



Volume 3

Living Resources

UPPER ROCK RIVER AREA ASSESSMENT



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VOLUME 3: LIVING RESOURCES

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About This Report

The *Upper Rock River Area Assessment*, part of a series of statewide regional assessments, examines approximately 830 square miles in northern Illinois. The report provides information on the natural and human resources of the area as a basis for managing and improving its ecosystems. The development of ecosystem-based information and management programs in Illinois are the result of three processes — the Critical Trends Assessment Program, Conservation Congress, and Water Resources and Land Use Priorities Task Force.

Background

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

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

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

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

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

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

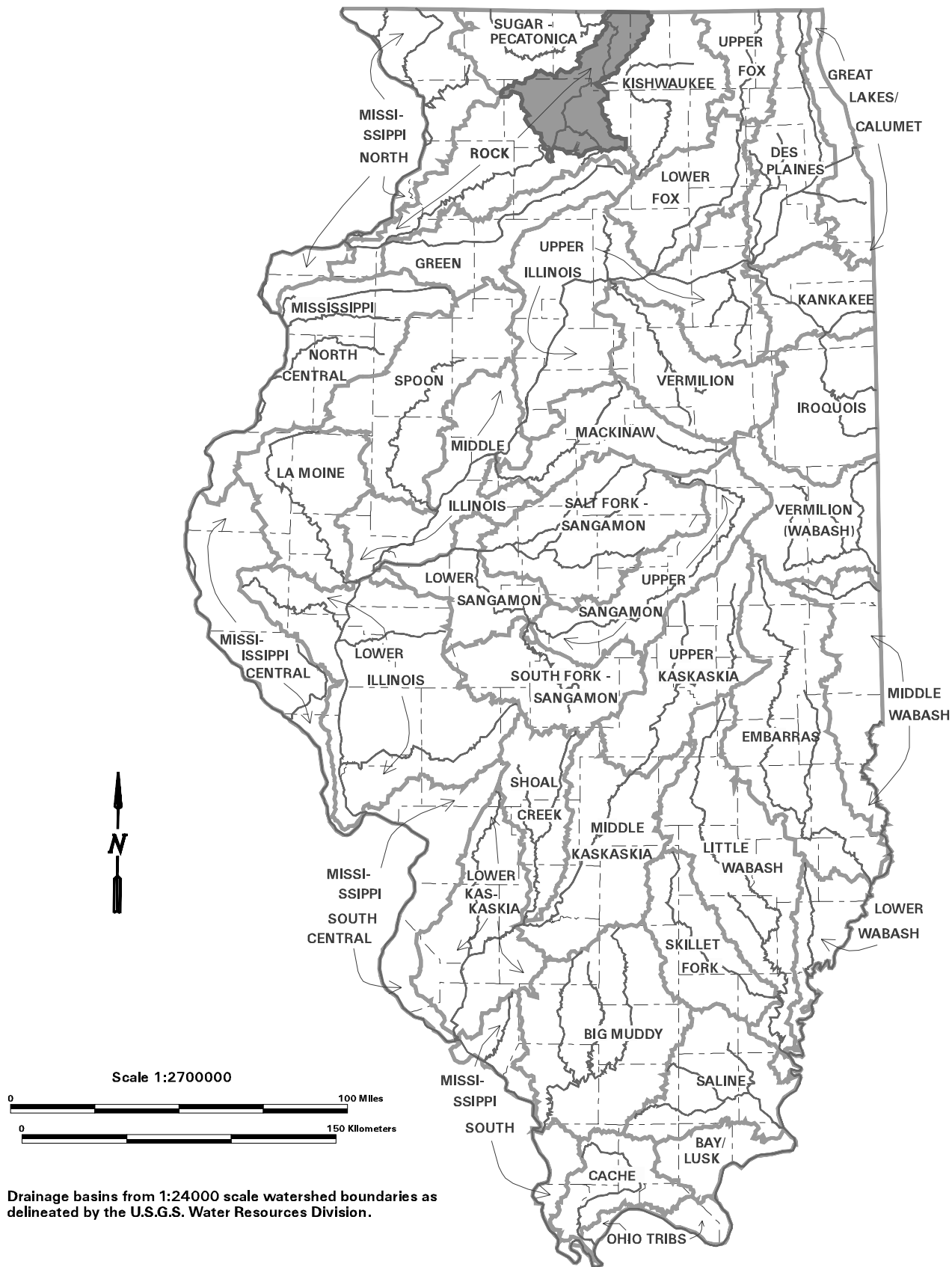
From the three initiatives was born Conservation 2000, a program designed to reverse ecosystem degradation, primarily through the Ecosystems Program, a cooperative process of public-private partnerships that merge natural resource stewardship with economic and recreational development. To achieve this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

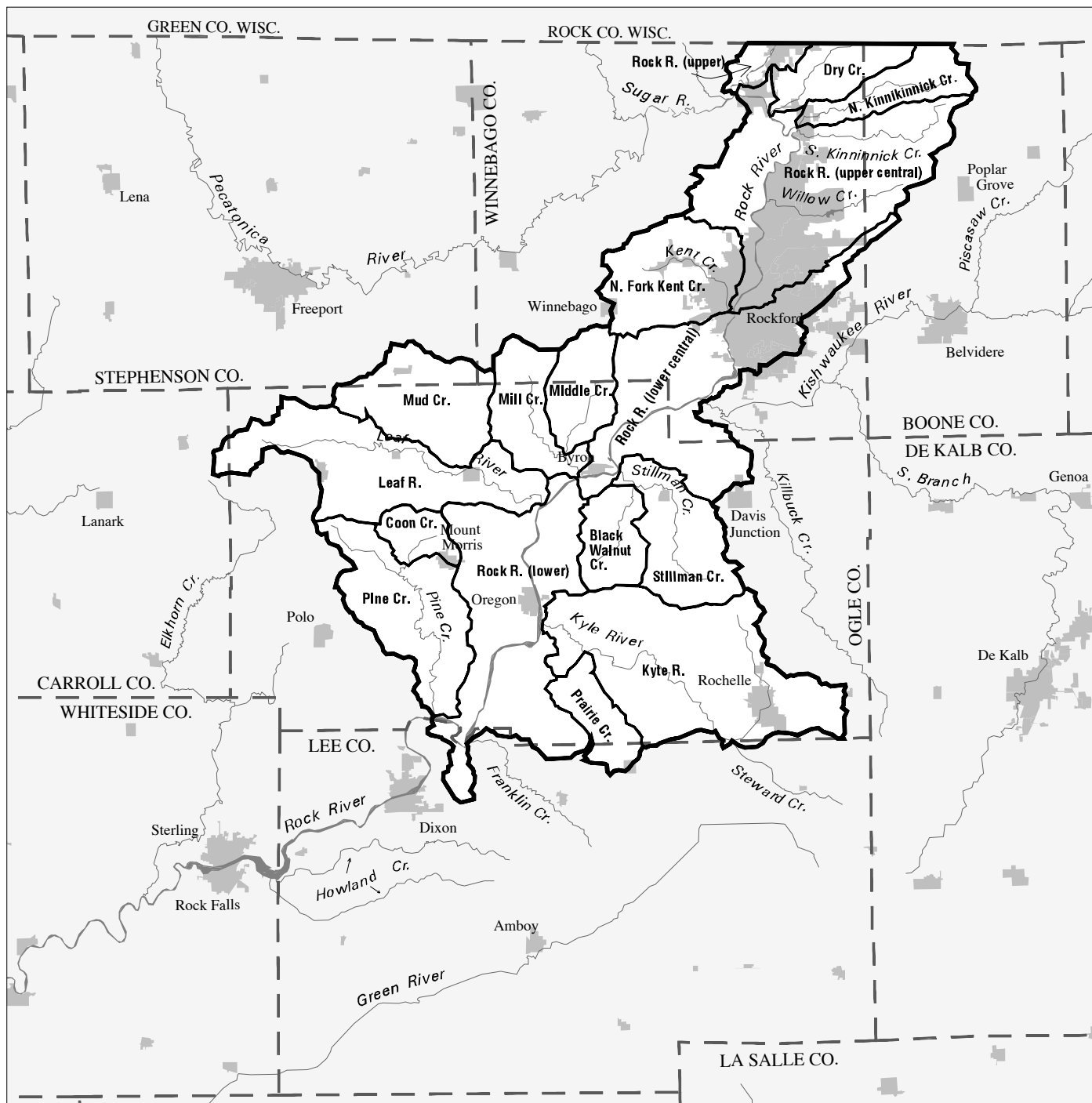
At the same time, CTAP identified 30 Resource Rich Areas (RRAs) throughout the state. In RRAs and other areas where Ecosystem Partnerships have been formed, CTAP is providing an assessment of the area, drawing from ecological and socio-economic databases to give an overview of the region's resources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

Upper Rock River Assessment Area

The Upper Rock River Assessment Area is defined by that portion of the Rock River watershed downstream from the Illinois-Wisconsin state line to the Rock River's confluence with Pine Creek near Grand Detour. The area falls predominantly within Winnebago and Ogle counties, with small areas in four additional counties — Boone, Carroll, Lee, and Stephenson. Encompassing approximately 830 square miles, the Upper Rock River area is located almost entirely within the physiographic division defined as the Rock River Hill Country. This division has been glaciated, but the glacial deposition is relatively thin, particularly for the western portion of the area. The topography is characterized by rolling hills and well-developed stream valleys.

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





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

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Introduction

Information current as of August 2000

Physiographic Characteristics and Natural Divisions

The Upper Rock River Assessment Area (URRAA) is an approximately 829.6-mile² (530,958 acres) contiguous area located mainly in Ogle and Winnebago counties (327,619 and 152,785 acres, respectively). Small portions of the assessment area are contained in southeast Stephenson, Carroll, northern Lee, and northwest Boone counties (7,763; 1,041; 9,076; 32,612 acres, respectively). This assessment area is the drainage of the upper Rock River bordered to the north by Wisconsin and to the south by the separation of the “lower Rock River” drainage from the upper (Figures 1 & 2).

The highest elevation in the area is 306 meters (1,004 ft.) at the northern tip of Boone county and at the western edge of the Ogle-Carroll County line. The lowest elevation is 201 m (660 ft.) in the Rock River floodplain at the Ogle-Lee County line. The area generally is characterized by rolling topography. The URRAA occurs in the Till Plains Section of the Central Lowland Province of the Interior Plains Physiographic Division (Leighton et al., 1948). The landscape tends to have greater maximum elevations, topographic relief, and river dissection west of the Rock River because of longer periods of stream erosion. Within this broad region that encompasses most of the Midwest, the URRAA contains portions within three natural divisions (Figure 3) as described by Schwegman et al. (1973). Most of the URRAA lies within the Rock River Hill Country Natural Division which is distinct from its unglaciated western border and its twice-glaciated eastern border. This division is subdivided into two sections (Table 1, Figure 3); the Freeport Section (about 58% of the URRAA), and the Oregon Section (about 15%).

The Rock River Hill Country Natural Division is characterized by rolling glaciated topography. Prairie formerly occupied the larger expanses of uplands and forests were equally abundant along water courses. The bedrock of this region is of dolomite and limestone, with outcrops commonly occurring, particularly along streams. St. Peter's sandstone crops out frequently as it underlies the Oregon Section of the natural division. The area contains many “dells”, which are bluffs along streams throughout the division. The Oregon Section occurs in south central Ogle County and is more rugged than the rest of the division, with ridges, bluffs, and ravines in the sandstone (Berg 1996). Several unique plant species are associated with the sandstone occurring in this section including some northern relicts (Schwegman et al 1973).

