthorn is a major problem in the Chicago region, but as yet it is not widespread in the DAA.

Three savanna subclasses are recognized in Illinois: **(silt-loam) savanna, sand savanna,** and **barrens** (Madany 1981, White and Madany 1978). Only the dry-mesic (silt-loam) savanna and sand savanna are known to occur in the DAA. Savanna community subclasses are further distinguished by soil-moisture characteristics. No savanna habitat was identified as high-quality by the Natural Areas Inventory (Illinois Natural Heritage database) in the DAA; however, restoration and management of savanna remnants may yield habitat that was overlooked. Two threatened or endangered species are known to occur in dry-mesic savanna. Thirteen threatened and endangered species are known to occur in sand savannas (Appendix 1).

Dry-mesic savanna - This community occurs scattered throughout the upland areas of the DAA. The composition of the understory is closely related to both prairie and dry oak forest communities (Curtis 1959). Because of their highly transitional nature, savanna remnants are sometimes difficult to identify. The suppression of fire quickly encloses the savanna canopy leaving prairie and savanna herbaceous species growing only on the edge or where a windfall has opened up the canopy. The Palisades Park area is an example of how quickly savanna communities can disappear with fire suppression. Wunderlin (1965) reported open forest and savanna habitat present in the park. Several species that occur in prairies and savannas were reported as frequent to common in open forest habitat. These include false foxglove, smooth aster, yellow star grass, wild quinine, prairie coreopsis, purple milkweed, white false indigo, hoary paccoon, bastard toadflax, and lead plant. A survey of the park in 1992 and 1993 found these species to be very rare, if not absent, in the park. Some of the species did exist in low numbers, but were confined to the loess hill prairies or the managed dry-mesic prairies along the trails (Handel 1994). In the DAA dry-mesic savannas are dominated by burr, white, Hill's, and black oaks, along with shagbark hickory. Dominant oak species of dry-mesic savanna in the DAA appear to be partially based on the soil type and depth of windblown loess. Although several species of oaks are found with all the savanna remnants, black and white oak dominate the sandy loam soils adjacent to the Mississippi River valley as well as several tributaries. On shallow soils over dolomite bedrock in the northern half of the DAA burr and white oak appear to be the dominant tree species. In the Rock River Hill Division small burr and white oak savanna remnants also occur. Pepoon (1910) also commented the different oak forest associations in the Driftless Area. The map of the forest associations of the Driftless area showed the majority of black oak forest association occurring in the sand area of the Savanna Army Depot and extending eastward into the bluffs. Scattered pockets of black oak also occurred in the Rush Creek and Apple and Plum river valleys. For the most part, the species list in Appendix 2 was compiled from species that are thought to be indicators of dry to dry-mesic savanna habitat in the Driftless Area (Purka et al. 1994) and throughout Illinois (Madany 1981). A species list for *Prairie Openings in the Forest* in eastern Iowa was also consulted for comparison of similar prairie openings in the DAA (Shimek 1910).

Mapped soil series: Fayette, Seaton, Eleroy, Massbach, Downs, Atterberry, Palsgrove, Tell

Characteristic species:

black oak	*Quercus velutina*	tree
burr oak	*Quercus macrocarpa*	tree
Hill's oak	*Quercus ellipsoidalis*	tree
shagbark hickory	*Carya ovata*	tree
white oak	*Quercus alba*	tree
hazelnut	*Corylus americana*	shrub
New Jersey tea	*Ceanothus americanus*	shrub
graceful sedge	*Carex gracillima*	sedge
Mead's sedge	*Carex meadii*	sedge
Pennsylvania sedge	*Carex pensylvanica*	sedge
tall nut sedge	*Scleria triglomerata*	sedge
big bluestem	*Andropogon gerardii*	grass
Indian grass	*Sorghastrum nutans*	grass
panic grass	*Panicum lanuginosum*	grass
silky wild rye	*Elymus villosus*	grass
bracken fern	*Pteridium aquilinum*	herb
Canadian milkvetch	*Astragalus canadensis*	herb
clammy false foxglove	*Aureolaria pedicularia*	herb
cream gentian	*Gentiana alba*	herb
culver's root	*Veronicastrum virginicum*	herb
false sunflower	*Krigia biflora*	herb
hairy mountain mint	*Pycnanthemum verticillatum*	herb
Indian paintbrush	*Castilleja coccinea*	herb
poke milkweed	*Asclepias exaltata*	herb
prairie phlox	*Phlox pilosa*	herb
purple milkweed	*Asclepias purpurascens*	herb
robin's plantain	*Erigeron pulchellus*	herb
seneca snakeroot	*Polygala senega*	herb
shooting star	*Dodecatheon meadia*	herb
showy goldenrod	*Solidago speciosa*	herb
smooth false foxglove	*Aureolaria grandiflora*	herb
spiked lobelia	*Lobelia spicata*	herb
wild hyacinth	*Camassia scilloides*	herb
wild indigo	*Baptisia lactea*	herb
wood betony	*Pedicularis canadensis*	herb
woodland boneset	*Eupatorium sessilifolium*	herb
yellow pimpernel	*Taenidia intergerrima*	herb

Dry sand savanna - This community type occurs on the sand dunes adjacent to the Mississippi River. This includes an area from the Savanna Army Depot south to Rush Creek. There may be a limited amount of this habitat from near Riverview south to Fulton along the Mississippi River. The dominant oak is black oak. Areas are excessively dry, with scattered blowouts. The vegetation is a mixture of species of dry sand prairie and sand forests. Many threatened and endangered species that occur in dry sand prairie and occur in dry sand savanna.

Mapped soil series: Sparta, Plainfield, Bloomfield
Characteristic species:

black oak	*Quercus velutina*	tree
sand bracted sedge	*Carex muhlenbergii*	sedge
Pennsylvania sedge	*Carex pensylvanica*	sedge
shaved sedge	*Carex tonsa*	sedge
Gray's umbrella sedge	*Cyperus grayioides*	sedge
big bluestem	*Andropogon gerardii*	grass
beach three-awn	*Aristida tuberculosa*	grass
hairy panic grass	*Panicum villosissimum*	grass
Canadian bluegrass	*Poa compressa*	grass
Kentucky bluegrass	*Poa pratensis*	grass
beach wormwood	*Artemisia campestris*	herb
butterfly weed	*Asclepias tuberosa*	herb
fameflower	*Talinum rugospermum*	herb
goat's rue	*Tephrosia virginiana*	herb
hairy umbrella wort	*Mirabilis hirsuta*	herb
James' clammyweed	*Polanisia jamesii*	herb
kitten tails	*Besseya bullii*	herb
poppy mallow	*Callirhoe triangulata*	herb
western ragweed	*Ambrosia psilostachya*	herb
whorled milkweed	*Asclepias verticillata*	herb
dwarf spike-rush	*Selaginella rupestris*	fern ally

Dry-mesic sand savanna - This community occurs in the same general geographic location as dry sand savanna. There also are small areas of dry-mesic sand savanna on the bluffs above the Mississippi River southeast of the Savanna Army Depot. This area is a series of perched sand dunes sometimes referred to as "pahas". These are sand dunes that are oval or linear in shape and oriented parallel to the prevailing winds, generally west to east. This area has several different sand communities, including dry-mesic sand savanna, dry-mesic sand prairie, sand forest, and sand ponds. Although many areas have been converted to pasture and hayfields, some of the original communities exist. It is the only known recorded location for wild lupine in the DAA. The dry-mesic sand savanna in this area usually occurs along the slopes; however, because of fire suppression forest vegetation covers most of the dunes. There may be dry-mesic sand savanna on bluffs south of Savanna and adjacent to Hanover Bluff.

Mapped soil series: Tell, Lamont, Seaton (sandy substratum), Bloomfield
Characteristic species:

black cherry	*Prunus serotina*	tree
black oak	*Quercus velutina*	tree
red cedar	*Juniperus virginiana*	tree
walnut	*Juglans nigra*	tree
fragrant sumac	*Rhus aromatica*	shrub
hazelnut	*Corylus americana*	shrub
New Jersey tea	*Ceanothus americanus*	shrub
Gray's umbrella sedge	*Cyperus grayioides*	sedge
sedge	*Carex tonsa*	sedge

Characteristic species. Continued.

plain's oval sedge	*Carex breivor*	sedge
June grass	*Koeleria macrantha*	grass
little bluestem	*Schizachyrium scoparium*	grass
blue sage	*Salvia azurea* subsp. *pitcheri*	herb
fameflower	*Talinum rugospermum*	herb
goat's rue	*Tephrosia virginiana*	herb
hairy puccoon	*Lithospermum caroliniense*	herb
James' clammyweed	*Polanisia jamesii*	herb
kitten tails	*Besseya bullii*	herb
late figwort	*Scrophularia marilandica*	herb
lead plant	*Amorpha canescens*	herb
Ohio spiderwort	*Tradescantia ohiensis*	herb
rough blazing star	*Liatris aspera*	herb
slender corydalis	*Corydalis micrantha*	herb
starry campion	*Silene stellata*	herb
starry false Solomon's seal	*Smilacina stellata*	herb
western sunflower	*Helianthus occidentalis*	herb
wild lupine	*Lupinus perennis*	herb

Wetlands

The wetland community class includes natural communities that are flooded or have hydric soils and that have a vegetative cover. No high-quality wetlands were found in the DAA during the Illinois Natural Areas Inventory (White 1978). Wetland community types in the DAA, following the natural community classification of White and Madany (1978), include **floodplain forest, marsh, sand pond, sedge meadow, seep,** and **spring.** Floodplain forests were described previously under the forest community class. Wetlands in the DAA are scattered throughout the assessment area, but the majority are concentrated in the Mississippi River valley (Figure 8). Lakes and ponds are described as a separate community class, according to White and Madany (1978). (See earlier section on wetlands describing effects of the damming of the Mississippi River.)

Marsh

Marshes are palustine wetlands characterized by having water at or near the surface during most of the growing season, dominance by herbaceous vegetation, and organic or mineral soils (White and Madany 1978). About 2,522 acres marsh habitat exist in the DAA (IGIS data base). Most of the marsh habitat occurs in the Mississippi River floodplain. Extensive marsh habitat occurs southeast of where the Apple River enters the Mississippi River. A series of backwater marshes and oxbow lakes of the old Apple River channel cover a large area. Smaller marsh communities occur south of Savanna where the Plum River joins the Mississippi and north of Fulton at Cattail Slough. Smaller inland marshes also occur along Irish Hollow Creek and near Whistling Wings in the Rush Creek drainage. Ecological problems in marshes include siltation, altered flooding regimes, invasion by

non-native species, and overabundance 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 cattail, river bulrush, and common reed. Many, perhaps most, marshes that remain in the DAA are threatened by non-native species. A serious threat to the marshes in the DAA is the exotic species purple loosestrife which replaces native vegetation (Havera and Suloway 1994, Havera et al. 1997). A serious infestation occurs in the Plum River basin near Savanna (Handel, personnel observation).

Mapped soil series: Otter or other soil inundated for most of the year.
Characteristic species:

black willow	*Salix nigra*	tree
sandbar willow	*Salix exigua*	tree
buttonbush	*Cephalanthus occidentalis*	shrub
pale dogwood	*Cornus obliqua*	shrub
red osier dogwood	*Cornus stolonifera*	shrub
pickerelweed	*Pontederia cordata*	aquatic
pondweeds	*Potamogeton* spp.	aquatics
small water plantain	*Alisma plantago-aquatica*	aquatic
common lake sedge	*Carex lacustris*	sedge
bluejoint grass	*Calamagrostis canadensis*	grass
rice grass	*Leerisa oryzoides*	grass
tall manna grass	*Glyceria striata*	grass
bulrushes	*Scirpis* spp.	rush
blue flag	*Iris virginica*	herb
cardinal flower	*Lobelia cardinalis*	herb
cattail	*Typha latifolia*	herb
cinnamon willow herb	*Epilobium coloratum*	herb
duckweeds	*Lemna* spp.	herb
hairy fruited sedge	*Carex trichocarpa*	herb
halberd-leaved rose mallow	*Hibiscus laevis*	herb
hop sedge	*Carex lupulina*	herb
swamp aster	*Aster puniceus*	herb
swamp milkweed	*Asclepias incarnata*	herb
smartweeds	*Polygonum* spp.	herbs

Seep

Seeps are wetland communities characterized by a constant diffuse flow of ground water (White and Madany 1978). The chemistry of the ground water, to some extent, controls species composition and is influenced by the material through which it flows. No seeps were recognized as high quality in the Natural Areas Inventory. Recently, seep communities have been found in the DAA that may be considered of Category I quality but they have yet to go through the Natural Areas Inventory nomination process (Handel, unpublished data). There are two types of seeps in the DAA. The most common is the

seep (typical) without a thick layer of peat. In the DAA this community type occurs in a wide variety of habitats along the base of hillside slopes. A rarer seep community currently is known only along the base of bluffs adjacent to the Mississippi River valley in one restricted area. Although no fens were described in the DAA during the Natural Areas Inventory, one of these seeps has several characteristics that are common to fens in the state. White (1978) considered the following factors for classification of a fen: calcareous ground water, a thick layer of peat and sphagnum moss, usually a pronounced slope, and certain floristic components. This type of community is thought to be restricted to the glaciated region of the northern third of Illinois south to the Illinois River valley near Peoria. Person & Leoschke's (1992) definition of fens in Iowa is broad and would cover several communities in Illinois' classification scheme, including seeps. Floristically this seep community is closely related to Iowa fens, but it lacks some of the characteristic plants found in fens of the Chicago region. For simplicity both communities are classified as seeps.

Seeps (sphagnum moss & peat present) - This community is extremely rare in the DAA, only occurring in one small area adjacent to the bluffs of the Mississippi River. It consists of a large spring complex perched just above a steep stream valley on windblown sandy soil. The surrounding community is sand forest. The ground water is calcareous (alkaline); however, the soil adjacent to the seep appears to acidic sand and has plants such as rattlesnake plantain orchid and shining club moss that are characteristic of acid soils. Peat is about 3 feet thick with a layer of living sphagnum moss covering most of the surface. The total seep area is approximately 1 acre in size and it grades into a wet forested seep dominated by beaked willow, swamp saxifrage, skunk cabbage, and marsh marigold.

Mapped soil series: Seeps are usually too small to be mapped on soil surveys.
Characteristic species:

beaked willow	*Salix bebbiana*	tree
pale dogwood	*Cornus obliqua*	shrub
wild black current	*Ribes americanum*	shrub
sedge	*Carex hystericina*	sedge
tussock sedge	*Carex stricta*	sedge
bluejoint grass	*Calamagrostis canadensis*	grass
stoutwood reed	*Cinna arundinacea*	grass
wedge grass	*Sphenopholis obtusata*	grass
angelica	*Angelica atropurpurea*	herb
boneset	*Eupatorium perfoliatum*	herb
crooked aster	*Aster prenanthoides*	herb
field mint	*Mentha arvensis*	herb
flattop aster	*Aster umbellatus*	herb
great lobelia	*Lobelia siphilitica*	herb
jewelweed	*Impatiens capensis*	herb
loosestrife	*Lysimachia hybrida*	herb
lousewort	*Pedicularis lanceolata*	herb
marsh bellflower	*Campanula aparinoides*	herb
marsh marigold	*Caltha palustris*	herb
marsh skullcap	*Scutellaria lateriflora*	herb

Characteristic species. Continued.

Michigan lily	*Lilium michiganense*	herb
narrow-leaved loosestrife	*Lysimachia quadriflora*	herb
nodding bur marigold	*Bidens cernua*	herb
nodding ladies' tresses	*Spiranthes cernua*	herb
northern blue violet	*Viola nephrophylla*	herb
purple meadow rue	*Thalictrum dasycarpum*	herb
skunk cabbage	*Symplocarpus foetidus*	herb
spotted joe-pye weed	*Eupatorium maculatum*	herb
swamp agrimony	*Agrimonia parviflora*	herb
swamp dock	*Rumex verticillatus*	herb
swamp aster	*Aster puniceus*	herb
swamp saxifrage	*Saxifraga pensylvanica*	herb
turtlehead	*Chelone glabra*	herb

Seep (typical) - This is the most common seep community in the DAA. It typically has water that is nearly neutral, or, as is mostly the case in the DAA, slightly calcareous, and the water is usually cold. Seeps can be open (informally called graminoid seep) or wooded (informally called forested seep). These seeps have no peat or, if they do, it is very shallow (less than a foot). They occur in virtually all the stream and river valleys, but some occur far up slope were aquifers or bedrock breech the soil surface. Although seeps comprise a small surface area of the DAA, they are an important component of biodiversity and harbor rare species.

Mapped soil series: Seeps are usually too small to be mapped on soil surveys.
Characteristic species:

pale dogwood	*Cornus obliqua*	shrub
wild black current	*Ribes americanum*	shrub
sedge	*Carex hystricina*	sedge
sedge	*Carex cristatella*	sedge
sedge	*Carex prasina*	sedge
tussock sedge	*Carex stricta*	sedge
rice cut grass	*Leerisa oryzoides*	grass
stout wood reed	*Cinna arundinacea*	grass
wedge grass	*Sphenopholis obtusata*	grass
angelica	*Angelica atropurpurea*	herb
bulb bittercress	*Cardamine bulbosa*	herb
cattail	*Typha latifolia*	herb
crooked aster	*Aster prenanthoides*	herb
field mint	*Mentha arvensis*	herb
giant St. John's wort	*Hypericum pyramidatum*	herb
great lobelia	*Lobelia siphilitica*	herb
jewelweed	*Impatiens capensis*	herb
marsh bellflower	*Campanula aparinoides*	herb
marsh marigold	*Caltha palustris*	herb
marsh skullcap	*Scutellaria lateriflora*	herb
Michigan lily	*Lilium michiganense*	herb
nodding bur marigold	*Bidens cernua*	herb

Characteristic species. Continued.

purple meadow rue	*Thalictrum dasycarpum*	herb
showy tick trefoil	*Desmodium canadense*	herb
side-flowered aster	*Aster lateriflorus*	herb
skunk cabbage	*Symplocarpus foetidus*	herb
spotted joe-pye weed	*Eupatorium maculatum*	herb
swamp agrimony	*Agrimonia parviflora*	herb
swamp dock	*Rumex verticillatus*	herb
swamp aster	*Aster puniceus*	herb
swamp saxifrage	*Saxifraga pensylvanica*	herb
water cress	*Nasturtium officinale*	herb

Sedge Meadow

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 meadows in the DAA is threatened by invasive non-native plant species, especially reed canary grass. Sedge meadows are sensitive to lowering the level of groundwater, such as by ditching. Sedge meadows occur scattered through the DAA. Lower Rush Creek has one of the largest sedge meadow areas in the DAA. Other known areas include Irish Hollow and the upper tributaries of Rush Creek (Tesenne and Harrold 1995, Tesenne and Keene 1996).

Mapped soil series: Birds, Lawson

Characteristic species:

meadow-sweet	*Spiraea alba*	shrub
pale dogwood	*Cornus obliqua*	shrub
wild black current	*Ribes americanum*	shrub
sedge	*Carex cristatella*	sedge
sedge	*Carex emoryi*	sedge
sedge	*Carex hystricina*	sedge
sedge	*Carex stipata*	sedge
sedge	*Carex trichocarpa*	sedge
tussock sedge	*Carex stricta*	sedge
bluejoint grass	*Calamagrostis canadensis*	grass
wedge grass	*Sphenopholis obtusata*	grass
American manna grass	*Glyceria grandis*	herb
angelica	*Angelica atropurpurea*	herb
boneset	*Eupatorium perfoliatum*	herb
field mint	*Mentha arvensis*	herb
fowl manna grass	*Glyceria striata*	herb
glade mallow	*Napaea dioica*	herb
great lobelia	*Lobelia siphilitica*	herb
jewelweed	*Impatiens capensis*	herb
loosestrife	*Lysimachia hybrida*	herb
marsh bellflower	*Campanula aparinoides*	herb

Characteristic species. Continued.

marsh marigold	*Caltha palustris*	herb
marsh skullcap	*Scutellaria lateriflora*	herb
Michigan lily	*Lilium michiganense*	herb
nodding bur marigold	*Bidens cernua*	herb
purple meadow rue	*Thalictrum dasycarpum*	herb
showy tick trefoil	*Desmodium canadense*	herb
sneezeweed	*Helenium autumnale*	herb
spotted joe-pye weed	*Eupatorium maculatum*	herb
swamp agrimony	*Agrimonia parviflora*	herb
swamp dock	*Rumex verticillatus*	herb
swamp aster	*Aster puniceus*	herb
turtlehead	*Chelone glabra*	herb

Lake and Pond

The majority of lakes and ponds in northwestern Illinois are human-made; Galena, Apple Canyon, and Carroll are the large constructed lakes in the DAA. A small amount of natural sand ponds occur in the DAA in the sand dune area just north of the Palisades Park (Handel, personnel observation). The rest of the lakes are either natural river lakes such as Buffalo, Pin Oak, and Brown or augmented lakes such as Spring Lake. Human-made lakes in the DAA are associated with housing developments and, for the most part, are kept relatively free of vegetation for recreational purposes such as boating or fishing. The majority of ponds also are constructed for similar purposes. Some have developed native vegetation and have become somewhat functional as far as wildlife habitat (Tessene and Harrold 1995, Tessene and Keene 1996).

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.

Sand Pond - Natural ponds include shallow-water wetlands, less than 20 acres, that are not excavated or impounded. Most of the ponds have been combined with marsh habitat or are oxbows along the Apple and other major rivers near their confluence with the Mississippi. They are shallow enough to allow rooted aquatic plants to grow across most of the area. One small area is known to have sand ponds; this is an area adjacent to the Mississippi River bluffs in perched dunes. This sand pond complex has not been studied in detail.

Mapped soil series: Soils are inundated.
Characteristic species:

common burreed	*Sparganium eurycarpum*	burreed
cattail	*Typha latifolia*	herb
buttonbush	*Cephalanthus occidentalis*	shrub
sedges	*Carex* spp.	sedges
spikerushes	*Eleocharis* spp.	rushes
duckweeds	*Lemna* spp.	duckweeds

Lakes (river) - Most of the major lakes in the DAA are impoundments such as Galena, Carroll, and Apple Canyon lakes. River lakes occur through the Mississippi River. The main problems are siltation from runoff and encroachment from exotics.

Mapped soil series: Soils are inundated.
Characteristic species:

black willow	*Salix nigra*	tree
buttonbush	*Cephalanthus occidentalis*	shrub
sandbar willow	*Salix exigua*	shrub
red osier dogwood	*Cornus stolonifera*	shrub
American lotus	*Nelumbo lutea*	aquatic
lesser naiad	*Najas minor*	aquatic
pickerelweed	*Pontederia cordata*	aquatic
pondweeds	*Potamogeton* spp.	aquatics
southern naiad	*Najas quadalupensis*	aquatic
rice grass	*Leerisa oryzoides*	grass
tall manna grass	*Glyceria striata*	grass
bulrushes	*Scirpis* spp.	rushes
blue flag	*Iris virginica*	herb
cardinal flower	*Lobelia cardinalis*	herb
cinnamon willow herb	*Epilobium coloratum*	herb
duckweeds	*Lemna* spp.	herb
halberd-leaved rose mallow	*Hibiscus laevis*	herb
hop sedge	*Carex lupulina*	herb
small water plaintain	*Alisma plantago-aquatica*	herb
smartweeds	*Polygonum* spp.	herbs
swamp aster	*Aster puniceus*	herb

Primary

The Primary community 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 **talus communities**. They are extremely important communities for the threatened and endangered species that occur in the DAA. Because of their low agricultural and urban potential, these areas are often the least disturbed communities in a given region. A large portion of threatened and endangered species of the DAA occur in primary communities, including several species that occur nowhere else in the state.

(Cedar Glade) dolomite substrate - Based on species composition, the limestone glade community described by the Illinois Natural Areas Inventory is more applicable in the southern areas of the state in the lower reaches of the Illinois and Mississippi river valleys. Some of the cedar glades described by Curtis (1959) in the Driftless Area of Wisconsin have several characteristics in common with the sites in the DAA. They occur on cliffs which provide protection from fire, important tree species are red cedar, black oak and

basswood, and the shrub layer is reduced or absent. Certain floristic components are common in both, including columbine, sand cress, and false Solomon's seal. The cedar glades described in the *Vegetation of Wisconsin* (Curtis 1959) have a more developed herbaceous layer dominated by dry prairie species that vegetatively resemble the dolomite hill prairies in the Apple and Galena river valleys. The cedar glades might actually represent the last stage of succession in the absence of fire in some hill prairie habitat. Cedar glades have been described by several authors in the DAA. Wunderlin (1965) and Handel (1994) examined the cedar glades in the Palisades State Park and Heim (1984) described a cedar glade community in Apple Canyon State Park. Generally, cedar glades have a mixture of prairie forbs and grasses with an overstory of red cedar, basswood, and, to a lesser extent, black oak. Although basswood is thought of as a mesic forest species in the state, in the DAA it occurs in a wide range of habitats. In the cedar glade area it often is confined to the xeric area right at the cliff edge. The herbaceous layer ranges from bare soil to a thick sod of ivory sedge. Several threatened and endangered species occur in or adjacent to cedar glades (Appendix 1).

Mapped soil series: Sogn, Lacrescent

Characteristic species:

basswood	*Tilia americana*	tree
black oak	*Quercus velutina*	tree
yellow chestnut oak	*Quercus muhlenbergii*	tree
paper birch	*Betula papyrifera*	tree
red cedar	*Juniperus virginiana*	tree
chokecherry	*Prunus virginiana*	shrub
gooseberry	*Ribes cynosbati*	shrub
lead plant	*Amorpha canescens*	shrub
sedge	*Carex eburnea*	herb
sedge	*Carex pensylvanica*	herb
bottlebrush grass	*Elymus hystrix*	herb
little bluestem	*Schizachyrium scoparium*	herb
side-oats gramma	*Bouteloua curtipendula*	herb
American stickseed	*Hackelia americana*	herb
Balsum ragwort	*Senecio pauperculus*	herb
cliff goldenrod	*Solidago sciaphila*	herb
columbine	*Aquilegia canadensis*	herb
false Solomon's seal	*Smilacina racemosa*	herb
green twayblade	*Liparis loeselii*	herb
hairy goldenrod	*Solidago hispida*	herb
jeweled shooting star	*Dodecatheon amethystinum*	herb
kitten tails	*Bessyea bullii*	herb
purple twayblade	*Liparis liliifolia*	herb
rock cress	*Arabis lyrata*	herb
small skullcap	*Scutellaria leonardii*	herb
stiff gentian	*Gentianella quinquefolia*	herb
violet wood sorrel	*Oxalis violacea*	herb
white snakeroot	*Eupatorium rugosum*	herb

Cliff

Cliff communities occur on or near vertical faces of exposed bedrock or unconsolidated materials. Soils are absent or very thin, and the plant communities are largely determined by the substrate. Aspect (the direction the cliff is facing) and amount of shade also are important. In Illinois there are four natural cliff communities: sandstone cliff, dolomite cliff, sandstone overhang, and eroding bluff communities. The cliffs of the DAA consist of various dolomites and dolomitic shales. Differences in response to erosional factors and geologic history of these dolomites and shales shaped the DAA in countless ways - from the development of the sand areas and palisades in the west to the buttes (locally called mounds) along the northern and eastern boundaries. Cliffs can be broken into two types: dry cliff communities which generally face south to west and mesic cliffs which generally face north to east. No high quality, Category I cliff community was found during the Natural Areas Inventory. Most natural cliff communities in the DAA fall under Category II natural area status because of the high concentration of threatened and endangered species that occur in these habitats (Table 11).

Dry cliff - The majority of this community type occurs on the bluffs facing the Mississippi River; however, it occurs throughout the DAA in river and creek valleys where south- to west-facing exposures exist. The most spectacular example of this community type occurs in the Mississippi Palisades State Park, where the cliffs rise 280 feet above the floodplain (Wunderlin 1965). Several threatened and endangered species occur on the cliff face as well as in the area of shallow soil at the cliff's edge and in the talus beneath the cliff face.

Mapped soil series Dolomite bedrock, or a thin layer of Sogn or Lacrescent.

Characteristic species

basswood	*Tilia americana*	tree
yellow chestnut oak	*Quercus muhlenbergii*	tree
red cedar	*Juniperus virginiana*	tree
chokecherry	*Prunus virginiana*	shrub
side-oats gramma	*Bouteloua curtipendula*	grass
sedge	*Carex eburnea*	herb
bottlebrush grass	*Elymus hystrix*	herb
American pennyroyal	*Hedeoma pulegioides*	herb
American stickseed	*Hackelia americana*	herb
aromatic aster	*Aster oblongifolius*	herb
cliff goldenrod	*Solidago sciaphila*	herb
columbine	*Aquilegia canadensis*	herb
common wood fern	*Woodsia obtusa*	herb
jeweled shooting star	*Dodecatheon amethystinum*	herb
pale vetchling	*Lathyrus ochroleucus*	herb
sand cress	*Arabis lyrata*	herb
baby lip fern	*Cheilanthes feei*	herb
purple cliff brake	*Pellaea atropurpurea*	herb
smooth purple cliff brake	*Pellaea glabella*	herb

Mesic cliff and talus - The mesic cliff community is one of the most interesting communities in the DAA. Also included in the mesic cliff community is the talus (crumbled rock from cliff face) below the cliff as well as rock outcrops that occur along the slope. Often these slopes are covered with mesic upland forest up to the vertical cliff. Pepoon (1909, 1916, 1917) discussed the interesting flora of the cliffs of Jo Daviess County. Many of the species of plants are disjunct from their northern range distribution. The cliff summits often contain several species of conifers, including red cedar, white pine, and Canada yew. According to Pepoon (1909) unique flora occurred on the cliff communities where seepage occurred on the rock. In this moist environment he stated that plants that occurred farther north and east in bogs and tamarack marshes occurred along the cracks and crevasses. Some of these species still occur on the bluffs, but others have yet to be relocated. This community is best known from Apple River Canyon and associated river bluffs of the Apple River. However, this habitat occurs through the Wisconsin Driftless Division in creek and river canyons.

Mapped soil series: Dolomite bedrock, or a thin layer of Sogn or Lacrescent.
Characteristic species:

basswood	*Tilia americana*	tree
blue ash	*Fraxinus quadrangulata*	tree
blue beech	*Carpinus caroliniana*	tree
hop hornbeam	*Ostrya virginiana*	tree
paper birch	*Betula papyrifera*	tree
red oak	*Quercus rubra*	tree
sugar maple	*Acer saccharum*	tree
bush honeysuckle	*Diervilla lonicera*	shrub
Canada yew	*Taxus canadensis*	shrub
leatherwood	*Dirca palustris*	shrub
ninebark	*Physocarpus opulifolius*	shrub
red raspberry	*Rubus strigosus*	shrub
round-leaved dogwood	*Cornus rugosa*	shrub
shrubby cinquefoil	*Potentilla fruticosa*	shrub
American spikenard	*Aralia racemosa*	herb
bird's-eye primrose	*Primula mistassinica*	herb
bishop's -cap	*Mitella diphylla*	herb
blue cohosh	*Caulophyllum thalictroides*	herb
columbine	*Aquilegia canadensis*	herb
dutchman's breeches	*Dicentra cucullaria*	herb
hillside strawberry	*Fragaria americana*	herb
red baneberry	*Actaea rubra*	herb
rice grass	*Oryzopsis racemosa*	herb
sedge	*Carex albursina*	herb
sedge	*Carex communis*	herb
slender cliffbrake	*Cryptogramma stelleri*	herb
sullivantia	*Sullivantia renifolia*	herb
walking fern	*Asplenium rhizophyllum*	herb
white camass	*Zigadenus glaucus*	herb
wild ginger	*Asarum canadense*	herb

Algific slopes - This rare community is confined to the Driftless Area of southeastern Minnesota, southwestern Wisconsin, northeastern Iowa, and northwestern Illinois. These communities are similar to talus slopes floristically and in their position in the landscape; however, there are several climatic and geologic factors that make algific slopes a unique and extremely rare community. Algific slopes were not recognized as a community in the INAI, so classification and discussion of algific slope communities are based on recent information from Illinois and Iowa. A great deal of information was gathered from Iowa where algific slopes have been studied in great detail. According to Kuchenreuther (1996) the following conditions have to occur for the formation of an algific slope. A karst topography with caves and fissures in the bedrock is essential. The bedrock usually consists of a thick layer of dolomite over a thinner layer of dolomite imbedded with partially impervious layers of shale, bentonite, or chert; in turn this layer is over an impervious shale layer that does not allow water to escape into deep ground water circulation. When the stream action erodes away the cliff it causes the softer shale to crumble and accumulate at the cliff base, forming a talus slope. Sinkholes from above the cliff open, allowing water to flow down to the lower layer until it becomes trapped between the talus slope and bottom layer. During the winter months ice is formed behind the talus slope in the fissures and crevices in and behind the talus slope. During the summer months the ice melts, causing a moist cool air to flood out down the slope. This creates a cool microclimate that is favorable for plants that occur in cool climates. Many of the plants that occur on algific slopes are disjunct populations from northern United States and Canada. Only a few algific slopes are known from the DAA; they are confined to the base or talus of high river bluffs. Two of the major threats to algific slopes are the sealing of sinkholes and groundwater contamination.

Mapped soil series: Lacrescent

Characteristic species:

basswood	*Tilia americana*	tree
paper birch	*Betula papyrifera*	tree
beaked hazelnut	*Corylus cornuta*	shrub
black ash	*Fraxinus nigra*	shrub
downy arrowwood	*Viburnum rafinesquianum*	shrub
nannyberry	*Viburnum lentago*	shrub
prickly rose	*Rosa acicularis*	shrub
round-leaved dogwood	*Cronus rugosa*	shrub
shadbush	*Amelanchier interior*	shrub
mountain clematis	*Clematis occidentalis*	vine
honeysuckle	*Lonicera prolifera*	vine
fowl bluegrass	*Poa palustris*	herb
rice grass	*Oryzopsis racemosa*	herb
sedge	*Carex albursina*	herb
American spikenard	*Aralia racemosa*	herb
bishop's -cap	*Mitella diphylla*	herb
Canada violet	*Viola canadensis*	herb
harebell	*Campanula rotundifoila*	herb
jewelweed	*Impatiens capensis*	herb
leafcup	*Polymnia canadense*	herb

Characterist species. Continued.		
red baneberry	*Actaea rubra*	herb
small enchanter's nightshade	*Circaea alpina*	herb
twinleaf	*Jeffersonia diphylla*	herb
wood amemone	*Anemone quinquefolia*	herb
fragile fern	*Cystopteris bulbifera*	herb
maidenhair fern	*Adiantum pedatum*	herb
slender cliffbrake	*Crytogramma stelleri*	herb

Cultural Habitats

This class describes communities formed by human 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 DAA, comprising about 72.5% of the total land area. No threatened or endangered species are known from cultural habitats in the DAA. These areas impose some of the most challenging ecological problems for natural habitats in the DAA (see discussion below). Two exceptions are the prairie reconstructions, termed prairie restoration by the INAI (White and Mandy 1978), and efforts at wetland restoration. These are the only community types mentioned below (briefly) because they are the only examples in the Cultural community class of efforts to replicate natural communities.

Prairie restoration and reconstruction - Typically, prairie reconstructions are plantings of prairie species on grassland soils where the original natural community has been destroyed. Restoration refers to a community that is degraded, but some of the characteristic floristic and faunistic components remain intact. With active management they can be restored to a functional community. 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. There are several prairie reconstructions and restorations currently underway in the DAA. The Prairie Enthusiasts currently have about 110 acres of prairie reconstructions and are restoring approximately 12 native remnants in Jo Daviess County. There also are prairie and savanna restoration and reconstruction projects in the Palisades State Park and surrounding area. Prairie reconstructions are often poor replacements for the native prairie that once occurred and often take years to develop floristically. However, reconstructions are very important in providing crucial habitat for faunistic components of prairies, including insects and birds. This is especially true with grassland bird species, for whom the structural components of grasslands are more important than floristic diversity. An example is Henslow's sparrow. Recently a central Illinois prairie reconstruction was given preliminary approval for dedication as an Illinois Nature Preserve. The Doris Westfall Prairie Restoration was started in 1973. After 25 years this 40-acre reconstruction harbors 119 native plant species, including one threatened plant and one endangered plant and one threatened grassland bird species. Prairie restorations and reconstructions done in accordance with the Illinois Nature Preserves Commission's plant translocation and restoration policy (approved by INPC in 1992, resolution 1149) are eligible for nature preserve dedication (pers. comm. Patti Malmborg,

Illinois Nature Preserves Commission). More study is needed on several aspects of prairie reconstruction (see McClain 1997a, Packard and Mutel 1997a, Handel 1997b, and Schramm 1992).

Wetland Restoration - Wetland restorations attempt to create a stable ecosystem that is functionally and floristically 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 two 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. As with prairie reconstructions, wetland reconstructions often provide functions that are unrelated to floristic diversity, such as floodwater storage and wetland bird habitat. Many wetlands in Illinois with low plant diversity provide invaluable habitat for threatened and endangered wetland birds. This is especially true with marsh habitat (pers. comm. Patti Malmborg, Illinois Nature Preserves Commission). One wetland reconstruction occurs south of Savanna near Route 84 and the Plum River.

Summary and Recommendations

Trends in the Driftless 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 equals or exceeds statewide rates. However, because of the conversion of shallow wetland communities to open water in the Mississippi River this trend is not reflected in the data. The whole DAA is of statewide significance today for several reasons. There are a relatively large number of extant remnants of natural communities that are otherwise rare or absent in the rest of Illinois; this is especially true for sand and cliff communities. The DAA also contains 21.5% of the state's threatened and endangered plant species, including several that occur nowhere outside the DAA.

Recent studies in the DAA have found many high quality remnants and threatened and endangered species as well as species previously unknown from the DAA. Most of these efforts have taken place in concentrated areas in Jo Daviess County or on public lands such as the Savanna Army Depot. Despite the availability of a great deal of descriptive information regarding natural communities in the DAA, there remain many knowledge gaps, particularly about the distribution, abundance, qualitative condition, and ecological trends among remnants. This is true with all habitats in the DAA; however, this is especially true in regards to the amount and quality of upland prairie, forest, savanna and cliff communities. A study of just Jo Daviess County in 1994 found 51 prairie remnants that were in need of management and floristic study (Rachuy 1994). Forest and cliff communities outside the state parks are in need of surveys as well. Almost no information was found about the bluffs from East Dubuque to Hanover Bluff and south of Savanna or for several of the interior river valleys. Though floristic information is available for the few remnants, there is a lack of quantitative data for many areas.

Many of the most challenging conservation issues in the DAA are addressed primarily at the community and ecosystem levels. There are serious ecological problems that threaten the long-term maintenance of biodiversity in the DAA. Throughout the natural community descriptions for the DAA 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 DAA 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. Certain areas in the state that are more isolated have not been studied in as great a detail as the more populated areas or areas that are near a university or college. The recent discoveries of plant communities and species in the DAA demonstrate the lack of knowledge about the resources within the DAA. The many natural communities in the DAA, though somewhat degraded, retain relatively high levels of ecological integrity and have potential for further improvement through restoration efforts. Since the INAI sites are few and small in total area the somewhat degraded, but restorable, natural communities that remain are critical for the long-term maintenance of biodiversity in the region. Remnants among all community classes (e.g. forest, prairie, savanna, wetland, lake and pond, and primary) need to be identified. For example, upland prairies, forests, savannas, seeps, marshes, and cliffs are known from the DAA and identification of these remnants is central to any recovery effort for these community types.

2. Mapping

All results from natural community inventory efforts should be categorized and mapped to provide a measurable context for the locations of habitats with differing ecological conditions. 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 assessment area will aid in the prioritization of protection efforts. Highly isolated remnants pose distinct conservation and protection challenges compared with clusters of restorable natural communities. Staff of the Illinois Nature Preserves Commission (524 S. Second St., Springfield, IL 62701) 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 DAA (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, and species migrations, and a reduction in habitat heterogeneity (Wilcove et al. 1986). The outcome typically is loss of species diversity. However, "solutions" to restoring biological integrity and ecosystem-level process are especially complex and costly if the goal is to recreate 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 or reducing the degradation factor (e.g. overgrazing, soil disturbances), although restoration to pre-disturbance condition may require intensive vegetation management in severe cases. Certain species (e.g. many ferns, orchids, trilliums, blue cohosh, bellflower, bloodroot, several grass and sedge species) appear to be sensitive to overgrazing 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, prickly ash, Missouri gooseberry, blackberries (*Rubus* spp.), Virginia creeper, and the exotic garlic mustard.

Fire is an ecological force that historically influenced many aspects of natural communities in the DAA. Many community types require fire for maintenance of community characteristics and diversity. Fire absence has resulted in changes in forest structure, composition, and diversity. Invasion of mesophytic species such as sugar maple into oak-hickory forests is a statewide phenomenon related to fire absence also occurring in the DAA. 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 European settlement. An obvious consequence of this change is the possible loss of oak woodlands and the plant and wildlife species that depend on them. A rich assemblage of spring wildflowers 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 often have been rotated historically to fescue pastures during spring months. Nevertheless, prescribed fires can be implemented in a wide variety of remnants and community types at little cost and can achieve measurable improvements in many parameters of ecosystem integrity (Schwartz and Hermann 1997, Taft 1997).

Exotic species invasion is a serious problem at the species and community level. 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 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 in the DAA are given in Table 12. Solecki (1997) provides valuable information for the control of exotic species in Illinois.

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. Several methods are available to gauge a community's status. Depending on the goals of the landowner each method can provide valuable information. Floristic Quality Assessment (Taft et al. 1997) may provide quick qualitative data to show trends on species diversity over time in a given area. The Illinois Natural Areas Inventory (White 1978) is a method used by many field biologists to evaluate land in regards to quality. Using several parameters, including disturbance, species diversity and abundance, age class of trees in forest and savanna habitat, and size, the area is graded A, B, C, or D. If the goal is to quantitatively assess an area and provide publishable data and to show specific changes in vegetation over time, quantitative data needs to be collected. Kent & Coker (1994) is a useful reference on vegetation analysis. Depending on the goals of the land owner or agency one or a combination of the above methods can provide data useful when considering management strategies for a specific site.

Table 12. List of selected invasive exotic species known to occur in the Driftless Assessment Area and recommended eradication methods[1].

Species	Cut & Apply Stump-Treatmt Herbicide	Foliar Herbicide Application	Prescribed Fire	Hand Pull/cut (get root)	Dig Root
amur honeysuckle	X		X	X	
black locust	X-Garlon 4				
Canada bluegrass			X		
dames' rocket		X			
glossy buckthorn	X-Garlon 4	X	X		
Japanese honeysuckle		X	X	X	
Kentucky bluegrass			X		
meadow fescue		X	X		X
moneywort		X			
multiflora rose	X				
reed canary grass		X			
smooth brome		X	X		
spotted knapweed[2]		X			
sweet clover			X	X	
white mulberry	X				
wild parsnip[3]		X	X	X*	

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

[2] ***Warning-*** knapweeds (*Centaurea* spp.) have been reported to contain cancer-causing compounds and have caused tumors in people who have had contact pulling plants with bare hands. Knapweed should only be pulled using gloves and then with extreme caution (McClain 1997b).

[3] This species has phototoxic properties and skin contact should be avoided.

Birds

Introduction

Information in this section is derived from standard references of Illinois, including the Illinois Natural Heritage Database (Illinois Department of Natural Resources 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 Driftless Assessment Area (DAA) is a very distinctive part of Illinois. Similar habitats extend into Wisconsin and parts of Minnesota and Iowa that are both botanically and geologically unique in the upper Midwest. These traits help create a wide variety of natural communities. Because of the geographical position of the area (in the extreme northwestern corner of the state), several species of birds either reach or are near the northern (e.g. Yellow-throated and Worm-eating Warblers), southern (Yellow-bellied Sapsucker and Sandhill Crane), or eastern (Yellow-headed Blackbird) limits of their range in the DAA, or are virtually disjunct outliers of their populations because of the unique botanical and geological traits of the area. Most, but not all native habitats in the DAA are chronically fragmented (Figures 4, 7, 8) and will likely remain so for the foreseeable future. For many birds of forest habitats, these are likely population "sinks" in which there is insufficient reproductive success to replace adults that die each year of natural causes. Nevertheless, the existence of several large public land holdings creates some opportunities for reducing the negative effects of fragmentation, especially in the larger forested tracts in Mississippi Palisades State Park (MPSP), the Upper Mississippi River National Fish and Wildlife Area (UMR), Tapley Woods State Conservation Area (TW), and the Apple River Canyon State Park, as well as the newly acquired lands that were formally part of the Savanna Army Depot (SAD), on which there are natural sand prairies, wetlands, riparian forest, and upland forest.

Bird species composition in the DAA is typical of the more heavily forested portions of the state except that the breeding species list has benefited from the existence of several large public land holdings (Table 13, Figure 10), many of which are mentioned above. Approximately 271 bird species regularly occur in the DAA (Table 13). This represents approximately 90% of the 300 species that regularly occur in the state (Illinois Ornithological Society, in press). Of these 271 species, over 138 breed or formerly bred in the area (Table 13). Several nesting species have been extirpated from the site, including several that are globally extinct (Passenger Pigeon-*Ectopistes migratorius* and Carolina

Parakeet-*Conuropsis carolinensis*) and some that are extinct or are nearly so in Illinois (Greater Prairie Chicken-*Tympanuchus cupido,* Sharp-tailed Grouse- *Tympanuchus phasianellus*, and Peregrine Falcon-*Falco peregrinus*). In addition, there are specimen records from Jo Daviess County for the federally endangered Whooping Crane (*Grus americana*) (Bohlen and Zimmerman 1989) and this species may have bred in the area prior to European settlement. The locally extirpated Ruffed Grouse has been released at several sites in the area over the years and a few wild birds apparently still cross over the border from Wisconsin (R. Montgomery, pers. comm.).

The bird species that live in the DAA are ecologically diverse, and although some species are able to live in a variety of habitats, many species are adapted to living in only one or a few habitats (Table 13). The sections following Table 13 describe the bird communities typically found in the major habitat types of the DAA, as well as unique environmental problems and management solutions for bird communities in each habitat.

Table 13. Bird species that regularly occur in the Driftless Assessment Area. These are species that are likely to be present all or most years. This list excludes extinct species and the many wandering or "vagrant" species that have been recorded in the area. The purpose is to list only those species that have or could have significant populations in the area. The table also lists the habitats that are most likely to be occupied during each season.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Common Loon *Gavia immer*			L
Pied-billed Grebe - ST ***Podilymbus podiceps***	**L W** (r)		**L W**
Horned Grebe *Podiceps auritus*			L
Eared Grebe *Podiceps nigricollis*			L
American White Pelican *Pelecanus erythrorhynchos*			L
Double-crested Cormorant - ST ***Phalarocorax auritus***	**L W**		**L**
American Bittern - SE ***Botaurus lentiginosus***	**W** (r)		**W**
Least Bittern - SE ***Ixobrychus exilis***	**W** (r)		**W**
Great Blue Heron *Ardea herodias*	L W Fs F	L W	L W
Great Egret - ST ***Ardea albus***	**L W**		**L W**

Table 13. Continued.

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

Table 13. Continued.

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

Table 13. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Broad-winged Hawk *Buteo platypterus*	F (r)		F
Red-tailed Hawk *Buteo jamaicensis*	F C G R S	F C G R S	F C G R S
Rough-legged Hawk *Buteo lagopus*		C G	
Golden Eagle *Aquila chrysaetos*			F S G
American Kestrel *Falco sparverius*	R C G Sav	R C G Sav	R C G Sav
Merlin *Falco columbarius*			All
Peregrine Falcon - SE, FE ***Falco peregrinus***			**All**
* Ring-necked Pheasant *Phasianus colchicus*	C G S	C G S	C G S
* Gray Partridge *Perdix perdix*	C G S	C G S	C G S
Wild Turkey *Meleagris gallopavo*	F S Sav Fs	F S Sav Fs C	F S Sav Fs C
Northern Bobwhite *Colinus virginianus*	S G C Sav	S G C Sav	S G C Sav
Yellow Rail - SE ***Coturnicops noveboracensis***			**G W**
King Rail - ST ***Rallus elegans***			**G W**
Virginia Rail *Rallus limicola*	W (r)		W G
Sora *Porzana carolina*		W G	
Common Moorhen - ST ***Gallinula chloropus***	**W (r)**		**W**
American Coot *Fulica americana*	W (r)	L	W L
Sandhill Crane - SE ***Grus canadensis***	**W (r)**		**W G C**
Black-bellied Plover *Pluvialis squatarola*			L W
American Golden-Plover *Pluvialis dominica*			W L C G
Semipalmated Plover *Charadrius semipalmatus*			W

Table 13. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Killdeer *Charadrius vociferus*	W R G C		W R G C
American Avocet *Recurvirostra americana*			W
Greater Yellowlegs *Tringa melanoleuca*			W
Lesser Yellowlegs *Tringa flavipes*			W
Solitary Sandpiper *Tringa solitaria*			W
Willet *Catoptrophorus semipalmatus*			W
Spotted Sandpiper *Actitis macularia*	L		W
Upland Sandpiper - SE ***Bartramia longicauda***	**G** (r)		**G**
Hudsonian Godwit *Limosa haemastica*			W
Ruddy Turnstone *Arenaria interpres*			W
Sanderling *Calidris alba*			W
Semipalmated Sandpiper *Calidris pusilla*			W
Western Sandpiper *Calidris mauri*			W
Least Sandpiper *Calidris minutilla*			W
White-rumped Sandpiper *Calidris fuscicollis*			W
Baird's Sandpiper *Calidris bairdii*			W G
Pectoral Sandpiper *Calidris melanotos*			C W G
Dunlin *Calidris alpina*			W
Stilt Sandpiper *Calidris himantopus*			W
Buff-breasted Sandpiper *Tryngites subruficollis*			W G
Short-billed Dowitcher *Limnodromus griseus*			W

Table 13. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Long-billed Dowitcher *Limnodromus scolopaceus*			W
Common Snipe *Gallinago gallinago*			W G
American Woodcock *Scolopax minor*	F Fs S		F Fs S
Wilson's Phalarope - SE ***Phalaropus tricolor***			**L W**
Red-necked Phalarope *Phalaropus lobatus*			L W
Franklin's Gull *Larus pipixcan*			L W C
Bonaparte's Gull *Larus philadelphia*			L W C
Ring-billed Gull *Larus delawarensis*		L W C	L W C
Herring Gull *Larus argentatus*		L	W L C
Glaucous Gull *Larus hyperboreus*		L	
Thayer's Gull *Larus thayeri*		L	
Caspian Tern *Sterna caspia*			L
Common Tern - SE ***Sterna hirundo***			**L**
Forster's Tern - SE ***Sterna forsteri***			**L W**
Black Tern - SE ***Chilidonias niger***			**L W**
* Rock Dove *Columba livia*	R C	R C	R C
Mourning Dove *Zenaida macroura*	R C S	R C S	R C S
Black-billed Cuckoo *Coccyzus erythropthalmus*	S		F S Sav
Yellow-billed Cuckoo *Coccyzus americanus*	F S Fs Sav		F S Fs Sav
Barn Owl - SE ***Tyto alba***	**G**[(r)]	**C G Sav**	**C G Sav**
Eastern Screech-Owl *Otus asio*	R S Sav	R S Sav	R S Sav

Table 13. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Great Horned Owl *Bubo virginianus*	F C R Fs Sav	F C R Fs Sav	F C R Fs Sav
Snowy Owl *Nyctea scandiaca*			C
Barred Owl *Strix varia*	F Fs	F Fs	F Fs
Long-eared Owl - SE ***Asio otus***		**F S**	**F S**
Short-eared Owl - SE ***Asio flammeus***		**G**	**G**
Northern Saw-whet Owl *Aegolius acadicus*		F S	F S
Common Nighthawk *Chordeiles minor*	R G Sav		R G C
Whip-poor-will *Caprimulgus vociferus*	F Sav		F Sav
Chimney Swift *Chaetura pelagica*	R F S Fs Sav		All
Ruby-throated Hummingbird *Archilochus colubris*	F S R Fs Sav		F S R Fs Sav
Belted Kingfisher *Ceryle alcyon*	L W	L W	L W
Red-headed Woodpecker *Melanerpes erythrocephalus*	Fs R C	F Fs Sav	F Fs C R Sav
Red-bellied Woodpecker *Melanerpes carolinus*	F Fs S R Sav	F Fs S R Sav	F Fs S R Sav
Yellow-bellied Sapsucker *Sphyrapicus varius*	F Fs [n]	F Fs R Sav	F Fs R Sav
Downy Woodpecker *Picoides pubescens*	F Fs R S Sav	F Fs R S Sav	F Fs R S Sav
Hairy Woodpecker *Picoides villosus*	F Fs Sav R	F Fs R S Sav	F Fs R S Sav
Northern Flicker *Colaptes auratus*	S F R Sav Fs	S F R Sav Fs	S F R Sav Fs
Pileated Woodpecker *Dryocopus pileatus*	F Fs Sav	F Fs Sav R	F Fs Sav R
Olive-sided Flycatcher *Contopus cooperi*			F Fs R S Sav
Eastern Wood-Pewee *Contopus virens*	F Fs R Sav		F Fs R Sav
Yellow-bellied Flycatcher *Empidonax flaviventris*			F S Fs

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Acadian Flycatcher *Empidonax virescens*	F Fs		F Fs
Alder Flycatcher *Empidonax alnorum*			W S Sav
Willow Flycatcher *Empidonax traillii*	W S		W S Sav
Least Flycatcher *Empidonax minimus*	F Sav (r)		F S R Fs Sav
Eastern Phoebe *Sayornis phoebe*	R Fs		R Fs
Great Crested Flycatcher *Myiarchus crinitus*	F Fs Sav		F Fs S R Sav
Eastern Kingbird *Tyrannus tyrannus*	S G C Sav		S G A F C Sav
Horned Lark *Eremophila alpestris*	C G	C G	C G
Purple Martin *Progne subis*	L R W G		L W G
Tree Swallow *Tachycineta bicolor*	L W Fs G		L W Fs G
Northern Rough-winged Swallow *Stelgidopteryx serripennis*	L W Fs G		L W G
Bank Swallow *Riparia riparia*	L W G		L W G
Barn Swallow *Hirundo rustica*	C R W L G S		C R W L G S
Cliff Swallow *Petrochelidon pyrrhonota*	L W G		L W G
Blue Jay *Cyanocitta cristata*	R F Fs S C Sav	R F Fs S C Sav	R F Fs S C Sav
American Crow *Corvus brachyrhynchos*	All	All	All
Black-capped Chickadee *Poecile atricapillus*	F S R Fs Sav	F S R Fs Sav	F S R Fs Sav
Tufted Titmouse *Baeolophus bicolor*	F R Fs Sav	F R Fs Sav	F R Fs Sav
Red-breasted Nuthatch *Sitta canadensis*		R	F R
White-breasted Nuthatch *Sitta carolinensis*	F R Fs Sav	F R Fs Sav	F R Fs Sav
Brown Creeper - ST ***Certhia americana***	**Fs (r)**	**F Fs R**	**F Fs R**

Table 13. Continued.

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

Table 13. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
* European Starling *Sturnus vulgaris*	R C F Fs Sav	R C	R C
White-eyed Vireo *Vireo griseus*	S Fs Sav [(r)]		S Fs Sav
Bell's Vireo *Vireo bellii*	S G		S G
Blue-headed Vireo *Vireo solitarius*			F Fs Sav
Yellow-throated Vireo *Vireo flavifrons*	F Fs		F Fs R
Warbling Vireo *Vireo gilvus*	S R Fs Sav		S R F Fs Sav
Philadelphia Vireo *Vireo philadelphicus*			S F R Sav
Red-eyed Vireo *Vireo olivaceus*	F Fs Sav		F Fs S R Sav
Blue-winged Warbler *Vermivora pinus*	S		S F R Sav Fs
Golden-winged Warbler *Vermivora chrysoptera*			F S Fs R Sav
Tennessee Warbler *Vermivora peregrina*			F R S Fs Sav
Orange-crowned Warbler *Vermivora celata*			S F R Sav Fs
Nashville Warbler *Vermivora ruficapilla*			S F R Sav Fs
Northern Parula *Parula americana*	F Fs [(r)]		F Fs R Sav
Yellow Warbler *Dendroica petechia*	S W		S W R Sav Fs
Chestnut-sided Warbler *Dendroica pensylvanica*	S [(r)]		S F Fs R Sav
Magnolia Warbler *Dendroica magnolia*			F S R Fs Sav
Cape May Warbler *Dendroica tigrina*			R F Fs Sav
Black-throated Blue Warbler *Dendroica caerulescens*			F R Fs Sav
Yellow-rumped Warbler *Dendroica coronata*		F Fs Sav	F S R Fs Sav
Black-throated Green Warbler *Dendroica virens*			F R Fs Sav

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Blackburnian Warbler *Dendroica fusca*			F Fs R Sav
Yellow-throated Warbler *Dendroica dominica*	Fs (r)		F Fs
Pine Warbler *Dendroica pinus*			F Fs Sav R
Palm Warbler *Dendroica palmarum*			Fs S F R W G Sav C
Bay-breasted Warbler *Dendroica castanea*			F R Fs S Sav
Blackpoll Warbler *Dendroica striata*			F Fs R S Sav
Cerulean Warbler *Dendroica cerulea*	F Fs		F Fs R Sav
Black-and-white Warbler *Mniotilta varia*	F (r)		F R Fs Sav S
American Redstart *Setophaga ruticilla*	Fs		F Fs S R Sav
Prothonotary Warbler *Protonotaria citrea*	Fs(r)		Fs
Worm-eating Warbler *Helmitheros vermivorus*	F(r)		F
Ovenbird *Seiurus aurocapillus*	F		F R S Sav
Northern Waterthrush *Seiurus noveboracensis*			Fs R
Louisiana Waterthrush *Seiurus motacilla*	F (r)		F Fs
Kentucky Warbler *Oporornis formosus*	F		F Sav Fs
Connecticut Warbler *Oporornis agilis*			S F Fs Sav R
Mourning Warbler *Oporornis philadelphia*			S F Fs Sav R
Common Yellowthroat *Geothlypis trichas*	G C W S R Sav		G C W S R Sav
Hooded Warbler *Wilsonia citrina*	F (r)		F R
Wilson's Warbler *Wilsonia pusilla*			S F Fs R Sav
Canada Warbler *Wilsonia canadensis*			F Fs S R Sav

Table 13. Continued.

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

Table 13. Continued.

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

Table 13. 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 *Carpodacus mexicanus*	R S	R S	F Fs R S Sav
Red Crossbill *Loxia curvirostra*		F R	F R
White-winged Crossbill *Loxia leucoptera*		F R	F R
Common Redpoll *Carduelis flammea*		G S R F	
Pine Siskin *Carduelis pinus*		R S F	R S F
American Goldfinch *Carduelis tristis*	S R G	S R G F Fs Sav	S R G F Fs Sav
Evening Grosbeak *Coccothraustes vespertinus*		R F Fs	R F Fs
* House Sparrow *Passer domesticus*	R C	R C	R C

[1] Bold type indicates an Illinois threatened (ST), Illinois endangered (SE), federally threatened (FT), and/or federally endangered (FE) species.

[2] * = introduced species.

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

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

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

[6] The following habitat codes are used:

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

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

Forest

Regularly Occurring Species

Typical Species - Upland and mesic forests of the region have been well characterized (Pepoon 1919, Wunderlin 1965). Virtually all forest songbirds characteristic of this latitude have significant, predictable breeding populations in the remaining forested areas. These include such common, widespread species as the Wild Turkey, Yellow-billed Cuckoo, Ruby-throated Hummingbird, Red-bellied, Hairy, and Downy Woodpeckers, Great Crested Flycatcher, Eastern Wood-Pewee, Blue Jay, Black-capped Chickadees, Tufted Titmouse, White-breasted Nuthatch, House Wren, Wood Thrush, Yellow-throated and Red-eyed Vireos, Ovenbird, Scarlet Tanager, Northern Cardinal, Rose-breasted Grosbeak, Indigo Bunting, and Brown-headed Cowbird. Many other less common species also breed in the area, including the Cooper's Hawk (found in virtually all large forested tracts and many small woodlots), Broad-winged Hawk (especially at MPSP), Barred Owl, Great Horned Owl, Yellow-bellied Sapsucker (probably more common in the DAA as a breeding bird than anywhere else in the state, with definite nesting at MPSP and elsewhere [Guth 1985, Robinson 1995, and McKay et al. 1995]), Pileated Woodpecker, Acadian Flycatcher (in most mesic ravines but especially at Mississippi Palisades), Veery (most numerous at Mississippi Palisades and Ward's Grove nature preserve), Worm-eating Warbler (steep forested hillsides at Hanover Bluff nature preserve), Yellow-throated Warbler (in sycamores in mesic ravines and along rivers), Hooded Warbler (regular breeder at TW and MPSP), American Redstart (large numbers in bottomland forest along the Mississippi River, especially at the SAD, UMR, and smaller numbers at MPSP), Louisiana Waterthrush (small numbers along forested streams), Cerulean Warbler (one of the larger populations outside of southern Illinois), Kentucky Warbler, and Summer Tanager. The Black and White Warbler, a forest species that is rare statewide, is absent or nearly absent from the area during most years, as is the Carolina Wren, which is found more or less commonly throughout the state with the notable exception of the DAA.

Threatened and endangered species - A few state threatened (ST) and state endangered (SE) species occur in the DAA. There are several records of Sharp-shinned Hawks (SE) from the area, including nesting records from MPSP. Long-eared Owls (SE) occasionally form winter roosts in cedar glades and pine plantations adjacent to forests in the DAA. The Veery (ST) is actually a regular and fairly common breeder in the area.

Exotic Species - European Starlings were introduced from Europe in the late nineteenth century and reached Illinois by 1922 (Bohlen and Zimmerman 1989). They are now one of the most abundant species in the state, and they can have detrimental effects on native species because they usurp breeding cavities from woodpeckers in many 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 reproducing in highly fragmented landscapes. Major factors influencing productivity of forest birds in the DAA are predation on eggs or young in nests, and brood parasitism by Brown-headed Cowbirds (Robinson 1995). 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-compete them for food, often leading to the starvation of the host young. Rates of nest predation and brood parasitism generally increase as a habitat become 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). Recently completed studies suggest that levels of nest predation and brood parasitism are high in this region of Illinois (Robinson 1995).

Even with some fairly large tracts of forest remaining in the region, predation and parasitism rates are very high (Robinson 1995). However, a few sites have the potential to become or presently are population sources for at least a few species (where productivity will be greater than the amount needed to replace the adults), especially if large, forested macrosites were to become a reality in the region. The best places for forest restoration are small openings in the midst of larger tracts that have the potential to be at least 500 acres or larger; below this size, nest predation and parasitism levels are extremely high statewide (Robinson et al., in press). Parasitism and nest predation levels tend to be highest along powerline cuts, campgrounds, and residential areas, and lowest in the interior of larger (>500 acre) tracts. There are several sections of forest, even in the fairly large tracts of MPSP, that could be enlarged by allowing regeneration of oak forest on ridgetops and along the old floodplain terrace. Given the importance of oaks to migrant birds, restoration efforts should seek to enhance oaks, especially White Oaks. Restoration in more mesic sites should also focus on oaks and sycamores. Ward's Grove nature preserve has a population of Wood Thrushes that experience relatively low (50-60%) rates of nest predation.

Wetland

Although wetlands may have historically accounted for considerably more of the land in the DAA, especially along the Mississippi River floodplain, only about 16,000 acres of wetland habitat remains. This represents about 2.6% of the DAA (Table 3, Figure 8). Most of the wetlands have been drained for agricultural purposes (see the discussion of wetlands in the introduction to this report). However, good examples still occur in the large UMR, both from Thomson (Carroll County) to the SAD and from southwest of Galena (Jo Daviess County) to the Wisconsin border.

Regularly Occurring Species

Typical Species - The continued presence of several fairly large wetlands in the area, mainly along the Mississippi River, makes it possible to characterize "typical" wetland species in the Driftless Area in spite of the large loss of wetland habitat that has taken place. Breeding species include Pied-billed Grebe (SAD and UMR), Double-crested Cormorant (UMR and Spring Lake conservation area), Least Bittern (UMR), Great Blue Heron (rookeries present), Great Egret (rookeries present), Green Heron, Canada Goose, Wood Duck, Mallard, Blue-winged Teal, Northern Harrier, Red-shouldered Hawk (forested wetlands), Virginia Rail (UMR), Killdeer, Spotted Sandpiper (strip-mine ponds), Barred Owl (forested), Belted Kingfisher, Red-headed Woodpecker (forested), Pileated Woodpecker (forested), Eastern Wood-Pewee (forested), Acadian Flycatcher (forested), Willow Flycatcher (shrubby), Eastern Phoebe, Great Crested Flycatcher (forested), Purple Martin, Tree Swallow, Northern Rough-winged Swallow, Bank Swallow, Barn Swallow, Cliff Swallow, Sedge Wren (grassy), Marsh Wren (marshes), Blue-gray Gnatcatcher (forested), Wood Thrush (forested), Veery (forested), Gray Catbird (shrubby), White-eyed Vireo (shrubby ; uncommon this far north), Yellow-throated Vireo (forested), Warbling Vireo (riparian willows and cottonwoods), Red-eyed Vireo, Yellow Warbler (shrubby), Yellow-throated Warbler (forested), American Redstart (young forested wetlands), Prothonotary Warbler (forested), Kentucky Warbler (forested), Common Yellowthroat, Indigo Bunting, Song Sparrow (shrubby), Swamp Sparrow (cattails), Red-winged Blackbird, Common Grackle, and Orchard Oriole (shrubby).

Threatened and Endangered Species - There are numerous state threatened or endangered species that occur in the wetlands of the DAA. These include the Pied-billed Grebe (ST) at the Savannah Army Depot, Double-crested Cormorant (ST) at UMR, Least Bittern (ST) at UMR, Great Egret (ST), Bald Eagle (SE) at several Mississippi River locations, Northern Harrier (SE), Red-shouldered Hawk (ST) at the Savannah Army Depot and several other locations, Virginia Rail (ST) at UMR, Sandhill Crane (SE) at UMR for several years (D. Dee, pers. comm.), Brown Creeper (ST) all along the Mississippi River bottomlands, Veery (ST) in forested wetlands, and Yellow-headed Blackbird (SE). Several other threatened or endangered species could recolonize restored wetlands in the area, including American Bittern (SE), Common Moorhen (ST), King Rail (ST), and possibly Black Rail (ST).

Exotic species - European Starlings are the only exotic species that is commonly found in the wetlands of the DAA (particularly among the dead snags in flooded, forested wetlands). Introduced Mute Swans have also been found in the area, and may breed here. Cattle Egrets formed a substantial breeding colony in the area in 1993, but it was destroyed by the extensive flooding along the Mississippi River (Kleen and Anderson 1994).

Population Dynamics and Management

The major conservation problem for wetland birds in the DAA is not the usual lack of large areas of contiguous habitat for birds of forested wetlands (Veery, Brown Creeper, Red-shouldered Hawk), as it is in most other areas of the state. A larger problem is the general scarcity of grass and sedge-dominated marshy habitat for bitterns, rails, moorhens, wrens, and harriers. This habitat loss is due mostly to the disruption of the natural flood regime of the Mississippi River. However, by manipulating water levels in some of the backwater pools (e.g. keeping water levels stable and high enough throughout the breeding season), nesting populations not only could be increased in this habitat type, but the populations now present in the area could become more successful and self-sustaining. Higher reproduction would not only be due to the increased amount of habitat, but also to decreased predation rates as a result of the stable water levels, which would deter most ground-dwelling predators. Where this habitat now exists, it attracts small nesting populations of some of these birds. Limited data on nesting success of birds of shrubby wetlands suggest that nest predation is a problem for some species (Yellow Warbler), but that other species may be able to nest successfully (e.g., Orchard Oriole). Wetland habitats are also heavily used by migrating waterfowl and shorebirds.

Wetland habitats should be a very high conservation and management priority for the region, especially grassy and sedge-dominated wetlands that are large enough to attract threatened and endangered breeding bird species, such as the Least and American Bitterns, Great Egret, King Rail, and Common Moorhen. Wetlands within restored grasslands should increase their potential to attract Short-eared Owls and Northern Harriers. Maintaining marshy borders around waterfowl management units will increase their potential to attract rare species as well. Restoration of forested wetlands should be coordinated with restoration of upland forests within large blocks to increase nesting success.

Savannas

Savannas used to be found along the dissected terrain of the major river valleys in the DAA, such as the Apple, Plum, and Galena Rivers. They were also found along the Mississippi River bluffs in areas such as MPSP. In recent decades, since fire has been effectively suppressed, savanna habitats have been greatly altered through vegetation changes and habitat destruction. Savannas are now one of the rarest plant communities in the region (see the chapter on "Vegetation communities" earlier in this report).

Regularly Occurring Species

Typical Species - Savanna birds are generally a subset of forest birds with a scattering of shrubland birds and a few species that actually prefer open, scattered trees. In the DAA, perhaps the most typical species are the Whip-poor-will, Red-headed Woodpecker, Great Crested Flycatcher, Eastern Wood-Pewee, Blue Jay, American Robin, Eastern Bluebird, Yellow-throated Vireo, Summer Tanager (rare this far north), Baltimore Oriole, and Indigo Bunting. The only known nesting Least Flycatchers in the DAA occur in open woodlands at MPSP. Summer Tanagers clearly prefer tall oaks along open areas. Other species that remain common in savannas include Red-tailed Hawks, Cooper's Hawks, Great Horned Owls, Wild Turkeys, Ruby-throated Hummingbirds, Northern Flickers, Red-bellied, Hairy, and Downy Woodpeckers, Black-capped Chickadees, Tufted Titmice, White-breasted Nuthatches, House Wrens, Scarlet Tanagers, Northern Cardinals, Rose-breasted Grosbeaks, Field Sparrows, and Brown-headed Cowbirds. Savannas with shrub thickets will attract birds of successional communities (e.g., Blue-winged Warbler, Yellow-breasted Chat, Rufous-sided Towhee, Indigo Bunting, American Goldfinch).

Threatened and Endangered Species - Historically, the Common Barn-Owl (SE) may have been associated with this habitat, but not recently. The preference of Long-eared Owls (SE) for cedar glades adjacent to open areas suggests a possible association with savanna-like habitats.

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

Population Dynamics and Management

There have been no detailed studies of the nesting success of birds in savanna habitat from this region. However, studies are underway elsewhere in the state (J.D. Brawn, unpubl. data), which should address this issue. Results of these studies have already shown that savannas are associated with high populations of Brown-headed Cowbirds. Many savanna nesting species, however, are at least partially resistant to cowbird parasitism. For example, some species may abandon parasitized nests or reject cowbird eggs (Rothstein and Robinson 1994) and some species nest in cavities that are inaccessible to cowbirds. Oak savannas appear to be heavily used by migrating birds, especially warblers and vireos. Oak restoration on upland ridges might also enhance populations of Cerulean Warblers, which nest fairly commonly in the area.

Prairie/Grassland

Native prairie habitat in the DAA is primarily located on the Savannah Army Depot. Less than 50 acres of high quality prairie vegetation remains in the area (see the section on "Current Land Cover" in the Introduction to this report). However, many bird species that historically lived in prairies are also able to live in grassland habitat such as hay fields, and sometimes pastures. These habitats are relatively common in the DAA. There are about 260,000 acres of "grassland" in the DAA (40% of the DAA). Pastures in the area are mostly lightly to moderately grazed and so are extensively used by grassland birds. However, they are also intensively hayed, which in one study has shown up to 94% mortality for nesting Bobolinks (Bollinger et al. 1990). They are also favored sites for foraging Brown-headed Cowbirds. But even though most of the grassland areas in the DAA are fairly small and heavily used, some of the larger areas, including large areas in the Savannah Army Depot have great potential for grassland birds.

Regularly Occurring Species

Typical Species - The restored prairies and grasslands in this region have a rich bird community. Typical nesting species include: Red-tailed Hawk, American Kestrel, Northern Bobwhite (grasslands with shrubs), Eastern Kingbird (shrubs), Barn Swallow, Sedge Wren (rare: tall, dense grass), Horned Lark (newly burned), Brown Thrasher (shrubs), Bell's Vireo (shrubs), Common Yellowthroat, Dickcissel, Savannah Sparrow (short grass), Grasshopper Sparrow, Vesper Sparrow (open grasses), Field Sparrow (shrubs), Lark Sparrow (shrubs in sandy soils), Bobolink (taller grass), Eastern and Western Meadowlarks, and Red-winged Blackbird.

Threatened and Endangered Species - Many threatened and endangered species currently nest in grasslands in the Driftless area, including the Northern Harrier (SE), Upland Sandpiper (SE), Loggerhead Shrike (ST), and Henslow's Sparrow (SE) (first documented nesting for this area in 1996, S. Amundsen pers. comm.). King Rails (ST) and Barn and Short-eared Owls (SE) also have the potential to return to restored grasslands.

Exotic Species - Two introduced species are found in the grasslands of the DAA. 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. Pheasants are abundant in prairie remnants statewide and they also nest abundantly in many restored prairies. Gray Partridge, although uncommon, have become permanent residents after the release of 12,000 birds from 1906 through 1927 (Farris 1970). European Starlings feed in grasslands following grazing, mowing, or burning.

Population Dynamics and Management

Some grassland habitat in the DAA has been created as a result of the Conservation Reserve Program (CRP). However, these habitats may disappear with changing farm policy; for this reason, it is important to maintain reliable preserves for grassland birds. The large numbers of grassland species (uncommon to rare in other areas of the state) which inhabit the large SAD (J.Herkert, unpubl. data) demonstrate the need for larger "macrosites" for sustaining viable nesting populations for such rare and/or declining species as Upland Sandpiper, Western Meadowlark, and Grasshopper Sparrow. Most of the remaining grassland acreage in the area is in much smaller private landholdings, mainly used for hay and grazing. One example of a relatively small (120 acres) native grassland site in the DAA, Ayers Sand Prairie, has a healthy population of such typical grassland species as Loggerhead Shrike, Eastern Meadowlark and Lark and Grasshopper Sparrows (pers. obs.). By reducing the intensity of haying on private landholdings, along with some restoration, the nesting success for these and other species such as Bobolinks (Bollinger, et al. 1990) could be greatly increased.

Nesting success of grassland species appears to be low in small grassland fragments, but appears to be relatively high in the SAD, mainly due to low-to-moderate predation rates. In general, woody vegetation should be removed from grassland areas. Small shrub thickets however, should be maintained to provide habitat for Bell's Vireo, Willow Flycatcher, Yellow Warbler, and Yellow-breasted Chat. Grassland areas with the best potential for benefiting area sensitive grassland bird species should be at least 125 acres and preferably more than 250 acres in area (Herkert et al. 1993). Some grazing may be allowable on restorations to provide conditions for Loggerhead Shrikes, Upland Sandpipers, and Savannah Sparrows. Some areas, however, should only be grazed, mowed, or burned at 3-year intervals to maintain habitat for Bobolinks, Sedge Wrens, and Henslow's Sparrows. Herkert et al. (1993), provides further guidelines for restoring grassland areas for birds.