About 20 percent of the URRAA lies within the of the Winnebago Drift Section of the Northeastern Morainal Natural Division (Table 1). This division encompasses the northern quarter of the URRAA. The distinguishing characteristics for this natural division in the URRAA follow. Glacial landforms are common and prominent. Moraines, kames, and eskers occur throughout the division. For example, a complex of kames, eskers, and kame

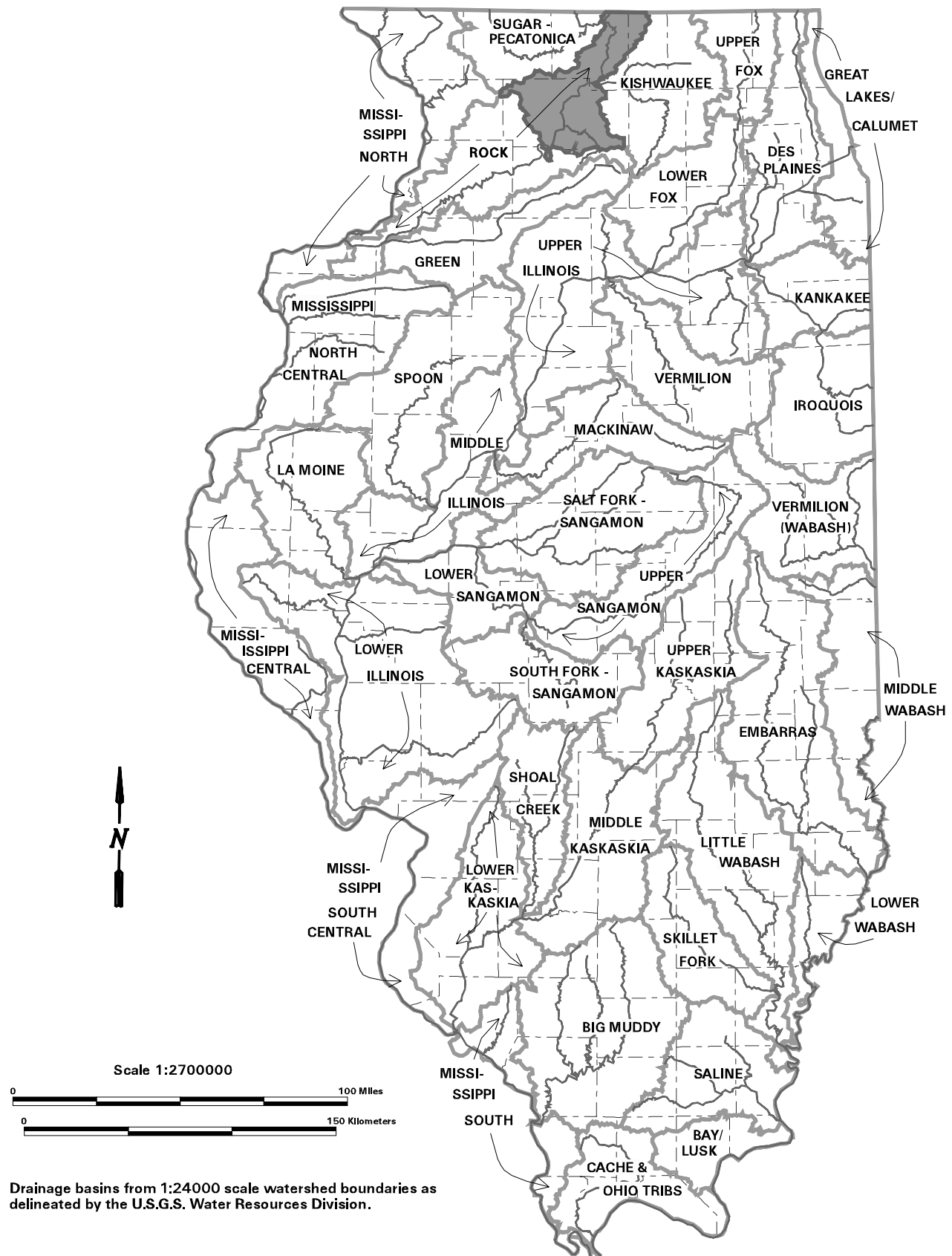


Figure 1. Major drainage basins of Illinois and location of the Upper Rock River Assessment Area

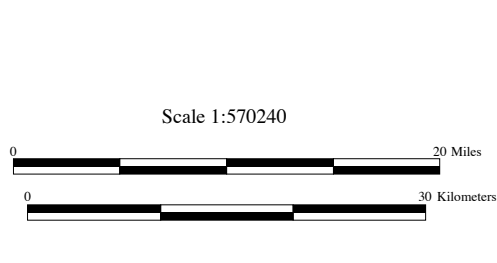
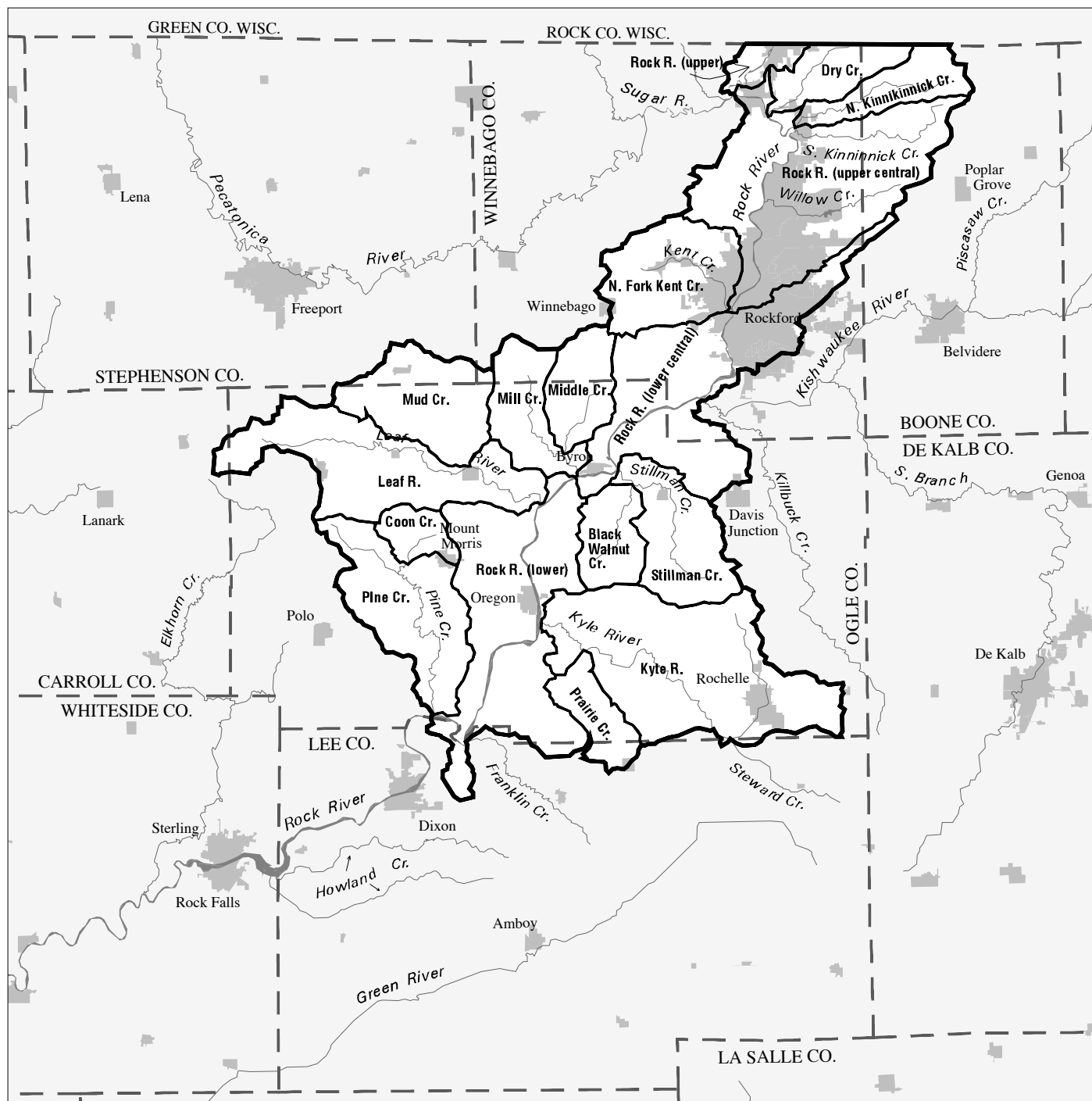


Figure 2. Subbasins in the Upper Rock River Assessment Area. Subbasin boundaries depicted are those determined by the Illinois Environmental Protection Agency.

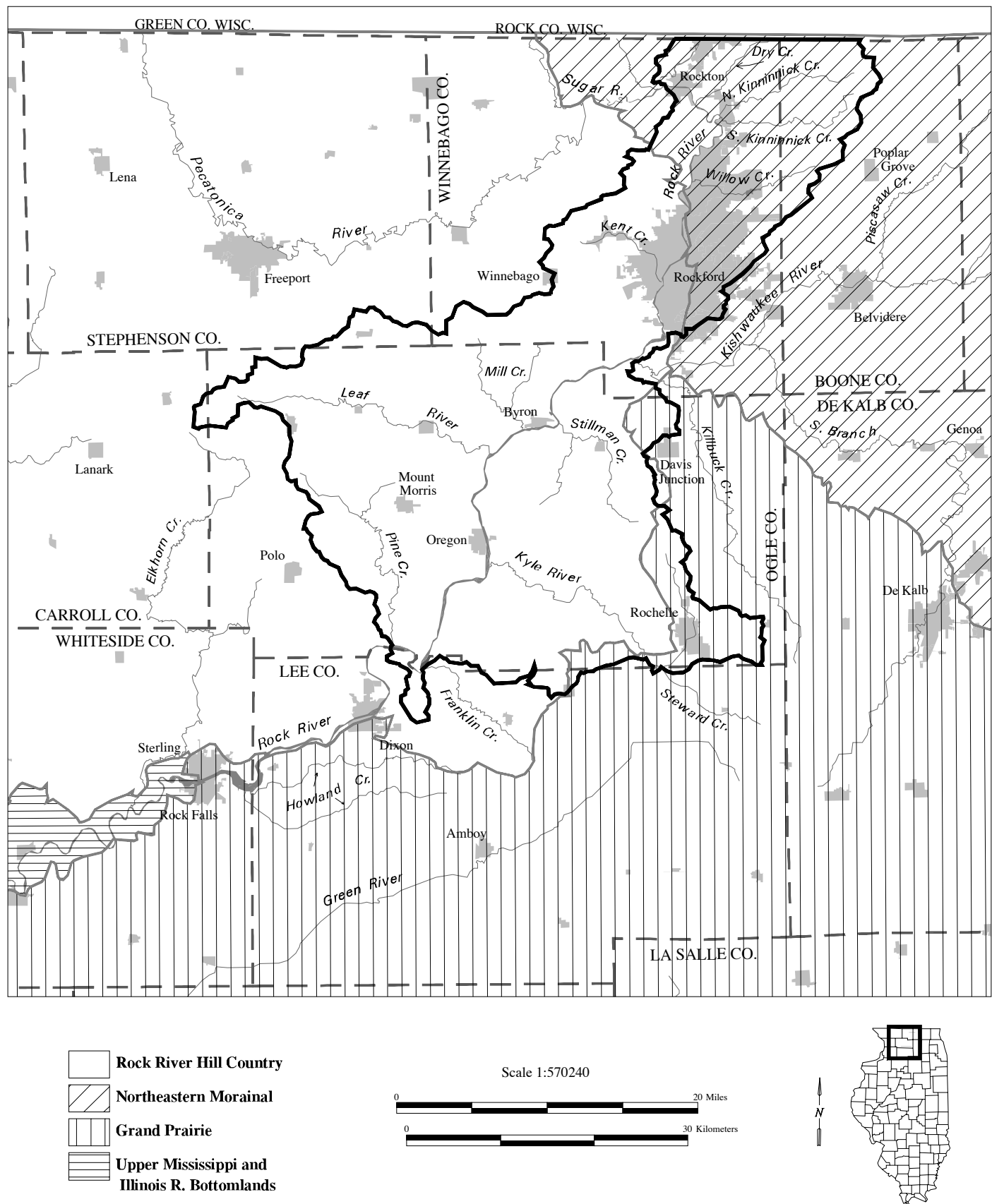


Figure 3. Natural Divisions in the Upper Rock River Assessment Area based on the classification developed by Schwegman et al. (1973).

terrace deposits form rolling hills and ridges in southeastern Winnebago County (Masters 1984). Glacial outwash is extensive along many of the creeks and rivers. Unlike most of Illinois, some of the soils are derived from glacial drift rather than loess. The original vegetation was predominantly prairie, with oak openings, dry upland forest, and floodplain forests. Large areas of sand dunes historically were present east of the Sugar River in Winnebago County which supported sand prairie vegetation and dry upland forest of black oak and Hill's oak. Another distinctive feature of the section were the extensive gravel hill prairies which once extended along the eroded eastern bluffs of the Rock River valley into Wisconsin. These prairies contained (and some still do) many western floral elements including pasque flower, plains buttercup, and prairie smoke (Schwegman et al 1973).

The Grand Prairie Section of the Grand Prairie Natural Division encompasses about 7 percent of the URRRA in south-eastern Ogle County. Two glacial episodes and their till formed this plain. The bedrock generally is buried deeply by till, with young fertile soil high in organic matter. This vast plain formerly was occupied primarily by mesic black soil tall-grass prairie. Natural drainage was poor, resulting in many marshes and prairie potholes. Forests bordered the rivers and were occasional as groves on moraines and other glacial landforms (Schwegman et al. 1973).

Table 1. Natural Divisions and Acreages occurring in the Upper Rock River Assessment Area

Division & Section	Acres
Rock River Hill Country/Freeport Section	308,747.57
Rock River Hill Country/Oregon Section	82,003.61
Northeastern Morainal/Winnebago Drift Section	105,840.74
Grand Prairie/Grand Prairie Section	34,369.54
Total:	530,961.46

Climate¹

The climate in the Upper Rock River Area Assessment is typical of many continental locations, in that there are rather wide temperature fluctuations. The average high temperatures (°F) in the summer are in the 80s with average lows in the 60s. Winter highs are generally in the 30s with lows in the teens. Record temperature extremes range from -27°F to a high of 112°F. There is an average of 5 months without frost each year.

Precipitation is highest during April through September (averages of 3.65 to 4.52 inches per month) and lowest in January (1.28 inches), and February (1.14 inches), with a yearly average of 36.28 inches.

¹ Information in this section has been taken from the Upper Rock River Area Assessment Volume 2 (Illinois Department of Natural Resources 2001). See that volume for a more detailed discussion of climate patterns and long-term trends in the URRRA.

Surficial Geology and Soils

The URRAA is characterized by surficial glacial features deposited over bedrock from three different glacial periods or substages. The earliest dates back to the Illinoian stage (which produced the Illinoian glacial lobe). In the URRAA, a ground moraine from this lobe covers the western half of Ogle County (Willman and Frye 1970). This till is generally sandy-silty with some interstratification of sand and gravel. It is generally less than 20 feet thick, rests directly on bedrock, is not calcareous, and is extensively eroded because it is older than Wisconsinian till. Sangamon Soil from the interglacial period developed on top of it, with Wisconsinian aged windblown loess of 100-150 inches overlain of top of that (Willman et al. 1975).

Boone, Winnebago, and north-central Ogle counties are covered by till from the substage which occurred at the beginning of the Wisconsinian glaciation episode, these deposits are referred to as the Winnebago formation (Willman and Frye 1970, see Hansel and Johnson 1996 for updated classifications). The till is exceptionally sandy, pinkish-tan or salmon colored, massive and calcareous. It overlies unnamed silts and tills of the Winnebago formation. These are generally overlain by 50-100 inches of windblown loess.

The youngest glacial deposits in the URRAA are found throughout the south and eastern halves of Ogle County. This Wisconsinian-aged till rarely exceeds 25 ft thick. The upper part is silty and the lower is clayey. It is calcareous and its clay mineral content is exceptionally high in illite. It overlies loess and older Winnebago till. It is overlain by 50-100 inches of Richland loess. Richland loess is a massive tan silt that is calcareous below the leached zone of current soil and is locally fossiliferous (Willman and Frye 1975).

Throughout the URRAA, the glacial sediments and bedrock are overlain predominantly by either fine-grained silts and clays (from glacial lakes or modern river sediments[alluvium]), or wind-blown deposits (Peoria silt/loess or Parkland sand). The silts and clays occur in numerous areas adjacent to the Rock River. Where glacial meltwater backed up from the Rock River and its tributaries, temporary lakes were created out of which the sediments settled (Lineback 1979). The largest areas are east of Byron, southeast of Oregon, and south of Grand Detour. Overlaying this is generally windblown silt (loess) which can be as much as 10 ft. thick in the western portion of the URRAA and in that region is usually more than 5 ft. thick (Lineback 1979).

Significant areas of the URRAA are composed of surficial alluvium which is not covered by loess. This alluvium occurs primarily in river beds and floodplains of the Rock River and its larger tributaries. The alluvium consists of poorly sorted sand deposits, gravel deposits, sand dunes, and/or gravel terraces. Their origins range from postglacial outwash of sand or gravel, to modern erosion and depositional processes such as river and stream deposits from flooding (Willman and Frye 1970). Generally, most of the Rock River valley north of Oregon contains significant deposits of well sorted sand and gravel from glacial outwash, whereas smaller streams typically contain floodplain alluvium of recent deposition (Lineback 1979).

The soils of the URRAA predominantly belong to two orders, Alfisols and Mollisols, with locally occurring Entisols and Histosols. Generally, Mollisols have developed under natural prairie or marsh vegetation. They are very dark with abundant humus and base nutrients (Ca, Mg, etc). They remain soft upon drying because of the large amounts of organic matter. These are the best farming soils. Alfisols have developed under forest vegetation; they are less fertile, have less organic matter, and are lighter in color than Mollisols. The Entisols and Histosols occupy small acreages in the area, but are significant because they help create unique communities where exceptionally sandy sediments (Entisols) or high organic matter materials (Histosols) are present. Entisols are lightly colored, recently deposited alluvial soils that are too young to have horizon development. Histosols, or organic soils, are composed of saturated organic matter. Poorly drained Mollisols are common along drainages and floodplains and may also play an important role in the development and maintenance of localized wet communities (Barnhardt 1996).

Special geologic characters are of interest to the area, because they are directly responsible for the region's plant and habitat diversity. The Castle Rock State Park/Lowden-Miller State Forest complex can be attributed to a concentration of distinct bedrock and surface geological features and a variety of moisture and pH conditions. Exposures of sandstone, dolomite, gravel, and glacial till are all present. The most noteworthy bedrock feature from a botanical perspective is the local prominence of sandstone, particularly the St. Peter formation of Ordovician-aged bedrock which is exposed mostly near the Rock River and associated minor drainages in the region (Willman 1967; Taft and Mankowski 1996). This bedrock is very fragile and easily weathered, forming in places such as Castle Rock State Park a dissected system of valleys, ravines, and cliffs. Where sandstone is near the surface, weathering has produced sandy soils from the residuum of the sandstone parent material. These soils, including Boone sand and Eleva sandy loam in upland areas, are highly permeable, usually well-drained and strongly acidic (Acker et al. 1980; Taft and Mankowski 1996).

These unique site conditions and edaphic characteristics provide habitat and refugia for a number of uncommon relict plant species. The dissected landscape characterized by deep, cool ravines and protected cliff faces has provided habitat for species that otherwise have more northern distributions (e.g., long beech fern, oak fern, running pine clubmoss, American mountain ash). These species are present as relicts of a more boreal climate in northern Illinois following Wisconsinian glaciation. Perhaps of equal phytogeographic interest is the fact that these relict species survived a pronounced post-glacial xerothermic period, from about 8,300 to 5,000 years BP (King 1981), characterized by hot, dry weather conditions. Other species such as white pine, Canada yew, yellow birch, and hairy wood rush persist near their midwestern southern range extent.

Vegetation History

The presettlement vegetation in Illinois generally can be described as prairie and forest. Interpretations of the original distribution of prairie and forest (Vestal 1931, Transeau 1935, Anderson 1970, Iverson et al. 1989) consistently indicate a predominance of prairie

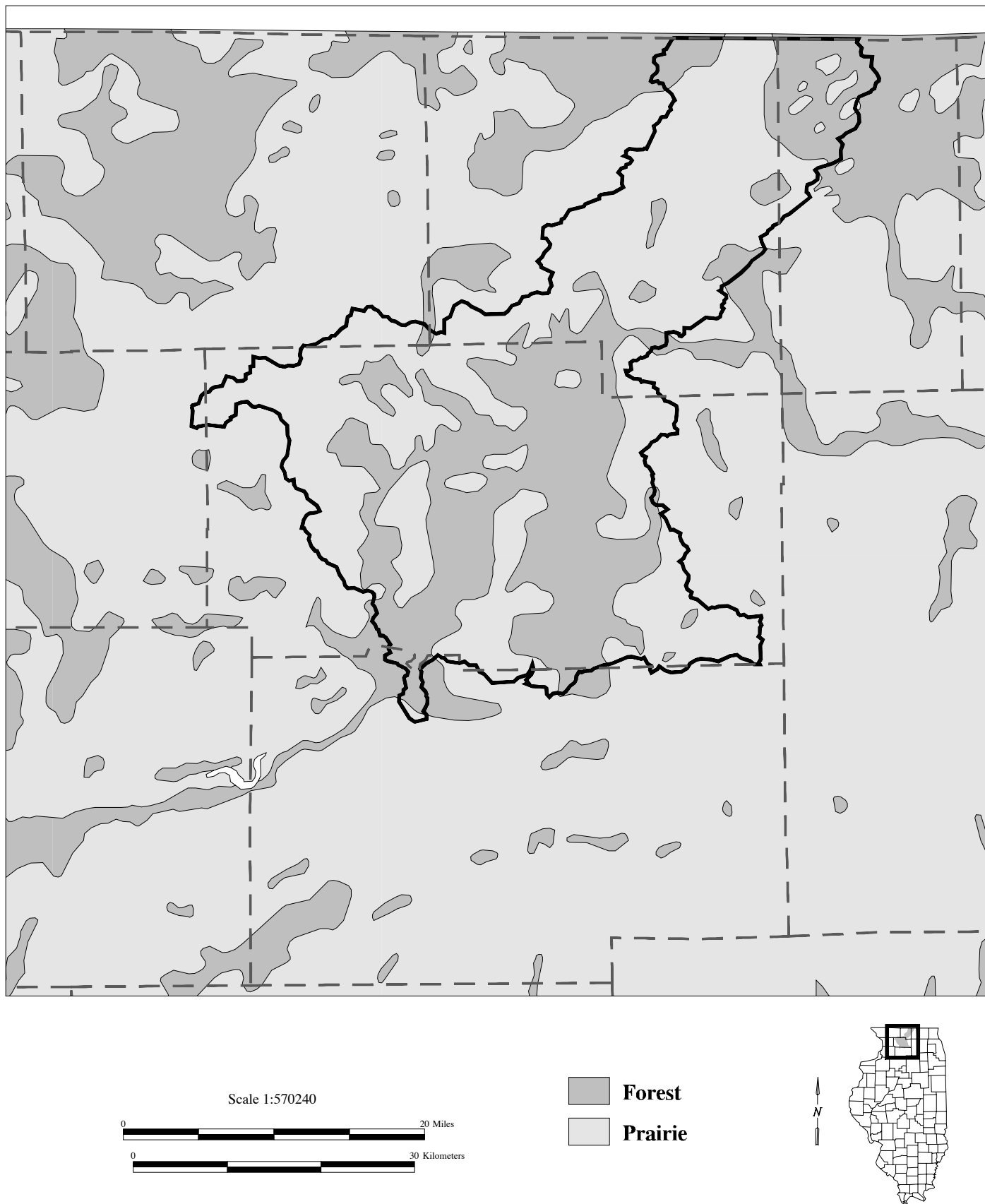


Figure 4. Forest and prairie distribution from the 1820 General Land Office plat maps for the Upper Rock River Assessment Area. Current county boundaries are shown for reference.

occupying about 60% of the state's total land area. Determining the ratio of prairie to forest in presettlement vegetation can be estimated using Government Land Office (GLO) land survey data (Figure 4) recorded circa 1830 (e.g., Meyer 1950). Analysis of GLO vegetation data for the assessment area (Figure 4, Table 2), using Geographic Information System (GIS), indicates the URRRA was approximately 59 percent prairie (312,439 acres) and 41% forest, woodland, and savanna (218,522 acres) (Anderson 1970, IGIS database). The remaining land (0.02%) was considered open-water habitat. Savannas were typically spatially dynamic and their total area and distribution varied on the presettlement landscape depending on several factors including local conditions of climate, and fire frequency and intensity. Fire generally is considered to have been a major ecological factor in the maintenance of tall-grass prairie, savanna, and open woodland vegetation in the Midwest (Anderson 1970, 1983, 1990; Axelrod 1985; Taft 1997). As in much of Illinois, in the URRRA timber generally is confined to those areas which are shielded from historical fires by landscape features such as ridges, moraines, and water courses. This created a heterogenous patchwork of forest and prairie where one had only to travel a few miles (6 to 12 miles at their widest points) to encounter a change from timber to prairie (Peck 1837, Whitney 1994).