Migrants also use grasslands in the DAA, and these habitats may be important stopover sites for longspurs, pipits, rails, bitterns, wrens, various shorebirds and several species of sparrows. In addition, grasslands also provide critical wintering habitat for several species of hawks including Northern Harrier and Rough-legged, Snowy and Short-eared Owls, Northern Shrike and Snow Buntings.

Lakes, Ponds, Impoundments, Creeks, and Rivers

Compared to the rest of the state, the creeks and rivers of the DAA are in relatively good condition (see section on "Aquatic Biota"); seven streams in the DAA are designated as Biological Significant Stream segments (Table 8, Figure 11). Nonetheless, as with several other habitats, creeks and rivers have been greatly altered. There are few natural lakes or

ponds in the DAA, and all open water combined accounts for only about 4.5% (28,800 acres) of the area (Table 2, Figure 9). However, locks and dams on the Mississippi River have created significant wildlife habitat both behind the dams in the form of various wetland type habitats and upstream in the form of deeper water. These habitats benefit migrating and wintering waterfowl.

Regularly Occurring 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. Typical breeding species include Double-crested Cormorant, Great Blue Heron, Great Egret, Green Heron, Canada Goose, Mallard, Wood Duck (forested bottomlands especially along the Mississippi River), Bald Eagle (mainly along the Mississippi River), Cooper's Hawk (riparian corridors), Killdeer, Spotted Sandpiper (strip-mine ponds), Belted Kingfisher, Eastern Phoebe (streams), Willow Flycatcher (willows), all of Illinois' swallows and martins, Brown Creeper (forested bottomlands mainly along the Mississippi River), House Wren, Blue-gray Gnatcatcher, Warbling Vireo (willows), Yellow Warbler (willows), American Redstart (forested bottomlands), Louisiana Waterthrush (forested streams), Common Yellowthroat, Song Sparrow, Swamp Sparrow, Red-winged Blackbird, Common Grackle (shores), Orchard Oriole (willows), and Baltimore Oriole (riparian corridors). Prothonotary Warblers nest in flooded backwaters of rivers.

Threatened and Endangered Species - Several threatened or endangered species breed in aquatic habitats in the DAA, mostly along the Mississippi River floodplain. These species include Pied-billed Grebe (ST), Double-crested Cormorant (ST) (especially at UMR), Great Egret (ST), Black-crowned Night-Heron SE), Bald Eagle (SE) (nesting at several Mississippi River locations), Red-shouldered Hawk (SE), Brown Creeper (ST), and Veery (ST) (along forested streams).

Exotic Species - The only exotic species found in these habitats in the DAA are the Mute Swan and Cattle Egret, both of which visit ponds in the area, and occasionally may breed here. European Starlings will also use the many dead snags along the borders of lakes, ponds and rivers, usurping cavities which might otherwise be used by native Tree Swallows and woodpeckers.

Population Dynamics and Management

We lack data on population size and nesting success of birds in aquatic habitats. Studies of the nesting success of birds in riparian corridors of different widths could provide data that could be usefully combined with information aimed at the design of erosion-control buffer strips along creeks. For example, restoration to promote more natural flood pulses would help create the kinds of disturbances necessary for some floodplain species (e.g.,

Prothonotary Warbler) and perhaps enhance mudflats for migrant shorebirds. Restoring wetland vegetation (e.g., cattails) along lakes and trees along creeks and rivers would provide nesting habitat. Restored corridors with woody vegetation (trees and shrubs) also provide excellent winter habitat for many species. But the most important role of these aquatic habitats for birds is as migratory stopover and wintering habitat for loons, grebes, herons, swans, geese, ducks, shorebirds, terns, and gulls. A study identifying which kinds of aquatic habitats are most attractive to migrants would be very helpful.

Cultural Habitats: Croplands

Agricultural areas generally provide poor quality habitat for most birds - diversity in cropland is much lower than in the original habitats. However, it is nonetheless important to consider the role of agricultural habitats for supporting bird populations in the DAA because much of the land within the DAA has been usurped for agricultural purposes. Over 33% of the DAA acreage is currently used for crop production (Table 2, Figure 5).

Regularly Occurring Species

Typical Species - Cropland bird communities are notable mainly for the many non-native species that nest in them (see below) and for a few native grassland species that appear to thrive in them, with Horned Larks being a good example. Other species found in cropland include the American Kestrel, Killdeer, Mourning Dove, Barn Swallow, American Crow, Common Grackle, Red-winged Blackbird, Savannah Sparrow (grassy strips), Grasshopper Sparrow (fallow stubble fields), Lark Sparrow (sand areas), and Vesper Sparrow (Warner 1994). Where there are wooded or shrubby areas along streams within cropland, other nesting species include Mallard, Red-tailed Hawk, Great Horned Owl, Eastern Screech-Owl, Eastern Bluebird (where nesting boxes are provided), Northern Cardinal, Indigo Bunting, Common Yellowthroat, Field Sparrow, and Song Sparrow. Farmsteads with tall shade trees often have nesting Warbling Vireos, House Wrens, Chipping Sparrows, and Baltimore Orioles. Eastern Phoebes often nest in farm buildings, as do Barn Swallows.

Threatened and Endangered Species - The Loggerhead Shrike (ST) is the only threatened or endangered species typically found in Illinois cropland habitats, and they are rare in the DAA.

Exotic Species - A number of exotic species are abundant in cropland in the DAA, including Ring-necked Pheasants, Rock Doves, European Starlings, and House Sparrows. Gray Partridge, which are much less common, may also be found in small numbers in agricultural areas, especially where there are grass and shrubby areas nearby.

Population Dynamics and Management

Warner (1994) documented the extent to which intensively used agricultural areas have few nesting birds and low nesting success. These areas aren't suitable for game species such as pheasants, and they often have high populations of feral cats, which are nest predators. However, CRP acreage can produce breeding habitat for some native grassland species such as Northern Harrier, Short-eared Owl, and Henslow's, Grasshopper, and Savannah Sparrows. Enhancement of grassy roadsides, shrubby streamsides, and riparian corridors can enormously increase the bird diversity within agricultural landscapes. Early mowing of hay adversely affects many species (Bollinger, et al. 1990).

Intensively farmed areas offer very little in the way of stopover habitat for migrant birds, except around farmsteads and flooded fields, which are used by large numbers of Canada Geese, Mallards, Ring-billed Gulls, and a few species of shorebirds (especially Lesser Golden Plovers and Pectoral Sandpipers). Wild Turkeys will also use waste grain in winter in agricultural areas near tracts of forest (pers. obs.). Also in winter, flocks of Snow Buntings and Lapland Longspurs join the resident Horned Larks, Rough-legged Hawks, Northern Harriers, and occasionally Short-eared and Snowy Owls forage over some fields.

Cultural Habitats: Successional Fields

Successional habitats, such as abandoned fields and pastures, are fairly common in the DAA. 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 cover and are often rich in fruit producing plants, and therefore offer rich habitat for breeding and migrating birds. However, given the scarcity of natural shrublands in the Midwest, we know little about "natural" shrublands. Nonetheless, many local bird species that use shrubby vegetation now depend almost entirely on anthropogenic disturbances to set back succession.

Regularly Occurring Species

Typical Species - Successional habitats dominated by forbs, shrubs, and saplings offer rich habitat for many breeding birds. Typical breeding species include: Northern Bobwhite, Ring-necked Pheasant, Gray Partridge, American Woodcock (wet areas), Mourning Dove (especially with conifers), Yellow-billed Cuckoo, Black-billed Cuckoo, Ruby-throated Hummingbird, Northern Flicker, Downy Woodpecker, Eastern Kingbird, Willow Flycatcher (wet), Blue Jay, Black-capped Chickadee, House Wren, Gray Catbird, Brown Thrasher, American Robin, Eastern Bluebird, Blue-gray Gnatcatcher, Cedar Waxwing, White-eyed (uncommon this far north), Bell's vireos, Yellow Warbler, Blue-winged

Warbler, Chestnut-sided Warbler (rare), Common Yellowthroat, Yellow-breasted Chat (uncommon), Red-winged Blackbird, Orchard Oriole, Baltimore Oriole (scattered trees), Northern Cardinal, Rose-breasted Grosbeak, Blue Grosbeak (rare this far north), Indigo Bunting, House Finch, American Goldfinch, Eastern Towhee, Lark Sparrow (sandy soil), Field Sparrow, and Song Sparrow.

Threatened and Endangered Species - Long-eared Owls (SE) occasionally nest in cedar glades that result from succession. Loggerhead Shrikes (ST) use successional areas, especially fence rows and treerows, for hunting and nesting.

Exotic Species - Ring-necked Pheasants can be abundant in early successional fields and Gray Partridges are found in some areas. House Finches are native to the western United States, but since a captive population was released on Long Island in the 1940's they have spread westward and are now common in the DAA, where they often nest in successional fields.

Population Dynamics and Management

Successional habitats add greatly to local diversity, but at least a few species are declining nationally and have few or no remaining natural habitats (e.g., Yellow-breasted Chat) or are rare in Illinois (e.g., Bell's Vireo, Lark Sparrow). 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 DAA.

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 (S. Robinson unpubl. data). Most species have adaptations that enable them to cope with nest predation (aggressive nest defense, rapid re-nesting 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 (S. Robinson unpubl. data). The SAD area, in particular, has a high potential to benefit from management for early successional species.

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, Ruby-crowned Kinglet, Philadelphia Vireo, Golden-winged Warbler, Orange-crowned Warbler, Chestnut-sided Warbler, Mourning Warbler, Connecticut Warbler, Wilson's Warbler, Canada Warbler, and Lincoln's, White-throated, Harris's and White-crowned Sparrows. Shrubland habitats therefore provide real benefits to migrant birds and greatly increase local biodiversity.

Cultural Habitats: Developed Land

Residential and urban areas represent about 1.3% of the DAA (Table 2, Figure 6). These areas, scattered with lawns, parks, and other manicured vegetation, offer suitable breeding habitat for relatively few bird species.

Regularly Occurring Species

Typical Species - Developed lands contain an unusual mix of species that can use ornamental shrubs (e.g., Northern Mockingbird, Northern Cardinal, Song Sparrow), shade trees (e.g., Baltimore Oriole, Warbling Vireo, Black-capped 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 [especially farmsteads], Killdeer [roofs, roads], Common Nighthawk [roofs], Chimney Swift [smokestacks and chimneys], Eastern Phoebe [buildings], Barn Swallow [buildings], Purple Martin, House Wrens, American Robin, Eastern Bluebird [farmsteads], European Starling, House Sparrow and House Finch). Other species commonly found in residential and urban areas include Red-tailed Hawk [in more sparsely inhabited areas], Eastern Screech-Owl, Great Horned Owl, Ruby-throated Hummingbird, Red-bellied Woodpecker ["urban forests"], White-breasted Nuthatch, Brown Thrasher, Common Yellowthroat, and American Goldfinch. This community has no parallel in the natural world and 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, especially the House Finch, by increasing winter survival.

Threatened and Endangered Species - Now that the Bewick's Wren is practically absent from the region, there are no threatened or endangered species in the developed habitats of the DAA other than the Loggerhead Shrike, which rarely forages in mowed grass of rural farmsteads.

Exotic Species - Huge populations of introduced Rock Doves, European Starlings, House Sparrows, and House Finches live in developed areas and compete for nest sites and food at bird feeders with native species.

Population Dynamics and Management

High populations of predatory birds and cats 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 bird species of developed areas has never 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 stopover habitat for migrating landbirds. Migrating birds make heavy use of shade trees in developed areas and, when available, also use shrubs. Typical migrants of "urban forests" include: Cooper's and Sharp-shinned Hawks [both forage at bird feeders], Common Nighthawk, Ruby-throated Hummingbird [especially at feeders], Northern Flicker, Yellow-bellied Sapsucker, Red-breasted Nuthatch [conifers], Brown Creeper, Hermit Thrush, Golden-crowned Kinglet, Ruby-crowned Kinglet, Cedar Waxwing, Red-eyed Vireo, Tennessee Warbler, Cape May Warbler [conifers], Black-throated Green Warbler, Blackburnian Warbler, Bay-breasted Warbler, Blackpoll Warbler, American Redstart, Eastern Towhee [feeders], Dark-eyed Junco [feeders], American Tree Sparrow, White-crowned Sparrow, White-throated Sparrow, Rusty Blackbird, Evening Grosbeak [feeders], Purple Finch [feeders], Pine Siskin [feeders, conifers], and American Goldfinch [feeders].

Management Recommendations

The Driftless Assessment Area is one of the most rural regions of the state, and for this reason, existing public landholdings are relatively large and often contiguous. Habitat quality for birds is surprisingly good and has the potential to get even better.

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

Forests - 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 - Restoration of forested wetlands should be of highest priority within the largest habitat blocks. Grassy wetlands, especially sedge meadows and marshes should be restored and enhanced whenever possible, including along the margins of lakes.

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

Developed and Agricultural Areas - 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 records in Hoffmeister (1989), the Illinois Natural Heritage Database (Illinois Department of Natural Resources [IDNR] 1997), a mammal survey in Jo Daviess and Stephenson counties (Hofmann and Handel 1995, Hofmann et al. 1996) and a small mammal trapping study in five northwestern Illinois counties (Kelt 1991). Taxonomy follows Wilson and Reeder (1993).

Mammal species known or likely to occur in the Driftless Assessment Area (DAA) are listed in Table 14. The 45 species in this table represent approximately 78% of the 58 mammal species that currently occur in Illinois (Hoffmeister 1989). Eight species of bats are included in the table, but only four (little brown bat, northern long-eared bat, big brown bat, and eastern pipistrelle) spend the winter in the DAA, hibernating in caves or abandoned mines (Illinois Natural History Survey [INHS]/IDNR, unpublished data), and the silver-haired bat is only likely to be present in the area during spring and autumn migration periods. The population status of many mammal species within the DAA is unknown; in some of these cases designations in Table 14 are projections based on their status in other parts of Illinois. Of the nine mammal species listed as threatened or endangered in Illinois (Illinois Endangered Species Protection Board 1994), only two, the state endangered river otter and the state threatened bobcat, have been recorded recently within the DAA (Illinois Department of Natural Resources 1997, Anderson 1995). There is also one historical record for the federally endangered Indiana bat (*Myotis sodalis*) in the DAA (Smith and Parmalee 1954), but this species is not included in Table 14 because there have been no additional records for more than 40 years (Gardner et al. 1996).

Much of the land within the DAA is agricultural, although rather than being planted almost entirely in row crops, a substantial amount of the agricultural land consists of pasture and hayfields. Many mammals are generalists that use a variety of habitat types and have adapted to living in areas that have been transformed by humans. Larger mammals that now commonly occur in agricultural and residential areas include the Virginia opossum, eastern cottontail, fox and gray squirrels, coyote, raccoon, striped skunk, and white-tailed deer. Several species of small mammals, including the eastern mole, northern short-tailed shrew, thirteen-lined ground squirrel, and meadow and prairie voles, can occupy hayfields, pastures, and fencerows in agricultural areas or other maintained areas such as roadsides, cemeteries, and lawns. Big brown and little brown bats commonly roost in buildings and other small mammals (such as the white-footed mouse) sometimes enter buildings in search of food and shelter.

The Norway rat and house mouse are the only exotic, non-domesticated mammals that occur regularly in Illinois. These species are strongly associated with human structures (e.g. houses, barns, warehouses), but both can be found in natural habitats near buildings. The house mouse, in particular, can sometimes reach substantial numbers in grasslands near structures. These species are now so widespread that they are part of the mammalian fauna throughout the United States. They could not readily be eliminated from natural habitats and their presence is not a matter of great concern. Large numbers of free-roaming and feral domestic cats (*Felis silvestris*) occur in Illinois as elsewhere (Warner 1985, Coleman and Temple 1996). They can have a serious negative impact on bird and small mammal populations (especially ground-nesting birds) and reduce prey availability for wild predators (Warner 1985, Churcher and Lawton 1987, Coleman and Temple 1996). There is also the potential for unvaccinated cats to transmit diseases to wild mammals or humans (Coleman and Temple 1996).

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

Common name[2]	Order Scientific Name	Habitat[3]	Population status[4,5]
Marsupials	Didelphimorphia		
Virginia opossum	*Didelphis virginiana*	F, W, G	C
Insectivores	Insectivora		
masked shrew	*Sorex cinereus*	F (mesic), G, W	C
northern short-tailed shrew	*Blarina brevicauda*	F, G, W	C
least shrew	*Cryptotis parva*	G	?
eastern mole	*Scalopus aquaticus*	F, G	C
Bats	Chiroptera		
little brown bat	*Myotis lucifugus*	F, caves, buildings	C
northern long-eared bat	*Myotis septentrionalis*	F, caves, buildings	U?
silver-haired bat	*Lasionycteris noctivagans*	F, caves (hibernation)	?
eastern pipistrelle	*Pipistrellus subflavus*	F, caves	C
big brown bat	*Eptesicus fuscus*	F, caves, buildings	C
red bat	*Lasiurus borealis*	F, residential	?
hoary bat	*Lasiurus cinereus*	F	U?
evening bat	*Nycticeius humeralis*	F, buildings	?
Rabbits	Lagomorpha		
eastern cottontail	*Sylvilagus floridanus*	G, F (edges)	C
Rodents	Rodentia		
eastern chipmunk	*Tamias striatus*	F	C
woodchuck	*Marmota monax*	G, F (edges)	C
thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*	G	C?
Franklin's ground squirrel	*Spermophilus franklinii*	G	R?
gray squirrel	*Sciurus carolinensis*	F, urban	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?

Table 14. Continued.

Common name[2]	Order Scientific Name	Habitat[3]	Population status[4,5]
deer mouse	*Peromyscus maniculatus*	G	C?
white-footed mouse	*Peromyscus leucopus*	F, W, G (mostly F)	C
meadow vole	*Microtus pennsylvanicus*	G	C
prairie vole	*Microtus ochrogaster*	G	C
woodland vole	*Microtus pinetorum*	F	U?
muskrat	*Ondatra zibethicus*	W	C
southern bog lemming	*Synaptomys cooperi*	G, W	U?
Norway rat *	*Rattus norvegicus*	buildings	C
house mouse *	*Mus musculus*	mostly buildings	C
meadow jumping mouse	*Zapus hudsonius*	G, F, W	U?
Carnivores	Carnivora		
coyote	*Canis latrans*	F, G, W	C
red fox	*Vulpes vulpes*	F, G, W	C
gray fox	*Urocyon cinereoargenteus*	F	U?
raccoon	*Procyon lotor*	F, W, G	C
least weasel	*Mustela nivalis*	G	U?
long-tailed weasel	*Mustela frenata*	F, W, G	C
mink	*Mustela vison*	W, G, F (mostly W)	C
badger	*Taxidea taxus*	G	U?
striped skunk	*Mephitis mephitis*	F, G, W	C
river otter - SE	***Lontra canadensis***	**W**	**C**
bobcat - ST	***Lynx rufus***	**F**	**U?**
Even-toed ungulates	Artiodactyla		
white-tailed deer	*Odocoileus virginianus*	F, W, G	C

[1] Compiled from range maps and records reported in Hoffmeister (1989), the Illinois Natural Heritage Database (Illinois Department of Natural Resources 1997), Hofmann and Handel (1995), Hofmann et al. (1996), and Kelt (1991).

[2] Bold type indicates an Illinois endangered (SE) or an Illinois threatened (ST) species; * = introduced species.

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

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

[5] Subjective estimates based largely on experience of J. E. Hofmann and E. J. Heske in Illinois.

Forest

Typical Species

Mammal species known or likely to occur in the DAA that are restricted to forested habitats are the hoary bat, eastern chipmunk, fox squirrel, southern flying squirrel, woodland vole, and gray fox. Species that are primarily associated with forests but also utilize other types of habitat include the masked shrew, red bat, gray squirrel, white-footed mouse, raccoon, and white-tailed deer. The little brown bat, big brown bat, northern long-eared bat, eastern pipistrelle, and evening bat forage in forested habitats, but roost in caves, abandoned mines, and buildings as well as trees. Some species, such as the eastern

cottontail and woodchuck, specialize in the use of forest edges. Additional habitat generalists that would typically occur in forests in the DAA are listed in Table 14.

Most species of mammals associated with forests are not restricted to a specific type of forest (i.e. upland forest or floodplain forest). They could also utilize the savannas, tree plantations, and hill prairies overgrown with eastern red cedars (*Juniperus virginiana*) or other woody vegetation that occur in the DAA. Species that hibernate (e.g. woodchucks, eastern chipmunks) or are primarily fossorial (e.g. woodland voles) need well-drained, uninundated soils. The gray fox requires extensive forest cover and has become less common in parts of Illinois (Hoffmeister 1989). Gray squirrels require extensive tracts of mature forest with a dense understory, whereas fox squirrels can occupy open forests, woodlots, and fencerows (Hoffmeister 1989). Consequently, gray squirrel numbers have also declined in Illinois, although they are common is parts of Jo Daviess and Carroll counties (Nixon et al. 1978). Gray squirrels occur in urban areas as well as forests, including some towns in the DAA (Nixon et al. 1978). Tree squirrels, flying squirrels, and chipmunks tend to be most abundant in forests containing large numbers of mast-producing trees such as oaks and hickories. Raccoons and opossums are most abundant in forest tracts in proximity to water (Hoffmeister 1989).

Threatened and Endangered Species

There are recent, confirmed records of the state threatened bobcat for four locations within the DAA (Illinois Department of Natural Resources 1997). A male bobcat was killed at Whistling Wings Duck Farm in Jo Daviess County in 1987 and bobcats have been sighted in the Plum River bottoms south of Stockton in Jo Daviess County (1987) and 3 km east of the Savanna Army Depot in Carroll County (1991). Three road-killed bobcats have been found in the vicinity of Hanover Bluff Nature Preserve in Jo Daviess County, the most recent during 1996. A road-killed bobcat was also found in Whiteside County, south of Albany on IL 84, in 1993 (Illinois Department of Natural Resources 1997). Bobcats are highly secretive and a small number of records is not necessarily indicative of their abundance in an area.

Three Indiana bats (now federally endangered) were collected in an abandoned lead mine 13 km southeast of Galena in Jo Daviess County during December 1953 (Smith and Parmalee 1954). No Indiana bats were found during a survey of caves and mines in Jo Daviess County in February 1988 (INHS/IDNR, unpublished data). The only Indiana bat specimen from Wisconsin was collected at an abandoned lead mine near Beetown in Grant County during November 1954 (Davis and Lidicker 1955); Grant County is adjacent to Jo Daviess County. Five Indiana bats have been found overwintering in caves in Dubuque County, Iowa (which is west of Jo Daviess County), but none were seen during a 1983-84 winter survey of caves in Dubuque and two adjacent counties (Pruszko and Bowles 1986).

Habitat Requirements and Distribution of Listed Forest 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. Ledges also appear to be an important element of bobcat habitat. They serve as activity centers, especially during courtship, as well as providing protective cover (McCord and Cardoza 1982). 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. The Illinois Department of Natural Resources (1997) includes recent bobcat records from 32 counties, most of which are in southern and northwestern Illinois. The portion of the DAA located in Jo Daviess and northern Carroll counties provides the most suitable habitat for this species.

Indiana bat - Indiana bats congregate in a limited number of caves and mines for hibernation, but are more widely dispersed during the summer (Barbour and Davis 1969). Indiana bat maternity colonies roost primarily beneath slabs of exfoliating bark on dead trees, but have also been found beneath the "shaggy" bark of certain live hickories (*Carya*) and in tree cavities (Cope et al. 1973; Humphrey et al. 1977; Gardner et al. 1991; Kurta et al. 1993a, 1993b, 1996; Callahan et al. 1997). Males and nonreproductive females may also roost in caves or abandoned mines during the summer. Roost trees used by this species have been located in both upland and floodplain forests; most are relatively large with a diameter at breast height of at least 30 cm (Gardner et al. 1991; Kurta 1993a, 1996; Callahan et al. 1997). Tree species that have been used by Indiana bat maternity colonies in Illinois are slippery elm[1], northern red oak, shagbark hickory, silver maple, cottonwood, post oak, bitternut hickory, white oak, American elm, sycamore, sweet pignut hickory, and green ash (Gardner et al. 1991; Kurta et al. 1993a; INHS, unpublished data). Indiana bats forage both in and along the edges of the canopy of floodplain and upland forests (Humphrey et al. 1977, LaVal et al. 1977, Brack 1983, Clark et al. 1987, Gardner et al. 1991). There are recent summer records for the Indiana bat in 23 Illinois counties, but no records north of Henderson County (Gardner et al. 1996, Illinois Department of Natural

[1] Scientific names of plants given in Appecdix 1.

Resources 1997). Thus, although suitable summer habitat is present in the DAA, this species is very unlikely to occur there. The only known Indiana bat hibernaculum in northern Illinois is a mine in La Salle County (Illinois Department of Natural Resources 1997). There is a slight possibility of an occasional Indiana bat hibernating in a cave or abandoned mine in the DAA. However, recent mine sealings by the Department of Mines and Minerals has greatly reduced the number of cave-like habitats available to roosting bats.

Information Gaps

Data on the population status of several forest-dwelling species are not available. Surveys should be conducted to determine the distribution and abundance of the bobcat in the DAA. Additional information on the distribution and abundance of the woodland vole, meadow jumping mouse, and gray fox would be of interest as well as surveys to determine the presence or absence of the hoary bat, red bat, and evening bat. The meadow jumping mouse is sometimes considered a grassland species, but has been trapped in upland forests in the DAA (Hofmann and Handel 1995, Hofmann et al. 1996). Because forest habitat is fragmented in the DAA, it would be valuable to assess the ability of forest species to maintain viable populations and to disperse between forested tracts in an agricultural landscape.

Grassland

Typical Species

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

Most grassland species of mammals are not restricted to native or undisturbed grassland habitat. Rather, the vegetative structure of rights-of-way, hayfields, pastures, crop field edges, old fields, prairie restorations, and similar 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, so they are rarely associated with tall grasses. The western harvest mouse inhabits grasslands that contain tall forbs or shrubs, whereas the deer mouse tends to disappear from grasslands if they are invaded by woody vegetation (Hoffmeister 1989). The masked shrew, meadow jumping mouse, southern bog lemming, 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 is adjacent to forested areas and can be considered edge species.

Threatened and Endangered Species

None of the mammal species primarily associated with grasslands in the DAA is listed as threatened or endangered in Illinois. The white-tailed jack rabbit (*Lepus townsendii*) which occurred on the Savanna Army Depot was formerly listed as state endangered, but this species is now considered extirpated from the state (Herkert 1994).

Information Gaps

Information is needed on the distribution and abundance in the DAA of several grassland small mammals, including the least shrew, Franklin's ground squirrel, western harvest mouse, deer mouse, and southern bog lemming. There are no records from the DAA for the least shrew and very few for the Franklin's ground squirrel, deer mouse, and southern bog lemming (Hoffmeister 1989). Franklin's ground squirrel appears to have become uncommon throughout much of its former range in Illinois. The western harvest mouse was found in Illinois for the first time in Carroll County in 1953 (Hoffmeister and Warnock 1955) and subsequently expanded its range eastward and southward through the state (Hoffmeister 1989). There are numerous specimens from northwestern Illinois in the Illinois Natural History Survey and University of Illinois Museum of Natural History collections, but none is more recent than 1970. The status of the badger in Illinois was recently investigated by Warner and Ver Steeg (1995) who documented its presence in Jo Daviess, Carroll, and Whiteside counties, but population status in the DAA should be determined more precisely. The distribution and abundance of the least weasel in the DAA is also poorly known. 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 may have negatively affected populations of red fox and the status of red fox populations in the DAA should be evaluated. Hill prairies in the DAA are small (in part because of encroachment by woody vegetation) and isolated. The persistence of grassland small mammal populations in hill prairies and the ability of these animals to travel between such habitat islands should be investigated.

Wetland

Typical Species

Mammal species in the DAA that require wetlands or aquatic habitats (lakes, ponds, streams, and rivers) are the beaver, muskrat, mink, and river otter. Beaver, muskrat, and river otter are highly specialized for aquatic life and need open water, whereas mink are more terrestrial but typically occur in proximity to water. All species of bats occurring in

the DAA would utilize wetlands as well as aquatic habitats for foraging. The masked shrew and southern bog lemming use emergent wetlands (marshes, sedge meadows, and wet meadows) extensively in addition to other types of habitats. Small mammals such as these are not adapted for aquatic life and occupy vegetation along the edges of wetlands or sites where standing water is not present. Additional habitat generalists that use wetlands are listed in Table 14.

Threatened and Endangered Species

The main breeding population of the state endangered river otter in Illinois occupies the backwaters and tributaries of the Mississippi River in Jo Daviess, Carroll, and Whiteside counties (Anderson 1995). Since 1951 there have been 104 reports of river otters from the Galena, Apple, and Plum river systems; these represent approximately one third of all reports for the state during that period (Anderson 1995). Otters have been recorded at 25 locations within the DAA since 1981 (Illinois Department of Natural Resources 1997; Figure 14).

Habitat Requirements of Listed 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). In northwestern Illinois activity was concentrated along tributaries and narrow backwater channels of the Mississippi River during the summer (Anderson 1982) and in areas with access to open water during winter (Anderson and Woolf 1984). River otters may travel long distances, 160 km or more, in search of suitable habitat (Jackson 1961).

Information Gaps

The impact of beaver populations on the physical structure of riparian systems in the DAA should be evaluated. Because of the region's topography the amount of non-forested wetland habitat in the DAA is very small (0.5% of the land cover). It would be interesting to determine if these isolated wetlands are used by small mammal species other than those occupying surrounding habitat types.

Enhancement and Restoration Potential

The preservation of upland and floodplain forests and the preservation or restoration of dispersal corridors such as forested riparian zones would enhance the suitability of the DAA as habitat for a variety of forest-dwelling species, including the bobcat and gray fox. Protection of floodplain and riparian forests is also necessary to maintain high-quality habitat for the river otter in the DAA. Reduction of silt and chemical runoff into aquatic habitats and wetlands would maintain or enhance their ability to support river otter and mink. The release of forested areas from grazing would benefit small mammal populations as might management activities (e.g. controlled burning, control of exotic vegetation) designed to improve forest quality.

Restored native grasslands could provide sites for reintroductions of Franklin's ground squirrels in areas where they no longer occur and, perhaps, for the reintroduction of the white-tailed jack rabbit in Illinois. Prairie restorations, coupled with the preservation of native prairie and other grassland habitats, also would provide habitat for badger and red fox. Hill prairies in the DAA have suffered encroachment by woody vegetation. Restoration of these areas could increase their suitability as habitat for grassland small mammals, but their isolation may limit the potential for re-colonization by such species.

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 (an Illinois Natural History Survey [INHS] computer database that contains information on Illinois 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 Driftless Assessment Area (DAA), but Phillips (1995) surveyed a portion of the DAA in Jo Daviess County for the proposed widening of US Highway 30. The DAA contains portions of four of Smith's (1961) eleven Herpetofaunal Divisions for the state; Upper Mississippi Border Division, Western Division Woodlands, Prairie, and Sand Areas.

Amphibian and reptile species that are known or likely to occur in the DAA are listed in Table 15. The 11 amphibian species and 25 reptile species in Table 15 represent 28% of the amphibian species and 42% of the reptile species of the State. The state threatened western hognose snake *(Heterodon nasicus)* and the state threatened timber rattlesnake (*Crotalus horridus*) are known to exist in the DAA. One other state listed species, the eastern massasauga *(Sistrurus catenatus*) has been extirpated from the DAA. There have been no reports of exotic reptile species in the DAA.

When referring to the habitat designations in Table 15, keep in mind that most amphibian and reptile species are not restricted to a single habitat type. For example, all but two of Illinois' amphibians require some type of aquatic habitat (wetland, pond, creek, or river) for breeding but the adults can also be found in a variety of terrestrial habitats. Some species require a combination of two habitat types throughout their life. For example, the timber rattlesnake requires forest habitat, but pregnant females also require open rocky areas. On the other hand, some species have narrower habitat requirements than the designations in Table 15 might suggest. For example, the smooth soft-shell turtle is listed as occurring in rivers and creeks, but it is only found in medium-sized creeks with sandy substrates and clear water.

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

Common Name[1,2]	Scientific Name[1,2]	Habitat[3]	Relative Abundance[4]
Amphibians			
tiger salamander	*Ambystoma tigrinum*	F,W,P,L	U
American toad	*Bufo americanus*	U	C
cricket frog	*Acris crepitans*	L,R	C
Cope's gray treefrog	*Hyla chrysoscelis*	F,W	C
eastern gray treefrog	*Hyla versicolor*	F,W	C
western chorus frog	*Pseudacris triseriata*	U	C
bullfrog	*Rana catesbeiana*	U	C
green frog	*Rana clamitans*	F,W,R	C
pickerel frog	*Rana palustris*	F,W,R	U
northern leopard frog	*Rana pipiens*	F,W,P	C
wood frog	*Rana sylvatica*	F,W	U
Reptiles			
snapping turtle	*Chelydra serpentina*	W,L,R	C
musk turtle	*Sternotherus odoratus*	W,L,R	U
painted turtle	*Chrysemys picta*	W,L,R	C
Blanding's turtle	*Emydoidea blandingii*	W	R
map turtle	*Graptemys geographica*	L,R	C
Ouachita map turtle	*Graptemys ouachitensis*	L,R	C
western box turtle	*Terrapene ornata*	P	U
smooth soft-shell turtle	*Apalone mutica*	L,R	R
spiny soft-shell turtle	*Apalone spinifera*	W,L,R	C
six-lined racerunner	*Cnemidophorus sexlineatus*	P	U
racer	*Coluber constrictor* -	U	C
ringneck snake	*Diadophis punctatus*	F,P	U
black rat snake	*Elaphe obsoleta*	F,W,P	U
fox snake	*Elaphe vulpina*	W,P,C	C
western hognose snake - ST	***Heterodon nasicus***	**P**	**R**
eastern hognose snake	*Heterodon platirhinos*	F,W,P	U
milk snake	*Lampropeltis triangulum*	F,W,P	U
northern water snake	*Nerodia sipedon*	W,R,L	C
bullsnake	*Pituophis catenifer*	P	U
Graham's crayfish snake	*Regina grahamii*	W,L	U
brown snake	*Storeria dekayi*	U	C
red-bellied snake	*Storeria occipitomaculata*	F,W	U
western ribbon snake	*Thamnophis proximus*	F,P,W,R	U
common garter snake	*Thamnophis sirtalis*	U	C
timber rattlesnake - ST	***Crotalus horridus***	**F**	**U/R**

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

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

[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 ? = status uncertain

Forest

Typical Species

Amphibian species of the DAA that are typical of forested habitats include both species of gray treefrog. As outlined above, some amphibians also require aquatic habitats for breeding. The gray treefrogs breed in forested wetlands and upland forested ponds. Among the reptiles of the DAA, the brown snake is typical of forested areas.

Endangered and Threatened Species

The timber rattlesnake usually occupies three distinct habitats: heavily forested areas for foraging (summer), south or west facing rock outcrops or talus slides containing deep cracks and fissures for denning (fall to mid-spring), and more open woods, fields and other disturbed habitats when moving between these two habitats (fall and spring). In addition, gravid females may occupy rocky open sites close to the den for gestation and birthing (summer). The activity period in northern Illinois is probably early April to October.

Enhancement and Restoration Potential

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

Management for the state threatened timber rattlesnake is complicated because this species utilizes more than one habitat (forest, open fields, rocky bluffs). This means that the various habitat components must be connected for the snakes to survive. Because timber rattlesnakes utilize large areas of land for their daily and seasonal activities, the ideal management situation is forest adjacent to rocky bluffs and open fields. If rattlesnakes must cross roads and developed areas to move among habitat types, they risk death from automobiles and ignorant humans.

Wetland

Typical Species

Amphibian species of the DAA that are typical of wetland habitats include the green frog and northern leopard frog. Almost all amphibians require some type of aquatic habitat for breeding and most breed in wetlands. Among the reptiles of the DAA, the painted turtle, Blanding's turtle, and common garter snake are typical of wetlands. These species reach their greatest abundance in wetland habitats.

Enhancement and Restoration Potential

Maintaining even small, temporary wetlands in the DAA would benefit almost all of the reptiles and amphibians of the region, as well as other groups that depend on them for food. The importance of cattail marshes under one acre should not be underestimated. Mowing in the vicinity of wetlands should be avoided.

Information Gaps

One of the most pressing questions concerning wetland amphibians and reptiles in the DAA is whether the Blanding's turtle still exists in this area. This large aquatic turtle was once very common in the upper and middle Mississippi River valley, but wetland destruction and contamination have reduced its numbers dramatically. In the DAA, the Blanding's turtle is at home in prairie marshes and floodplain sloughs of the Mississippi River. It is most commonly found in shallow (10-20 cm) open water areas of cattail marshes, sloughs, ponds, and flooded ditches. Aquatic plants, especially emergent vegetation and a mud bottom are important habitat components. The activity period in northern Illinois is probably late March to October. Nesting occurs in June in sandy, well drained soil near the aquatic habitat. Hatching usually takes place in September. An effort should be made to determine if this species still exists in the DAA.

Prairie

Typical Species

Of the amphibian species listed in Table 15, the tiger salamander and western chorus frog are typical of prairie habitats in the DAA. The tiger salamander requires fishless ponds and wetlands for breeding. Because of the destruction and degradation of these habitats, the tiger salamander has declined in the DAA. The western chorus frog has a shorter larval period and therefore can breed in more temporary aquatic habitats such as flooded

fields and ditches. Reptile species in the DAA that are typical of prairie habitats include the bullsnake and plains garter snake. Both of these snakes can tolerate disturbed habitats such as mowed right-of-way, pasture, oldfield, and agricultural edge. The Blanding's turtle was once common in wet prairie habitats of the DAA, especially sand prairies.