It is not possible to determine with accuracy the total amount of presettlement wetlands in the URRRA because the available evidence is at the scale of county-wide data. Based on soil surveys of hydric soils (Havera et al. 1994; Taft and Mankowski 1996), it is estimated that wetlands covered 8% of Ogle County. Other estimates put the percentages much higher: up to 40% in Boone and Winnebago counties, and approximately 15% in Ogle County (Havera et al. 1994, Soil Conservation Service Soils Surveys, Unpublished). Based on aerial photography (IGIS Database) from 1980, we estimate presettlement wetlands to have covered at least 7.8% of the URRRA (41,003 acres) (Table 2). Predominant wetland types probably included wet prairie, marsh, sedge meadow, and local areas of peatlands (Taft and Mankowski 1996).

Current Land Cover

The following characterization of the land cover of the URRRA is based on information from the Land Cover of Illinois database (IGIS database), which was derived from Landsat Thematic satellite imagery acquired between 1991 and 1995. For wetlands the Illinois Wetlands Inventory (IWI) provides more detailed information about the wetlands in the area, and so it was used in this report. IWI data for the Upper Rock River Assessment Area was derived from high-altitude photography taken in 1980-1981.

The landscape of the URRRA is currently dominated by cropland (Figure 5), comprising about 52.1% of the area (Table 3). Croplands are found mainly in uplands and are notably uncommon in the Rock River floodplain and valley, most likely because of the infertile sandy soil from glacial outwash deposits found there.

The next most abundant cover type are grasslands that cover 25.1% of the URRRA. These mainly are comprised of non-native or ruderal species including a predominance of cool-

Table 2. Trends over time in land coverage and natural area abundances in the URRAA as compared to Illinois.

	Statewide Percentages			
	Original Extent	Remaining*	Proportion of original*	Amount Cat. 1 of original of remaining*
Prairie	59.96	?	?	0.01
Forest	38.28	11.34	29.62	0.08
Wetland	23.00	2.60	11.30	0.07

	Assessment Area Percentages				Compared to Illinois	
	Original Extent **	Remaining*	Proportion of original*	Amount Cat. 1 of original of remaining*	Trend in amount	Compared to Illinois
Prairie	58.84	?	?	0.0155	?	Trend
Forest	41.16	10.33	25.09	0.0339	0.1350	lower in amount
Wetland	7.72	1.49	19.27	0.0383	0.1987	lower ?

lower

Assessment area acreage								
	Statewide Acreage			Original # remain. Cat 1			Trend	
	Original Extent**	Remaining* Extent Cat 1	Extent	Extent in AA	# remain. in AA	Cat 1 area	in Quality	higher#
Prairie	21,624,000	?	2,300.00	218,522	54,833	74	lower	higher#
Forest	13,804,600	4,088,623	11,593.00	41,003	7,900	15.7	lower	lower
Wetland	8,294,197	937,605	6,000.00	530,958	62,733	138.2		lower
** TOTAL	36,061,727		19,893.00					

- A "higher" trend indicates that there is currently more (quantity or quality) of a community type in the URRAA compared to the rest of IL.

* - There exists grade C & D prairie remnants for which area amounts are not known (i.e. highly degraded natural prairie).

** - Some overlap of wetland and prairie classifications produce values greater than 100%.

season grass species. This category includes pastures, hayfields, fallow fields, road/railroad rights-of-way, and remnant prairies (Figure 6, Table 3). These tend to occur in uplands and areas of moderate topography. About 48.5 acres of high-quality undegraded prairie is present in the URRAA (Table 2), totaling about .022% of the current grasslands in the URRAA and .019% of the original prairie in the area. High-quality undegraded prairies are defined as stable natural vegetation communities that reflect as nearly as possible their condition at the time of settlement (species present, appearance, soil, hydrology, etc.). They retain an ecological character typical of pre-settlement communities where exotic species, heavy

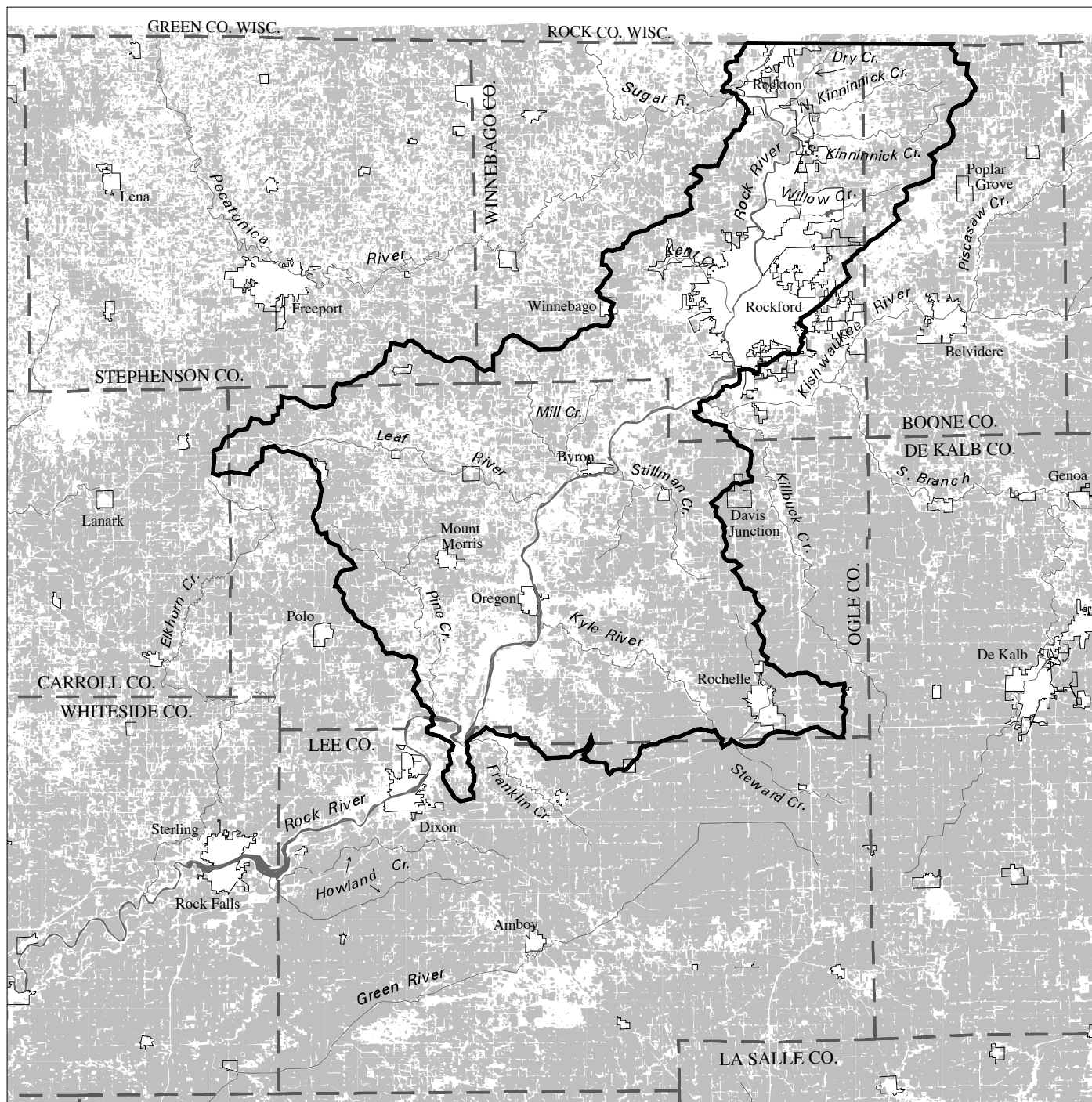


Figure 5. Cropland in the Upper Rock River Assessment Area. Cropland depicted on this map includes row crops and small grains from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

Table 3. Land Cover for the Upper Rock River Assessment Area.

Land Cover	Acres	Percent
Cropland	276,843	52.1
Grassland	133,128	25.1
Urban/Built-up	56,955	10.7
Upland forest	50,288	9.5
Water	5,770	1.1
Bottomland forest	4,545	0.9
Nonforested wetlands	3,426	0.6
Total	530,958	100.0

grazing, agriculture, and logging have been absent (White 1978, White and Madany 1978). Urban or developed lands comprise 10.7% of the URRAA (Figure 7, Table 3).

Forest cover is approximately 10.4% of the assessment area combining upland (9.5%) and bottomland (0.9%) forest (Figure 8, Table 3). Forests in the URRAA typically occur in public land holdings, in areas of rugged topography, along rivers, and in valleys. About 74 acres, or 0.04% of the forest is present in a high-quality, undegraded state (Table 2).

Open water comprises 1.1% of the URRAA (Figure 9, Table 3). Open water consists of a few artificial lakes and ponds and the Rock River and its tributaries.

Wetlands occupy 1.5% of the URRAA compared to 3.5 % of the total area of the state (Suloway and Hubbell 1994). In the URRAA, wetlands occupy about 7,900 acres (Table 4). Forty-five percent of the wetland area is bottomland forest, compared to the statewide percentage of 60.5%. Approximately 36.4% of the wetland acreage is shallow marsh/wet meadow (compared to 13.1% statewide). Open water wetlands account for 8.9% of the wetland acreage in the assessment area (compared to 11.4% for the state) followed by shrub-scrub (4.6%), intermittent riverine (2.4%), deep marsh (0.9%), lake shore (0.6%), perennial riverine (0.3%), and swamp (0.2%) (Figure 10 and Table 3).

Biologically Significant Features of Natural Communities

Public Land

Two percent (11,293 acres) of the land in the URRAA has been set aside by the state and county government as parks, fish and wildlife areas, conservation areas, forest preserves, etc. (Table 5, Figure 11). These areas give some level of protection to the natural communities in the area, and in some cases they are the only refuges for certain endangered species or natural

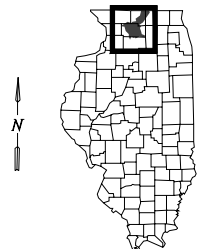
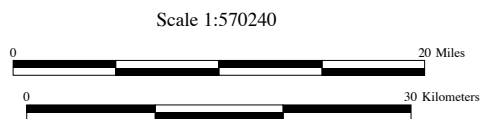
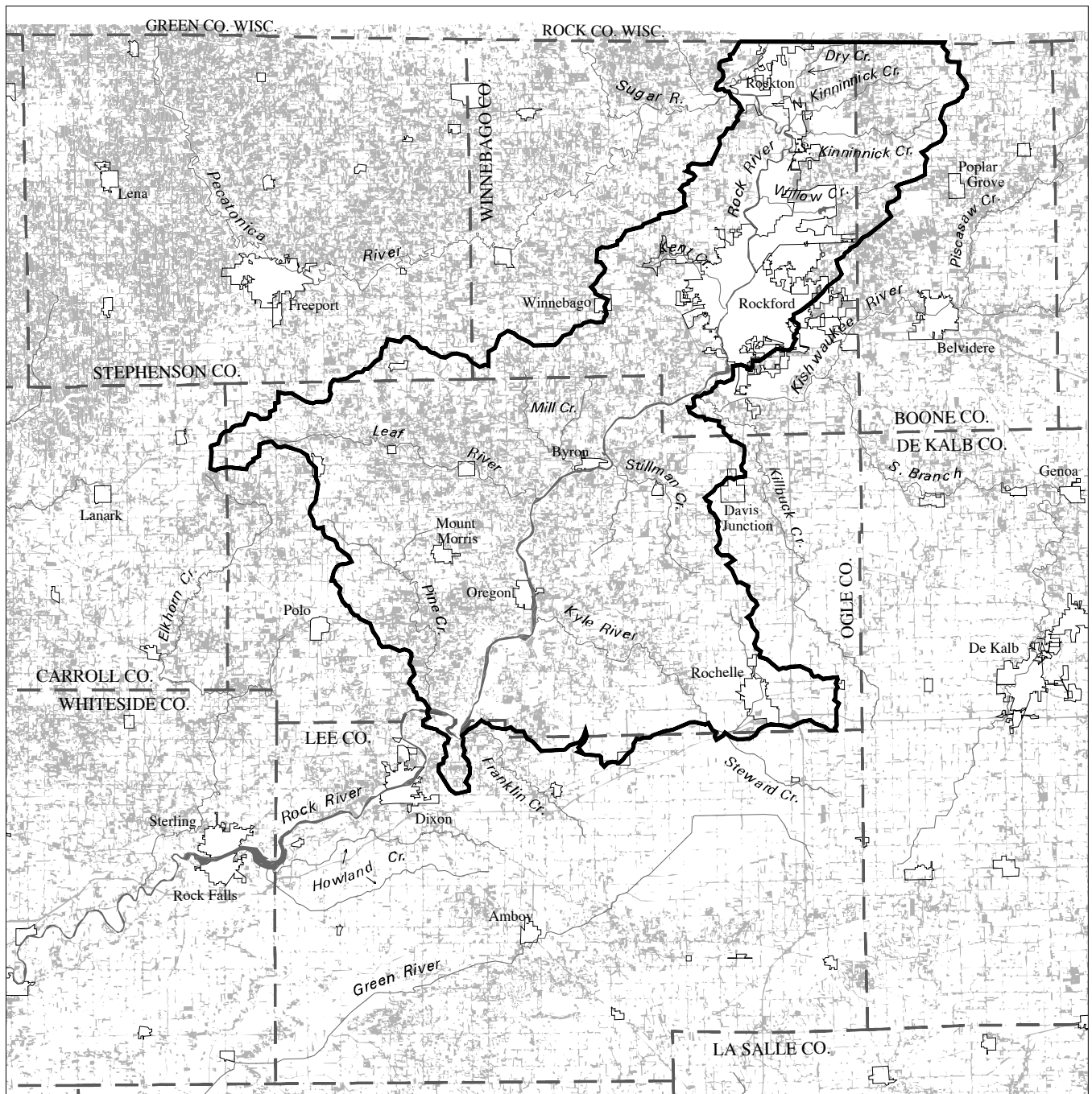


Figure 6. Grasslands in the Upper Rock River Assessment Area. Grasslands depicted on this map are nonurban grasslands from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

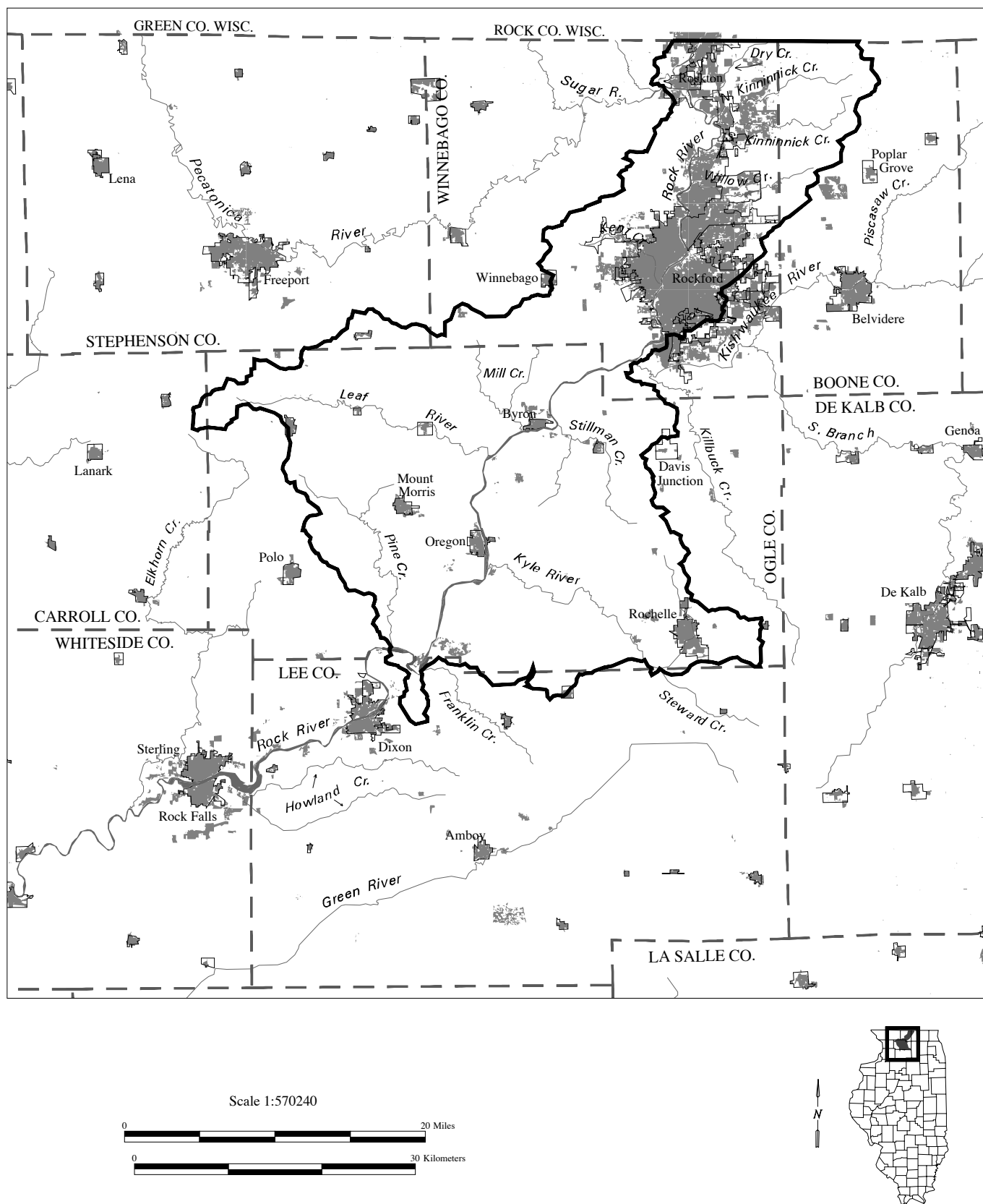


Figure 7. Urban land in the Upper Rock River Assessment Area. Urban land depicted on this map includes urban/built-up land and urban grassland from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

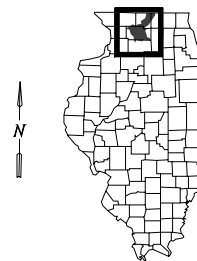
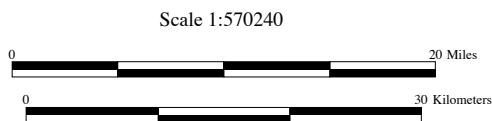
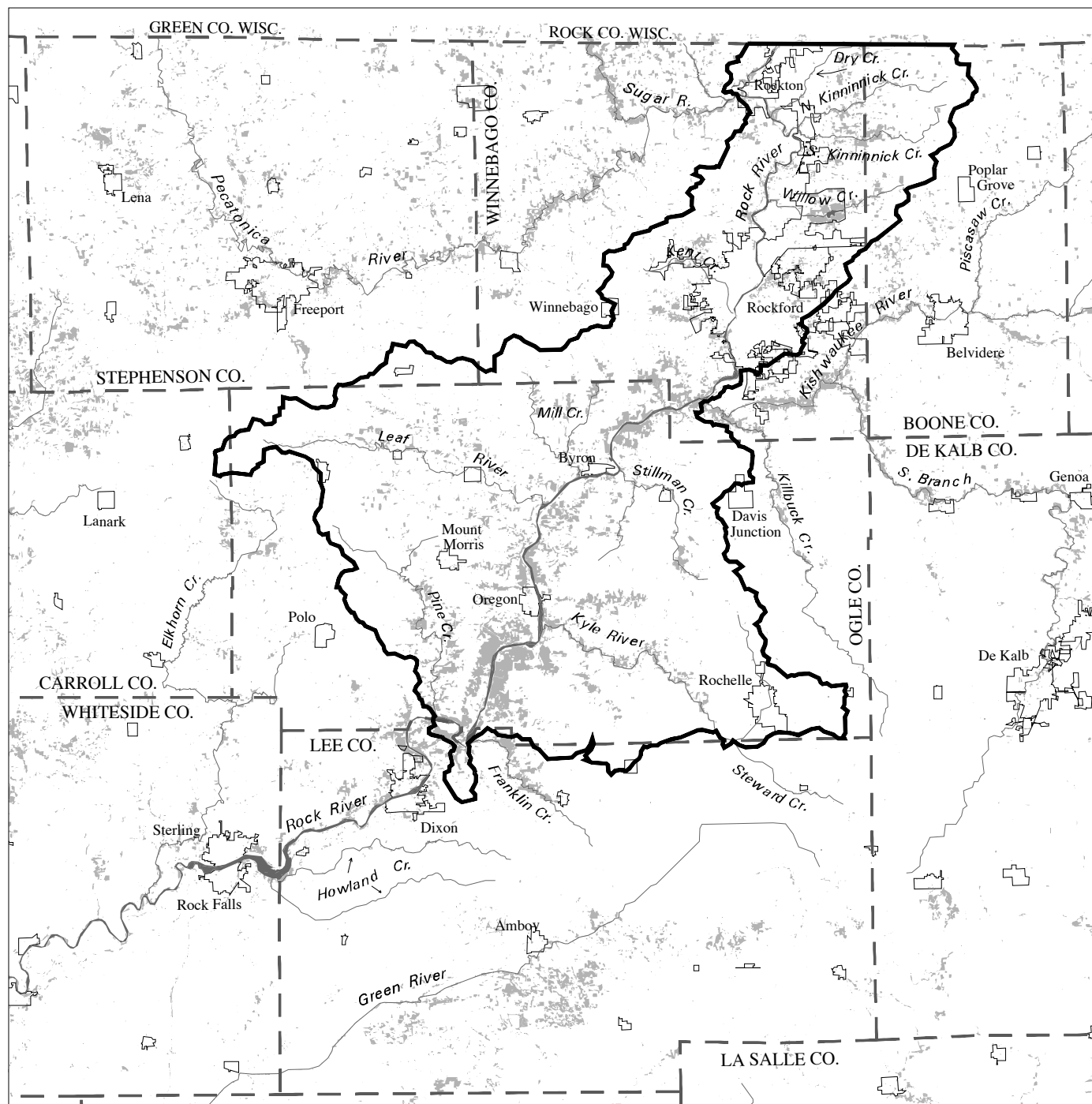