Endangered and Threatened Species

The western hognose snake is restricted to sand prairies and adjacent woodlots along the upper Mississippi River. It spends a large part of its time buried just below the surface in loose sand but it also forages in sandy woodlots and savannas. Threats include destruction and degradation of sand prairies and woodlots. In addition, off-road vehicles and indiscriminate killing have severely impacted populations of the western hognose snake in the DAA.

Enhancement and Restoration Potential

Many sand prairies have become overgrown with brush or planted in pine plantations or vegetables. Restoring native prairie, especially sand prairie, in the DAA would benefit a variety of amphibians and reptiles especially the state threatened western hognose snake, tiger salamander, and the Blanding's turtle (if present in the DAA).

Lakes, Ponds, and Impoundments

Typical Species

Of the amphibian species listed in Table 15, the bullfrog and cricket frog are typical of lakes, ponds, and impoundments in the DAA. Both of these species have developed strategies for coexisting with fish and are usually more widely distributed than other amphibians. Among the reptiles of the DAA the snapping turtle, painted turtle, common garter snake, and northern water snake are typical of lakes, ponds, and impoundments.

Enhancement and Restoration Potential

Restoration of fishless, forested ponds in upland areas would benefit the tiger salamander and gray treefrogs. Leaving at least part of the shore around ponds, lakes and

impoundments unmowed and providing forest or grassland connections among ponds, lakes and impoundments in the DAA would benefit a variety of amphibians and reptiles.

Creeks and Rivers

Typical Species

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

Enhancement and Restoration Potential

Restoring the riparian zone and associated floodplain forests and wetlands along the Mississippi River and its tributaries would benefit a variety of amphibians and reptiles. Water quality must also be improved if any significant progress is expected. In addition, if the Blanding's turtle still exists in the DAA, it is in the backwater sloughs of the Mississippi River. These habitats have been adversely affected by siltation and agricultural runoff. Special effort should be made to survey the sloughs for the existence of the Blanding's turtle.

Cultural Habitats

Typical Species

Of the amphibian species listed in Table 15, the American toad, western chorus frog, and bullfrog are typical of cultural habitats in the DAA. These species can be found in cropland, pasture, successional field, developed land, and tree plantations providing that adequate breeding sites (ditches, flooded fields, stock tanks, remnant marshes) are present. Among the reptiles of the DAA, the common garter snake, brown snake, and northern water snake are typical of cultural habitats in the DAA.

Enhancement and Restoration Potential

Small stock ponds and farm ponds can provide important breeding sites for amphibians of the DAA 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 cattail marsh under one acre, even when the marsh is surrounded by developed

land. It is always best to strive for larger size and connectivity of habitat , but the utility of these smaller areas should not be underestimated. It is important to leave a moderate buffer of unmowed grass around these habitats.

Overall Habitat Quality and Management Concerns

Overall, opportunities for amphibians and reptiles in the DAA are fair. Compared to pre-settlement, the present landscape of the DAA lacks a significant amount of sand prairie and the riparian zone and backwater sloughs along the Mississippi River have been destroyed or degraded.

The most critical management concerns for the DAA Partnership are restoration of the riparian zone and backwater sloughs along the Mississippi River and improvement of water quality throughout the area. Intact riparian zones may act as dispersal corridors for many amphibians and reptiles, thus reducing the effects of habitat fragmentation. In addition, natural habitats in the DAA 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 (timber rattlesnakes, for example) move from lowland foraging areas to upland retreats for winter hibernation.

Butterflies and Skippers

Introduction

The information presented in this section has been compiled from distributional records in Irwin and Downey (1973), Ebner (1970), and the seasonal summaries published by the Lepidopterist Society and from range maps in Opler and Malikul (1992). The terrestrial insect fauna of the Driftless Assessment Area (DAA) is not well known, and no specific study of the butterflies and skippers of the area has been undertaken.

The butterflies and skippers known to have been collected in the DAA are listed in Table 16 along with species deemed by the writer to be of likely or possible occurrence. Because the author of this report spent his youth in the DAA at Savanna and collected butterflies and skippers there during that time, he has been influenced in his choice of species of likely or possible occurrence there by his youthful experience; but, because of the passage of time and the possible failure of memory, none of the species thus collected is listed in Table 16 if not otherwise recorded.

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

Two typical forest species whose caterpillars feed on understory shrubs are the Giant Swallowtail on Prickly Ash and Waffer Ash and the Spring Azure on Dogwoods. The Northern Pearly Eye, whose larvae feed on Bottle Brush and Broad Leaved Uniola, 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

Few records of prairie butterflies are available for the DAA. 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

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

Few, if any DAA 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 Sheep Sorrel, and the Regal Fritillary on Birdsfoot Violet. Also to the expected, is the Silver Spotted Skipper on Legumes.

Cultural Habitats

Many butterflies and skippers are commonly found in distributed 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 DAA. 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

The butterflies and skippers of the DAA are very poorly known. Only 26 of the 72 species of butterflies deemed likely to occur have been recorded. Only 6 of the 44 species of skippers thought likely to occur have been recorded. All counties of the Driftless Area should be surveyed for butterflies and skippers.

The Regal Fritillary is thought to be in decline throughout its range. The presence of populations of this handsome species in Carroll and Whiteside counties gives opportunity for detailed study. Because of the widespread use of fire as a tool of management in habitats occupied by the Regal Fritillary, particular attention should be given to the effect of that practice on populations of the declining species.

Table 16. List of species of butterflies and skippers of known (+) or possible (-) occurrence in the Driftless Assessment Area.

Common Name[1,2,3,4] *Scientific Name*	Habitat[5]	Carroll County	JoDaviess County	Whiteside County
Black Swallowtail *Papilio polyxenes*	P,C	-	-	-
Giant Swallowtail *Papilio cresphontes*	F	-	-	-
Tiger Swallowtail *Papilio glaucus*	F,C	-	-	-
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	-	-	-
Edward's Hairstreak *Satyrium edwardsii*	S	-	-	-
Acadian Hairstreak *Satyrium acadica*	W	-	-	-
Henry's Elfin *Incisalia henrici*	F	-	-	-

Table 16. Continued.

Common Name[1,2,3,4] *Scientific Name*	Habitat[5]	Carroll County	JoDaviess County	Whiteside County
Eastern Pine Elfin *Incisalia niphon*	F,C	+	-	-
Olive Hairstreak *Mitourea gyrnea*	P,C	-	+	-
White-M 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	-	-	-
American Snout *Libytheana carinenta*	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*	W	-	-	-
Viceroy *Liminitis archippus*	W	-	-	-

Table 16. Continued.

Common Name[1,2,3,4] *Scientific Name*	Habitat[5]	Carroll County	JoDaviess County	Whiteside County
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	-	-	-
Green Comma *Polygonia faunus*	F	+	-	-
Gray Comma *Polygonia progne*	F,W	+	+	-
Silvery Checkerspot *Chlosyne nycteis*	F,C	-	+	-
Gorgone Checkerspot *Chlosyne gorgone*	P	+	-	+
Pearl Crescent *Phyciodes tharos*	F,P,S,C	-	-	-
Tawny Crescent *Phyciodes batesii*	P,W,C	-	-	-
Baltimore *Euphydryas phaeton*	W	-	-	-
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	+	+	-

Table 16. Continued.

Common Name[1,2,3,4] *Scientific Name*	Habitat[5]	Carroll County	JoDaviess County	Whiteside County
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 *Lethe eurydice*	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	-	-	-
Mulberry Wing *Poanes massasoit*	W,C	-	-	-
Hobomok Skipper *Poanes hobomok*	F	-	-	-
Zabulon Skipper *Poanes zabulon*	F	-	-	-
Broad Winged Skipper *Poanes viator*	W	-	-	-
Byssus Skipper *Problema byssus*	P	-	-	-
Delaware Skipper *Atrytone delaware*	P,W,C	+	-	-
Sachem *Atalapodes campestris*	C	-	-	-

Table 16. Continued.

Common Name[1,2,3,4] *Scientific Name*	Habitat[5]	Carroll County	JoDaviess County	Whiteside County
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	-	-	-
Fiery Skipper *Hylephila phyleus*	C	+	-	-
European Skipper * *Thymelicus lineola*	W,C	-	-	-
Poweshiek Skipperling *Oarisma poweshiek*	W	-	-	-
Least Skipper *Ancyloxypha numitor*	W	-	-	-
Common Sooty Wing *Pholisora catullus*	C	-	-	-
Grizzled Skipper *Pyrgus centaurea*	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	-	-	-

Table 16. Continued.

Common Name[1,2,3,4] *Scientific Name*	Habitat[5]	Carroll County	JoDaviess County	Whiteside County
Juvenal's Dusky Wing *Erynnis juvenalis*	F	-	-	-
Columbine Dusky Wing *Erynnis 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] Scientific and common names follow Opler and Malikul (1984).

[2] Order of treatment follows Irwin and Downey (1973), but with skippers following butterflies.

[3] Bold type indicates an Illinois endangered (SE), Illinois threatened (ST), and/or federally endangered (FE) species.

[4] * = introduced species

[5] Habitats: F=forest, P=prairie, S=savanna, W=wetland, C=cultural.

Aquatic Biota

Introduction

The Galena, Apple, and Plum River systems are bordered by the Mississippi River on the west, Wisconsin on the north, and the Rock River Basin on the east and south. This region drains approximately 855 square miles in four northwestern Illinois counties—Jo Daviess, Stephenson, Carroll, and Whiteside. Four natural divisions of Illinois are encompassed—Rock River Hill Country, Illinois and Mississippi River Sand Areas, Upper Mississippi and Illinois River Bottomlands, and Wisconsin Driftless Division (Schwegman 1973). The last division comprises the majority of the basin. Topography varies greatly from little relief in the glaciated part of the region to rolling hills in the unglaciated areas (Page et al. 1992).

Soils range from thick to thin loess deposits on limestone to sandy or clay deposits on the bottomlands (Iverson 1987). Agriculture, both row crops and pasture, accounts for the majority of land use and silt appears to be the number one stream pollutant in the basin. Effluents from sewage treatment plants are a local problem. Drainage is via the Apple, Galena, and Plum River systems plus a number of smaller stream systems that flow directly into the Mississippi River. Camping, boating, and stream fishing are the major water-based activities.

The Galena River drains approximately 203 square miles. The river enters Illinois from Wisconsin about 5.5 miles north of Galena. It flows in a southwesterly direction and enters the Mississippi River via Harris Slough, approximately two miles south of Galena (Figure 2). The average width of the river is 58 feet. The substrate is silt, gravel, and rubble with bedrock in the upper reaches. Below the town of Galena pools and riffles are absent due to dredging of the river. This section once carried barge traffic. Agriculture accounts for the majority of land use.

The Apple River and its two principal tributaries, the North and South forks, drain approximately 262 square miles. The North Fork enters Illinois from Wisconsin approximately 1.5 miles west of the town of Apple River. The South Fork enters from the east about 2.5 miles southeast of Nora. The two forks unite in Apple River Canyon State Park and form the Apple River proper (Figure 2). Before the Illinoian glaciation, part of the Apple River drained southeast along the valley of the South Fork of the Apple River and into the Pecatonica River south of Freeport. The Illinoian ice front blocked the southeast outlet, impounding the water. The impounded water cut a new channel to the southwest. Upon deglaciation, the Apple River continued to use this channel and flowed southwestward to empty into the Mississippi River approximately seven miles north of Savanna (Evers and Page 1977). The average width of the Apple River is 60 feet. The

substrate is a combination of silt, gravel, rubble, and bedrock. The Apple River and its tributaries drain a highly dissected upland. The drainage is surrounded by pasture and riverbanks are badly eroded in areas where cattle have access to the river.

Originating south of Stockton, Illinois, the Plum River flows in a southerly direction and enters the Mississippi via a series of sloughs south of Savanna. The river drains approximately 299 square miles of highly dissected upland. Wide valleys have developed along the main stream. The substrate is primarily silt and gravel. With an average width of 24 feet the Plum River experiences frequent fluctuations in its water level and often floods bottomlands. Pastures and row crops, with heavy livestock use of the stream banks, account for the adjacent land use. Silt suspension remains high throughout the year.

Statewide Comparison of Aquatic Biota

The DAA supports a moderately large diversity of aquatic species. Known from the basin are 89 species of fishes, 39 species of mussels, and 9 species of malacostracans (large crustaceans). Some species have disappeared from the drainage in recent decades; however, with improvements in water quality, species that have been extirpated could return and natural communities could become reestablished in areas where they have been eliminated or altered.

The DAA also supports a moderate diversity of aquatic macroinvertebrates. Three extensive surveys for aquatic macroinvertebrates have been conducted in the Driftless Assessment Area over the past 20 years. In 1976, Brigham (1977) conducted surveys for aquatic macroinvertebrates at 149 stream sites located in parts of Jo Daviess, Stephenson, Carroll, Rock Island, and Whiteside counties in Illinois. Using the Illinois Environmental Protection Agency Stream Classification, Brigham (1977) determined the predominant stream classifications were unbalanced (47%) and semi-polluted (48%) of all streams classified, respectively. Low water levels from the drought conditions during sampling likely contributed to the substantial number of semi-polluted stations observed.

Common Species

Eighty-nine species of fishes are known from the Driftless Assessment Area (Tables 17 and 18). Common fishes throughout the drainage are the common shiner, bluntnose minnow, central stoneroller, white sucker, green sunfish, fantail darter, and johnny darter. Common fishes in the Mississippi River are the emerald shiner, river shiner, spottail shiner, bullhead minnow, gizzard shad, brook silverside, white bass, and largemouth bass. Common fishes in the headwaters are the creek chub and central stoneroller and, in spring-fed headwaters, the southern redbelly dace.

Thirty-nine species of freshwater mussels have been reported from this region (Tables 19 and 20). However, the fauna of the Mississippi River is very different from the tributaries feeding it. Common species found in the tributaries include the giant floater, lilliput, and

plain pocketbook. The common species in the Mississippi River include the three-ridge, Wabash pigtoe, and mapleleaf (Cummings and Mayer 1997, Illinois Natural History Survey Mollusk Collection data). Of the 39 mussel species known from the area only 16 have been collected alive in the past 20 years. Most of the tributaries (i.e. Apple River, Plum River, etc.) have a very depauperate mussel fauna which may be explained by the relatively small size of these drainages. However, additional collecting will likely add more species to the list of known taxa from this region.

Nine species of crayfishes, isopods, and amphipods are found in the basin (Tables 21 and 22). The most common crayfishes are the virile crayfish, which usually is found over rocky substrates or around woody debris or vegetation, and the clearwater crayfish, which is found in rocky riffles. 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.

During 1993-1994, Wetzel et al. (1995) collected over 140 taxa of aquatic macroinvertebrates from 19 stream sites in Jo Daviess and Stephenson counties. Streams surveyed included Galena River, Smallpox Creek, Hughlett Branch, Furnace Creek, Irish Hollow Creek, Wolf Creek, Apple River, Rush Creek, Rindesbacher Creek, Yellow Creek, several unnamed tributaries of these streams, and an unnamed tributary of the Pecatonica River. In June 1995, Wetzel et al. (1996) collected one hundred twenty-eight taxa of aquatic macroinvertebrates from four stream sites in Jo Daviess County: East Fork Galena River, Smallpox Creek, an unnamed tributary of Smallpox Creek, and Irish Hollow Creek.

The collection of several aquatic macroinvertebrates (including mussels) by Wetzel et al. (1995, 1996) from Jo Daviess and Stephenson counties represented new county records. Several species identified during that study were either previously unknown from the state or were known from only a few collections. These included *Amphiagrion saucium* (Odonata), *Hesperocorixa atopodonta* (Hemiptera), and *Saldula opacula* (Hemiptera). Their presence in Jo Daviess and/or Stephenson counties was not too surprising given the proximity of areas in adjoining states from which they are known. Comparisons of the two studies suggest that none of these drainages offer unique resources. The few possible county records for some macroinvertebrate taxa reflect the relative paucity of collection effort in the northwest corner of Illinois, not significant findings. Recently, Webb et al. (1998) reported several distribution records for aquatic macroinvertebrate species from the DAA that previously were considered rare in Illinois; one represented a new state record (see below, Unique Habitats).

Table 23 lists aquatic macroinvertebrate taxa known or thought likely to occur in the DAA. Most of these species are considered to be relatively common in the state of Illinois; exceptions are those species reported above by Webb et al. (1998) and Wetzel et al. (1995, 1996) as new for the county or state. Records for species included in Table 23 have been obtained from the following sources: Malloch (1915a, b), Frison (1935), Ross

(1944), Burks (1953), Wooldridge (1967), Lauck (1959), Brigham (1977), Pechuman et al. (1983), Wetzel (1992), Taylor (1997), Webb and DeWalt (1997), Webb et al. (1993, 1998), Wetzel et al. (1995, 1996), and the INHS Insect and Annelida Collections.

Although many of the species listed in Table 23 are known to occur in both standing and running water, the paucity of accessible historical records and the limited recent information for taxa known to occur within the DAA 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. Exceptions to this are the taxa noted with an asterisk (*). Table 23 those known to occur in the DAA that, to date, have been collected only from spring and springbrook habitats.

Table 17. Freshwater fishes recorded from the Driftless Assessment Area.[1]

FAMILY *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Medium & Large Rivers	Standing Water
PETROMYZONTIDAE						
Ichthyomyzon unicuspis	silver lamprey				X	
ACIPENSERIDAE						
***Acipenser fulvescens*-SE**	**lake sturgeon**				**X**	
Scaphirhynchus platorynchus	shovelnose sturgeon			X		
LEPISOSTEIDAE						
Lepisosteus osseus	longnose gar				X	
Lepisosteus platostomus	shortnose gar				X	
HIODONTIDAE						
Hiodon tergisus	mooneye				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
Ericymba buccata	silverjaw minnow		X	X	X	
Hybognathus hankinsoni	brassy minnow	X	X			
Hybognathus nuchalis	Mississippi silvery minnow		X	X	X	
***Hybopsis amnis* -SE**	**pallid shiner**			**X**	**X**	
Luxilus cornutus #	common shiner		X	X	X	
Lythrurus umbratilis	redfin shiner		X	X	X	
Macrhybopsis aestivalis	speckled chub				X	
Macrhybopsis storeriana	silver chub				X	
Nocomis biguttatus	hornyhead chub		X	X		
Notemigonus crysoleucas	golden shiner			X	X	X
Notropis atherinoides #	emerald shiner				X	

Table 17. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Medium & Large Rivers	Standing Water
Notropis blennius #	river shiner				X	
Notropis buchanani	ghost shiner			X	X	
Notropis dorsalis	bigmouth shiner		X	X	X	
***Notropis heterolepis* -SE**	**blacknose shiner**		**X**	**X**		
Notropis hudsonius #	spottail shiner				X	
Notropis ludibundus	sand shiner		X	X	X	
Notropis nubilus	Ozark minnow		X	X		
Notropis rubellus	rosyface shiner		X	X	X	
Notropis volucellus	mimic shiner				X	
Notropis wickliffi	channel 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			
Rhinichthys cataractae	longnose dace		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	
Hypentelium nigricans	northern hog sucker		X	X	X	
Ictiobus bubalus	smallmouth buffalo				X	
Ictiobus cyprinellus	bigmouth buffalo				X	
Ictiobus niger	black buffalo				X	
Minytrema melanops	spotted sucker		X	X		
Moxostoma duquesnei	black redhorse		X	X	X	
Moxostoma erythrurum	golden redhorse		X	X	X	
Moxostoma macrolepidotum	shorthead redhorse			X	X	
ICTALURIDAE						
Ameiurus melas	black bullhead		X	X	X	X
Ameiurus natalis	yellow bullhead		X	X	X	X
Ictalurus furcatus	blue catfish				X	
Ictalurus punctatus	channel catfish			X	X	X
Noturus flavus	stonecat		X	X		
Noturus gyrinus	tadpole madtom		X	X		
ESOCIDAE						
Esox lucius	northern pike			X	X	X
UMBRIDAE						
Umbra limi	central mudminnow		X			X

Table 17. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Medium & Large Rivers	Standing Water
GADIDAE						
Lota lota	burbot				X	
ATHERINIDAE						
Labidesthes sicculus #	brook silverside			X	X	X
GASTEROSTEIDAE						
Culaea inconstans	brook stickleback	X	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
Micropterus dolomieu	smallmouth bass		X	X	X	X
Micropterus salmoides #	largemouth bass		X	X	X	X
Pomoxis annularis	white crappie		X	X	X	X
Pomoxis nigromaculatus	black crappie		X	X	X	X
PERCIDAE						
***Ammocrypta clara* -SE**	**western sand darter**				**X**	**X**
Etheostoma asprigene	mud darter		X	X	X	
Etheostoma flabellare #	fantail darter	X	X	X		
Etheostoma nigrum #	johnny darter	X	X	X	X	
Perca flavescens	yellow perch		X	X		X
Percina caprodes	logperch		X	X	X	
Percina phoxocephala	slenderhead darter		X	X	X	
Percina shumardi	river darter				X	
Stizostedion canadense	sauger			X	X	
Stizostedion vitreum	walleye			X	X	
SCIAENIDAE						
Aplodinotus grunniens	freshwater drum			X	X	

[1] Data from the Illinois Natural History Survey Fish Collection.
[2] Bold type indicates an Illinois endangered (SE) species.
[3] * = introduced species; # = species common to this region.
[4] Total number of species = 89 (88 native, 1 introduced).

Table 18. Freshwater fishes recorded from the Driftless Assessment Area, by habitat.[1]

FAMILY *Scientific Name*[2,3,4]	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
PETROMYZONTIDAE						
Ichthyomyzon unicuspis	silver lamprey	X	X			
ACIPENSERIDAE						
***Acipenser fulvescens*-SE**	**lake sturgeon**		**X**	**X**		
Scaphirhynchus platorynchus	shovelnose sturgeon		X	X		
LEPISOSTEIDAE						
Lepisosteus osseus	longnose gar				X	
Lepisosteus platostomus	shortnose gar		X		X	X
HIODONTIDAE						
Hiodon tergisus	mooneye		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	
Ericymba buccata	silverjaw minnow		X	X		
Hybognathus hankinsoni	brassy minnow			X		
Hybognathus nuchalis	Mississippi silvery minnow		X	X		
***Hybopsis amnis*-SE**	**pallid shiner**			**X**		
Luxilus cornutus #	common shiner		X	X		
Lythrurus umbratilis	redfin shiner		X	X		
Macrhybopsis aestivalis	speckled chub		X	X		
Macrhybopsis storeriana	silver chub			X		
Nocomis biguttatus	hornyhead chub		X	X		
Notemigonus crysoleucas	golden shiner			X	X	X
Notropis atherinoides #	emerald shiner			X		
Notropis blennius #	river shiner		X	X		
Notropis buchanani	ghost shiner			X		
Notropis dorsalis	bigmouth shiner		X	X		
***Notropis heterolepis*-SE**	**blacknose shiner**			**X**		
Notropis hudsonius #	spottail shiner			X	X	X
Notropis ludibundus	sand shiner		X	X		
Notropis nubilus	Ozark minnow		X	X		
Notropis rubellus	rosyface shiner		X	X		X
Notropis volucellus	mimic shiner		X	X		
Notropis wickliffi	channel shiner			X		
Opsopoeodus emiliae	pugnose minnow			X		
Phenacobius mirabilis	suckermouth minnow	X	X			
Phoxinus erythrogaster #	southern redbelly dace	X	X			

Table 18. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
Pimephales notatus #	bluntnose minnow		X	X		
Pimephales promelas	fathead minnow			X		
Pimephales vigilax #	bullhead minnow		X	X		
Rhinichthys atratulus	blacknose dace	X	X			
Rhinichthys cataractae	longnose dace	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		
Hypentelium nigricans	northern hog sucker	X	X			
Ictiobus bubalus	smallmouth buffalo			X		
Ictiobus cyprinellus	bigmouth buffalo			X		
Ictiobus niger	black buffalo			X		
Minytrema melanops	spotted sucker			X		
Moxostoma duquesnei	black redhorse		X	X		
Moxostoma erythrurum	golden redhorse		X	X		
Moxostoma macrolepidotum	shorthead redhorse		X	X		
ICTALURIDAE						
Ameiurus melas	black bullhead			X	X	
Ameiurus natalis	yellow bullhead			X	X	
Ictalurus furcatus	blue catfish		X	X		
Ictalurus punctatus	channel catfish		X	X	X	
Noturus flavus	stonecat	X				
Noturus gyrinus	tadpole madtom		X	X		
ESOCIDAE						
Esox lucius	northern pike			X	X	
UMBRIDAE						
Umbra limi	central mudminnow			X	X	
GADIDAE						
Lota lota	burbot		X	X		
ATHERINIDAE						
Labidesthes sicculus #	brook silverside			X	X	X
GASTEROSTEIDAE						
Culaea inconstans	brook stickleback			X	X	
MORONIDAE						
Morone chrysops #	white bass			X		
Morone mississippiensis	yellow bass			X	X	
CENTRARCHIDAE						
Ambloplites rupestris	rock bass			X		
Lepomis cyanellus #	green sunfish			X		X
Lepomis gibbosus	pumpkinseed			X		

Table 18. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
Lepomis gulosus	warmouth			X	X	
Lepomis humilis	orangespotted sunfish			X		
Lepomis macrochirus	bluegill			X	X	
Micropterus dolomieu	smallmouth bass			X	X	X
Micropterus salmoides #	largemouth bass			X	X	X
Pomoxis annularis	white crappie			X	X	X
Pomoxis nigromaculatus	black crappie			X	X	X
PERCIDAE						
***Ammocrypta clara*-SE**	**western sand darter**		**X**			
Etheostoma asprigene	mud darter	X		X		
Etheostoma flabellare #	fantail darter	X				
Etheostoma nigrum #	johnny darter		X	X		
Perca flavescens	yellow perch			X	X	
Percina caprodes	logperch		X	X		
Percina phoxocephala	slenderhead darter	X	X			
Percina shumardi	river darter	X				
Stizostedion canadense	sauger			X		
Stizostedion vitreum	walleye			X		
SCIAENIDAE						
Aplodinotus grunniens	freshwater drum			X		

[1] Data from the Illinois Natural History Survey Fish Collection.
[2] Bold type indicates an Illinois endangered (SE) species.
[3] * = introduced species; # = species common to this region.
[4] Total number of species = 89 (88 native, 1 introduced).

Table 19. Freshwater mussels recorded from the Driftless Assessment Area .[1]

ORDER Subfamily *Scientific Name*[2,3,4]	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
Arcidens confragosus	rock-pocketbook			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

Table 19. Continued.

ORDER Subfamily *Scientific Name*[2,3,4]	Common Name	Headwaters/ Creeks	Small Rivers	Medium Rivers	Standing Water
Ambleminae					
Amblema plicata #	threeridge		X	X	
Cyclonaias tuberculata	purple wartyback			X	
***Elliptio crassidens*-ST**	**elephantear**			**X**	
***Elliptio dilatata*-ST**	**spike**		**X**	**X**	
***Fusconaia ebena*-ST**	**ebonyshell**			**X**	
Fusconaia flava #	Wabash pigtoe		X	X	
Megalonaias nervosa	washboard			X	
***Plethobasus cyphyus*-SE**	**sheepnose**			**X**	
Pleurobema sintoxia	round pigtoe		X	X	
Quadrula metanevra	monkeyface			X	
Quadrula nodulata	wartyback			X	
Quadrula pustulosa	pimpleback		X	X	
Quadrula quadrula #	mapleleaf		X	X	
Tritogonia verrucosa	pistolgrip		X	X	
Lampsilinae					
Actinonaias ligamentina	mucket		X	X	
***Ellipsaria lineolata*-ST**	**butterfly**			**X**	
Lampsilis cardium #	plain pocketbook		X	X	
***Lampsilis higginsii*-SE, FE**	**Higgins eye**		**X**	**X**	
Lampsilis siliquoidea	fatmucket		X	X	X
Lampsilis teres	yellow sandshell		X	X	
Leptodea fragilis	fragile papershell		X	X	
Leptodea leptodon	scaleshell			X	
Ligumia recta	black sandshell			X	
Obliquaria reflexa	threehorn wartyback			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	
Truncilla truncata	deertoe			X	
DREISSENIDAE					
Dreissena polymorpha *	zebra mussel			X	

[1] Data from the Illinois Natural History Survey Mollusk Collection.
[2] Bold type indicates an Illinois endangered (SE); Illinois threatened (ST); and/or federally endangered (FE) species.
[3] * = introduced species; # = common species.
[4] Total number of species = 40 (39 native, 1 introduced).

Table 20. Freshwater mussels recorded from the Driftless Assessment Area, by habitat.[1]

FAMILY Subfamily *Scientific Name* [2,3,4]	Common Name	Streams			Standing Water
		Riffles	Runs	Pools	Littoral Zone
UNIONIDAE					
Anodontinae					
Alasmidonta marginata	elktoe	X	X		
***Alasmidonta viridis*-SE**	**slippershell mussel**	**X**	**X**		
Anodontoides ferussacianus	cylindrical papershell		X	X	X
Arcidens confragosus	rock-pocketbook		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
Ambleminae					
Amblema plicata #	threeridge	X	X	X	
Cyclonaias tuberculata	purple wartyback	X	X		
***Elliptio crassidens*-ST**	**elephantear**		**X**	**X**	
***Elliptio dilatata*-ST**	**spike**	**X**	**X**		
***Fusconaia ebena*-ST**	**ebonyshell**	**X**	**X**		
Fusconaia flava #	Wabash pigtoe	X	X		
Megalonaias nervosa	washboard	X	X	X	
***Plethobasus cyphyus*-SE**	**sheepnose**	**X**	**X**		
Pleurobema sintoxia	round pigtoe	X	X		
Quadrula metanevra	monkeyface	X	X		
Quadrula nodulata	wartyback	X	X		
Quadrula pustulosa	pimpleback	X	X		
Quadrula quadrula #	mapleleaf	X	X	X	
Tritogonia verrucosa	pistolgrip	X	X		
Lampsilinae					
Actinonaias ligamentina	mucket	X	X		
***Ellipsaria lineolata*-ST**	**butterfly**		**X**	**X**	
Lampsilis cardium #	plain pocketbook	X	X	X	
***Lampsilis higginsii*-SE, FE**	**Higgins eye**		**X**	**X**	
Lampsilis siliquoidea	fatmucket	X	X	X	X
Lampsilis teres	yellow sandshell	X	X		
Leptodea fragilis	fragile papershell	X	X	X	
Leptodea leptodon	scaleshell	X	X	X	
Ligumia recta	black sandshell	X	X		
Obliquaria reflexa	threehorn wartyback	X	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		
Truncilla truncata	deertoe	X	X		

Table 20. Continued.

FAMILY Subfamily *Scientific Name* [2,3,4]	Common Name	Streams Riffles	Runs	Pools	Standing Water Littoral Zone
DREISSENIDAE					
*Dreissena polymorpha**	zebra mussel		X	X	

[1] Data from the Illinois Natural History Survey Mollusk Collection.
[2] Bold type indicates an Illinois endangered (SE); Illinois threatened (ST); and/or federally endangered (FE) species.
[3] * = introduced species; # = common species.
[4]Total number of species = 40 (39 native, 1 introduced).

Table 21. Freshwater crustaceans recorded from the Driftless Assessment Area .[1]

ORDER Family *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Medium Rivers	Standing Water
ISOPODA (Isopods)						
Asellidae						
Caecidotea intermedia #		X	X	X	X	
***Caecidotea spatulata*-SE**		**Springs**				
AMPHIPODA (Amphipods)						
Gammaridae						
Gammarus pseudolimnaeus #		X				
***Stygobromus iowae*-SE**		**Springs**				
Hyalellidae						
Hyalella azteca #		X	X	X	X	X
DECAPODA (Crayfishes & shrimps)						
Cambaridae						
Procambarus acutus	White River crawfish		X	X	X	X
Orconectes propinquus #	clearwater crayfish		X	X	X	
Orconectes virilis #	virile crayfish		X	X	X	X
Cambarus diogenes	devil crawfish			burrower		

[1] Data from the Illinois Natural History Survey Crustacean Collection.
[2] Bold type indicates an Illinois endangered (SE) species.
[3] # = common species.
[4] Total number of species = 9.

Table 22. Freshwater crustaceans recorded from the Driftless Assessment Area, by habitat.[1]

ORDER Family *Scientific Name*[2,3]	Common Name	Streams Riffles	Runs	Pools	Standing Water Littoral	Open Water
ISOPODA (Isopods)						
Asellidae						
Caecidotea intermedia #		X		X		
***Caecidotea spatulata* -SE**		**X**				
AMPHIPODA (Amphipods)						
Gammaridae						
Gammarus pseudolimnaeus #		X				
***Stygobromus iowae*-SE**		**X**				
Hyalellidae						
Hyalella azteca #		X	X	X	X	
DECAPODA (Crayfishes & shrimps)						
Cambaridae						
Procambarus acutus	White River crawfish			X	X	
Orconectes propinquus #	clearwater crayfish	X				
Orconectes virilis #	virile crayfish	X	X		X	
Cambarus diogenes	devil crawfish			burrower		

[1] Data from the Illinois Natural History Survey Crustacean Collection.
[2] Bold type indicates an Illinois endangered (SE) species, # = common species.
[3] Total number of species =9.

Table 23. Aquatic macroinvertebrates, exclusive of the Crustacea and unionid Mollusca, recorded for the Driftless Assessment Area.[1]

Phylum NEMATODA - Nematode Worms

Phylum NEMATOMORPHA - Horsehair Worms
Gordiidae

Phylum TURBELLARIA - Flatworms
Tricladida
Planariidae
Dugesia dorotocephala
Phagocata velata

Phylum ANNELIDA - Segmented Worms
Class APHANONEURA - Suction-Feeding Worms
Aeolosomatida
Aeolosomatidae

Class BRANCHIOBDELLAE - Crayfish Worms
Branchiobdellida
Cambarincolidae

Class OLIGOCHAETA - Oligochaete Worms
Lumbriculida
Lumbricidae
(unidentified sp.).
Lumbriculidae
(several unidentified taxa)
Tubificida
Enchytraeidae
Achaeta sp.
Naididae
Allonais paraguayensis *
Chaetogaster diaphanus
Dero digitata

Table 23. Continued.

Nais behningi
Nais bretscheri
Nais communis
Nais pardalis
Nais variabilis
Ophidonais serpentina
Paranais frici
Pristina leidyi
Slavina appendiculata
Stylaria lacustris
Tubificidae
Aulodrilus pigueti
Branchiura sowerbyi
Ilyodrilus templetoni
Limnodrilus cervix
Limnodrilus claparedianus
Limnodrilus hoffmeisteri
Tubifex tubifex
Varichaetadrilus angustipenis *
Class HIRUDINEA - Leeches
Rhynchobdellida
Glossiphoniidae
Helobdella stagnalis
Placobdella ornata
Gnathobdellida
Hirudinidae
Dina dubia
Pharyngobdellida
Erpobdellidae
Erpobdella punctata

Phylum ARTHROPODA - Arthropods
Acari
Hydracarina (Water Mites)
Class INSECTA - Insects
Ephemeroptera - Mayflies
Baetidae
Baetis brunneicolor
Baetis flavistriga
Baetis intercalaris
Baetis tricaudatus
Callibaetis skokianus
Labiobaetis dardanus
Labiobaetis propinquus
Caenidae
Brachycercus prudens
Caenis sp.
Ephemeridae
Hexagenia limbata
Hexagenia bilineata
Heptageniidae
Heptagenia diabasia
Stenacron gildersleevei
Stenacron interpunctatum
Stenonema femoratum
Stenonema luteum
Stenonema mediopunctatum
Stenonema mexicanum integrum
Stenonema pulchellum
Isonychiidae
Isonychia rufa
Isonychia sicca
Leptophlebiidae
Leptophlebia sp.
Polymitarcyidae
Ephoron album
Potamanthidae
Anthopotamus myops
Anthopotamus verticis
Siphlonuridae
Ameletus sp.
Tricorhythidae
Tricorhythodes sp.
Odonata - Damselflies and Dragonflies
Zygoptera - Damselflies
Calopterygidae
Calopteryx aequabilis
Calopteryx maculata
Hetaerina americana
Coenagrionidae
Amphiagrion saucium
Argia apicalis
Argia moesta
Argia plana
Enallagma antennatum
Enallagma carunculatum
Enallagma exsultans
Ischnura verticalis
Lestidae
Archilestes grandis
Lestes rectangularis
Lestes unguiculatus
Anisoptera - Dragonflies
Aeshnidae
Aeshna tuberculifera

Table 23. Continued.