Figure 8. Forest in the Upper Rock River Assessment Area. Forest depicted on this map includes upland and bottomland forest from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

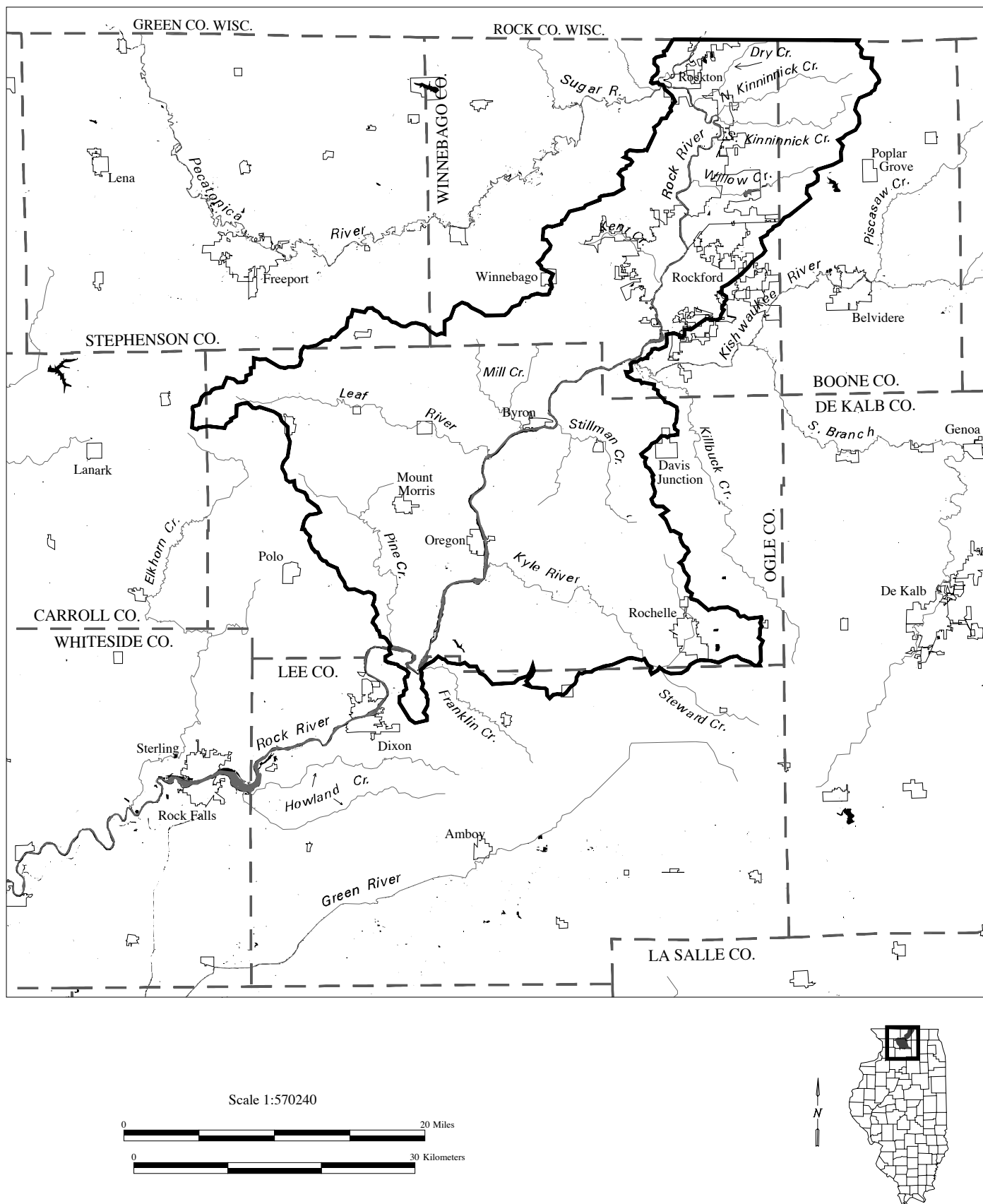


Figure 9. Open water in the Upper Rock River River Assessment Area from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

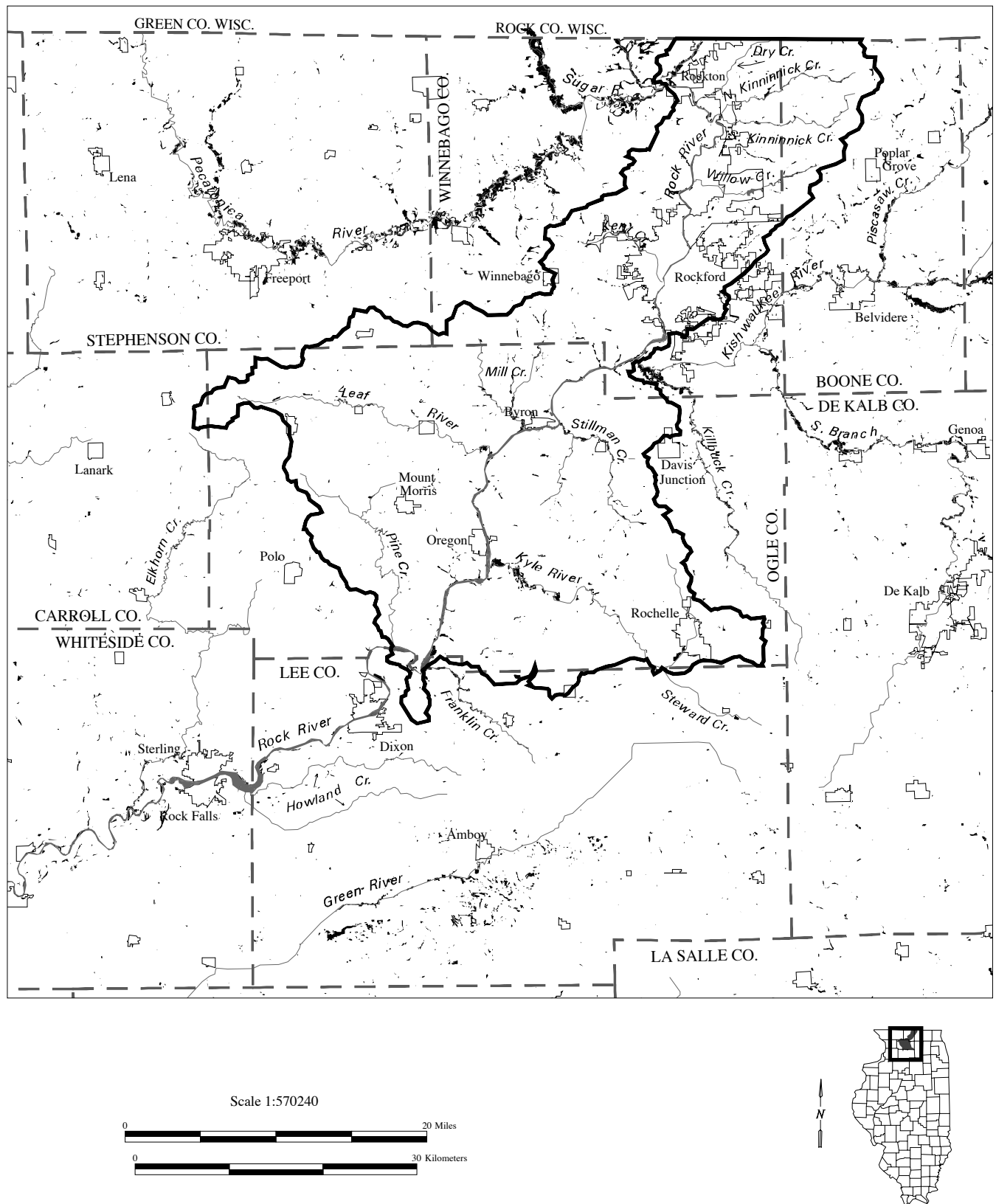


Figure 10. Wetlands in the Upper Rock River Assessment Area. Wetlands depicted on this map include nonforested wetlands and bottomland forest from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

**Table 4. Wetlands of Upper Rock River Assessment Area based
on Illinois Wetlands Inventory data¹.**

Category	Acreage	% of Wetland Area	% of Assessment Area
Palustrine Wetlands			
Shrub-Scrub Wetlands	360.05	4.6	0.1
Forested Wetlands			
Bottomland Forest	3,610.06	45.7	0.7
Swamp	13.14	0.2	0.0
Emergent Wetlands			
Shallow Marsh/Wet Meadow	2,872.13	36.4	0.5
Deep Marsh	74.99	0.9	0.0
Open Water Wetlands	706.65	8.9	0.1
Subtotal Palustrine	7,637.02	96.7	1.4
Lacustrine Wetlands			
Shallow Lake	0.00	0.0	0.0
Lake Shore	44.90	0.6	0.0
Emergent Lake	0.00	0.0	0.0
Subtotal Lacustrine	44.90	0.6	0.0
Riverine Wetlands			
Perennial Riverine	25.74	0.3	0.0
Intermittent Riverine	192.03	2.4	0.0
Subtotal Riverine	217.77	2.8	0.0
Total Wetlands	7,899.69	100.0	1.5

* Subtotal of shrub-scrub, forested, emergent, and open water wetlands

¹Suloway, L. and M. Hubbell. 1994. Wetland resources of Illinois: an analysis and atlas. Ill. Nat. Hist. Surv. Special Publ. 15. 88 pp.

communities. However, these areas do not always offer adequate protection, and they are not all situated in the most biologically important areas.

Natural Areas and Nature Preserves

The Illinois Natural Areas Inventory (INAI) was conducted over a three-year period during the mid 1970's to document remaining significant and exceptional examples of the natural communities and other features in Illinois (White 1978). The INAI established seven categories of natural areas based on significant features. The categories were: 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 is an ongoing effort and over the years, the categories for qualifying have changed to: I–High Quality Natural Community; II–Habitat for Endangered Species; III–All Illinois Nature Preserves; IV–Outstanding Geological Areas; V–Species Reintroductions and Translocations; VI–Unique assemblages of flora and fauna (including relicts); and VII–Outstanding Aquatic Areas (Tara Gibbs, personal communication). For the purpose of this report we are using the 1978 INAI categories. The INAI established a grading system to rank natural quality (White 1978). The natural quality of a community type was graded from A (undegraded), B (nearly undegraded), to E (very severely degraded). In general, only A and B communities were designated as significant or exceptional features, although many natural areas included some Grade C quality habitats. Estimates and comparisons of natural areas acreage within the URRRA and statewide are based on the best available data (Table 6, Table 2). In some cases, recent data for natural communities within the assessment area are compared to 20 year old statewide data from White (1978). Consequently, if discoveries of natural areas do not equal the area of recently degraded or destroyed natural areas, some numbers may be slightly over or under estimated.

The INAI has recognized 35 natural areas occurring within the URRRA boundaries (Table 7, Figure 12). Thirteen of these are Category I (high-quality, essentially undegraded) sites and nine of these include populations of species listed by the IESPB as threatened or endangered. An additional 25 sites are Category II natural areas (containing threatened and endangered species but no high-quality natural communities). Among the thirteen Category I sites identified within the URRRA are 21 occurrences of 12 different natural community types (some sites have multiple high-quality natural communities). The Category I natural areas comprise a total of about 136.8 acres (Table 6), or about 0.026% of the total area of the URRRA. This compares to 0.07% of Category I acreage for the entire state (White 1978). Some natural communities at the Category II sites also may include areas that are relatively high-quality thus having restoration potential. These areas, if restored, ultimately may meet INAI standards for Category I natural communities. The area of all INAI natural areas, including their buffer areas, totals about 2,732 acres in the assessment area (about 0.51%).