Aeshna umbrosa umbrosa
Anax junius
Boyeria vinosa
Gomphidae
Gomphus externus
Gomphus notatus
Gomphus vastus
Stylurus amnicola
Macromiidae
Didymops transversa
Libellulidae
Erythemis simplicicollis
Libellula (Plathemis) lydia
Libellula pulchella
Perithemis tenera
Sympetrum obtusum
Sympetrum rubicundulum
Sympetrum vincinum
Tramea onusta

Plecoptera - Stoneflies
Capniidae
Allocapnia vivipara
Nemouridae
Amphinemura delosa
Amphinemura varshava
Nemoura trispinosa *
Perlidae
Acroneuria abnormis
Attaneuria ruralis
Perlesta decipiens
Perlinella drymo
Taeniopterygidae
Taeniopteryx burksi

Heteroptera - True Bugs
Pleidae
Neoplea striola
Plea stridida
Nepidae - Water Scorpions
Ranatra fusca
Ranatra kirkaldyi
Corixidae - Water Boatmen
Corisella edulis
Hesperocorixa atopodonta
Hesperocorixa obliqua
Palmocorixa sp.
Ramphocorixa acuminata
Sigara alternata
Sigara grosslineata
Trichocorixa calva
Trichocorixa kanza
Trichocorixa naias
Trichocorixa sexcincta
Notonectidae - Backswimmers
Buenoa margaritacea
Buenoa scimitra
Notonecta raleighi
Notonecta (Paranecta) undulata
Mesoveliidae - Water Treaders
Mesovelia mulsanti
Gerridae - Pond Skaters
Aquarius remigis
Gerris argenticollis
Gerris buenoi
Gerris comatus
Gerris marginatus
Gerris (Limnoporus) canaliculatus
Gerris (Limnoporus) dissortis
Metrobates hesperius
Rheumatobates palosi
Trepobates knighti
Saldulidae
Salda lugubris
Saldula opacula
Veliidae - Little Water Striders
Microvelia americana
Rhagovelia oriander
Belostomatidae - True Water Bugs
Belostoma flumineum
Lethocerus americanus

Coleoptera - Beetles
Dryopidae
Helichus fastigiatus
Helichus lithophilus
Helichus striatus
Dytiscidae
Agabus semivittatus
Agabus seriatus
Coptotomus loticus
Hydroporus difformis
Hydroporus consimilus
Hydroporus oppositus
Hydroporus pulcher
Hydroporus undulatus
Hygrotus impressopunctatus
Ilybius pleuriticus
Laccophilus proximus

Table 23. Continued.

Laccophilus maculosus maculosus
Laccophilus proximus
Liodessus affinis
Sanfilippodytes pseudovilis
Elmidae
Dubiraphia brevipennis
Dubiraphia parva
Dubiraphia quadrinotata
Dubiraphia vittata
Macronychus glabratus
Optioservus fastiditus
Stenelmis crenata
Stenelmis sexlineata
Stenelmis vittipennis
Gyrinidae
Dineutus assimilus
Dineutus sp.
Gyrinus sp.
Haliplidae
Peltodytes duodecimpuctatus
Peltodytes edentulus
Peltodytes sp.
Haliplus borealis
Haliplus immaculicollis
Haliplus sp.
Hydrophilidae
Anacaena limbata
Berosus aculeatus
Berosus exiquus
Berosus fraternus
Berosus peregrinus
Berosus striatus
Cymbiodyta blanchardi
Cymbiodyta chamberlaini
Cymbiodyta toddi
Cymbiodyta vindicata
Enochrus blatchleyi
Enochrus cinctus
Enochrus hamiltoni
Enochrus nebulosus
Enochrus ochraceus
Enochrus pygmaeus
Enochrus pygmaeus nebulosus
Helophorus lacustris
Helophorus nitidulus
Hydrobius sp.
Laccobius agilis
Laccobius spangleri
Paracymus confluens
Paracymus subcupreus
Sperchopsis tesselatus
Tropisternus blatchleyi
Tropisternus ellipticus
Tropisternus glaber
Tropisternus lateralis nimbatus
Tropisternus mixtus
Tropisternus modestus
Tropisternus natator
Psephenidae
Ectopria sp.
Megaloptera - hellgrammites, Alderflies, Dobsonflies, Fishflies
Corydalidae
Chauliodes sp.
Sialidae
Sialis sp.
Trichoptera - Caddisflies
Brachycentridae
Brachycentrus numerosus
Helicopsychidae
Helicopsyche borealis
Hydropsychidae
Ceratopsyche alhedra
Ceratopsyche bronta
Ceratopsyche morosa
Ceratopsyche group
Ceratopsyche slossonae *
Cheumatopsyche aphanta
Cheumatopsyche campyla
Cheumatopsyche pettiti
Diplectrona modesta *
Homoplectron doringa
Hydropsyche betteni
Hydropsyche bidens
Hydropsyche orris
Potamyia flava
Hydroptilidae
Hydroptila ajax
Hydroptila angusta
Hydroptila consimilis
Hydroptila grandiosa
Hydroptila waubesiana
Ithytrichia clavata
Leucotrichia pictipes
Mayatrichia ayama
Neotrichia falca

Table 23. Continued.

Neotrichia okopa
Ochrotrichia riesi *
Oxyethira pallida
Stactobiella palmata
Lepidostomatidae
Lepidostoma libum *
Triaenodes baris *
Leptoceridae
Leptocerus americanus
Ceraclea tarsipunctata
Ceraclea transversa
Nectopsyche candida
Oecetis avara
Oecetis inconspicua
Limnephilidae
Anabolia sordidus
Drusinus uniformis
Hesperophylax designatus *
Pycnopsyche antica *
Philopotamidae
Chimarra aterrima
Chimarra feria
Phryganeidae
Ptilostomis semifasciata
Polycentropodidae
Cernotina sp.
Neureclipsis crepuscularis
Nyctiophylax vestitus
Polycentropus centralis
Polycentropus cinerus
Polycentropus interruptus
Psychomyiidae
Psychomyia flavida *
Uenoidae
Neophylax cocinnus

Diptera - Flies

Athericidae
Atherix variegata
Chironomidae
Ablabesmyia illinoensis
Brillia flavifrons
Chironomus sp.
Cladotanytarsus sp.
Cricotopus / Isocladius sp.
Cricotopus / Orthocladius complex
Cricotopus bicinctus
Cricotopus trifasciatus
Cryptochironomus fulvus group
Cryptotendipes sp.
Dicrotendipes neomodestus
Eukiefferiella bavarica group
Eukiefferiella devonica group
Microtendipes pedellus group
Odontomesa sp.
Orthocladius annectens
Parakiefferiella sp.
Parametriocnemus sp.
Paratanytarsus sp.
Paratendipes albimanus
Phaenopsectra obediens group
Polypedilum convictum group
Polypedilum halteralis
Polypedilum illinoense group
Rheocricotopus sp.
Rheotanytarsus sp.
Tanytarsus spp.
Thienemanniella sp.
Thienemannimyia group
Tribelos sp.
Ceratopogonidae
Bezzia complex
Culicoides sp.
Culicidae
Anopheles barberi
Anopheles quadrimaculatus
Anopheles walkeri
Anopheles punctipennis
Mansonia perturbans
Culiseta inornata
Culex restuans
Culex pipiens
Culex salinarius
Culex tarsalis
Aedes triseriatus
Aedes vexans
Aedes fitchi
Aedes trivittatus
Aedes dorsalis
Aedes sticticus
Aedes spenceri
Psorophora ciliata
Psorophora cyanescens
Dixidae
Dixa sp.
Dolichipodidae
Empididae

Table 23. Continued.

Hemerodromia sp.
Ephydridae
Psychodidae
Psychoda sp.
Ptychopteridae
Ptychoptera quadrifasciata
Stratiomyidae
Stratiomys sp.
Simuliidae
Simulium spp.
Tabanidae
Chrysops callidus
Chrysops cincticornis
Chrysops indus
Chrysops macquarti
Chrysops niger
Chrysops pikei
Chrysops univittatus
Chrysops vittatus
Hybomitra epistates
Hybomitra sodalis
Tabanus atratus
Tabanus lineola
Tabanus sackeni
Tabanus similis
Tabanus trimaculatus
Tipulidae
Antocha sp.
Pilaria sp.
Tipula sp.
Phylum MOLLUSCA - Mollusks
Gastropoda - Snails
Ancylidae
Lymnaeidae
Pseudosuccinea columella
Physidae
Physa sp.
Physella sp.
Planorbidae
Pelecypoda - Bivalve Mollusks
Sphaeriidae
Pisidium sp.
Sphaerium sp.

[1] Data are from the Illinois Natural History Survey Insect and Annelida collections, and literature cited in this document. List compiled by M.J. Wetzel, D.W. Webb, S.J. Taylor, and M.L. Biyal, Illinois Natural History Survey Center for Biodiversity.

* = those taxa known to occur in the Driftless Assessment Area that, to date, have been collected only from spring and springbrook habitats.

Threatened and Endangered Species

State threatened or endangered fishes known from the Driftless Assessment Area include the lake sturgeon, observed as recently as 1989, the western sand darter, observed in 1991, the pallid shiner, last observed in 1963, and the blacknose shiner, last observed in 1901.

Lake sturgeon: Although once commercially important in Illinois, the lake sturgeon has been in decline for several decades and is now rarely encountered in Illinois. However, the species is being raised in hatcheries and stocked in other states in the upper Mississippi River basin, and it may soon become more common in the large rivers of Illinois. A lake sturgeon was found in Pool 13 of the Mississippi River in 1989.

Western sand darter: The western sand darter is fairly common in clean sandy runs in portions of the upper Mississippi River, including along the Savannah Army Depot in Carroll County. Elsewhere the species survives only in isolated stretches of the Kaskaskia River and in Sugar River in Winnebago County. Once found in a few tributaries of the Illinois River, the species now appears to have been extirpated from the entire basin.

Pallid shiner: The pallid shiner lives in shallow sandy and rocky pools of medium to large rivers. It is on the verge of extinction in Illinois, being present only in a segment of the Kankakee River, and in a small stretch of the upper Mississippi River from Carroll County to Rock Island County. The pallid shiner was found in the Mississippi River near Blackhawk in Carroll County in 1963, and south of the Driftless Assessment Area near Cordova in Rock Island County in 1979 and in 1986.

Blacknose shiner: It is doubtful that the blacknose shiner still exists in the region since it has not been seen since 1901. In Illinois in the late 1800's, the blacknose shiner occurred throughout much of northern and central Illinois and was present but highly localized in southern Illinois. Today, populations remain in Illinois only in the Kankakee, Fox, and Rock River basins in the northern part of the state. The habitat of the blacknose shiner is clear vegetated lakes and pools of creeks and small rivers and usually is found over sand. Its disappearance from much of Illinois is thought to be a result of the increasing turbidity and sedimentation associated with poor agricultural practices. As the aquatic vascular plants and sandy substrate required by this species are covered with silt and disappear, the blacknose shiner is unable to feed and reproduce.

Longnose dace: Plum River in Carroll County from East Plum River to, and including, Carroll Creek, Menominee River throughout its length in Illinois, and Sinsinawa River throughout its length in Illinois, support populations of the longnose dace, a fish that otherwise is restricted in Illinois to Lake Michigan. Continued existence of the longnose dace in these streams was documented as recently as 1995; these streams warrant protection as a refuge for this species.

Four state threatened mussels (elephant-ear, spike, ebonyshell, butterfly) and three state endangered mussels (slippershell mussel, sheepnose, Higgins eye) are reported from this region. Higgins eye is also federally endangered. Of all of the threatened or endangered mussels known from the area the only ones that likely still exist are the butterfly, sheepnose, and Higgins eye. A summary of the past occurrence of each species is given below.

Slippershell: The only slippershell collected in this area was from the Galena River at Sand Prairie in 1941. This species usually inhabits small streams. Additional collecting in the creeks in this area may reveal new localities for this species.

Butterfly: The butterfly is a large river species and was found alive in the Mississippi River in the late 1970's. It is still relatively common around the Quad Cities and probably still exists in the Mississippi in this area.

Elephant-ear: Last documented alive in 1907, this mussel has been extirpated from the upper Mississippi River.

Spike: This mussel was widespread and common in Illinois as recently as the 1960's but has since experienced a severe decline. In this area, it has been found only as weathered dead shells in the past 20 years.

Ebonyshell: Like the elephant-ear, the ebony shell has been extirpated from the Upper Mississippi River. It was last documented alive in this area in the 1920's. Weathered-dead shells were found in the Mississippi River at the U.S. Rt. 30 bridge in 1997.

Higgins eye: Last confirmed in this area in 1907, this species is still found in various localities in the upper Mississippi (i.e. the Quad Cities, Cordova) and may still occur in this area.

Sheepnose: Like the Higgins eye, the sheepnose was last confirmed in this area in 1907. This species is still found in various localities in the upper Mississippi (i.e. the Quad Cities) and may still occur in this area.

The state and federally endangered Iowa Pleistocene Snail also occurs in this region. Currently this terrestrial snail is known from only 18 locations in Illinois and Iowa. Originally described from fossils, the first living specimens were found in 1955. It is restricted to algific talus slopes in the Driftless area (U.S. Fish & Wildlife Service 1984d)

Two of the nine species of crustaceans known from the basin are state endangered: *Caecidotea spatulata*, an isopod known from Smith Park Cave, near Wacker in Carroll County (1978), and *Stygobromus iowae*, an amphipod known from an abandoned mine in Jo Daviess County (Holsinger 1972), Mississippi Palisades State Park in Carroll County (1995), and Wellhouse Spring near Blackhawk in Carroll County (1997). Both species are restricted to caves and springs outflows.

In addition to several listed unionid mussels, one state endangered amphipod species is known from the Driftless Assessment Area. *Stygobromus iowae hubricht*, previously known from one specimen collected from an algific slope in an abandoned mine along the Mississippi River in Jo Daviess County in 1965 (Holsinger 1972, Herkert 1992), was recently collected from two spring localities by Webb et al. (1998, see below).

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 1996) does not include any aquatic macroinvertebrate species other than unionid mussels known or thought likely to occur in the DAA.

Non-native Species

The common carp is found throughout Illinois. It can be found in almost any type of habitat but prefers warm sluggish waters of streams and lakes and is very tolerant of high turbidity and low oxygen levels. Native to Eurasia, the common carp has been present in Illinois since the earliest surveys, making its effect on native species difficult to determine. The species tends to destroy vegetation and increase water turbidity by dislodging plants and rooting around in the substrate, causing a deterioration of habitat for species requiring

vegetation and clear water. The common carp attains a large size and has become an important commercial food species in Illinois; however, it may have done so at the expense of ecologically similar native species such as carpsuckers and buffalos. It was distributed throughout Illinois by the time of Forbes and Richardson's (1908) survey of Illinois fishes and was described as abundant in all parts of the state by Smith (1979). It remains common in most areas of Illinois, including the Driftless Assessment Area.

In this region, the zebra mussel is found in the Mississippi River. The zebra mussel is having negative impacts on many native Illinois species, particularly native mussels that are restricted to large rivers. Although often thought to occur statewide, the Asian clam has not been reported from this area.

Of the aquatic macroinvertebrate taxa known or thought likely to occur in the DAA (Table 23), none other than one aquatic worm species is thought to have been introduced. *Branchiura sowerbyi* (Annelida: Oligochaeta: Tubificidae) was first reported in the USA from a lake in Ohio in 1932. It most likely was introduced to the continent with imported aquatic and semiaquatic plants or other aquatic organisms. Originally thought to be restricted to thermally influenced habitats, *B. sowerbyi* is now commonly collected from a variety of stream and lake systems. This species is widespread throughout North America and Europe, and has been recorded from all continents except Antarctica. It does not appear to pose any threat to native populations of aquatic macroinvertebrates.

Information Gaps

The Driftless Assessment Area has been fairly well studied with respect to fishes and crayfishes, but little survey work has been conducted on mussels. Additional survey work in the smaller tributaries would better define the limits of some of the species, especially mussels, and possibly uncover additional populations of state endangered species.

The status of several species, especially freshwater mussels, is uncertain; additional survey work is needed to determine whether these species still occur in the drainage and, if not, whether they could be successfully reintroduced.

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.

Prior to studies by Brigham (1977) and Wetzel et al. (1995, 1996), major groups of aquatic macroinvertebrates known to occur in the DAA (Table 22) had not been well studied. Exceptions included statewide surveys for several insect groups by Malloch (1915a, b), Frison (1935), Ross (1944, 1947), Burks (1953), Lauck (1959), Ross and Horsfall (1965), Pechuman et al. (1983), and Wooldridge (1967). The recent studies by Webb et al. (1993, 1998) have provided distributional information for many aquatic species occurring in caves and springs, respectively; many of the species collected from these caves and springs represented new county records, and a few represented new state records.

Historical and recent collections of aquatic macroinvertebrates are deposited in the permanent Illinois Natural History Survey Collections; much of the information for historical collections is not easily retrievable because either specimens have not yet been identified or the identified material has not yet been incorporated into a searchable database.

Once specimens have been identified and incorporated into a database, comparisons 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 1996) rated the Apple River and this stretch of the Mississippi River as "Full Support" (water quality meets the needs of all designated uses protected by applicable water quality standards). Twenty-six percent of the Galena River was rated as "Partial Support/Minor Impairment" (water quality has been impaired, but only to a minor degree) and the remainder was rated "Full Support." The majority of the Plum River and its tributary Carroll Creek were rated as "Partial Support/Minor Impairment." Phosphorus released in municipal wastewater discharges and agricultural runoff led to the lower ratings.

The Biological Stream Characterization (Bertrand et al. 1995) rated the Apple River from U.S. Hwy. 20 to the South Fork of the Apple and the West Fork of the Apple River as "B" Streams (Highly Valued Aquatic Resource: good fishery for gamefish species; species richness somewhat below expectations). The rest of the Apple River, the Sinsinawa River, and parts of the Galena and Plum rivers were rated as "C" Streams (Moderate Aquatic Resource: fair fishery; species diversity and number of intolerant fish reduced). The Mississippi river was not rated.

Smith (1971) rated the Apple River as "Good" with an "Excellent" rating in the upper reaches. Barnyard pollution and siltation were noted as problems in the lower reaches. The Galena River was rated as "Good" with minor barnyard pollution problems. The Plum River was rated as "Fair" with both barnyard pollution and siltation problems. The Mississippi river was not rated. Smith (1971) discussed the high diversity of fishes in the Apple River and referred to it as the best stream in the region. In addition to overall high fish diversity, Apple River from Wolf Creek to Mill Creek and West Fork Apple River support populations of the Ozark minnow and the largescale stoneroller. The Ozark minnow is found in Illinois only in a few streams in northwestern Illinois, including Apple River. The largescale stoneroller was once fairly widespread in Illinois but has been extirpated from much of its former range. No recent records of threatened and endangered mussels are known from the area, but populations have not been adequately surveyed.

Unique Habitats

Numerous springs are known to occur within the Driftless Assessment Area (Webb et al. 1998). These include Airhart Spring, Five Springs Complex, Nadig Spring, Plum Spring, Randecker Spring, Sand Boil Spring, Sand Boil Tributary Spring, Skeeter Spring, Sorrel Horse Camp Spring, South Gate Spring, Well House Spring, several unnamed springs (Carroll Co.), Ice Spring (Jo Daviess Co.), Two Springs, and several unnamed springs (Whiteside Co.).

The aquatic macroinvertebrates considered unique to spring and springbrook habitats are listed in Table 23. *Allonais paraguayensis*, an aquatic worm considered rare in United States, was reported from Ice Spring in Jo Daviess County; previously this species was reported from several other spring habitats in western and southern Illinois (Webb et al. 1995, 1996, 1998a 1998b). *Varichaetadrilus angustipenis*, another aquatic worm considered rare in United States, was reported from Two Springs in Whiteside County; previously this species was reported from several other spring habitats in western and southern Illinois (Webb et al. 1995, 1996, 1998a, 1998b) and from several other sites in Illinois influenced by groundwater (Wetzel 1982, 1992).

Stygobromus iowae, a troglodític species of amphipod previously reported from an algific slope in an abandoned mine in Jo Daviess County, was reported from Well House Spring and Spring #1 [South Gate Spring] in Mississippi Palisades State Park. Several species of rare caddisflies in Illinois were collected from springs in the Driftless Assessment Area: *Ceratopsyche slossonae, Diplectrona modesta, Glossosoma intermedium, Hesperophylax designatus, Lepidostoma libum, Ochrotrichia riesi, Psychomyia flavida*, and *Triaenodes baris. Pycnopsyche antica*, a caddisfly previously reported from southwestern Michigan (Ross 1944), was reported from Nadig Spring a new state record for this species. *Nemoura trispinosa*, a species of stonefly previously reported from one locality in Illinois (Ross 1944), was collected from five springs in the DAA.

Numerous caves are known to occur within the Driftless Assessment Area including: Bork Cave, Camp Benson Cave, Corner Cave, Fecke Cave, Iron Mine Cave, Oak Grove School Cave, Old Clifton School Cave, Smith (Mt. Carroll) Cave, Meppen Cave, Bob Upton Cave, Escape Cave, Bat Cave, Squaw Cave, Squaw Double Pit (Carroll County); and Apple River Schoolhouse Cave, Burial Cave, Cotton Candy Cave, Coyote Cave, Crevice Cave, Flashlight Cave, Goodmiller Cave, Haler's Ice Cave, Homes Cave, Ice Cave, Kevern's Cavern, Merkle's Cave, Mud Run Cave, Ray's Cave, Sentinel Cave, Wilson Cave, Wiley Cave, Wuster Cave (Jo Daviess County). The biota and geology of some of these caves have been reported on (Bretz and Harris 1961, Webb et al. 1993).

Biologically Significant Streams

Seven areas in the Driftless Assessment Area were recognized as Biologically Significant Streams (Page et al. 1992) because of their mussel and/or fish diversity. These streams provide the best opportunities in the basin for the protection of large numbers of native species.

1. *Apple River, from Wolf Creek to Mill Creek, Jo Daviess County.* Along this stretch of the Apple River the banks rise as much as 200 feet from the stream bed. The river averages 60 feet in width. The substrate consists of gravel and cobble over a bedrock bottom; sand and silt are present in backwaters and pools. A variety of habitats are present, including gravel/ cobble riffles and runs, bedrock riffles and runs, sand/silt bottomed pools, undercut banks, and quiet pools with vascular aquatic vegetation. The Ozark minnow and the largescale stoneroller are present. Apple River Canyon State Park is located along this stretch of the Apple River.

2. *West Fork Apple River, Jo Daviess County.* The Ozark minnow and the largescale stoneroller are present. No data on stream characteristics are available for this site.

3. *Plum River, from East Plum River to Carroll Creek, Carroll County.* This segment of the Plum River flows mostly through farmland and carries a fairly heavy silt load. The longnose dace occupies the cobble riffles that are interspersed between the long sandy pools and runs.

4. *Carroll Creek, Carroll County.* The longnose dace is present. No data on stream characteristics are available for this site.

5. *Menominee River, Jo Daviess County.* The Menominee River in Jo Daviess County is an upland, clear-flowing, gravel-bottom stream with pools and riffles. The longnose dace is present. Riparian vegetation consists of woods, row crops, or pasture. In several areas, cattle have access to the stream and are causing erosion of the riverbanks.

6. *Sinsinawa River, Jo Daviess County.* The meandering Sinsinawa River averages 35 feet in width and is up to five feet deep under normal conditions. A variety of stream habitats exist, including gravel and cobble riffles, sandy runs, and silty pools with overhanging riparian vegetation. The riparian vegetation is a combination of old fields, pastures, and trees. The longnose dace is present.

7. *Mississippi River, river miles 545-550, Carroll County.* The Mississippi River along the Savannah Army Depot consists of clean sandy runs and pools, and an occasional sand/ gravel riffle near the bank. Streambank erosion is low and the riparian zone, which is over 200 feet wide, consists of oaks and other savanna species. Large populations of a diversity of fishes, including the western sand darter, are present. This site is a excellent candidate for protection of a large-river habitat in Illinois.

Environmental Problems

Stream ecosystems are fragmented by landscape changes that render stream habitats unsuitable for aquatic organisms and by instream modifications that eliminate stream habitats. Smith (1971) ranked the causes of extirpation or declines in fish species in Illinois as follows: siltation (as the primary factor responsible for the loss of 2, and

decimation of 14, species), drainage of bottomland lakes, swamps, and prairie marshes (0, 13), desiccation during drought (0, 12), species introductions (2, 7), pollution (2, 5), impoundments (0, 4), and increased water temperatures (0, 1). All of these factors render habitats unsuitable for many aquatic species throughout Illinois and lead to extirpations. Streams in Illinois naturally have wooded floodplains that are extremely important in maintaining a healthy aquatic environment. The vegetation on a floodplain shades the stream and keeps it from becoming excessively hot during the summer, stabilizes the streambank and reduces erosion, and acts as a filter that removes topsoil and pesticides which would otherwise reach the stream as water drains from croplands. During periods of high water, vegetated floodplains provide feeding and spawning areas for many species of aquatic organisms and nurseries for developing larvae. When floodplains are converted to crop production as they have been throughout much of Illinois, they no longer provide these benefits to aquatic organisms.

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

Siltation, increased water temperatures, and desiccation follow the removal of riparian vegetation and the tiling of fields as land is prepared for agriculture. The excessive siltation associated with the removal of floodplain vegetation is among the most damaging forms of stream pollution. The clean rock and gravel substrates that are normally characteristic of riffles and other stream habitats with fast-flowing water provide living space for many species of aquatic insects and other invertebrates and important spawning habitat for many species of fishes. The deposition of silt covers the rocks, leaving no place for small organisms to hide or for fishes to hide their eggs. Silt can also cover the leaves of aquatic plants and, if sufficient to prevent gas exchange or photosynthesis, will cause the plants to die. The reduction of plant life in a stream has a cascading negative impact on the stream ecosystem. Many animals, in particular insect larvae and fishes, use the plants as places to hide and forage. Some fishes use plants to hide from predators, others use plants as sites from which to ambush prey. As plants are eliminated, populations of insects and fishes are reduced or eliminated because they have fewer places to live.

The impact of increased water temperatures resulting from the loss of riparian vegetation and reduced water flow during warm seasons is difficult to separate from the effects of siltation and other factors that occur concomitantly. However, throughout Illinois, increased water temperatures per se are probably especially harmful to cool-water species such as northern pike and species dependent on springs and spring-fed streams, such as the southern redbelly dace and many species of amphipods, isopods, and crayfishes.

Stream desiccation is thought to be primarily an effect of the artificially extreme fluctuations in water levels that follow tiling of fields 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 the drainage of bottomland lakes, require more public education and governmental action including, perhaps providing better incentives to landowners. Assuming that pollution will be held at current levels or reduced, nothing will be more beneficial to the biota of Illinois streams than to have natural riparian vegetation restored. Siltation, desiccation, and higher than normal temperatures would all be reduced to acceptable levels if streams were lined with native plants that shaded the stream, stabilized the banks, and filtered sediment and chemicals from runoff before they reached the stream.

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

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

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Appendix 1

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

Common Name[1,2]	Scientific Name[1,2]	Class / Sub-class	Forest: Upland	Forest: Flood	Forest: Sand	Prairie: Prairie	Prairie: Sand	Prairie: Hill	Sav.: Sand	Sav.: Savanna	Wetland: Marsh	Wetland: Spring Seep/fen	Wetland: Sedge meadow	Wetland: Lake/pond/river	Primary: Cliff and talus	Primary: Glade	Primary: Algific	Cultural
alfalfa*	*Medicago sativa**																	x
alsike clover*	*Trifolium hybridum**																	x
Alumroot	*Heuchera richardsonii**		x			x	x	x	x	x					x	x		
American bellflower	*Campanula americana*		x	x	x					x		x						
American bindweed	*Calystegia sepium*			x														
American bugbane-SE	***Cimicifuga americana-SE***		x															
American cromwell	*Lithospermum latifolium*		x												x			
American elm	*Ulmus americana*		x	x	x		x		x	x					x			
American filbert	*Corylus americana*		x		x	x	x	x	x	x								
American linden	*Tilia americana*		x		x			x							x	x	x	
American lotus	*Nelumbo lutea*											x		x				
American manna grass	*Glyceria grandis*										x	x	x					
American pennyroyal	*Hedeoma pulegioides*		x					x	x	x					x			
American plum	*Prunus americana*		x		x	x	x	x	x	x								
American pondweed	*Potamogeton nodosus*										x			x				
American spikenard	*Aralia racemosa*		x		x										x		x	
American stickseed-SE	***Hackelia americana-SE***														x	x		
angelica	*Angelica atropurpurea*			x								x	x		x			
anise root	*Osmorhiza longistylis*		x	x	x					x								
annual bedstraw	*Galium aparine*		x	x	x			x	x	x								
annual bluegrass*	*Poa annua **																	x
annual fleabane	*Erigeron annuus*		x		x	x	x	x	x	x					x	x		
apple*	*Malus pumila**		x															x
arbor vitae*	*Thuja occidentalis**																	x
Arkansas rose	*Rosa arkansana*		x				x	x										
aromatic aster	*Aster oblongifolius*				x		x								x			
aromatic sumac	*Rhus aromatica*						x	x	x						x			
arrow-leaved tearthumb	*Polygonum sagittatum*			x							x	x	x	x				
arrow-leaved violet	*Viola sagittata*		x			x		x	x									
arrow-wood	*Viburnum dentatum*		x															
alternate leaved dogwood	*Cornus alternifolia*		x		x										x		x	
Aunt Lucy	*Ellisia nyctelea*				x													

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class / Sub-class	Forest			Prairie			Sav.		Wetland				Primary			
			Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
autumn bent grass	*Agrostis perennans*									x								
autumn coral-root orchid	*Corallorhiza odontorhiza*		x		x					x								
awl-fruited sedge	*Carex tribuloides*		x	x							x	x						
awned graceful sedge	*Carex davisii*			x														
baby lip fern	*Cheilanthes feei*														x			
ballon flower*	*Platycodon grandiflorum**																	x
balsam ragwort	*Senecio pauperculus*		x				x	x	x			x			x	x		
bare-stemmed tick trefoil	*Desmodium nudiflorum*		x															
barnyard grass	*Echinochloa walteri*			x							x	x	x	x				
barnyard grass*	*Echinochloa crusgalli**			x								x	x					x
bastard toad-flax	*Comandra umbellata*		x			x	x	x	x	x	x				x			
beach three awn grass	*Aristida tuberculosa*						x	x	x									
beach wormwood	*Artemisia campestris*				x		x		x						x			
bead grass	*Paspalum ciliatifolium*						x	x	x									
beak grass	*Diarrhena americana*		x	x														
beaked black snakeroot	*Sanicula trifoliata*		x												x			
beaked hazelnut-SE	***Corylus cornuta-SE***																x	
beaked willow	*Salix bebbiana*			x								x			x			
bearded wheat grass-SE	***Agropyron subsecundum-SE***								x						x			
beggar's lice*	*Lappula echinata**						x		x									x
bellwort	*Uvularia grandiflora*		x		x													
bent milk vetch	*Astragalus distortus*						x											
berry bladder fern	*Cystopteris bulbifera*		x		x										x		x	
Bicknell's sedge	*Carex bicknellii*					x	x	x	x	x								
biennial gaura	*Gaura biennis*		x				x	x	x									
biennial wormwood*	*Artemisia biennis**																	x
big bluestem	*Andropogon gerardii*				x	x	x	x	x	x								
big shellbark	*Carya laciniosa*			x														
big-tooth aspen	*Populus grandidentata*		x		x			x	x	x								
bird's foot violet	*Viola pedata*						x	x	x									
bird's-eye primrose-SE	***Primula mistassinica-SE***														x			
birdsfoot trefoil*	*Lotus corniculatus**																	x
bishop's cap	*Mitella diphylla*		x		x										x		x	
bitternut hickory	*Carya cordiformis*		x	x	x													
bittersweet nightshade*	*Solanum dulcamara**														x			x
black ash	*Fraxinus nigra*		x									x			x		x	
black birdweed*	*Polygonum convolvulus**						x		x			x			x			x
black haw	*Viburnum prunifolium*		x															
black locust	*Robinia pseudoacacia*						x							x				x
black medic*	*Medicago lupulina**							x										x
black mustard*	*Brassica nigra**			x								x						x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
black nightshade	*Solanum ptycanthum*			x			x		x						x			
black oak	*Quercus velutina*		x		x		x	x	x	x						x		
black raspberry	*Rubus occidentalis*		x	x	x			x	x	x								
black snakeroot	*Sanicula marilandica*		x	x														
black walnut	*Juglans nigra*		x	x	x													
black willow	*Salix nigra*			x							x	x	x	x				
black-eyed Susan	*Rudbeckia hirta*		x			x	x	x	x	x								
black-seeded rice grass-ST	***Oryzopsis racemosa-ST***		x												x	x	x	
blackberry	*Rubus argutus*		x		x			x										
blackberry lily*	*Belamcanda chinensis**		x															x
bladdernut	*Staphylea trifolia*		x		x										x			
bloodroot	*Sanguinaria canadensis*		x		x					x					x			
blue ash	*Fraxinus quadrangulata*		x												x			
blue beech	*Carpinus caroliniana*		x		x										x			
blue cohosh	*Caulophyllum thalictroides*		x		x										x			
blue flag	*Iris virginica*			x							x	x	x	x				
blue grama	*Boutelous gracilis*						x											
blue joint grass	*Calamagrostis canadensis*					x					x	x	x					
blue lettuce	*Lactuca floridana*		x	x		x	x		x	x								
blue phlox	*Phlox divaricata*		x	x														
blue sage-ST	***Salvia azurea ssp. pitcheri-ST***						x	x	x									
blue toadflax	*Linaria canadensis*				x			x										
blue vervain	*Verbena hastata*			x							x	x	x	x				
blue-eyed grass	*Sisyrinchium albidum*					x									x			
blue-eyed grass	*Sisyrinchium angustifolium*			x		x												
bluets	*Hedyotis pusilla*							x										
blueweed*	*Echium vulgare**																	x
blunt spike rush	*Eleocharis obtusa*			x							x	x	x	x				
bottlebrush grass	*Elymus hystrix*		x		x					x						x		
bouncing bet*	*Saponaria officinalis**			x			x											x
boxelder	*Acer negundo*		x	x	x													
bracken fern	*Pteridium aquilinum*		x		x		x	x	x									
bracted green orchid	*Coeloglossum virde*		x															
bracted sedge	*Carex sparganioides*		x	x														
bracted tick trefoil	*Desmodium cuspidatum*					x		x	x	x								
bristly crowfoot	*Ranunculus pensylvanicus*			x							x	x	x	x				
bristly green brier	*Smilax hispida*		x	x	x											x		
bristly sunflower	*Helianthus hirsutus*					x		x										
broad beech fern	*Phegopteris hexagonoptera*		x															
broad-leaved cattail	*Typha latifolia*										x	x	x	x				
broad-leaved goldenrod	*Solidago flexicaulis*		x		x										x			

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie			Sav.		Wetland				Primary			
	Class	Forest			Prairie			Sav.		Wetland				Primary			
	Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
broad-leaved panic grass	*Panicum latifolium*	x					x	x	x								
brome grass	*Bromus purgens*	x							x					x			
broomrape	*Orobanche uniflora*	x							x					x			
brown fox sedge	*Carex vulpinoidea*		x							x	x	x					
brown-eyed Susan	*Rudbeckia triloba*	x	x	x				x	x		x	x					
buffalo-burr*	*Solanum cornutum**																x
bugle weed	*Lycopus virginicus*		x	x							x	x					
bulb bittercress	*Cardamine bulbosa*		x							x	x	x		x			
bull thistle*	*Cirsium vulgare**					x					x	x					x
bur cucumber	*Sicyos angulatus*		x							x			x				
burdock*	*Arctium lappa**																x
burdock*	*Arctium minus**																x
burning bush*	*Kochia scoparia**						x										x
burr oak	*Quercus macrocarpa*						x	x	x					x			
bush honeysuckle*	*Lonicera maakii**	x															x
bush honeysuckle*	*Lonicera morrowii**																x
bushy aster	*Aster dumosus*			x													
bushy knotweed	*Polygonum ramosissimum*		x			x	x	x									
bushy pinweed	*Lechea stricta*			x		x		x									
butter-and-eggs*	*Linaria vulgaris**																x
butterfly weed	*Asclepias tuberosa*				x	x	x	x	x								
butternut	*Juglans cinerea*	x		x													
buttonbush	*Cephalanthus occidentalis*		x							x		x	x				
buttonbush dodder	*Cuscuta cephalanthi*		x							x			x				
buttonweed	*Diodia teres*			x		x	x	x									
buttonweed*	*Abutilon theophrasti**																x
cabomba*	*Cabomba caroliniana**																x
Canada clearweed	*Pilea pumila*		x											x			
Canada goldenrod	*Solidago canadensis*	x	x	x	x	x	x	x									
Canada mayflower	*Maianthemum canadense*			x													
Canada plum	*Prunus nigra*			x													
Canada thistle*	*Cirsium arvense**										x	x					x
Canada violet-SE	***Viola canadensis-SE***	x														x	
Canada wild ginger	*Asarum canadense*	x	x											x			
Canada wild rye	*Elymus canadensis*				x	x	x	x	x						x		
Canada wood nettle	*Laportea canadensis*	x	x	x													
Canada yew	*Taxus canadensis*													x			
Canadian brome	*Bromus ciliatus*										x	x					
Canadian black snakeroot	*Sanicula canadensis*	x	x	x													
Canadian blue grass*	*Poa compressa**					x	x	x						x	x		x
Canadian milk vetch	*Astragalus canadensis*			x				x	x								

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class / Sub-class	Forest			Prairie			Sav.		Wetland				Primary			
			Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
candle anemone	*Anemone cylindrica*		x		x	x			x	x						x		
caraway*	*Carum carvi**																	x
cardinal flower	*Lobelia cardinalis*			x							x							
Carolina anemone	*Anemone caroliniana*				x		x	x	x									
Carolina cranesbill	*Geranium carolinianum*						x	x	x									
carpet weed*	*Mollugo verticillata**				x			x										x
carrion flower	*Smilax ecirrata*		x		x													
cat's foot	*Antennaria neglecta*				x	x	x	x	x	x						x		
Catalpa	*Catalpa bignonioides*							x										x
catnip*	*Nepeta cataria**		x				x		x						x	x		x
cattail sedge	*Carex squarrosa*										x							
cheat grass*	*Bromus tectorum**						x		x						x			x
cheeses*	*Malva neglecta**																	x
chickory*	*Cichorium intybus**						x											x
Christmas fern	*Polystichum acrostichoides*		x		x													
cigar tree	*Catalpa speciosa*			x					x									x
cinnamon willow herb	*Epilobium coloratum*			x							x	x	x					
clammy ground cherry	*Physalis heterophylla*						x	x	x									
clammy hedge hyssop	*Gratiola neglecta*			x							x	x	x					
clammy locust*	*Robinia viscosa**																	x
clammy weed	*Polanisia dodecandra*						x											
cliff goldenrod-ST	***Solidago sciaphila-ST***		x					x							x	x		
climbing bittersweet	*Celastrus scandens*		x		x		x		x	x					x			
climbing false buckwheat	*Polygonum scandens*		x	x	x		x		x		x	x	x					
closed gentian	*Gentiana andrewsii*				x	x	x	x	x			x	x					
clustered broomrape-SE	***Orobanche fasciculata-SE***						x		x									
clustered poppy mallow	*Callirhoe triangulata*						x		x									
cocklebur	*Xanthium strumarium*			x										x				
Colorado bluestem*	*Agropyron smithii**						x											x
columbine	*Aquilegia canadensis*		x		x				x	x					x	x		
comb pondweed	*Potamogeton pectinatus*										x							
common arrowhead	*Sagittaria latifolia*			x							x	x						
common beggar's ticks	*Bidens frondosa*			x							x	x	x	x				
common blackberry	*Rubus allegheniensis*		x		x	x	x	x	x	x								
common boneset	*Eupatorium perfoliatum*			x							x	x	x	x				
common buckthorn*	*Rhamnus cathartica**		x												x			x
common bur reed	*Sparganium eurycarpum*			x							x			x				
common carrion flower	*Smilax lasioneuron*				x				x	x								
common cattail sedge	*Carex typhina*		x		x													
common chickweed*	*Cerastium vulgatum**			x										x				x
common chickweed*	*Stellaria media**			x														x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
common choke cherry	*Prunus virginiana*		x		x			x							x	x	x	
common cinquefoil	*Potentilla simplex*		x								x	x	x					
common dandelion*	*Taraxacum officinale**																	x
common day flower	*Commelina communis*																	x
common dewberry	*Rubus flagellaris*		x		x		x											
common elder	*Sambucus canadensis*		x	x							x	x	x	x				
common flax*	*Linum usitatissimum**																	x
common forget-me-not	*Myosotis scorpioides*			x								x						
common fox sedge	*Carex stipata*			x	x						x	x	x	x				
common foxtail	*Alopecus carolinianus*			x										x				
common hops	*Humulus lupulus*		x	x														
common horsetail	*Equisetum arvense*		x	x	x						x	x	x					
common hound's tongue*	*Cynoglossum officinale**		x		x			x							x	x		x
common ironweed	*Vernonia fasciculata*			x							x	x	x					
common knotweed*	*Polygonum aviculare**										x							x
common lake sedge	*Carex lacustris*			x							x			x				
common milfoil*	*Achillea millefolium**						x	x	x									x
common milkweed	*Asclepias syriaca*		x	x	x	x	x											
common ninebark	*Physocarpus opulifolius*		x		x		x		x	x					x		x	
common peppergrass*	*Lepidium virginicum**					x	x	x										x
common polypody	*Asplenium platyneuron*		x		x					x					x			
common purslane*	*Portulaca oleracea**																	x
common ragweed	*Ambrosia artemisiifolia*		x				x		x									
common reed*	*Phragmites australis**										x							x
common rockrose	*Helianthemum canadense*						x	x										
common satin grass	*Muhlenbergia frondosa*		x	x											x			
common snakeroot	*Sanicula odorata*		x	x	x				x	x								
common spiderwort	*Tradescantia ohiensis*					x	x	x	x	x								
common St. John's-wort*	*Hypericum perforatum**					x	x		x									
common stichwort	*Stellaria graminea*																	x
common sunflower*	*Helianthus annuus**				x	x	x											
common water horehound	*Lycopus americanus*				x						x	x	x					
common whitlow grass	*Draba reptans*						x		x									
common wood fern	*Dryopteris intermedia*		x	x	x							x						
common wood fern	*Woodsia obtusa*		x		x										x			
common wood reed	*Cinna arundinacea*		x	x	x					x		x						
common wood sedge	*Carex blanda*		x	x	x					x					x			
common wood sorrel	*Oxalis dillenii*				x			x	x									
compass plant	*Silphium laciniatum*					x												
coontail	*Ceratophyllum demersum*													x				
coral berry	*Symphoricarpos orbiculatus*		x		x													

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			Cultural
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	
corn speedwell*	*Veronica arvensis**		x			x												x
corn*	*Zea mays**																	x
cottonweed	*Froelichia gracilis*						x	x	x									x
cottonweed	*Froelichia floridana*						x	x	x									
cow parsnip	*Heracleum lanatum*			x							x							
crack willow*	*Salix fragilis**			x								x		x				x
cream gentian	*Gentiana alba*					x	x			x								
cream indigo	*Baptisia bracteata*					x	x	x		x								
creeping love grass	*Eragrostis hypnoides*			x							x	x		x				
creeping vervain	*Verbena bracteata*								x									
creeping yellow cress	*Rorippa sylvestris*			x							x			x				
crested oval sedge	*Carex cristatella*		x	x							x	x	x					
crooked aster	*Aster prenanthoides*			x	x							x	x					
crowfoot grass*	*Eleusine indica**																	x
crown vetch*	*Coronilla varia**																	x
cultivated raspberry*	*Rubus idaeus**		x															x
culver's root	*Veronicastrum virginicum*		x		x	x		x		x								
cup plant	*Silphium perfoliatum*		x	x	x	x						x						
curly dock*	*Rumex crispus**			x							x							x
curly pondweed*	*Potamogeton crispus**											x						x
curlycup-gumweed	*Grindelia squarrosa*						x											
cursed crowfoot	*Ranunculus sceleratus*			x							x	x	x	x				
curttop lady's thumb	*Polygonum lapathifolium*			x							x	x	x					
cylindrical blazing star	*Liatris cylindracea*							x	x	x								
cypress spurge*	*Euphorbia cyparissias**							x										x
daisy fleabane	*Erigeron strigosus*		x	x	x	x	x	x	x									
dame's rocket*	*Hesperis matronalis**		x	x														x
dark green rush	*Scirpus atrovirens*					x					x	x	x	x				
day flower	*Commelina erecta*						x	x	x									
daylilly*	*Hemerocallis fulva**		x			x												x
declined trillium	*Trillium flexipes*		x		x													
deer-tongue grass	*Panicum clandestinum*		x	x						x								
deptford pink*	*Dianthus armeria**		x		x	x	x	x										x
dissected grapefern	*Botrychium dissectum*		x	x	x					x								
ditch stonecrop	*Penthorum sedoides*			x							x							
dodder	*Cuscuta compacta*			x							x			x				
dodder	*Cuscuta gronovii*			x							x			x				
dog fennel*	*Anthemis cotula**																	x
dog mustard*	*Erucastrum gallicum**																	x
dogbane	*Apocynum cannabinum*		x	x	x		x	x										
doll's eyes	*Actaea pachypoda*		x		x					x								

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			Cultural
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	
downy arrowwood	*Viburnum rafinesquianum*		x												x		x	
downy gentian	*Gentiana puberulenta*						x		x	x								
downy hawthorn	*Crataegus mollis*		x	x							x							
downy woodmint	*Blephilia ciliata*		x							x								
downy yellow painted cup	***Castilleja sessiliflora-SE***							x										
downy yellow violet	*Viola pubescens*		x	x														
Drummond's aster	*Aster drummondii*		x			x				x								
duckweed	*Lemna trisulca*										x			x				
Dudley's rush	*Juncus dudleyi*			x							x	x	x	x				
Dutchman's breeches	*Dicentra cucullaria*		x	x	x										x			
dwarf bindweed	*Calystegia spithamaea*		x							x		x			x			
dwarf dandelion	*Krigia virginica*						x	x	x									
dwarf honeysuckle	*Diervilla lonicera*		x												x			
dwarf plantain	*Plantago virginiana*			x														
dwarf scouring rush-SE	***Equisetum scirpoides-SE***		x												x			
dwarf snapdragon*	*Chaenorrhinum minus**																	x
dwarf St. John's-wort	*Hypericum mutilum*										x	x	x					
dwarf sumac	*Rhus copallina*		x															
ear-leaved false foxglove	*Tomanthera auriculata*					x			x	x								
early buttercup	*Ranunculus fascicularis*					x	x		x	x					x			
early figwort	*Scrophularia lanceolata*				x			x	x									
early goldenrod	*Solidago juncea*					x			x									
early horse gentian	*Triosteum aurantiacum*				x				x	x								
early meadow rue	*Thalictrum dioicum*		x		x						x				x			
early wild rose	*Rosa blanda*		x			x		x		x								
eastern cottonwood	*Populus deltoides*		x	x	x													
eastern prickly-pear	*Opuntia humifusa*						x	x										
eastern red cedar	*Juniperus virginiana*		x		x		x	x	x	x					x	x		
eastern redbud	*Cercis canadensis*		x															x
eel grass	*Vallisneria americana*										x	x		x				
elm-leaved goldenrod	*Solidago ulmifolia*		x		x				x	x								
enchanter's nightshade	*Circaea lutetiana*		x	x	x													
English plantain*	*Plantago lanceolata**																	x
European bellflower*	*Campanula rapunculoides**																	x
European mountain ash*	*Sorbus aucuparia**														x			x
European watermilfoil*	*Myriophyllum spicatum**										x			x				x
evening primrose	*Oenothera biennis*					x	x	x	x									
fall panicum*	*Panicum dichotomiflorum**		x	x								x		x	x			x
fall witch grass	*Leptoloma cognatum*						x	x	x					x				
false aster	*Boltonia asteroides*			x														
false boneset	*Brickellia eupatorioides*					x	x	x	x	x								

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			Cultural
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	
false dandelion	*Krigia biflora*		x		x			x	x	x								
false foxglove	*Agalinis purpurea*						x											
false foxglove	*Aureolaria grandiflora*				x			x	x	x								
false foxglove	*Aureolaria pedicularia*							x	x	x								
false heather-SE	***Hudsonia tomentosa-SE***						x		x									
false indigo bush	*Amorpha fruticosa*			x							x							
false loosestrife	*Ludwigia polycarpa*						x				x			x				
false melic grass-SE	***Schizachne purpurascens-SE***		x												x			
false nettle	*Boehmeria cylindrica*			x										x				
false pennyroyal	*Isanthus brachiatus*						x		x									
false pennyroyal	*Trichostema brachiatum*						x	x	x									
false pimpernel	*Lindernia dubia*			x										x				
false rue anemone	*Isopyrum biternatum*		x	x	x													
false sunflower	*Heliopsis helianthoides*		x			x	x	x	x	x								
fame flower	*Talinum rugospermum*						x		x									
fat-hen saltbush*	*Atriplex patula**																	x
feathery false Solomon's seal	*Smilacina racemosa*		x		x	x		x	x	x					x	x		
fescue	*Festuca paradoxa*		x	x														
fescue*	*Festuca elatior**		x		x													x
field bindweed*	*Convolvulus arvensis**						x	x										x
field cress*	*Lepidium campestre**					x	x	x										x
field dodder	*Cuscuta campestris*		x		x													
field mint	*Mentha arvensis*			x								x	x					
field nut sedge	*Cyperus esculentus*			x							x	x	x	x				
field oval sedge	*Carex molesta*		x					x										
field penny cress*	*Thlaspi arvense**					x	x	x										x
field sorrel*	*Rumex acetosella**						x	x	x									x
fireweed	*Erechtites hieracifolia*			x	x		x	x	x									
flat-top aster	*Aster umbellatus*											x	x					
flatsedge	*Cyperus aristatus*			x														
flax-leaved aster	*Aster linariiflorus*				x		x		x									
flowering spurge	*Euphorbia corollata*		x			x	x	x	x	x								
flowering spurge	*Euphorbia cyathophora*		x						x									
flowering spurge*	*Euphorbia dentata**					x	x		x									x
fog-fruit	*Phyla lanceolata*										x	x	x					
forked aster-ST	***Aster furcatus-ST***		x									x						
forked chickweed	*Paronychia canadensis*				x				x									
forked chickweed	*Paronychia fasitgiata*				x													
fowl bluegrass*	*Poa palustris**			x								x					x	
fowl manna grass	*Glyceria striata*			x							x	x	x					
fox sedge	*Carex annectens*			x	x						x	x	x					

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
foxglove beard tongue	*Penstemon digitalis*					x	x	x	x	x								
fragile fern	*Cystopteris protrusa*		x		x													
fragile fern	*Cystopteris tennesseensis*		x		x										x			
fragile prickly pear-SE	***Opuntia fragilis-SE***						x											
fragrant water lily	*Nymphaea odorata*										x			x				
fringed gentian	*Gentianopsis crinita*				x							x						
fringed loosestrife	*Lysimachia ciliata*			x	x													
fringed puccoon	*Lithospermum incisum*						x	x	x									
frost grape	*Vitis vulpina*		x													x		
garden asparagus*	*Asparagus officinalis**		x												x			x
garden phlox*	*Phlox paniculata**		x															x
garlic mustard*	*Alliaria petiolata**		x	x	x			x								x		x
gaura	*Gaura longiflora*			x			x											
germander	*Teucrium canadense*		x	x	x	x	x	x	x	x	x				x	x		
giant foxtail*	*Setaria faberii**						x											x
giant ragweed	*Ambrosia trifida*			x					x									
giant St. John's-wort	*Hypericum pyramidatum*			x						x		x			x			
Ginseng	*Panax quinguefolia*		x		x										x			
glade fern	*Athyrium pycnocarpon*		x															
glade mallow	*Napaea dioica*			x									x					
glaucous campion*	*Silene cserei**						x	x										x
glaucous white lettuce	*Prenanthes racemosa*					x												
goat's rue	*Tephrosia virginiana*						x	x	x									
goat's-beard	*Aruncus dioicus*		x		x			x		x								
golden Alexanders	*Zizia aurea*		x		x	x				x								
golden aster	*Heterotheca camporum*						x	x	x									
golden chamomile*	*Anthemis tinctoria**																	x
golden corydalis	*Corydalis aurea*					x	x	x										
golden ragwort	*Senecio aureus*			x			x	x	x			x						
goldie fern	*Dryopteris goldiana*		x															
goosefoot	*Chenopodium gigantospermum*								x									
goosefoot	*Chenopodium pratericola*							x	x						x			
graceful sedge	*Carex gracillima*		x		x					x								
grape honeysuckle	*Lonicera prolifera*		x		x										x	x	x	
grass pink orchid-ST	***Calopogon tuberosa-ST***					x									x			
grass sedge	*Carex jamesii*		x	x														
grass-leaved goldenrod	*Euthamia graminifoila*					x	x				x		x					
grass-leaved goldenrod	*Euthamia gymnospermoides*			x							x		x					
gray dogwood	*Cornus racemosa*		x	x	x	x	x	x	x	x					x	x		
Gray's umbrella sedge-ST	***Cyperus grayioides-ST***						x		x									
great blue lobelia	*Lobelia siphilitica*			x					x			x	x		x			

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class / Sub-class	Forest			Prairie			Sav.		Wetland				Primary			Cultural
			Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	
great bulrush	*Scirpus tabernaemontanii*			x							x	x	x	x				
great duckweed	*Spirodela polyrhiza*										x			x				
Great Plaines ladies' tresses	*Spiranthes magnicamporum*						x	x										
great waterleaf	*Hydrophyllum appendiculatum*		x	x											x			
great white lettuce	*Prenanthes crepidinea*		x															
green dragon	*Arisaema dracontium*		x	x														
green foxtail*	*Setaria viridis**							x	x									x
green milkweed	*Asclepias viridiflora*					x	x	x	x									
green twayblade	*Liparis loeselii*		x		x										x	x		
green-headed sedge	*Carex conjuncta*			x														
grooved yellow flax	*Linum sulcatum*					x	x	x	x									
ground ivy*	*Glechoma hederacea**			x														x
ground pine-SE	***Lycopodium dendroideum-SE***				x													
ground-nut	*Apios americana*		x	x						x		x	x					
Gyere's spurge	*Chamaesyce geyeri*							x										
hackberry	*Celtis occidentalis*		x	x														
hair grass	*Agrostis hyemalis*		x					x	x						x			
hair sedge	*Bulbostylis capillaris*				x		x											
hairy aster	*Aster pilosus*				x	x	x	x	x	x	x	x						
Hairy bead grass	*Paspalum bushii*						x	x	x									
hairy bedstraw	*Galium pilosum*		x		x			x							x	x		
hairy brome	*Bromus commutatus*			x														
hairy crab grass*	*Digitaria sanguinalis**							x										x
hairy goldenrod	*Solidago hispida*							x	x						x	x		
hairy grama	*Bouteloua hirsuta*						x	x	x						x			
hairy rock cress	*Arabis hirsuta*			x			x								x			
hairy ruellia	*Ruellia humilis*					x	x	x										
hairy sweet cicely	*Osmorhiza claytonii*		x	x	x					x								
hairy umbrella wort-SE	***Mirabilis hirsuta-SE***						x		x									
hairy wood rush-SE	***Luzula acuminata-SE***		x		x													
hairy wood sedge	*Carex hirtifolia*		x		x				x	x								
hairy-fruited sedge	*Carex trichocarpa*			x							x	x	x					
halberd-leaved rose mallow	*Hibiscus laevis*			x							x			x				
harebell	*Campanula rotundifolia*					x			x						x		x	
hariy mountain mint	*Pycnanthemum verticillatum*				x			x		x								
hawksbeard*	*Crepis tectorum**						x											x
hawkweed	*Hieracium canadense*						x	x	x	x								
hawkweed	*Hieracium scabrum*				x			x	x	x					x			
hawthorn	*Crataegus calpodendron*				x		x		x									
heard-stemmed bulrush	*Scirpus acutus*			x							x	x	x	x				
heart-leaved parsnip	*Zizia aptera*		x			x												

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
heart-leaved aster	*Aster cordifolius*		x		x										x			
heart-leaved skullcap	*Scutellaria ovata*		x	x	x				x	x					x			
heart-leaved willow*	*Salix eriocephala**			x								x						x
heath aster	*Aster ericoides*						x	x	x									
heavy sedge	*Carex gravida*		x		x		x		x									
hedge mustard*	*Sisymbrium officinale**																	
hemlock parsley	*Conioselinum chinense*														x			
hemp*	*Cannabis sativa**			x					x									x
hepatica	*Hepatica nobilis*		x		x										x			
highbush cranberry*	*Viburnum opulus**				x												x	x
Hill's oak	*Quercus ellipsoidalis*		x					x	x	x								
Hill's thistle	*Cirsium hillii*						x	x										
hillside strawberry	*Fragaria americana*														x			
hispid hedge nettle	*Stachys hispida*			x							x		x	x				
hoary alyssum*	*Berteroa incana**						x		x									x
hoary cinquefoil	*Potentilla inclinata*																	
hoary puccoon	*Lithospermum canescens*					x	x	x	x	x						x		
hoary tick trefoil	*Desmodium canescens*		x						x	x								
hoary vervain	*Verbena stricta*					x	x	x	x									
hog peanut	*Amphicarpa bracteata*			x	x		x			x	x	x	x					
honewort	*Cryptotaenia canadensis*		x	x	x						x							
honey locust	*Gleditsia triacanthos*		x	x	x		x		x									
honeysuckle	*Lonicera dioica*		x												x			
hooked buttercup	*Ranunculus recurvatus*		x	x	x													
hop hornbeam	*Ostrya virginiana*		x		x											x		
hop sedge	*Carex lupulina*			x							x							
horned pondweed	*Zannichellia palustris*										x			x				
horse nettle	*Solanum carolinense*							x										
horsemint	*Monarda punctata*				x		x	x	x									
horseradish*	*Armoracia lapathifolia**																	x
horsetail	*Equisetum fluviatile*										x							
horsetail milkweed	*Asclepias verticillata*					x	x	x	x	x						x		
horseweed*	*Conyza canadensis**		x	x	x	x	x	x	x	x								
Hungarian brome*	*Bromus inermis**		x					x										x
ill-scented trillium-SE	***Trillium erectum-SE***		x															
Illinois bundle flower	*Desmanthus illinoensis*						x											
Illinois tick trefoil	*Desmodium illinoense*					x	x	x	x	x								
Indian grass	*Sorghastrum nutans*					x	x	x	x	x								
Indian hemp	*Apocynum sibiricum*		x	x	x			x			x							
Indian mustard*	*Brassica juncea**			x														x
Indian paintbrush	*Castilleja coccinea*				x	x	x			x		x						

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
Indian pipe	*Monotropa uniflora*		x															
Indian plantain	*Cacalia muhlenbergia*		x	x						x								
Indian tobacco	*Lobelia inflata*		x		x			x		x								
Indian turnip	*Arisaema triphyllum*		x	x	x										x			
inland rush	*Juncus interior*			x		x		x				x	x					
interrupted fern	*Osmunda claytoniana*		x		x				x									
Iowa crab	*Malus ioensis*		x		x				x									
ivory sedge	*Carex eburnea*				x			x							x	x	x	
jack pine*	*Pinus banksiana**		x															x
Jacob's ladder	*Polemonium reptans*		x	x	x					x								
jagged chickweed*	*Holosteum umbellatum**						x											x
James' clammy weed-SE	***Polanisia jamesii-SE***				**x**		**x**		**x**									
Japanese barberry*	*Berberis thunbergii**		x															x
Japanese honeysuckle*	*Lonicera japonica**		x					x										x
Japanese hops*	*Humulus japonicus**		x															x
Jerusalem artichoke	*Helianthus tuberosus*			x		x	x				x							
jeweled shooting star	*Dodecatheon amethystinum*														x	x		
jimsonweed*	*Datura stramonium**																	x
Johnny-jump-up*	*Viola rafinesquii**																	x
jointweed	*Polygonella articulata*						x	x	x									
June grass	*Koeleria macrantha*						x	x	x							x		
Kenilworth ivy*	*Cymbalaria muralis**																	x
Kentucky blue grass *	*Poa pratensis**							x	x							x		x
Kentucky coffee tree	*Gymnocladus dioicus*		x		x													
kitten tails-ST	***Besseya bullii-ST***		**x**		**x**		**x**	**x**	**x**						**x**	**x**		
lace grass	*Eragrostis capillaris*		x															
ladies tresses	*Spiranthes cernua*					x		x				x						
lady fern	*Athyrium filix-femina*		x		x													
lady's thumb*	*Polygonum persicaria**			x														
lamb's quarters*	*Chenopodium album**																	x
lance-leaved buckthorn	*Rhamnus lanceolata*		x					x							x			
lance-leaved ground cherry	*Physalis virginiana*						x	x	x									
lance-leaved loosestrife	*Lysimachia lanceolata*			x	x	x						x						
large bent grass	*Agrostis gigantea*		x			x	x		x			x	x					
large white trillium	*Trillium grandiflorum*		x															
large-flowered beard	***Penstemon grandiflorus-SE***						**x**	**x**										
large-leaved shinleaf	*Pyrola elliptica*		x		x													
late boneset	*Eupatorium serotinum*			x	x						x	x	x	x				
late figwort	*Scrophularia marilandica*		x		x			x	x	x								
late goldenrod	*Solidago gigantea*		x	x			x	x	x	x	x	x						
late horse gentian	*Triosteum perfoliatum*				x		x		x	x								

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
lawn prunella*	*Prunella vulgaris**		x	x			x											x
lead plant	*Amorpha canescens*					x	x	x	x	x						x		
leafy pondweed	*Potamogeton foliosus*										x			x				
leafy satin grass	*Muhlenbergia mexicana*								x		x	x	x		x			
leafy spurge*	*Euphorbia escula**						x											
least duckweed	*Lemna perpusilla*										x			x				
leather flower	*Clematis pitcheri*			x			x											
leatherwood	*Dirca palustris*		x												x			
leathery grape fern-SE	***Botrychium multifidum-SE***				x				x									
lesser love grass*	*Eragrostis minor**																	x
lesser naiad	*Najas minor*										x			x				
lilac*	*Syringa vulgaris**			x														x
lion's foot	*Prenanthes alba*		x		x		x			x								
little bluestem	*Schizachyrium scoparium*					x	x	x	x	x						x		
little hop clover*	*Trifolium dubium**		x															x
little-leaf buttercup	*Ranunculus abortivus*		x	x	x										x			
long-awned wood grass	*Brachyelytrum erectum*		x		x					x								
long-beaked sedge	*Carex sprengelii*		x		x										x			
long-bearded hawkweed	*Hieracium longipilum*							x	x	x								
long-scaled nut sedge	*Cyperus strigosus*			x							x	x	x	x				
long-toothed sedge	*Carex laeviconica*			x				x			x			x				
lopseed	*Phryma leptostachya*		x		x											x		
lousewort	*Pedicularis lanceolata*										x	x						
low hop clover*	*Trifolium campestre**																	x
low shadbush	*Amelanchier humilis*		x		x										x			
lyre-leaved rock cress	*Arabis lyrata*						x	x	x						x	x		
mad-dog skullcap	*Scutellaria lateriflora*			x							x	x	x	x				
maidenhair fern	*Adiantum pedatum*		x	x	x					x					x		x	
marbleseed	*Onosmodium hispidissimum*							x			x							
marbleseed	*Onosmodium occidentale*							x										
marsh bellflower	*Campanula aparanoides*										x	x	x					
Marsh blue violet	*Viola obliqua*			x								x	x					
marsh fern	*Thelypteris palustris*										x	x						
marsh fleabane	*Erigeron philadelphicus*		x	x	x					x					x			
marsh marigold	*Caltha palustris*			x							x	x	x					
marsh skullcap	*Scutellaria galericulata*										x	x	x	x				
marsh vetchling	*Lathyrus palustris*																	x
marsh yellow cress	*Rorippa palustris*			x							x	x	x	x				
mat sandbur	*Cenchrus longispinus*						x											
may apple	*Podophyllum peltatum*		x	x	x	x				x								
mead's sedge	*Carex meadii*		x			x		x	x	x								

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
meadow -sweet	*Spiraea alba*					x						x	x					
meadow anemone	*Anemone canadensis*		x	x	x	x			x		x							
meadow horsetail-SE	***Equisetum pratense-SE***				x							x						
meadow parsnip	*Thaspium barbinode*		x							x					x			
meadow willow	*Salix petiolaris*			x		x						x	x					
Mexican azolla	*Azolla mexicana*											x		x				
Mexican tea*	*Chenopodium ambrosiodes**																	x
Michigan lily	*Lilium michiganense*					x						x	x					
Missouri goldenrod	*Solidago missouriensis*					x	x		x									
Missouri gooseberry	*Ribes missouriense*		x	x	x			x	x	x								
Missouri goosefoot	*Chenopodium missouriense*																	
monkey flower	*Mimulus ringens*			x							x	x	x					
moonseed	*Menispermum canadense*		x		x													
moschatel - SE	***Adoxa moschatellina - SE***														x			
moth mullein*	*Verbascum blattaria**																	x
motherwort*	*Leonurus cardiaca**		x		x													x
mountain clematis-SE	***Clematis occidentalis-SE***																x	
mountain mint	*Pycnanthemum virginianum*				x	x	x			x	x	x	x					
mouse-ear chickweed	*Cerastium brachypodum*					x												x
muhly grass	*Muhlenbergia glomerata*											x						
muhly grass	*Muhlenbergia racemosa*				x		x		x									
multiflora rose*	*Rosa multiflora**		x															x
musk thistle*	*Carduus nutans**																	x
nannyberry	*Viburnum lentago*		x														x	
narrow-leaved sedge	*Carex tenera*						x											
narrow-leaved cattail*	*Typha angustifolia**													x				x
narrow-leaved loosestrife	*Lysimachia quadriflora*		x	x								x	x					
narrow-leaved pinweed	*Lechea tenuifolia*				x		x	x	x									
New England aster	*Aster novae-angliae*					x				x	x	x	x		x			
New Jersey tea	*Ceanothus americanus*				x	x	x	x	x	x								
nimblewill	*Muhlenbergia schreberi*		x	x	x										x			
nodding brome*	*Bromus squarrosus**				x													x
nodding bur marigold	*Bidens cernua*			x								x	x	x				
nodding chickweed	*Cerastium nutans*			x										x				
nodding fescue	*Festuca obtusa*		x		x				x						x			
nodding pogonia	*Triphora trianthophora*		x															
nodding spurge	*Chamaesyce maculata*								x						x			
northern adder's tongue	*Ophioglossum pusillum*			x														
northern bedstraw	*Galium boreale*				x	x				x	x		x		x			
northern drop seed	*Sporobolus heterolepis*					x	x											
northern mana-grass-SE	***Glyceria borealis-SE***											x	x					

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
northern red oak	*Quercus rubra*		x		x					x					x	x		
northern rush grass	*Sporobolus vaginiflorus*						x		x									
northern willow herb	*Epilobium ciliatum*			x							x	x	x					
nothern bugle weed	*Lycopus uniflorus*			x														
nut sedge	*Cyperus odoratus*			x										x				
nut sedge	*Cyperus rivularis*			x							x			x				
oak fern-SE	***Gymnocarpium dryopteris-SE***				x										x			
oats*	*Avena sativa**																	x
obedient plant	*Physostegia virginiana*			x										x				
old field goldenrod	*Solidago nemoralis*					x	x	x	x	x					x	x		
old witch grass	*Panicum capillare*				x		x		x			x						
old-field balsam	*Gnaphalium obtusifolium*						x	x										
Ontario aster	*Aster ontarionis*			x														
orchard grass*	*Dactylis glomerata**																	x
ostrich fern	*Matteuccia struthiopteris*		x															
ox-eye daisy*	*Leucanthemum vulgare**					x												x
pale allysum*	*Alyssum alyssoides**						x	x										x
pale beard tongue	*Penstemon pallidus*						x	x	x									
pale dock	*Rumex altissimus*			x														
pale dogwood	*Cornus obliqua*										x	x	x					
pale Indian plantain	*Cacalia atriplicifolia*		x			x				x								
pale leafcup	*Polymnia canadensis*		x												x		x	
pale purple coneflower	*Echinacea pallida*						x	x										
pale sedge	*Carex granularis*		x												x			
pale spiked lobelia	*Lobelia spicata*		x		x			x	x	x								
pale sunflower	*Helianthus decapetalus*		x															
pale touch-me-not	*Impatiens pallida*		x	x								x		x			x	
pale vetchling-SE	***Lathyrus ochroleucus-SE***		x												x			
pale-leaved sunflower	*Helianthus strumosus*		x		x			x	x	x								
panic grass	*Panicum lanuginosum*		x				x		x	x								
panic grass	*Panicum meridionale*					x			x									
panic grass	*Panicum oligosanthes*					x	x	x	x	x								
panicled aster	*Aster lanceolatus*			x							x	x						
papaw	*Asimina triloba*			x														
paper birch	*Betula papyrifera*		x		x			x							x		x	
partridge pea	*Chamaecrista fasciculata*				x		x	x	x	x								x
pasque flower	*Pulsatilla patens*					x		x										
pasture rose	*Rosa carolina*		x			x		x	x	x								
pasture thistle	*Cirsium discolor*							x				x	x					
path rush	*Juncus tenuis*		x	x		x			x									
peach-leaved willow	*Salix amygdaloides*			x							x	x		x				

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
pear*	*Pyrus communis**		x															x
pecan	*Carya illinoinensis*																	x
Pennsylvania bittercress	*Cardamine pensylvanica*			x								x			x			
Pennsylvania pellitory	*Parietaria pensylvanica*			x			x		x						x	x		
Pennsylvania sedge	*Carex pensylvanica*		x		x		x	x	x	x						x		
peppermint*	*Mentha piperita**											x						x
perennial rye grass*	*Lolium perenne**																	x
Peruvian daisy*	*Galinsoga quadriradiata**																	x
petioled sunflower*	*Helianthus petiolaris**						x	x										
pickerelweed	*Pontederia cordata*										x							
pigeon grass*	*Setaria glauca**						x							x				x
pin oak	*Quercus palustris*			x	x													
pineapple weed*	*Matricaria matricarioides**																	x
pink milkwort	*Polygala sanguinea*					x	x	x	x									
pink milkwort-SE	***Polygala incarnata-SE***					**x**	**x**		**x**	**x**								
pinkweed	*Polygonum pensylvanicum*			x							x	x	x					
pinweed	*Lechea villosa*				x			x	x									
pinweed-SE	***Lechea intermedia-SE***						x											
pipsissewa-SE	***Chimaphila umbellata-SE***														x			
plains oval sedge	*Carex brevior*		x		x		x	x	x	x								
plains prickly-pear	*Opuntia macrorhiza*						x	x	x									
plains three awn grass	*Aristida oligantha*						x	x										
plantain	*Plantago aristata*					x	x	x										
plantain	*Plantago patagonica*						x	x	x									
pointed tick trefoil	*Desmodium glutinosum*		x		x				x	x								
poison hemlock*	*Conium maculatum**			x														x
poison ivy	*Toxicodendron radicans*		x	x	x	x	x	x	x	x	x	x	x		x	x		
poke milkweed	*Asclepias exalata*		x							x								
pokeweed	*Phytolacca americana*		x															
porcupine grass	*Stipa spartea*						x	x	x									
prairie avens	*Geum triflorum*						x	x										
prairie blue-eyed grass	*Sisyrinchium campestre*						x	x	x	x								
prairie brome	*Bromus kalmii*		x	x						x								
prairie buttercup	*Ranunculus rhomboides*							x										
prairie cinquefoil	*Potentilla arguta*				x		x		x	x								
prairie cord grass	*Spartina pectinata*					x					x							
prairie coreopsis	*Coreopsis palmata*		x		x		x	x	x	x								
prairie dandelion-SE	***Microseris cuspidata-SE***						**x**	**x**										
prairie Indian plantain	*Cacalia plantaginea*						x	x	x									
prairie panic grass	*Panicum leibergii*		x			x		x		x					x			
prairie ragwort	*Senecio plattensis*				x		x	x	x	x					x	x		