Comparison of the area of Category I natural communities in relation to the total remaining in Illinois for each community type is summarized in Table 6 and described in the following

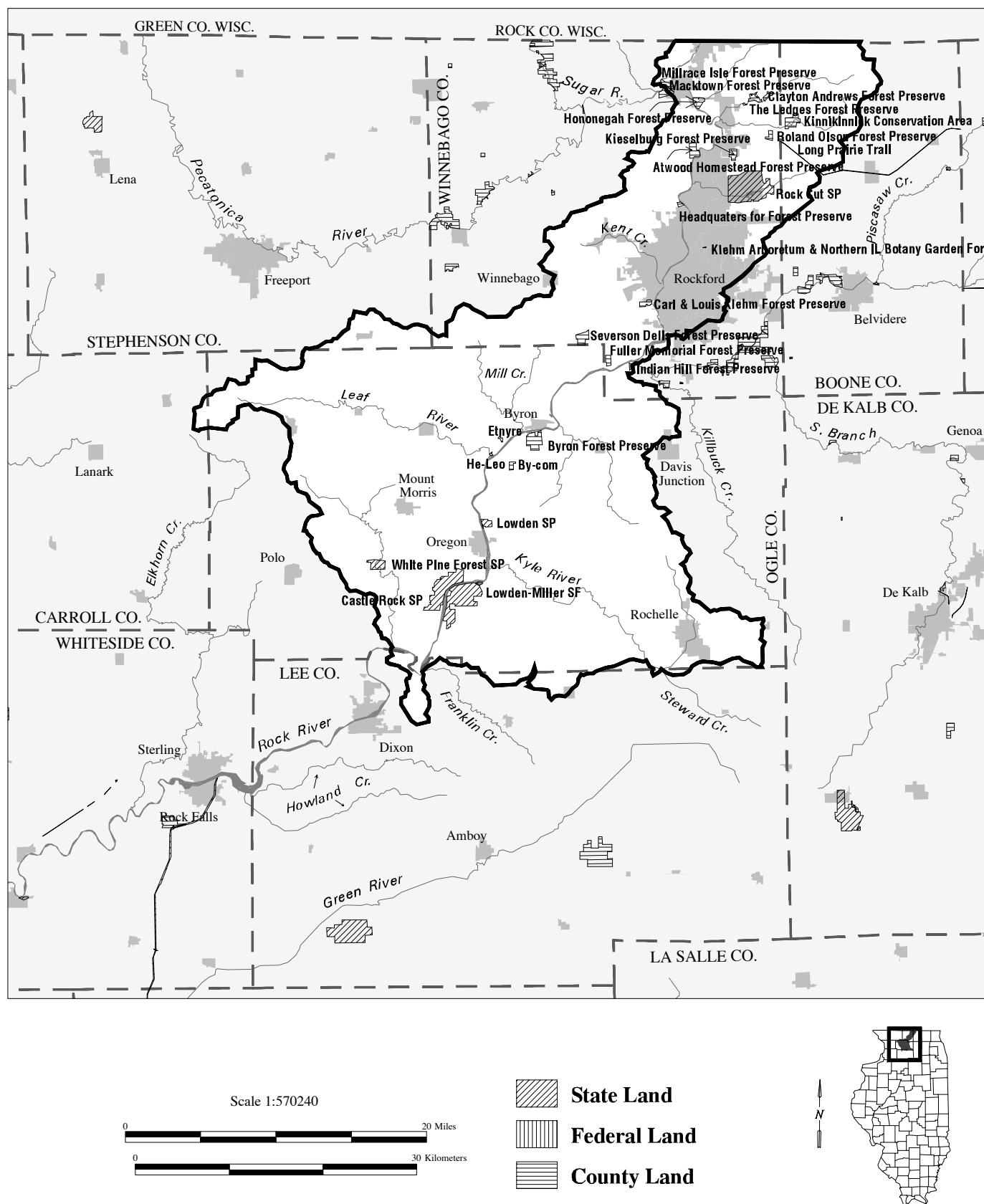


Figure 11. State, federal, and county land in the Upper Rock River Assessment Area. State land is limited to parks (SP), conservation areas (SCA), forests (SF), and fish and wildlife areas (SFWA) and county land to forest preserves and similar land.

Table 5. State, federal, and county land in the Upper Rock River Assessment Area.

Name	Acres
State Land*	
Castle Rock SP	1,778
Lowden SP	203
Lowden-Miller SF	2,292
Rock Cut SP	3,157
White Pine Forest SP	393
Total state land	<u>7,823</u>
Federal Land	
Total federal land	<u>0</u>
County Land**	
Atwood Homestead Forest Preserve	336
By-com	103
Byron Forest Preserve	640
Carl & Louis Klehm Forest Preserve	163
Clayton Andrews Forest Preserve	99
Etnyre	35
Fuller Memorial Forest Preserve	149
He-Leo	24
Headquarters for Forest Preserve	64
Hononegah Forest Preserve	257
Indian Hill Forest Preserve	41
Kieselburg Forest Preserve	201
Kinnikinnick Conservation Area	413
Klehm Arboretum & Northern IL Botany	
Garden Forest Preserve	5
Long Prairie Trail	26
Macktown Forest Preserve	83
Millrace Isle Forest Preserve	148
Roland Olson Forest Preserve	136
Severson Dells Forest Preserve	354
The Ledges Forest Preserve	193
Total county land	<u>3,470</u>

* Parks (SP), Conservation Areas (SCA), Forest (SF), and Fish and Wildlife Areas (SFWA)

** County land is limited to forest preserves and similar land. Other public lands which may include natural habitat are not included adequate information was not available.

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Table 6. Total acreages of natural communities in the Upper Rock River Assessment Area (URRAA) that are represented by Category I natural areas. Areas designated as Category I are high-quality (Illinois Natural Areas Inventory Grades A and B) and relatively undegraded natural areas (White 1978).

Community type	Acres of Category I in the URRAA			Acres of Category I in Illinois			% of Illinois Category I in the URRAA		
	Grade A	Grade B	URRAA Total	Grade A	Grade B	Ill. Total	Grade A	Grade B	of Ill. Total
dry-mesic prairie	1	0	1.0	11.0	45.1	56.1	9.1	0.0	1.8
wet-mesic prairie	2	4.3	6.3	23.7			8.4		
wet prairie	0	8	8.0	14.5	250.2	273.9	0.0	1.7	2.3
gravel hill prairie	2.5	0	2.5	3.4			73.5		
glacial drift hill prairie	0	2	2.0	37.1	223.6	238.1	0.0	3.6	3.4
dry gravel prairie	0.4	0.25	0.7	8.4			4.8		
dry-mesic gravel prairie	9	30	39.0	10.0	11.2	14.6	90.0	0.0	17.1
dry dolomite prairie	1.1	0.8	1.9	4.1			26.8		
dry-mesic upland forest	0	74	74.0	424.0	30.6	67.7	0.0	6.5	3.0
sedge meadow	0	1.4	1.4	193.3			0.0		
Totals	16.0	120.8	136.8						

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section ‘Terrestrial Natural Community Descriptions’.

Illinois Nature Preserves are areas of land or water that are formally dedicated to receive maximum protection of significant natural features. The central goal of the nature preserve system, currently with about 300 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 aesthetic 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 private land owners (McFall and Karnes 1995). Many nature preserves are quite small representing mere fragments of once large natural communities; however, these are still important for conservation (Schwartz and van Mantgem 1997).

There presently are 13 nature preserves within the URRAA (Table 8, Figure 12) totaling 1,237.96 acres (about 0.23% of the URRAA). Eighteen additional nature preserves occur outside the URRAA but within the area shown in Figure 12. One of these occurs just one mile from the boundary of the assessment area (Table 8, Figure 12).

**Table 7. Natural areas in the Upper Rock River Assessment Area
and surrounding area.**

NA#	COUNTY	ACRES	NAME
11	Ogle	15.46	Douglas E. Wade Memorial Prairie
53	De Kalb	21.95	Wilkinson Marsh
74	Ogle	0.88	Stronghold Hill Prairie
86	Ogle	25.82	Lowden Memorial Forest
87	Ogle	66.21	White Pines Forest
88	Ogle	54.64	Pine Rock
89	Ogle	3.37	Heeren Prairie
90	Ogle	0.85	Adeline Prairie
348	Boone	10.33	Flora Prairie
379	Boone	123.05	Kinnikinnick Creek
414	Carroll	1.45	Brookville Lutheran Cemetery Prairie
458	Ogle	9.67	Oregon Geological Area
459	Ogle	1.85	Prairie Star School Geological Area
478	Lee	6.71	Ashton Geological Area
479	Lee	16.95	Dixon Southwest Geological Area
522	De Kalb	33.85	Dekalb Geological Area
683	Lee	14.22	Foley Sand Prairie
684	Lee	3.75	Rock River Botanical Area
685	Lee	50.88	Nachusa Grasslands
686	Lee	14.78	Grand Detour Botanical Area
689	Lee	2.82	Temperance Hill Cemetery Prairie
690	Lee	16.01	Compton Geological Area
691	Lee	9.51	Ashton East Geological Area
693	Lee	21.52	Amboy North Railroad Prairie
694	Lee	2.83	Amboy Central Railroad Prairie
695	Lee	17.58	Amboy South Railroad Prairie
710	McHenry	86.81	Beck Woods Conservation Area
720	McHenry	0.00+	Kishwaukee River
765	Ogle	7.43	Sinnissippi Forest
770	Ogle	144.11	Fearer Tract At Castle Rock
772	Lee	2.68	L & M Prairie
773	Ogle	2.93	Beach Cemetery Prairie
774	Ogle	10.49	Mount Morris East Geological Area
843	Stephenson	1.47	Dakota Prairie
844	Stephenson	5.77	Freeport Prairie
845	Stephenson	0.91	Afolkey Road Prairie
846	Stephenson	33.40	Freeport Southeast Geological Area
908	Winnebago	20.70	Laona Heights Forest Preserve
909	Winnebago	40.73	Hartley Memorial Forest Preserve
910	Winnebago	50.41	Pecatonica Bottoms
914	Winnebago	2.34	Winkvist Prairie
915	Winnebago	4.74	Silver Creek Prairie
* 916	Winnebago	4.45	Bell Bowl Prairie *
917	Winnebago	66.07	Rockton Bog

Table 7. Continued

NA#	COUNTY	ACRES	NAME
918	Winnebago	77.30	Harlem Hills
919	Winnebago	20.42	Nimtz Ponds
920	Winnebago	72.64	Searls Park Prairie
923	Winnebago	19.40	Sumner Prairie
926	Winnebago	10.61	Durand Southeast Geological Area
931	Winnebago	46.16	Severson Dells
977	Boone	7.85	Ipsen Prairie
994	Winnebago	2.79	Shirland Railroad Prairie
1025	Winnebago	39.98	South Ledges of Kinnikinnick Creek
1042	Winnebago	0.67	Hamborg Railroad Prairie
1052	Ogle	629.38	Castle Rock
1068	Lee	134.68	Franklin Creek
1072	Lee	1,103.36	Green River Prairie and Wetlands
1075	Whiteside	49.53	Lyndon - Agnew Railroad Prairie
1106	Ogle	15.44	Byron Dragway Prairie
1107	Ogle	145.36	Commonwealth Edison Prairie
1108	Ogle	0.00*	Kilbuck Prairie
1109	Lee	0.00*	East Grove
1111	Lee	19.44	Rocky Ford Road Site
1112	Lee	254.98	Sand Prairie Habitat Area
1114	Lee	17.61	Dickenson Site
1115	Lee	9.55	Longanecker Farm
1270	McHenry	78.13	Hum Railroad Prairie West
1423	Bureau	0.00+	Fairfield Ditch
1454	Ogle	139.00	Jarrett Prairie
1455	Ogle	954.84	Lowden - Miller Forest
1461	Whiteside	0.00+	Coon Creek
1463	Winnebago	8.75	Beloit Gravel Prairie
1464	Winnebago	6.99	Burr Oak Road Prairie
1466	Winnebago	2,995.49	Sugar River
1508	McHenry	0.00+	Piscasaw Creek
1527	Ogle	5.07	Piros Prairie
1544	Winnebago	22.92	Plum Grove
1552	Lee	76.64	Broderick Prairie

Total acreage for natural areas within the boundary = 2,732.54

Bold indicates natural area boundary is within the assessment area

* Indicates natural area boundary is within the 1 mile buffer zone

+ Stream Natural Areas do not have acreage. This figure is an approximate distance in miles.