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class / Sub-class	Forest			Prairie			Sav.		Wetland				Primary			Cultural
			Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	
prairie sunflower	*Helianthus rigidus*						x	x	x	x								
prairie switch grass	*Panicum virgatum*				x	x	x	x	x	x								
prairie violet	*Viola pedatifida*		x				x	x	x							x		
prairie wedge grass	*Sphenopholis obtusata*		x		x		x	x				x			x			
prairie willow	*Salix humilis*						x	x	x	x					x			
pretty pinweed	*Lechea pulchella*				x		x		x									
pretty sedge-SE	***Carex woodii-SE***		x															
prickly ash	*Zanthoxylum americanum*		x		x				x	x					x			
prickly lettuce*	*Lactuca serriola**						x											x
prickly rose-SE	***Rosa acicularis-SE***		x														x	
prickly wild gooseberry	*Ribes cynosbati*		x		x										x	x	x	
prostrate pigweed*	*Amaranthus graecizans**																	x
purple cliff brake	*Pellaea atropurpurea*														x			
purple cliff brake	*Pellaea glabella*														x			
purple giant hyssop	*Agastache scrophulariaefolia*		x	x						x								
purple Joe Pye weed	*Eupatorium purpureum*		x		x				x	x								
purple loosestrife	*Lythrum salicaria*										x							
purple meadow rue	*Thalictrum dasycarpum*		x	x	x	x				x	x	x	x					
purple milkweed	*Asclepias purpurascens*		x		x			x	x	x								
purple milkwort	*Polygala polygama*						x		x									
purple prairie clover	*Petalostemum purpurem*					x	x	x	x	x						x		
purple sandgrass	*Triplasis purpurea*						x	x	x									
purple turtlehead	*Chelone obliqua*			x														
purple twayblade	*Liparis liliifolia*		x		x										x	x		
purple-stem tickseed	*Bidens connata*			x							x	x	x	x				
purpletop	*Tridens flavus*					x	x	x	x	x								
purslane speedwell	*Veronica peregrina*			x														
pussy toes	*Antennaria plantaginifolia*		x		x	x	x	x	x	x						x		
putty root orchid	*Aplectrum hyemale*		x		x													
quack grass*	*Agropyron repens**			x			x	x										x
quaking aspen	*Populus tremuloides*		x		x			x	x	x								
Queen Anne's lace*	*Daucus carota**			x			x											x
rabbit-foot clover*	*Trifolium arvense**																	x
ragged evening primrose	*Oneothera laciniata*						x											
rattlebox	*Crotalaria sagittalis*						x		x									
rattlesnake fern	*Botrychium virginianum*		x	x	x					x					x	x		
rattlesnake master	*Eryngium yuccifolium*					x		x		x								
rattlesnake plantain	*Goodyera pubescens*		x		x													
red ash	*Fraxinus pennsylvanica*			x	x				x									
red baneberry	*Actaea rubra*		x		x										x		x	
red clover*	*Trifolium pratense**								x									x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
red current*	*Ribes rubrum**		x															x
red mulberry	*Morus rubra*		x		x													
red osier dogwood	*Cornus stolonifera*			x							x	x	x					
red pine*	*Pinus resinosa**																	x
red raspberry	*Rubus strigosus*														x			
red trillium	*Trilium recurvatum*		x		x				x	x								
red-rooted nut sedge	*Cyperus erythrorhizos*			x							x	x	x	x				
red-rooted spike rush	*Eleocharis erythropoda*			x							x	x	x	x				
red-seeded dandelion*	*Taraxacum laevigatum**		x															x
red-stalked plantain*	*Plantago rugelii**																	x
redroot-SE	***Ceanothus ovatus-SE***						**x**	**x**										
reed canary grass*	*Phalaris arundinacea**			x							x							x
rice cut grass	*Leersia oryzoides*			x							x	x	x	x				
rigid goldenrod	*Solidago rigida*		x			x	x	x	x	x								
river birch	*Betula nigra*		x	x	x			x										
river bulrush	*Scripus fluviatilis*										x	x	x	x				
riverbank grape	*Vitis riparia*		x	x				x	x									
riverbank sedge	*Carex emoryi*			x							x	x	x					
robin's plantain	*Erigeron pulchellus*		x						x	x					x			
rock elm-SE	***Ulmus thomasii-SE***		**x**	**x**											**x**			
rock jasmine	*Androsace occidentalis*						x	x	x									
rock satin grass	*Muhlenbergia sobolifera*		x												x			
rock selaginella	*Selaginella rupestris*						x											
rockrose	*Helianthemum bicknellii*						x	x	x									
rocky mountain sage*	*Salvia reflexa**																	x
rope dodder	*Cuscuta glomerata*			x							x			x				
rosinweed	*Silphium integrifolium*					x			x	x								
rough avens	*Geum laciniatum*			x							x	x						
rough bedstraw	*Galium asprellum*		x	x							x				x			
rough blazing star	*Liatris aspera*					x	x	x	x	x								
rough buttercup	*Ranunculus hispidus*			x							x	x						
rough cinquefoil	*Potentilla norvegica*			x											x			x
rough clustered sedge	*Carex cephaloidea*		x		x					x								
rough dropseed	*Sporobolus asper*					x	x	x	x									
rough false foxglove	*Agalinis aspera*						x	x	x									
rough hedge nettle	*Stachys aspera*			x		x					x		x	x				
rough pennyroyal	*Hedeoma hispida*				x				x									
rough pigweed*	*Amaranthus retroflexus**																	x
rough sand sedge	*Cyperus schweinitzii*						x	x	x									
rough-leaved dogwood	*Cornus drummondii*		x	x			x		x	x						x		
rough-stalked bluegrass*	*Poa trivalis**											x						x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			Cultural
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	
round-fruited St. John's-wort	*Hypericum sphaerocarpum*				x	x			x									
round-headed bush clover	*Lespedeza capitata*					x	x	x	x	x								
round-leaved dogwood	*Cornus rugosa*		x												x		x	
rue anemone*	*Thalictrum thalictroides**		x															x
running pine-SE	***Lycopodium clavatum-SE***				**x**							x						
rush	*Juncus nodosus*											x	x					
rush	*Juncus balticus*										x							
rushfoil	*Crotonopsis linearis*						x	x										
Russian olive*	*Elaeagnus angustifolia**																	x
rye*	*Secale cereale**																	x
saltwort*	*Salsola collina**						x											x
sand bracted sedge	*Carex muhlenbergii*						x	x	x									
sand cherry	*Prunus susquehanae*						x											
sand croton	*Croton glandulosus*						x	x	x									
sand dropseed	*Sporobolus cryptandrus*					x		x	x									
sand evening primrose	*Oenothera rhombipetala*						x	x	x									
sand goat's beard*	*Tragopogon dubius**						x	x	x									x
sand love grass	*Eragrostis trichodes*						x	x	x									
sand milkweed	*Asclepias amplexicaulis*						x	x	x									
sand prairie phlox	*Phlox pilosa*		x			x		x	x	x								
sand puccoon	*Lithospermum carolinense*					x		x	x									
sand reed	*Calamovilfa longifolia*						x	x	x									
sand St. John's-wort	*Hypericum majus*			x	x													
sandbar love grass*	*Eragrostis frankii**			x							x	x						x
sandbar willow	*Salix exigua*			x							x		x					
sandwort	*Moehringia laterifolia*		x							x								
sandwort*	*Arenaria serphyllifolia**						x											x
saw-toothed sagebrush	*Artemisia serrata*											x						
sawtooth sunflower	*Helianthus grosseserratus*			x		x					x	x	x					
scented oak fern-SE	***Gymnocarpium robertianum-SE***														**x**			
scouring rush	*Equisetum hyemale*				x	x	x		x		x							
sedge	*Carex careyana*		x	x														
sedge	*Carex diandra*														x			
sedge	*Carex albursina*		x		x										x		x	
sedge	*Carex bebbii*										x	x	x					
sedge	*Carex convoluta*		x															
sedge	*Carex debilis*				x				x									
sedge	*Carex duriuscula*						x											
sedge	*Carex frankii*			x								x	x					
sedge	*Carex grayi*			x														
sedge	*Carex grisea*		x	x											x			

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie			Sav.		Wetland				Primary			
	Class / Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
sedge	*Carex haydenii*		x											x			
sedge	*Carex heliophila*			x			x										
sedge	*Carex hitchcockiana*	x	x														
sedge	*Carex hystricina*		x							x	x	x	x				
sedge	*Carex laevivaginata*												x				
sedge	*Carex lanuginosa*		x							x		x	x				
sedge	*Carex oligocarpa*	x															
sedge	*Carex pedunculata*	x															
sedge	*Carex pellita*				x					x							
sedge	*Carex scoparia*				x	x			x	x							
sedge	*Carex vescaria*									x	x						
sedge-SE	***Carex communis-SE***	x												x			
sedge-SE	***Carex prasina-SE***										x						
seedbox	*Ludwigia alternifolia*		x							x	x	x	x				
seneca snakeroot	*Polygala senega*						x	x	x								
sensitive fern	*Onoclea sensibilis*	x	x	x						x	x	x					
sessile-flowered cress	*Rorippa sessiliflora*		x							x			x				
shadbush	*Amelanchier arborea*	x												x			
shadbush	*Amelanchier laevis*	x		x										x			
shadbush-SE	***Amelanchier interior-SE***													x		x	
shagbark hickory	*Carya ovata*	x		x			x	x	x								
shaved sedge-SE	***Carex tonsa-SE***			x	x			x									
shepherd's purse*	*Capsella bursa-pastoris**		x														x
shining bedstraw	*Galium concinnum*	x		x		x		x	x								
shining club-moss	*Lycopodium lucidulum*			x							x						
shooting star	*Dodecatheon meadia*	x		x		x			x					x			
Short's aster	*Aster shortii*	x	x			x			x								
short-beaked arrowleaf	*Sagittaria brevirostra*		x							x							
short-headed sedge	*Carex cephalophora*	x							x								
showy goldenrod	*Solidago speciosa*			x		x	x	x	x								
showy lady's slipper-SE	***Cypripedium reginae-SE***													x			
showy orchis	*Galearis spectabilis*	x		x					x								
showy tick trefoil	*Desmodium canadense*					x	x	x	x								
shrubby cinquefoil	*Potentilla fruticosa*													x			
Siberian elm*	*Ulmus pumila**					x											x
sicklepod	*Arabis canadensis*	x					x										
side-flowering aster	*Aster lateriflorus*	x	x														
side-oats grama	*Bouteloua curtipendula*				x	x	x	x						x	x		
silky aster	*Aster sericeus*					x	x	x									
silky wild rye	*Elymus villosus*	x							x						x		
silky willow	*Salix sericea*									x							

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
silver grass*	*Miscanthus sacchariflorus**																	x
silver maple	*Acer saccharinum*			x														
silvery cinquefoil	*Potentilla argentea*						x	x										
Silvery Spleenwort	*Athyrium thelytherioides*		x															
six weeks fescue	*Vulpia octoflora*						x	x	x									
skunk cabbage	*Symplocarpus foetidus*											x						
sky blue aster	*Aster oolentangiensis*				x	x	x	x	x	x								
sleepy catchfly	*Silene antirrhina*					x		x	x	x					x			
slender beard grass	*Agropyron trachycaulum*									x					x			
slender cliffbrake	*Cryptogramma stelleri*														x		x	
slender corydalis	*Corydalis micrantha*						x		x									
slender false foxglove	*Agalinis tenuifolia*					x	x											
slender fesuce*	*Festuca ovina**							x										x
slender knotweed	*Polygonum tenue*						x		x									
slender ladies' tresses	*Spiranthes lacera*						x	x	x									
slender mountain mint	*Pycnanthemum tenuifolium*		x			x												
slender pondweed	*Potamogeton pusillus*										x			x				
slender sand sedge	*Cyperus filiculmis*				x		x	x	x									
slender waterweed	*Elodea nuttallii*			x								x						
slender wood sedge	*Carex gracilescens*		x		x				x	x					x			
slender-leaved panic grass	*Panicum linearifolium*							x	x									
slenderwort	*Minuartia michauxii*						x											
slippery elm	*Ulmus rubra*		x		x					x					x			
small water plantain	*Alisma plantago-aquatica*			x							x	x	x					
small bedstraw	*Galium trifidum*			x							x	x						
small bittercress	*Cardamine parviflora*			x								x			x			
small duckweed	*Lemna minor*										x	x	x	x				
small enchanter's-SE	***Circaea alpina-SE***														**x**		**x**	
small love grass	*Eragrostis pectinacea*						x		x									
small peppergrass*	*Lepidium densiflorum**			x				x	x									x
small skullcap	*Scutellaria parvula*						x		x						x	x		
small wild bean	*Strophostyles leiosperma*				x		x		x									
small wormseed mustard*	*Erysimum inconspicuum**																	x
small-headed aster	*Aster parviceps*						x	x	x									
smartweed	*Polygonum punctatum*										x	x	x	x				
smartweed*	*Polygonum cespitosum**																	x
smooth blue aster	*Aster laevis*					x	x		x	x								
smooth brome*	*Bromus racemosus**						x		x									x
smooth crab grass*	*Digitaria ischaemum**											x		x				x
smooth hedge nettle	*Stachys tenuifolia*			x		x					x	x	x	x				
smooth pigweed*	*Amaranthus powellii**																	x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			Cultural
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	
smooth rock cress	*Arabis laevigata*														x			
smooth scaleseed	*Spermolepis inermis*						x	x	x									
smooth scouring rush	*Equisetum laevigatum*				x				x									
smooth sumac	*Rhus glabra*						x		x							x		
smooth tick trefoil	*Desmodium glabellum*		x							x								
sneezeweed	*Helenium autumnale*			x							x	x	x					
snow trillium	*Trillium nivale*		x												x			
snowberry-SE	***Symphoricarpos albus var. albus-SE***				x													
snowy campion	*Silene nivea*		x	x								x						
soft agrimony	*Agrimonia pubescens*		x		x													
soft-stemmed rush	*Scripus validus*											x	x	x				
Solomon's seal	*Polygonatum commutatum*		x		x	x				x								
sorghum*	*Sorghum bicolor**																	x
southern broom rape-SE	***Orobanche ludoviciana-SE***						x	x	x									
southern naiad	*Najas guadalupensis*										x			x				
speedwell*	*Veronica dillenii**					x												x
spicebush	*Lindera benzoin*		x															
spikerush	*Eleocharis acicularis*			x							x	x	x	x				
spinulose wood fern	*Dryopteris carthusiana*		x		x				x									
spiny amaranth*	*Amaranthus spinosus**			x														x
spiny barnyard grass	*Echinochloa muricata*			x								x	x	x				
spotted coral-root orchid-SE	***Corallorhiza maculata-SE***		x		x													
spotted Joe Pye weed	*Eupatorium maculatum-SR*			x								x	x					
spotted knapweed*	*Centaurea maculosa**																	x
spotted St. John's-wort	*Hypericum punctatum*		x	x		x	x											
spotted touch-me-not	*Impatiens capensis*			x								x	x	x			x	
spreading dogbane	*Apocynum androsaemifolium*						x		x									
spreading oval sedge	*Carex normalis*		x	x	x					x			x					
spreading sedge-ST	***Carex laxiculmis-ST***		x															
spring avens	*Geum vernum*		x	x														
spring beauty	*Claytonia virginica*		x	x	x			x		x		x	x					
spring cress	*Cardamine hirsuta*			x								x						
spurge	*Chamaesyce nutans*						x											
Squirrel-corn	*Dicentra canadensis*		x															
squirrel-tail grass*	*Hordeum jubatum**							x										x
St. John's-wort	*Hypericum canadense*													x				
staghorn sumac	*Rhus typhina*		x	x											x			
stalked water horehound	*Lycopus rubellus*			x														
Star-of-Bethlehem*	*Ornithogalum umbellatum**																	x
starry campion	*Silene stellata*				x				x	x					x			

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class: Forest			Prairie			Sav.		Wetland				Primary			Cultural
	Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	
starry false Solomon's seal	*Smilacina stellata*	x		x	x		x	x	x					x	x		
starved panic grass	*Panicum depauperatum*						x	x									
stickseed	*Hackelia virginiana*	x	x					x	x	x					x		
stiff aster	*Solidago ptarmicoides*						x										
stiff gentian	*Gentianella quinquefolia*	x					x	x	x					x	x		
stink grass*	*Eragrostis cilianensis**									x							x
strawberry blite*	*Chenopodium capitatum**																x
streambank chervil	*Chaerophyllum procumbens*		x														
sugar maple	*Acer saccharum*	x		x										x		x	
sulfur cinquefoil*	*Potentilla recta**	x					x										x
Sullivant's milkweed	*Asclepias sullivantii*				x												
sullivantia-ST	***Sullivantia renifolia-ST***													x			
summer grape	*Vitis aestivalis*	x					x										
sunshine rose	*Rosa suffulta*		x	x													
swamp agrimony	*Agrimonia parviflora*	x	x								x						
swamp aster	*Aster puniceus*		x							x	x	x					
swamp buttercup	*Ranunculus septenrionalis*	x	x	x													
swamp candles	*Lysimachia terrestris*		x							x							
swamp dock	*Rumex verticillatus*										x		x				
swamp marigold	*Bidens aristosa*		x							x							
swamp milkweed	*Asclepias incarnata*		x							x	x	x					
swamp saxifrage	*Saxifraga pensylvanica*	x		x							x			x			
swamp tickseed	*Bidens tripartita*		x							x	x		x				
swamp white oak	*Quercus bicolor*		x											x			
sweet black-eyed Susan	*Rudbeckia subtomentosa*		x		x				x								
sweet cherry*	*Prunus avium**													x			x
sweet flag*	*Acorus calamus**									x			x				x
sweet Indian plantain	*Cacalia suaveolens*										x	x					
sweet-scented bedstraw	*Galium triflorum*	x		x													
sycamore	*Platanus occidentalis*		x														
tail leafed aster	*Aster urophyllus*	x		x					x					x			
tall agrimony	*Agrimonia gryposepala*	x	x	x				x	x								
tall anemone	*Anemone virginiana*	x	x	x				x	x								
tall beggar's ticks	*Bidens vulgata*		x							x	x		x				
tall boneset	*Eupatorium altissimum*	x			x		x	x									
tall green milkweed	*Asclepias hirtella*					x	x										
tall ground cherry	*Physalis longifolia*		x					x									
tall hedge mustard	*Sisymbrium loeselii*	x															
tall nettle	*Urtica dioica*		x							x	x	x	x				
tall nut grass	*Scleria triglomerata*				x		x	x	x								
tall thistle	*Cirsium altissimum*	x			x		x		x								

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class	Forest			Prairie			Sav.		Wetland				Primary			
		Sub-class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
tall waterhemp	*Amaranthus tuberculatus*			x							x							
tall white orchid	*Platanthera dilatata*						x				x							
tall wood sorrel	*Oxalis stricta*		x													x		
tamarisk waterhemp	*Amaranthus rudis*			x														
tansy mustard*	*Descurainia pinnata**						x	x	x						x			x
Tartarian honeysuckle*	*Lonicera tatarica**																	x
Thicket creeper	*Parthenocissus vitacea*			x					x	x					x			
three-awn	*Aristida longespica*								x									
three-awn grass	*Aristida basiramea*						x	x	x									
three-seeded mercury	*Acalypha rhomboidea*		x	x	x													
thyme-leaved speedwell*	*Veronica serpyllifolia**																	x
tickle grass	*Agrostis scabra*		x							x					x			
timothy*	*Phleum pratense**							x										x
tooth-cup	*Ammannia coccinea*			x							x							
toothed cress	*Arabis shortii*		x	x											x			
toothwort	*Dentaria laciniata*		x	x														
Torrey's rush	*Juncus torreyi*										x	x	x					
tower mustard	*Arabis glabra*			x			x	x										
trumpet creeper*	*Campsis radicans**																	x
tumble mustard*	*Sisymbrium altissimum**																	x
tumblegrass	*Eragrostis spectabailis*					x	x	x	x	x								
tumbleweed	*Amaranthus albus*							x										
tussock sedge	*Carex stricta*			x							x	x	x					
twinleaf	*Jeffersonia diphylla*		x	x													x	
umbel sedge	*Carex umbellata*		x		x			x	x									
umbrella flat sedge	*Cyperus diandrus*			x							x			x				
upland boneset	*Eupatorium sessilifolium*		x							x					x			
valeriana	*Valeriana edulis*					x			x			x			x			
Venus's looking glass	*Triodanis perfoliata*				x	x	x	x	x	x								
vernal whitlow grass	*Draba verna*																	
violet	*Viola pratincola*		x	x	x													
violet bush-clover	*Lespedeza violacea*								x	x					x			
violet wood sorrel	*Oxalis violacea*							x	x	x					x	x		
virgin's bower	*Clematis virginiana*		x		x											x		
Virginia bluebells	*Mertensia virginica*		x	x														
Virginia creeper	*Parthenocissus quinquefolia*		x	x	x				x	x						x		
Virginia knotweed	*Polygonum virginianum*		x	x	x		x		x	x		x			x			
Virginia waterleaf	*Hydrophyllum virginianum*		x	x											x			
Virginia wild rye	*Elymus virginicus*		x	x	x					x								
wafer ash	*Ptelea trifoliata*		x		x		x	x	x									
wahoo	*Euonymus atropurpurea*		x												x			

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class / Sub-class	Forest: Upland	Forest: Flood	Forest: Sand	Prairie: Prairie	Prairie: Sand	Prairie: Hill	Sav.: Sand	Sav.: Savanna	Wetland: Marsh	Wetland: Spring Seep/fen	Wetland: Sedge meadow	Wetland: Lake/pond/river	Primary: Cliff and talus	Primary: Glade	Primary: Algific	Cultural
walking fern	*Asplenium rhizophyllum*		x												x		x	
water chickweed*	*Myosoton aquaticum**										x	x	x	x				x
water cress*	*Nasturtium officinale**											x						x
water hemlock	*Cicuta maculata*			x							x							
water hyssop	*Bacopa rotundifolia*													x				
water knotweed	*Polygonum amphibium*		x								x	x	x	x				
water meal	*Wolffia columbiana*										x	x		x				
water parsnip	*Sium suave*										x	x	x	x				
water pepper*	*Polygonum hydropiper**			x							x	x	x					
water plantain	*Alisma subcordatum*										x	x						
weak bluegrass-SE	***Poa languida-SE***		x															
weeping willow*	*Salix baylonica**																	x
western ragweed	*Ambrosia psilostachya*						x	x										
western sunflower	*Helianthus occidentalis*				x			x	x									
western wild lettuce-SE	***Lactuca ludoviciana-SE***					x	x											
wheelwort	*Rotala ramosior*													x				
white adder's tongue	*Erythronium albidum*		x															
white ash	*Fraxinus americana*		x						x							x		
white avens	*Geum canadense*		x	x	x													
white camass-SE	***Zigadenus glaucus-SE***														x			
white clover*	*Trifolium repens**		x															x
white false indigo	*Baptisia alba*					x	x	x	x	x			x					
white grass	*Leersia virginica*		x	x								x	x					
white lady's slipper-SE	***Cypripedium candidum-SE***					x		x										
white mulberry*	*Morus alba**		x															x
white oak	*Quercus alba*		x		x			x	x	x								
white pine	*Pinus strobus*		x												x			
white poplar*	*Populus alba**																	x
white prairie clover	*Petalostemum candida*						x	x	x	x								
white prairie fringed orchid-SE, FT	*Platanthera leucophaea-SE, FT*					x												
white sage	*Artemisia ludoviciana*				x		x	x										
white snakeroot	*Eupatorium rugosum*		x	x			x	x	x	x						x		
white sweet clover*	*Melilotus alba**				x	x	x	x	x	x								x
white turtlehead	*Chelone glabra*			x								x	x					
white vervain	*Verbena urticifolia*		x	x			x		x									
white violet-SE	***Viola incognita-SE***				x													
white willow*	*Salix alba**			x														x
white-haired panic grass	*Panicum villosissimum*						x	x										
whorled loosestrife	*Lysimachia quadriflolia*		x		x	x			x	x								
whorled milkwort	*Polygala verticillata*						x	x	x									

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie			Sav.		Wetland				Primary			
	Class	Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	Cultural
	Sub-class																
Wilcox's panic grass	*Panicum wilcoxianum*					x	x	x									
wild bean	*Strophostyles helvula*			x		x	x	x									
wild bergamot	*Monarda fistulosa*	x			x	x	x	x	x					x			
wild black cherry	*Prunus serotina*	x				x	x										
wild black current	*Ribes americanum*		x								x	x					
wild cucumber	*Echinocystis lobata*		x							x			x				
wild four o'clock*	*Mirabilis nyctaginea**					x	x	x									x
wild garlic	*Allium canadense*	x	x				x										
wild geranium	*Geranium maculatum*	x		x					x								
wild golden glow	*Rudbeckia laciniata*		x														
wild goose plum*	*Prunus hortulana**	x															x
wild hyacinth	*Camassia scilloides*				x				x								
wild leek	*Allium tricoccum*	x												x			
wild lettuce	*Lactuca canadensis*		x		x	x	x										
wild licorice*	*Galium circaezans**	x		x			x	x	x						x		
wild lupine	*Lupinus perennis*							x									
wild madder	*Galium obtusum*		x	x						x							
wild parsnip*	*Pastinaca sativa**				x												x
wild poinsetta	*Poinsetta dentata*					x	x										
wild quinine	*Parthenium integrifolium*			x			x	x	x								
wild sarsaparilla	*Aralia nudicaulis*	x		x			x	x						x			
wild senna	*Senna marilandica*						x							x			
wild strawberry	*Fragaria virginiana*	x		x			x	x	x					x	x		
wild sweet crab	*Malus coronaria*							x									
wild sweet potato vine	*Impomoea pandurata*	x			x				x								
wild yam	*Dioscorea villosa*	x		x					x								
windmill grass*	*Chloris verticillata**																x
winged euonymus*	*Euonymus alata**																x
winged loosestrife	*Lythrum alatum*		x							x	x						
winged pigweed	*Cycloloma atriplicifolium*				x	x	x	x									
winter cress*	*Barbarea vulgaris**		x														x
winter vetch*	*Vicia villiosa**					x	x										x
witch hazel	*Hamamelis virginiana*	x															
wolfberry	*Symphoricarpos occidentalis*	x					x		x								
wood anemone	*Anemone quinquefolia*	x		x												x	
wood betony	*Pedicularis canadensis*	x					x	x	x					x			
wood lily	*Lilium philadelphicum*			x	x			x	x								
wood mint	*Blephilia hirsuta*	x	x														
wood sedge	*Carex rosea*	x	x	x													
woodland bluegrass	*Poa sylvestris*										x						
woodland brome	*Bromus pubescens*	x		x					x					x			

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Class / Sub-class	Forest			Prairie			Sav.		Wetland				Primary			Cultural
			Upland	Flood	Sand	Prairie	Sand	Hill	Sand	Savanna	Marsh	Spring Seep/fen	Sedge meadow	Lake/pond/river	Cliff and talus	Glade	Algific	
woodland goosefoot	*Chenopodium standleyanum*		x															
woodland satin grass	*Muhlenbergia sylvatica*		x	x														
woodland sunflower	*Helianthus divaricatus*							x		x								
wool grass	*Scirpus cyperinus*			x							x	x	x	x				
woolly blue violet	*Viola sororia*		x	x					x									
woolly milkweed-SE	***Asclepias lanuginosa-SE***						x	x										
woolly mullein*	*Verbascum thapsus**						x		x									x
wormseed mustard*	*Erysimum cheiranthoides**							x										x
woundwort	*Stachys palustris*			x		x					x	x	x	x				
yellow adder's tongue	*Erythronium americanum*		x															
yellow avens	*Geum aleppicum*										x		x					
yellow chestnut oak	*Quercus muhlenbergii*		x				x	x							x	x		
yellow coneflower	*Ratibida pinnata*						x		x	x								
yellow giant hyssop	*Agastache nepetoides*		x	x					x	x								
yellow lady's slipper	*Cypripedium pubescens*		x		x					x								
yellow monkey flower-SE	***Mimulus glabratus-SE***											x						
yellow pimpernel	*Taenidia integerrima*		x							x					x			
yellow star grass	*Hypoxis hirsuta*					x			x	x								
yellow sweet clover*	*Melilotus officinalis**				x	x	x	x	x	x								x
yerba de tajo	*Eclipta prostrata*			x										x				

[1] Bold type indicates an Illinois endangered (SE), Illinois threatened (ST), and/or federally threatened (FT) species.
[2] * = introduced species

Appendix 2

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

Scientific Name[1,2]	Common Name[1,2]	Scientific Name[1,2]	Common Name[1,2]
*Abutilon theophrasti**	buttonweed*	*Ambrosia psilostachya*	western ragweed
Acalypha rhomboidea	three-seeded mercury	*Ambrosia trifida*	giant ragweed
Acer negundo	boxelder	*Amelanchier arborea*	shadbush
Acer saccharinum	silver maple	*Amelanchier humilis*	low shadbush
Acer saccharum	sugar maple	***Amelanchier interior-SE***	**shadbush-SE**
*Achillea millefolium**	common milfoil*	*Amelanchier laevis*	shadbush
*Acorus calamus**	sweet flag*	*Ammannia coccinea*	tooth-cup
Actaea pachypoda	doll's eyes	*Amorpha canescens*	lead plant
Actaea rubra	red baneberry	*Amorpha fruticosa*	false indigo bush
Adiantum pedatum	maidenhair fern	*Amphicarpa bracteata*	hog peanut
Adoxa moschatellina - SE	**moschatel - SE**	*Andropogon gerardii*	big bluestem
Agalinis aspera	rough false foxglove	*Androsace occidentalis*	rock jasmine
Agalinis purpurea	false foxglove	*Anemone canadensis*	meadow anemone
Agalinis tenuifolia	slender false foxglove	*Anemone caroliniana*	Carolina anemone
Agastache nepetoides	yellow giant hyssop	*Anemone cylindrica*	candle anemone
Agastache scrophulariaefolia	purple giant hyssop	*Anemone quinquefolia*	wood anemone
Agrimonia gryposepala	tall agrimony	*Anemone virginiana*	tall anemone
Agrimonia parviflora	swamp agrimony	*Angelica atropurpurea*	angelica
Agrimonia pubescens	soft agrimony	*Antennaria neglecta*	cat's foot
*Agropyron repens**	quack grass*	*Antennaria plantaginifolia*	pussy toes
*Agropyron smithii**	Colorado bluestem*	*Anthemis cotula**	dog fennel*
Agropyron subsecundum-SE	**bearded wheat grass-SE**	*Anthemis tinctoria**	golden chamomile*
Agropyron trachycaulum	slender beard grass	*Apios americana*	ground-nut
Agrostis gigantea	large bent grass	*Aplectrum hyemale*	putty root orchid
Agrostis hyemalis	hair grass	*Apocynum androsaemifolium*	spreading dogbane
Agrostis perennans	autumn bent grass	*Apocynum cannabinum*	dogbane
Agrostis scabra	tickle grass	*Apocynum sibiricum*	Indian hemp
Alisma plantago-aquatica	small water plantain	*Aquilegia canadensis*	columbine
Alisma subcordatum	water plantain	*Arabis canadensis*	sicklepod
*Alliaria petiolata**	garlic mustard*	*Arabis glabra*	tower mustard
Allium canadense	wild garlic	*Arabis hirsuta*	hairy rock cress
Allium tricoccum	wild leek	*Arabis laevigata*	smooth rock cress
Alopecus carolinianus	common foxtail	*Arabis lyrata*	lyre-leaved rock cress
*Alyssum alyssoides**	pale allysum*	*Arabis shortii*	toothed cress
Amaranthus albus	tumbleweed	*Aralia nudicaulis*	wild sarsaparilla
*Amaranthus graecizans**	prostrate pigweed*	*Aralia racemosa*	American spikenard
*Amaranthus powellii**	smooth pigweed*	*Arctium lappa**	burdock*
*Amaranthus retroflexus**	rough pigweed*	*Arctium minus**	burdock*
Amaranthus rudis	tamarisk waterhemp	*Arenaria serphyllifolia**	sandwort*
*Amaranthus spinosus**	spiny amaranth*	*Arisaema dracontium*	green dragon
Amaranthus tuberculatus	tall waterhemp	*Arisaema triphyllum*	Indian turnip
Ambrosia artemisiifolia	common ragweed	*Aristida basiramea*	three-awn grass

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]	Scientific Name[1,2]	Common Name[1,2]
Aristida longespica	three-awn	*Athyrium thelytherioides*	Silvery Spleenwort
Aristida oligantha	plains three awn grass	*Atriplex patula**	fat-hen saltbush*
Aristida tuberculosa	beach three awn grass	*Aureolaria grandiflora*	false foxglove
*Armoracia lapathifolia**	horseradish*	*Aureolaria pedicularia*	false foxglove
*Artemisia biennis**	biennial wormwood*	*Avena sativa**	oats*
Artemisia campestris	beach wormwood	*Azolla mexicana*	Mexican azolla
Artemisia ludoviciana	white sage	*Bacopa rotundifolia*	water hyssop
Artemisia serrata	saw-toothed sagebrush	*Baptisia alba*	white false indigo
Aruncus dioicus	goat's-beard	*Baptisia bracteata*	cream indigo
Asarum canadense	Canada wild ginger	*Barbarea vulgaris**	winter cress*
Asclepias amplexicaulis	sand milkweed	*Belamcanda chinensis**	blackberry lily*
Asclepias exalata	poke milkweed	*Berberis thunbergii**	Japanese barberry*
Asclepias hirtella	tall green milkweed	*Berteroa incana**	hoary alyssum*
Asclepias incarnata	swamp milkweed	***Besseya bullii-ST***	**kitten tails-ST**
Asclepias lanuginosa-SE	**woolly milkweed-SE**	*Betula nigra*	river birch
Asclepias purpurascens	purple milkweed	*Betula papyrifera*	paper birch
Asclepias sullivantii	Sullivant's milkweed	*Bidens aristosa*	swamp marigold
Asclepias syriaca	common milkweed	*Bidens cernua*	nodding bur marigold
Asclepias tuberosa	butterfly weed	*Bidens connata*	purple-stem tickseed
Asclepias verticillata	horsetail milkweed	*Bidens frondosa*	common beggar's ticks
Asclepias viridiflora	green milkweed	*Bidens tripartita*	swamp tickseed
Asimina triloba	papaw	*Bidens vulgata*	tall beggar's ticks
*Asparagus officinalis**	garden asparagus*	*Blephilia ciliata*	downy woodmint
Asplenium platyneuron	common polypody	*Blephilia hirsuta*	wood mint
Asplenium rhizophyllum	walking fern	*Boehmeria cylindrica*	false nettle
Aster cordifolius	heart-leaved aster	*Boltonia asteroides*	false aster
Aster drummondii	Drummond's aster	*Botrychium dissectum*	dissected grapefern
Aster dumosus	bushy aster	***Botrychium multifidum-SE***	**leathery grape fern-SE**
Aster ericoides	heath aster	*Botrychium virginianum*	rattlesnake fern
Aster furcatus-ST	**forked aster-ST**	*Bouteloua curtipendula*	side-oats grama
Aster laevis	smooth blue aster	*Bouteloua hirsuta*	hairy grama
Aster lanceolatus	panicled aster	*Boutelous gracilis*	blue grama
Aster lateriflorus	side-flowering aster	*Brachyelytrum erectum*	long-awned wood grass
Aster linariiflorus	flax-leaved aster	*Brassica juncea**	Indian mustard*
Aster novae-angliae	New England aster	*Brassica nigra**	black mustard*
Aster oblongifolius	aromatic aster	*Brickellia eupatorioides*	false boneset
Aster ontarionis	Ontario aster	*Bromus ciliatus*	Canadian brome
Aster oolentangiensis	sky blue aster	*Bromus commutatus*	hairy brome
Aster parviceps	small-headed aster	*Bromus inermis**	Hungarian brome*
Aster pilosus	hairy aster	*Bromus kalmii*	prairie brome
Aster prenanthoides	crooked aster	*Bromus pubescens*	woodland brome
Aster puniceus	swamp aster	*Bromus purgens*	brome grass
Aster sericeus	silky aster	*Bromus racemosus**	smooth brome*
Aster shortii	Short's aster	*Bromus squarrosus**	nodding brome*
Aster umbellatus	flat-top aster	*Bromus tectorum**	cheat grass*
Aster urophyllus	tail leafed aster	*Bulbostylis capillaris*	hair sedge
Astragalus canadensis	Canadian milk vetch	*Cabomba caroliniana**	cabomba*
Astragalus distortus	bent milk vetch	*Cacalia atriplicifolia*	pale Indian plantain
Athyrium filix-femina	lady fern	*Cacalia muhlenbergia*	Indian plantain
Athyrium pycnocarpon	glade fern	*Cacalia plantaginea*	prairie Indian plantain

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]	Scientific Name[1,2]	Common Name[1,2]
Cacalia suaveolens	sweet Indian plantain	*Carex hitchcockiana*	sedge
Calamagrostis canadensis	blue joint grass	*Carex hystricina*	sedge
Calamovilfa longifolia	sand reed	*Carex jamesii*	grass sedge
Callirhoe triangulata	clustered poppy mallow	*Carex lacustris*	common lake sedge
Calopogon tuberosa-ST	**grass pink orchid-ST**	*Carex laeviconica*	long-toothed sedge
Caltha palustris	marsh marigold	*Carex laevivaginata*	sedge
Calystegia sepium	American bindweed	*Carex lanuginosa*	sedge
Calystegia spithamaea	dwarf bindweed	***Carex laxiculmis-ST***	**spreading sedge-ST**
Camassia scilloides	wild hyacinth	*Carex lupulina*	hop sedge
Campanula americana	American bellflower	*Carex meadii*	mead's sedge
Campanula aparanoides	marsh bellflower	*Carex molesta*	field oval sedge
*Campanula rapunculoides**	European bellflower*	*Carex muhlenbergii*	sand bracted sedge
Campanula rotundifolia	harebell	*Carex normalis*	spreading oval sedge
*Campsis radicans**	trumpet creeper*	*Carex oligocarpa*	sedge
*Cannabis sativa**	hemp*	*Carex pedunculata*	sedge
*Capsella bursa-pastoris**	shepherd's purse*	*Carex pellita*	sedge
Cardamine bulbosa	bulb bittercress	*Carex pensylvanica*	Pennsylvania sedge
Cardamine hirsuta	spring cress	***Carex prasina-SE***	**sedge-SE**
Cardamine parviflora	small bittercress	*Carex rosea*	wood sedge
Cardamine pensylvanica	Pennsylvania bittercress	*Carex scoparia*	sedge
*Carduus nutans**	musk thistle*	*Carex sparganioides*	bracted sedge
Carex albursina	sedge	*Carex sprengelii*	long-beaked sedge
Carex annectens	fox sedge	*Carex squarrosa*	cattail sedge
Carex bebbii	sedge	*Carex stipata*	common fox sedge
Carex bicknellii	Bicknell's sedge	*Carex stricta*	tussock sedge
Carex blanda	common wood sedge	*Carex tenera*	narrow-leaved sedge
Carex brevior	plains oval sedge	***Carex tonsa-SE***	**shaved sedge-SE**
Carex careyana	sedge	*Carex tribuloides*	awl-fruited sedge
Carex cephaloidea	rough clustered sedge	*Carex trichocarpa*	hairy-fruited sedge
Carex cephalophora	short-headed sedge	*Carex typhina*	common cattail sedge
Carex communis-SE	**sedge-SE**	*Carex umbellata*	umbel sedge
Carex conjuncta	green-headed sedge	*Carex vescaria*	sedge
Carex convoluta	sedge	*Carex vulpinoidea*	brown fox sedge
Carex cristatella	crested oval sedge	***Carex woodii-SE***	**pretty sedge-SE**
Carex davisii	awned graceful sedge	*Carpinus caroliniana*	blue beech
Carex debilis	sedge	*Carum carvi**	caraway*
Carex diandra	sedge	*Carya cordiformis*	bitternut hickory
Carex duriuscula	sedge	*Carya illinoinensis*	pecan
Carex eburnea	ivory sedge	*Carya laciniosa*	big shellbark
Carex emoryi	riverbank sedge	*Carya ovata*	shagbark hickory
Carex frankii	sedge	*Castilleja coccinea*	Indian paintbrush
Carex gracilescens	slender wood sedge	***Castilleja sessiliflora-SE***	**downy yellow painted cup-SE**
Carex gracillima	graceful sedge	*Catalpa bignonioides*	Catalpa
Carex granularis	pale sedge	*Catalpa speciosa*	cigar tree
Carex gravida	heavy sedge	*Caulophyllum thalictroides*	blue cohosh
Carex grayi	sedge	*Ceanothus americanus*	New Jersey tea
Carex grisea	sedge	***Ceanothus ovatus-SE***	**redroot-SE**
Carex haydenii	sedge	*Celastrus scandens*	climbing bittersweet
Carex heliophila	sedge	*Celtis occidentalis*	hackberry
Carex hirtifolia	hairy wood sedge	*Cenchrus longispinus*	mat sandbur

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]	Scientific Name[1,2]	Common Name[1,2]
*Centaurea maculosa**	spotted knapweed*	*Corallorhiza odontorhiza*	autumn coral-root orchid
Cephalanthus occidentalis	buttonbush	*Coreopsis palmata*	prairie coreopsis
Cerastium brachypodum	mouse-ear chickweed	*Cornus alternifolia*	atlernate leaved dogwood
Cerastium nutans	nodding chickweed	*Cornus drummondii*	rough-leaved dogwood
*Cerastium vulgatum**	common chickweed*	*Cornus obliqua*	pale dogwood
Ceratophyllum demersum	coontail	*Cornus racemosa*	gray dogwood
Cercis canadensis	eastern redbud	*Cornus rugosa*	round-leaved dogwood
*Chaenorrhinum minus**	dwarf snapdragon*	*Cornus stolonifera*	red osier dogwood
Chaerophyllum procumbens	streambank chervil	*Coronilla varia**	crown vetch*
Chamaecrista fasciculata	partridge pea	*Corydalis aurea*	golden corydalis
Chamaesyce geyeri	Gyere's spurge	*Corydalis micrantha*	slender corydalis
Chamaesyce maculata	nodding spurge	*Corylus americana*	American filbert
Chamaesyce nutans	spurge	***Corylus cornuta-SE***	**beaked hazelnut-SE**
Cheilanthes feei	baby lip fern	*Crataegus calpodendron*	hawthorn
Chelone glabra	white turtlehead	*Crataegus mollis*	downy hawthorn
Chelone obliqua	purple turtlehead	*Crepis tectorum**	hawksbeard*
*Chenopodium album**	lamb's quarters*	*Crotalaria sagittalis*	rattlebox
*Chenopodium ambrosiodes**	Mexican tea*	*Croton glandulosus*	sand croton
*Chenopodium capitatum**	strawberry blite*	*Crotonopsis linearis*	rushfoil
Chenopodium gigantospermum	goosefoot	*Cryptogramma stelleri*	slender cliffbrake
Chenopodium missouriense	Missouri goosefoot	*Cryptotaenia canadensis*	honewort
Chenopodium pratericola	goosefoot	*Cuscuta campestris*	field dodder
Chenopodium standleyanum	woodland goosefoot	*Cuscuta cephalanthi*	buttonbush dodder
Chimaphila umbellata-SE	**pipsissewa-SE**	*Cuscuta compacta*	dodder
*Chloris verticillata**	windmill grass*	*Cuscuta glomerata*	rope dodder
*Cichorium intybus**	chickory*	*Cuscuta gronovii*	dodder
Cicuta maculata	water hemlock	*Cycloloma atriplicifolium*	winged pigweed
Cimicifuga americana-SE	**American bugbane-SE**	*Cymbalaria muralis**	Kenilworth ivy*
Cinna arundinacea	common wood reed	*Cynoglossum officinale**	common hound's tongue*
Circaea alpina-SE	**small enchanter's-SE**	*Cyperus aristatus*	flatsedge
Circaea lutetiana	enchanter's nightshade	*Cyperus diandrus*	umbrella flat sedge
Cirsium altissimum	tall thistle	*Cyperus erythrorhizos*	red-rooted nut sedge
*Cirsium arvense**	Canada thistle*	*Cyperus esculentus*	field nut sedge
Cirsium discolor	pasture thistle	*Cyperus filiculmis*	slender sand sedge
Cirsium hillii	Hill's thistle	***Cyperus grayioides-ST***	**Gray's umbrella sedge-ST**
*Cirsium vulgare**	bull thistle*	*Cyperus odoratus*	nut sedge
Claytonia virginica	spring beauty	*Cyperus rivularis*	nut sedge
Clematis occidentalis-SE	**mountain clematis-SE**	*Cyperus schweinitzii*	rough sand sedge
Clematis pitcheri	leather flower	*Cyperus strigosus*	long-scaled nut sedge
Clematis virginiana	virgin's bower	***Cypripedium candidum-SE***	**white lady's slipper-SE**
Coeloglossum virde	bracted green orchid	*Cypripedium pubescens*	yellow lady's slipper
Comandra umbellata	bastard toad-flax	***Cypripedium reginae-SE***	**showy lady's slipper-SE**
Commelina communis	common day flower	*Cystopteris bulbifera*	berry bladder fern
Commelina erecta	day flower	*Cystopteris protrusa*	fragile fern
Conioselinum chinense	hemlock parsley	*Cystopteris tennesseensis*	fragile fern
*Conium maculatum**	poison hemlock*	*Dactylis glomerata**	orchard grass*
*Convolvulus arvensis**	field bindweed*	*Datura stramonium**	jimsonweed*
*Conyza canadensis**	horseweed*	*Daucus carota**	Queen Anne's lace*
Corallorhiza maculata-SE	**spotted coral-root orchid-SE**	*Dentaria laciniata*	toothwort
		*Descurainia pinnata**	tansy mustard*

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]	Scientific Name[1,2]	Common Name[1,2]
Desmanthus illinoensis	Illinois bundle flower	***Equisetum scirpoides-SE***	**dwarf scouring rush-SE**
Desmodium canadense	showy tick trefoil	*Eragrostis capillaris*	lace grass
Desmodium canescens	hoary tick trefoil	*Eragrostis cilianensis**	stink grass*
Desmodium cuspidatum	bracted tick trefoil	*Eragrostis frankii**	sandbar love grass*
Desmodium glabellum	smooth tick trefoil	*Eragrostis hypnoides*	creeping love grass
Desmodium glutinosum	pointed tick trefoil	*Eragrostis minor**	lesser love grass*
Desmodium illinoense	Illinois tick trefoil	*Eragrostis pectinacea*	small love grass
Desmodium nudiflorum	bare-stemmed tick trefoil	*Eragrostis spectabailis*	tumblegrass
*Dianthus armeria**	deptford pink*	*Eragrostis trichodes*	sand love grass
Diarrhena americana	beak grass	*Erechtites hieracifolia*	fireweed
Dicentra canadensis	Squirrel-corn	*Erigeron annuus*	annual fleabane
Dicentra cucullaria	Dutchman's breeches	*Erigeron philadelphicus*	marsh fleabane
Diervilla lonicera	dwarf honeysuckle	*Erigeron pulchellus*	robin's plantain
*Digitaria ischaemum**	smooth crab grass*	*Erigeron strigosus*	daisy fleabane
*Digitaria sanguinalis**	hairy crab grass*	*Erucastrum gallicum**	dog mustard*
Diodia teres	buttonweed	*Eryngium yuccifolium*	rattlesnake master
Dioscorea villosa	wild yam	*Erysimum cheiranthoides**	wormseed mustard*
Dirca palustris	leatherwood	*Erysimum inconspicuum**	small wormseed mustard*
Dodecatheon amethystinum	jeweled shooting star	*Erythronium albidum*	white adder's tongue
Dodecatheon meadia	shooting star	*Erythronium americanum*	yellow adder's tongue
Draba reptans	common whitlow grass	*Euonymus alata**	winged euonymus*
Draba verna	vernal whitlow grass	*Euonymus atropurpurea*	wahoo
Dryopteris carthusiana	spinulose wood fern	*Eupatorium altissimum*	tall boneset
Dryopteris goldiana	goldie fern	*Eupatorium maculatum*	spotted Joe Pye weed
Dryopteris intermedia	common wood fern	*Eupatorium perfoliatum*	common boneset
Echinacea pallida	pale purple coneflower	*Eupatorium purpureum*	purple Joe Pye weed
*Echinochloa crusgalli**	barnyard grass*	*Eupatorium rugosum*	white snakeroot
Echinochloa muricata	spiny barnyard grass	*Eupatorium serotinum*	late boneset
Echinochloa walteri	barnyard grass	*Eupatorium sessilifolium*	upland boneset
Echinocystis lobata	wild cucumber	*Euphorbia corollata*	flowering spurge
*Echium vulgare**	blueweed*	*Euphorbia cyathophora*	flowering spurge
Eclipta prostrata	yerba de tajo	*Euphorbia cyparissias**	cypress spurge*
*Elaeagnus angustifolia**	Russian olive*	*Euphorbia dentata**	flowering spurge*
Eleocharis acicularis	spikerush	*Euphorbia esula**	leafy spurge*
Eleocharis erythropoda	red-rooted spike rush	*Euthamia graminifoila*	grass-leaved goldenrod
Eleocharis obtusa	blunt spike rush	*Euthamia gymnospermoides*	grass-leaved goldenrod
*Eleusine indica**	crowfoot grass*	*Festuca elatior**	fescue*
Ellisia nyctelea	Aunt Lucy	*Festuca obtusa*	nodding fescue
Elodea nuttallii	slender waterweed	*Festuca ovina**	slender fesuce*
Elymus canadensis	Canada wild rye	*Festuca paradoxa*	fescue
Elymus hystrix	bottlebrush grass	*Fragaria americana*	hillside strawberry
Elymus villosus	silky wild rye	*Fragaria virginiana*	wild strawberry
Elymus virginicus	Virginia wild rye	*Fraxinus americana*	white ash
Epilobium ciliatum	northern willow herb	*Fraxinus nigra*	black ash
Epilobium coloratum	cinnamon willow herb	*Fraxinus pennsylvanica*	red ash
Equisetum arvense	common horsetail	*Fraxinus quadrangulata*	blue ash
Equisetum fluviatile	horsetail	*Froelichia floridana*	cottonweed
Equisetum hyemale	scouring rush	*Froelichia gracilis*	cottonweed
Equisetum laevigatum	smooth scouring rush	*Galearis spectabilis*	showy orchis
Equisetum pratense-SE	**meadow horsetail-SE**	*Galinsoga quadriradiata**	Peruvian daisy*

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Galium aparine	annual bedstraw
Galium asprellum	rough bedstraw
Galium boreale	northern bedstraw
*Galium circaezans**	wild licorice*
Galium concinnum	shining bedstraw
Galium obtusum	wild madder
Galium pilosum	hairy bedstraw
Galium trifidum	small bedstraw
Galium triflorum	sweet-scented bedstraw
Gaura biennis	biennial gaura
Gaura longiflora	gaura
Gentiana alba	cream gentian
Gentiana andrewsii	closed gentian
Gentiana puberulenta	downy gentian
Gentianella quinquefolia	stiff gentian
Gentianopsis crinita	fringed gentian
Geranium carolinianum	Carolina cranesbill
Geranium maculatum	wild geranium
Geum aleppicum	yellow avens
Geum canadense	white avens
Geum laciniatum	rough avens
Geum triflorum	prairie avens
Geum vernum	spring avens
*Glechoma hederacea**	ground ivy*
Gleditsia triacanthos	honey locust
Glyceria borealis-SE	**northern mana-grass-SE**
Glyceria grandis	American manna grass
Glyceria striata	fowl manna grass
Gnaphalium obtusifolium	old-field balsam
Goodyera pubescens	rattlesnake plantain
Gratiola neglecta	clammy hedge hyssop
Grindelia squarrosa	curlycup-gumweed
Gymnocarpium dryopteris-SE	**oak fern-SE**
Gymnocarpium robertianum-SE	**scented oak fern-SE**
Gymnocladus dioicus	Kentucky coffee tree
Hackelia americana-SE	**American stickseed-SE**
Hackelia virginiana	stickseed
Hamamelis virginiana	witch hazel
Hedeoma hispida	rough pennyroyal
Hedeoma pulegioides	American pennyroyal
Hedyotis pusilla	bluets
Helenium autumnale	sneezeweed
Helianthemum bicknellii	rockrose
Helianthemum canadense	common rockrose
*Helianthus annuus**	common sunflower*
Helianthus decapetalus	pale sunflower
Helianthus divaricatus	woodland sunflower
Helianthus grosseserratus	sawtooth sunflower
Helianthus hirsutus	bristly 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**	daylilly*
Hepatica nobilis	hepatica
Heracleum lanatum	cow parsnip
*Hesperis matronalis**	dame's rocket*
Heterotheca camporum	golden aster
*Heuchera richardsonii**	Alumroot
Hibiscus laevis	halberd-leaved rose mallow
Hieracium canadense	hawkweed
Hieracium longipilum	long-bearded hawkweed
Hieracium scabrum	hawkweed
*Holosteum umbellatum**	jagged chickweed*
*Hordeum jubatum**	squirrel-tail grass*
Hudsonia tomentosa-SE	**false heather-SE**
*Humulus japonicus**	Japanese hops*
Humulus lupulus	common hops
Hydrophyllum appendiculatum	great waterleaf
Hydrophyllum virginianum	Virginia waterleaf
Hypericum canadense	St. John's-wort
Hypericum majus	sand St. John's-wort
Hypericum mutilum	dwarf 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
Hypoxis hirsuta	yellow star grass
Impatiens capensis	spotted touch-me-not
Impatiens pallida	pale touch-me-not
Impomoea pandurata	wild sweet potato vine
Iris virginica	blue flag
Isanthus brachiatus	false pennyroyal
Isopyrum biternatum	false rue anemone
Jeffersonia diphylla	twinleaf
Juglans cinerea	butternut
Juglans nigra	black walnut
Juncus balticus	rush
Juncus dudleyi	Dudley's rush
Juncus interior	inland rush
Juncus nodosus	rush
Juncus tenuis	path rush
Juncus torreyi	Torrey's rush
Juniperus virginiana	eastern red cedar
*Kochia scoparia**	burning bush*
Koeleria macrantha	June grass
Krigia biflora	false dandelion

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]	Scientific Name[1,2]	Common Name[1,2]
Krigia virginica	dwarf dandelion	*Lonicera japonica**	Japanese honeysuckle*
Lactuca canadensis	wild lettuce	*Lonicera morrowii**	bush honeysuckle*
Lactuca floridana	blue lettuce	*Lonicera prolifera*	grape honeysuckle
Lactuca ludoviciana-SE	**western wild lettuce-SE**	*Lonicera tatarica**	Tartarian honeysuckle*
*Lactuca serriola**	prickly lettuce*	*Lotus corniculatus**	birdsfoot trefoil*
Laportea canadensis	Canada wood nettle	*Ludwigia alternifolia*	seedbox
*Lappula echinata**	beggar's lice*	*Ludwigia polycarpa*	false loosestrife
Lathyrus ochroleucus-SE	**pale vetchling-SE**	*Lupinus perennis*	wild lupine
Lathyrus palustris	marsh vetchling	***Luzula acuminata-SE***	**hairy wood rush-SE**
Lechea intermedia-SE	**pinweed-SE**	***Lycopodium clavatum-SE***	**running pine-SE**
Lechea pulchella	pretty pinweed	***Lycopodium dendroideum-SE***	**ground pine-SE**
Lechea stricta	bushy pinweed	*Lycopodium lucidulum*	shining club-moss
Lechea tenuifolia	narrow-leaved pinweed	*Lycopus americanus*	common water horehound
Lechea villosa	pinweed	*Lycopus rubellus*	stalked water horehound
Leersia oryzoides	rice cut grass	*Lycopus uniflorus*	nothern bugle weed
Leersia virginica	white grass	*Lycopus virginicus*	bugle weed
Lemna minor	small duckweed	*Lysimachia ciliata*	fringed loosestrife
Lemna perpusilla	least duckweed	*Lysimachia lanceolata*	lance-leaved loosestrife
Lemna trisulca	duckweed	*Lysimachia quadriflolia*	whorled loosestrife
*Leonurus cardiaca**	motherwort*	*Lysimachia quadriflora*	narrow-leaved loosestrife
*Lepidium campestre**	field cress*	*Lysimachia terrestris*	swamp candles
*Lepidium densiflorum**	small peppergrass*	*Lythrum alatum*	winged loosestrife
*Lepidium virginicum**	common peppergrass*	*Lythrum salicaria*	purple loosestrife
Leptoloma cognatum	fall witch grass	*Maianthemum canadense*	Canada mayflower
Lespedeza capitata	round-headed bush clover	*Malus coronaria*	wild sweet crab
Lespedeza violacea	violet bush-clover	*Malus ioensis*	Iowa crab
*Leucanthemum vulgare**	ox-eye daisy*	*Malus pumila**	apple*
Liatris aspera	rough blazing star	*Malva neglecta**	cheeses*
Liatris cylindracea	cylindrical blazing star	*Matricaria matricarioides**	pineapple weed*
Lilium michiganense	Michigan lily	*Matteuccia struthiopteris*	ostrich fern
Lilium philadelphicum	wood lily	*Medicago lupulina**	black medic*
Linaria canadensis	blue toadflax	*Medicago sativa**	alfalfa*
*Linaria vulgaris**	butter-and-eggs*	*Melilotus alba**	white sweet clover*
Lindera benzoin	spicebush	*Melilotus officinalis**	yellow sweet clover*
Lindernia dubia	false pimpernel	*Menispermum canadense*	moonseed
Linum sulcatum	grooved yellow flax	*Mentha arvensis*	field mint
*Linum usitatissimum**	common flax*	*Mentha piperita**	peppermint*
Liparis liliifolia	purple twayblade	*Mertensia virginica*	Virginia bluebells
Liparis loeselii	green twayblade	***Microseris cuspidata-SE***	**prairie dandelion-SE**
Lithospermum canescens	hoary puccoon	***Mimulus glabratus-SE***	**yellow monkey flower-SE**
Lithospermum carolinense	sand puccoon	*Mimulus ringens*	monkey flower
Lithospermum incisum	fringed puccoon	*Minuartia michauxii*	slenderwort
Lithospermum latifolium	American cromwell	***Mirabilis hirsuta-SE***	**hairy umbrella wort-SE**
Lobelia cardinalis	cardinal flower	*Mirabilis nyctaginea**	wild four o'clock*
Lobelia inflata	Indian tobacco	*Miscanthus sacchariflorus**	silver grass*
Lobelia siphilitica	great blue lobelia	*Mitella diphylla*	bishop's cap
Lobelia spicata	pale spiked lobelia	*Moehringia laterifolia*	sandwort
*Lolium perenne**	perennial rye grass*	*Mollugo verticillata**	carpet weed*
*Lonicera maakii**	bush honeysuckle*	*Monarda fistulosa*	wild bergamot
Lonicera dioica	honeysuckle	*Monarda punctata*	horsemint

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]	Scientific Name[1,2]	Common Name[1,2]
Monotropa uniflora	Indian pipe	*Panicum leibergii*	prairie panic grass
*Morus alba**	white mulberry*	*Panicum linearifolium*	slender-leaved panic grass
Morus rubra	red mulberry	*Panicum meridionale*	panic grass
Muhlenbergia frondosa	common satin grass	*Panicum oligosanthes*	panic grass
Muhlenbergia glomerata	muhly grass	*Panicum villosissimum*	white-haired panic grass
Muhlenbergia mexicana	leafy satin grass	*Panicum virgatum*	prairie switch grass
Muhlenbergia racemosa	muhly grass	*Panicum wilcoxianum*	Wilcox's panic grass
Muhlenbergia schreberi	nimblewill	*Parietaria pensylvanica*	Pennsylvania pellitory
Muhlenbergia sobolifera	rock satin grass	*Paronychia canadensis*	forked chickweed
Muhlenbergia sylvatica	woodland satin grass	*Paronychia fasitgiata*	forked chickweed
Myosotis scorpioides	common forget-me-not	*Parthenium integrifolium*	wild quinine
*Myosoton aquaticum**	water chickweed*	*Parthenocissus quinquefolia*	Virginia creeper
*Myriophyllum spicatum**	European watermilfoil*	*Parthenocissus vitacea*	Thicket creeper
Najas guadalupensis	southern naiad	*Paspalum bushii*	Hairy bead grass
Najas minor	lesser naiad	*Paspalum ciliatifolium*	bead grass
Napaea dioica	glade mallow	*Pastinaca sativa**	wild parsnip*
*Nasturtium officinale**	water cress*	*Pedicularis canadensis*	wood betony
Nelumbo lutea	American lotus	*Pedicularis lanceolata*	lousewort
*Nepeta cataria**	catnip*	*Pellaea atropurpurea*	purple cliff brake
Nymphaea odorata	fragrant water lily	*Pellaea glabella*	purple cliff brake
Oenothera biennis	evening primrose	*Penstemon digitalis*	foxglove beard tongue
Oenothera rhombipetala	sand evening primrose	***Penstemon grandiflorus-SE***	**large-flowered beard tongue-SE**
Oneothera laciniata	ragged evening primrose	*Penstemon pallidus*	pale beard tongue
Onoclea sensibilis	sensitive fern	*Penthorum sedoides*	ditch stonecrop
Onosmodium hispidissimum	marbleseed	*Petalostemum candida*	white prairie clover
Onosmodium occidentale	marbleseed	*Petalostemum purpurem*	purple prairie clover
Ophioglossum pusillum	northern adder's tongue	*Phalaris arundinacea**	reed canary grass*
Opuntia fragilis-SE	**fragile prickly pear-SE**	*Phegopteris hexagonoptera*	broad beech fern
Opuntia humifusa	eastern prickly-pear	*Phleum pratense**	timothy*
Opuntia macrorhiza	plains prickly-pear	*Phlox divaricata*	blue phlox
*Ornithogalum umbellatum**	Star-of-Bethlehem*	*Phlox paniculata**	garden phlox*
Orobanche fasciculata-SE	**clustered broomrape-SE**	*Phlox pilosa*	sand prairie phlox
Orobanche ludoviciana-SE	**southern broom rape-SE**	*Phragmites australis**	common reed*
Orobanche uniflora	broomrape	*Phryma leptostachya*	lopseed
Oryzopsis racemosa-ST	**black-seeded rice grass-ST**	*Phyla lanceolata*	fog-fruit
		Physalis heterophylla	clammy ground cherry
Osmorhiza claytonii	hairy sweet cicely	*Physalis longifolia*	tall ground cherry
Osmorhiza longistylis	anise root	*Physalis virginiana*	lance-leaved ground cherry
Osmunda claytoniana	interrupted fern	*Physocarpus opulifolius*	common ninebark
Ostrya virginiana	hop hornbeam	*Physostegia virginiana*	obedient plant
Oxalis dillenii	common wood sorrel	*Phytolacca americana*	pokeweed
Oxalis stricta	tall wood sorrel	*Pilea pumila*	Canada clearweed
Oxalis violacea	violet wood sorrel	*Pinus banksiana**	jack pine*
Panax quinguefolia	Ginseng	*Pinus resinosa**	red pine*
Panicum capillare	old witch grass	*Pinus strobus*	white pine
Panicum clandestinum	deer-tongue grass	*Plantago aristata*	plantain
Panicum depauperatum	starved panic grass	*Plantago lanceolata**	English plantain*
*Panicum dichotomiflorum**	fall panicum*	*Plantago patagonica*	plantain
Panicum lanuginosum	panic grass	*Plantago rugelii**	red-stalked plantain*
Panicum latifolium	broad-leaved panic grass	*Plantago virginiana*	dwarf plantain

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Platanthera dilatata	tall white orchid
Platanthera luecophaea-SE, FT	**white prairie fringed orchid-SE, FT**
Platanus occidentalis	sycamore
*Platycodon grandiflorum**	ballon flower*
*Poa annua **	annual bluegrass*
*Poa compressa**	Canadian blue grass*
Poa languida-SE	**weak bluegrass-SE**
*Poa palustris**	fowl bluegrass*
*Poa pratensis**	Kentucky blue grass *
Poa sylvestris	woodland bluegrass
*Poa trivalis**	rough-stalked bluegrass*
Podophyllum peltatum	may apple
Poinsetta dentata	wild poinsetta
Polanisia dodecandra	clammy weed
Polanisia jamesii-SE	**James' clammy weed-SE**
Polemonium reptans	Jacob's ladder
Polygala incarnata-SE	**pink milkwort-SE**
Polygala polygama	purple milkwort
Polygala sanguinea	pink milkwort
Polygala senega	seneca snakeroot
Polygala verticillata	whorled milkwort
Polygonatum commutatum	Solomon's seal
Polygonella articulata	jointweed
Polygonum amphibium	water knotweed
*Polygonum aviculare**	common knotweed*
*Polygonum cespitosum**	smartweed*
*Polygonum convolvulus**	black birdweed*
*Polygonum hydropiper**	water pepper*
Polygonum lapathifolium	curttop lady's thumb
Polygonum pensylvanicum	pinkweed
*Polygonum persicaria**	lady's thumb*
Polygonum punctatum	smartweed
Polygonum ramosissimum	bushy knotweed
Polygonum sagittatum	arrow-leaved tearthumb
Polygonum scandens	climbing false buckwheat
Polygonum tenue	slender knotweed
Polygonum virginianum	Virginia knotweed
Polymnia canadensis	pale leafcup
Polystichum acrostichoides	Christmas fern
Pontederia cordata	pickerelweed
*Populus alba**	white poplar*
Populus deltoides	eastern cottonwood
Populus grandidentata	big-tooth aspen
Populus tremuloides	quaking aspen
*Portulaca oleracea**	common purslane*
*Potamogeton crispus**	curly pondweed*
Potamogeton foliosus	leafy pondweed
Potamogeton nodosus	American pondweed
Potamogeton pectinatus	comb pondweed
Potamogeton pusillus	slender pondweed
Potentilla argentea	silvery cinquefoil
Potentilla arguta	prairie cinquefoil
Potentilla fruticosa	shrubby cinquefoil
Potentilla inclinata	hoary cinquefoil
Potentilla norvegica	rough cinquefoil
*Potentilla recta**	sulfur cinquefoil*
Potentilla simplex	common cinquefoil
Prenanthes alba	lion's foot
Prenanthes crepidinea	great white lettuce
Prenanthes racemosa	glaucous white lettuce
Primula mistassinica-SE	**bird's-eye primrose-SE**
*Prunella vulgaris**	lawn prunella*
Prunus americana	American plum
*Prunus avium**	sweet cherry*
*Prunus hortulana**	wild goose plum*
Prunus nigra	Canada plum
Prunus serotina	wild black cherry
Prunus susquehanae	sand cherry
Prunus virginiana	common choke cherry
Ptelea trifoliata	wafer ash
Pteridium aquilinum	bracken fern
Pulsatilla patens	pasque flower
Pycnanthemum tenuifolium	slender mountain mint
Pycnanthemum verticillatum	hariy mountain mint
Pycnanthemum virginianum	mountain mint
Pyrola elliptica	large-leaved shinleaf
*Pyrus communis**	pear*
Quercus alba	white oak
Quercus bicolor	swamp white oak
Quercus ellipsoidalis	Hill's oak
Quercus macrocarpa	burr oak
Quercus muhlenbergii	yellow chestnut oak
Quercus palustris	pin oak
Quercus rubra	northern red oak
Quercus velutina	black oak
Ranunculus abortivus	little-leaf buttercup
Ranunculus fascicularis	early buttercup
Ranunculus hispidus	rough buttercup
Ranunculus pensylvanicus	bristly crowfoot
Ranunculus recurvatus	hooked buttercup
Ranunculus rhomboides	prairie buttercup
Ranunculus sceleratus	cursed crowfoot
Ranunculus septenrionalis	swamp buttercup
Ratibida pinnata	yellow coneflower
*Rhamnus cathartica**	common buckthorn*
Rhamnus lanceolata	lance-leaved buckthorn
Rhus aromatica	aromatic sumac
Rhus copallina	dwarf sumac
Rhus glabra	smooth sumac

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]	Scientific Name[1,2]	Common Name[1,2]
Rhus typhina	staghorn sumac	*Sanicula canadensis*	Canadian black snakeroot
Ribes americanum	wild black current	*Sanicula marilandica*	black snakeroot
Ribes cynosbati	prickly wild gooseberry	*Sanicula odorata*	common snakeroot
Ribes missouriense	Missouri gooseberry	*Sanicula trifoliata*	beaked black snakeroot
*Ribes rubrum**	red current*	*Saponaria officinalis**	bouncing bet*
Robinia pseudoacacia	black locust	*Saxifraga pensylvanica*	swamp saxifrage
*Robinia viscosa**	clammy locust*	***Schizachne purpurascens-SE***	**false melic grass-SE**
Rorippa palustris	marsh yellow cress	*Schizachyrium scoparium*	little bluestem
Rorippa sessiliflora	sessile-flowered cress	*Scirpus acutus*	heard-stemmed bulrush
Rorippa sylvestris	creeping yellow cress	*Scirpus atrovirens*	dark green rush
Rosa acicularis-SE	**prickly rose-SE**	*Scirpus cyperinus*	wool grass
Rosa arkansana	Arkansas rose	*Scirpus tabernaemontanii*	great bulrush
Rosa blanda	early wild rose	*Scleria triglomerata*	tall nut grass
Rosa carolina	pasture rose	*Scirpus fluviatilis*	river bulrush
*Rosa multiflora**	multiflora rose*	*Scirpus validus*	soft-stemmed rush
Rosa suffulta	sunshine rose	*Scrophularia lanceolata*	early figwort
Rotala ramosior	wheelwort	*Scrophularia marilandica*	late figwort
Rubus allegheniensis	common blackberry	*Scutellaria galericulata*	marsh skullcap
Rubus argutus	blackberry	*Scutellaria lateriflora*	mad-dog skullcap
Rubus flagellaris	common dewberry	*Scutellaria ovata*	heart-leaved skullcap
*Rubus idaeus**	cultivated raspberry*	*Scutellaria parvula*	small skullcap
Rubus occidentalis	black raspberry	*Secale cereale**	rye*
Rubus strigosus	red raspberry	*Selaginella rupestris*	rock selaginella
Rudbeckia hirta	black-eyed Susan	*Senecio aureus*	golden ragwort
Rudbeckia laciniata	wild golden glow	*Senecio pauperculus*	balsam ragwort
Rudbeckia subtomentosa	sweet black-eyed Susan	*Senecio plattensis*	prairie ragwort
Rudbeckia triloba	brown-eyed Susan	*Senna marilandica*	wild senna
Ruellia humilis	hairy ruellia	*Setaria faberii**	giant foxtail*
*Rumex acetosella**	field sorrel*	*Setaria glauca**	pigeon grass*
Rumex altissimus	pale dock	*Setaria viridis**	green foxtail*
*Rumex crispus**	curly dock*	*Sicyos angulatus*	bur cucumber
Rumex verticillatus	swamp dock	*Silene antirrhina*	sleepy catchfly
Sagittaria brevirostra	short-beaked arrowleaf	*Silene cserei**	glaucous campion*
Sagittaria latifolia	common arrowhead	*Silene nivea*	snowy campion
*Salix alba**	white willow*	*Silene stellata*	starry campion
Salix amygdaloides	peach-leaved willow	*Silphium integrifolium*	rosinweed
*Salix baylonica**	weeping willow*	*Silphium laciniatum*	compass plant
Salix bebbiana	beaked willow	*Silphium perfoliatum*	cup plant
*Salix eriocephala**	heart-leaved willow*	*Sisymbrium altissimum**	tumble mustard*
Salix exigua	sandbar willow	*Sisymbrium loeselii*	tall hedge mustard
*Salix fragilis**	crack willow*	*Sisymbrium officinale**	hedge mustard*
Salix humilis	prairie willow	*Sisyrinchium albidum*	blue-eyed grass
Salix nigra	black willow	*Sisyrinchium angustifolium*	blue-eyed grass
Salix petiolaris	meadow willow	*Sisyrinchium campestre*	prairie blue-eyed grass
Salix sericea	silky willow	*Sium suave*	water parsnip
*Salsola collina**	saltwort*	*Smilacina racemosa*	feathery false Solomon's seal
Salvia azurea ssp. pitcheri-ST	**blue sage-ST**	*Smilacina stellata*	starry false Solomon's seal
*Salvia reflexa**	rocky mountain sage*	*Smilax ecirrata*	carrion flower
Sambucus canadensis	common elder	*Smilax hispida*	bristly green brier
Sanguinaria canadensis	bloodroot	*Smilax lasioneuron*	common carrion flower

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Solanum carolinense	horse nettle
*Solanum cornutum**	buffalo-burr*
*Solanum dulcamara**	bittersweet nightshade*
Solanum ptycanthum	black nightshade
Solidago canadensis	Canada goldenrod
Solidago flexicaulis	broad-leaved goldenrod
Solidago gigantea	late goldenrod
Solidago hispida	hairy goldenrod
Solidago juncea	early goldenrod
Solidago missouriensis	Missouri goldenrod
Solidago nemoralis	old field goldenrod
Solidago ptarmicoides	stiff aster
Solidago rigida	rigid goldenrod
Solidago sciaphila-ST	**cliff goldenrod-ST**
Solidago speciosa	showy goldenrod
Solidago ulmifolia	elm-leaved goldenrod
*Sorbus aucuparia**	European mountain ash*
Sorghastrum nutans	Indian grass
*Sorghum bicolor**	sorghum*
Sparganium eurycarpum	common bur reed
Spartina pectinata	prairie cord grass
Spermolepis inermis	smooth scaleseed
Sphenopholis obtusata	prairie wedge grass
Spiraea alba	meadow -sweet
Spiranthes cernua	ladies tresses
Spiranthes lacera	slender ladies' tresses
Spiranthes magnicamporum	Great Plaines ladies' tresses
Spirodela polyrhiza	great duckweed
Sporobolus asper	rough dropseed
Sporobolus cryptandrus	sand dropseed
Sporobolus heterolepis	northern drop seed
Sporobolus vaginiflorus	northern rush grass
Stachys aspera	rough hedge nettle
Stachys hispida	hispid hedge nettle
Stachys palustris	woundwort
Stachys tenuifolia	smooth hedge nettle
Staphylea trifolia	bladdernut
Stellaria graminea	common stichwort
*Stellaria media**	common chickweed*
Stipa spartea	porcupine grass
Strophostyles helvula	wild bean
Strophostyles leiosperma	small wild bean
Sullivantia renifolia-ST	**sullivantia-ST**
Symphoricarpos albus var. albus-SE	**snowberry-SE**
Symphoricarpos occidentalis	wolfberry
Symphoricarpos orbiculatus	coral berry
Symplocarpus foetidus	skunk cabbage
*Syringa vulgaris**	lilac*
Taenidia integerrima	yellow pimpernel
Talinum rugospermum	fame flower
*Taraxacum laevigatum**	red-seeded dandelion*
*Taraxacum officinale**	common dandelion*
Taxus canadensis	Canada yew
Tephrosia virginiana	goat's rue
Teucrium canadense	germander
*Thalictrum thalictroides**	rue anemone*
Thalictrum dasycarpum	purple meadow rue
Thalictrum dioicum	early meadow rue
Thaspium barbinode	meadow parsnip
Thelypteris palustris	marsh fern
*Thlaspi arvense**	field penny cress*
*Thuja occidentalis**	arbor vitae*
Tilia americana	American linden
Tomanthera auriculata	ear-leaved false foxglove
Toxicodendron radicans	poison ivy
Tradescantia ohiensis	common spiderwort
*Tragopogon dubius**	sand goat's beard*
Trichostema brachiatum	false pennyroyal
Tridens flavus	purpletop
*Trifolium arvense**	rabbit-foot clover*
*Trifolium campestre**	low hop clover*
*Trifolium dubium**	little hop clover*
*Trifolium hybridum**	alsike clover*
*Trifolium pratense**	red clover*
*Trifolium repens**	white clover*
Trilium recurvatum	red trillium
Trillium erectum-SE	**ill-scented trillium-SE**
Trillium flexipes	declined trillium
Trillium grandiflorum	large white trillium
Trillium nivale	snow trillium
Triodanis perfoliata	Venus's looking glass
Triosteum aurantiacum	early horse gentian
Triosteum perfoliatum	late horse gentian
Triphora trianthophora	nodding pogonia
Triplasis purpurea	purple sandgrass
*Typha angustifolia**	narrow-leaved cattail*
Typha latifolia	broad-leaved cattail
Ulmus americana	American elm
*Ulmus pumila**	Siberian elm*
Ulmus rubra	slippery elm
Ulmus thomasii-SE	**rock elm-SE**
Urtica dioica	tall nettle
Uvularia grandiflora	bellwort
Valeriana edulis	valeriana
Vallisneria americana	eel grass
*Verbascum blattaria**	moth mullein*
*Verbascum thapsus**	woolly mullein*
Verbena bracteata	creeping vervain

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]	Scientific Name[1,2]	Common Name[1,2]
Verbena hastata	blue vervain	*Viola pedatifida*	prairie violet
Verbena stricta	hoary vervain	*Viola pratincola*	violet
Verbena urticifolia	white vervain	*Viola pubescens*	downy yellow violet
Vernonia fasciculata	common ironweed	*Viola rafinesquii**	Johnny-jump-up*
*Veronica arvensis**	corn speedwell*	*Viola sagittata*	arrow-leaved violet
*Veronica dillenii**	speedwell*	*Viola sororia*	woolly blue violet
Veronica peregrina	purslane speedwell	*Vitis aestivalis*	summer grape
*Veronica serpyllifolia**	thyme-leaved speedwell*	*Vitis riparia*	riverbank grape
Veronicastrum virginicum	culver's root	*Vitis vulpina*	frost grape
Viburnum dentatum	arrow-wood	*Vulpia octoflora*	six weeks fescue
Viburnum lentago	nannyberry	*Wolffia columbiana*	water meal
*Viburnum opulus**	highbush cranberry*	*Woodsia obtusa*	common wood fern
Viburnum prunifolium	black haw	*Xanthium strumarium*	cocklebur
Viburnum rafinesquianum	downy arrowwood	*Zannichellia palustris*	horned pondweed
*Vicia villiosa**	winter vetch*	*Zanthoxylum americanum*	prickly ash
Viola canadensis-SE	**Canada violet-SE**	*Zea mays**	corn*
Viola incognita-SE	**white violet-SE**	***Zigadenus glaucus-SE***	**white camass-SE**
Viola obliqua	Marsh blue violet	*Zizia aptera*	heart-leaved parsnip
Viola pedata	bird's foot violet	*Zizia aurea*	golden Alexanders

[1] Bold type indicates an Illinois endangered (SE), Illinois threatened (ST), and/or federally threatened (FT) species.

[2] * = introduced species