The total for acreage of natural areas does not include these stream segments.

* Boundaries for these natural areas have not been mapped as of August, 2000.

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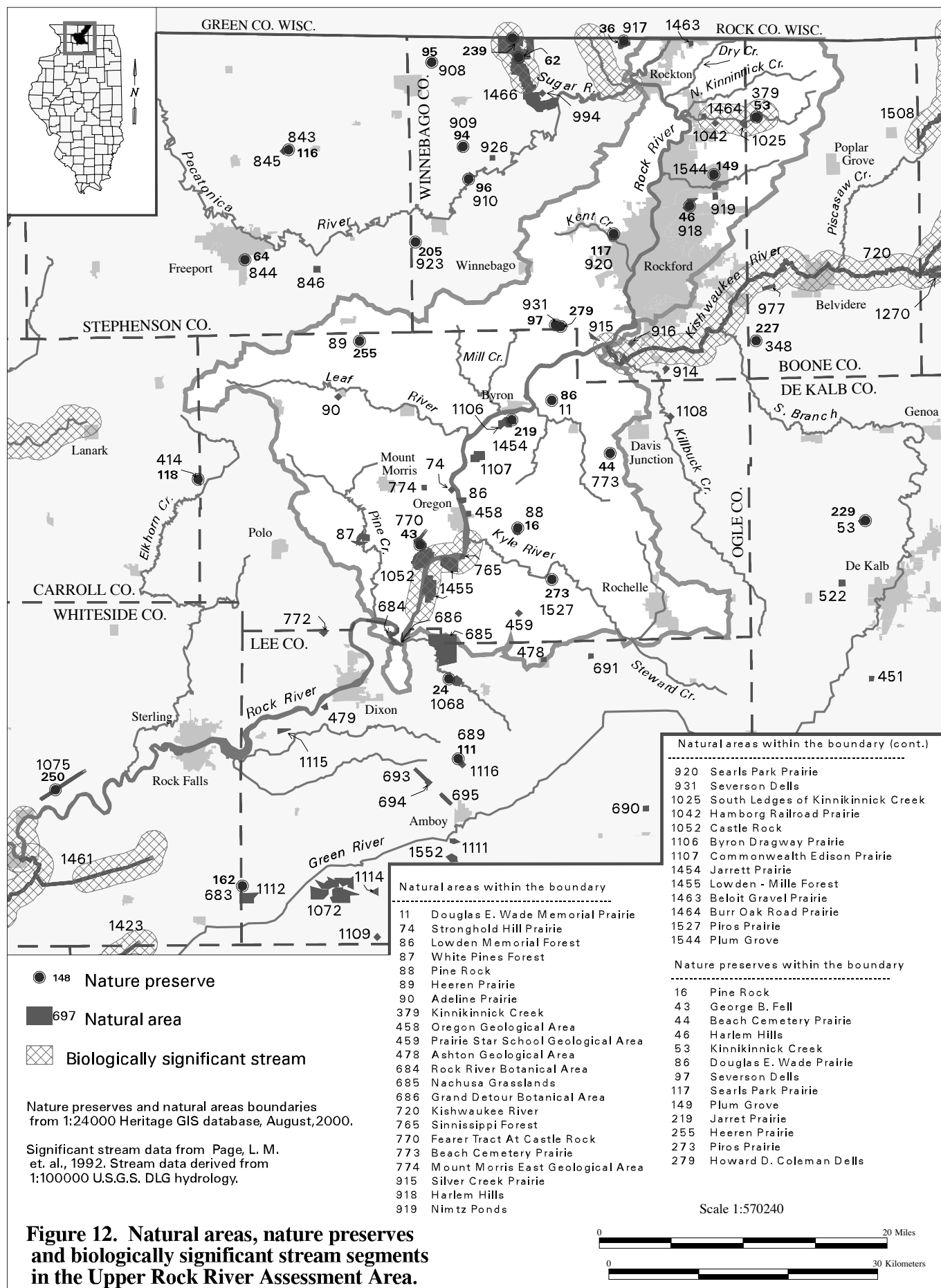


Figure 12. Natural areas, nature preserves and biologically significant stream segments in the Upper Rock River Assessment Area.

Table 8. Nature preserves and ids in the Upper Rock River Assessment watersheds and surrounding area.

NP#	CORR-NA	COUNTY	ACRES	NAME
16	88	Ogle	57.80	Pine Rock
24	1068	Lee	216.83	Franklin Creek
* 36	917	Winnebago	53.59	Rockton Township Bog
43	1052	Ogle	668.46	George B. Fell
44	773	Ogle	3.87	Beach Cemetery Prairie
46	918	Winnebago	58.73	Harlem Hills
53	379	Boone	111.29	Kinnikinnick Creek
62	1466	Winnebago	55.88	Colored Sands Bluff
64	844	Stephenson	10.16	Freeport Prairie
86	11	Ogle	13.42	Douglas E. Wade Prairie
94	909	Winnebago	39.75	Hartley Memorial
95	908	Winnebago	20.07	Laona Heights
96	910	Winnebago	58.46	Pecatonica Bottoms
97	931	Winnebago	43.55	Severson Dells
111	689	Lee	1.84	Temperance Hill Cemetery Prairie
116	845	Stephenson	4.54	Wirth Prairie
117	920	Winnebago	68.70	Searls Park Prairie
118	414	Carroll	4.43	Brookville Lutheran Cemetery Prairie
149	1544	Winnebago	19.94	Plum Grove
151	1100	Jo Daviess	315.86	Wards Grove
153	688	Lee	34.62	Bartlett Woods
162	683	Lee	15.36	Foley Sand Prairie
205	923	Winnebago	18.64	Wilson Prairie
219	1454	Ogle	127.40	Jarret Prairie
227	348	Boone	14.37	Flora Prairie
229	53	De Kalb	47.46	Wilkinson-Renwick Marsh
239	1466	Winnebago	166.35	Sugar River Alder Site
250	1075	Whiteside	58.88	Lyndon Prairie
255	89	Ogle	2.29	Heeren Prairie
273	1571	Ogle	7.75	Piros Prairie
279	0	Winnebago	54.76	Howard D. Coleman Dells

Bold indicates nature preserve boundary is within the assessment area.

* Indicates nature preserve boundary is within the 1 mile buffer zone.

–Each of the nature preserves is associated with a corresponding natural area (Corr-NA) referred to in Table 7.

–Acreage used in the table is derived from the Illinois Geographic Information System. August 2000.

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). Of the 13,521.6 stream miles rated as of 1996, 612 miles (4.5% of the statewide total) have received an “A” rating and another 4545 miles (34%) are rated “B” streams.

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

Rock River from Honey Creek to Clear Creek in Ogle County was recognized as a Biologically Significant Stream because of the presence of the gravel chub in the large rocky riffles and runs (Page et al., 1992) (Table 9). This segment of the Rock River is a moderately large stream with gravel and cobble riffles and sandy pools and runs. In some areas, the shoreline is wooded. This stream segment provides the best opportunity in the assessment area for the protection of large numbers of native aquatic species.

Table 9. Biologically significant stream segments in the Upper Rock River Assessment Area.

Stream name	Length (Mi)
Rock River, Honey Creek to Clear Creek	6.802509
Total	6.802509

Illinois Threatened and Endangered Species

At least 41 species of plants and animals considered to be threatened or endangered by the Illinois Endangered Species Protection Board (IESPB) currently occur in the URRRA (Table 10). This represents 12.4% of the states 331 threatened or endangered plants that are known to occur in the URRRA. For other taxa, the percentage of the state's threatened or endangered species that occur in the area are as follows: birds (20.6%), mammals (12.5%), reptiles (6.7%), amphibians (0%), mollusks (3.7%), fishes (0%), and insects (8.3%). Two species (prairie bush clover and the bald eagle) are also listed by the U.S. Fish and Wildlife Agency as federally threatened. Additional information about threatened or endangered species (both historical and current) is given in their respective chapters.

Table 10. Endangered/Threatened species and natural communities occurring in the Upper Rock River Assessment Area

GROUP	Common name	Scientific name	Status
MAMMALS			
	River otter	<i>Lontra canadensis</i>	ST
BIRDS			
	Pied-billed grebe	<i>Podilymbus podiceps</i>	ST
	Bald eagle	<i>Haliaeetus leucocephalus</i>	ST, FT
	Red-shouldered hawk	<i>Buteo lineatus</i>	ST
	Sandhill crane	<i>Grus canadensis</i>	ST
	Upland sandpiper	<i>Bartramia longicauda</i>	SE
	Loggerhead shrike	<i>Lanius ludovicianus</i>	ST
	Brown creeper	<i>Certhia americana</i>	ST
REPTILES			
	Western hognose snake	<i>Heterodon nasicus</i>	ST

Table 10. Continued.

GROUP	Common name	Scientific name	Status
MOLLUSKS			
	Slippershell mussel	<i>Alasmodonta viridis</i>	ST
INSECTS			
	Ottoe skipper	<i>Hesperia ottoe</i>	ST
PLANTS			
	Woolly milkweed	<i>Asclepias lanuginosa</i>	SE
	False tarragon	<i>Artemisia dracunculus</i>	SE
	Forked aster	<i>Aster furcatus</i>	ST
	Hill's thistle	<i>Cirsium hillii</i>	ST
	Prairie dandelion	<i>Microseris cuspidata</i>	SE
	Yellow birch	<i>Betula alleghaniensis</i>	SE
	Gray birch	<i>Betula populifolia</i>	SE
	Bunchberry	<i>Cornus canadensis</i>	SE
	Red-berried elder	<i>Sambucus pubens</i>	SE
	Bearberry	<i>Arctostaphylos uva-ursi</i>	SE
	Pale vetchling	<i>Lathyrus ochroleucus</i>	ST
	Prairie bush-clover	<i>Lespedeza leptostachya</i>	SE, FT
	Pink corydalis	<i>Corydalis sempervirens</i>	SE
	Sweet fern	<i>Comptonia peregrina</i>	SE
	Star-flower	<i>Trientalis borealis</i>	ST
	Pipsissewa	<i>Chimaphila umbellata</i>	SE
	Prairie buttercup	<i>Ranunculus rhomboideus</i>	ST
	Redroot	<i>Ceanothus herbaceus</i>	SE
	Shadbush	<i>Amelanchier sanguinea</i>	SE
	American mountain-ash	<i>Sorbus americana</i>	SE
	Sullivantia	<i>Sullivantia renifolia</i>	ST
	Kitten tails	<i>Besseyia bullii</i>	ST
	Downy yellow painted cup	<i>Castilleja sessiliflora</i>	SE
	Rock elm	<i>Ulmus thomasi</i>	SE
	Large fruited star sedge	<i>Carex echinata</i>	SE
	Pretty sedge	<i>Carex woodii</i>	ST
	Hairy woodrush	<i>Luzula acuminata</i>	SE
	Spotted coral-root orchid	<i>Corallorhiza maculata</i>	ST
	Moccasin flower	<i>Cypripedium acaule</i>	SE
	White lady's slipper	<i>Cypripedium candidum</i>	ST
	Northern panic grass	<i>Panicum boreale</i>	SE
	Bearded wheat grass	<i>Elymus trachycaulus</i>	SE
	American bur-reed	<i>Sparganium americanum</i>	SE
	Oak fern	<i>Gymnocarpium dryopteris</i>	SE
	Rusty woodsia	<i>Woodsia ilvensis</i>	SE
	Meadow horsetail	<i>Equisetum pratense</i>	ST
	Horsetail	<i>Equisetum sylvaticum</i>	SE
	Running pine clubmoss	<i>Lycopodium clavatum</i>	SE
	Ground pine clubmoss	<i>Lycopodium dendroideum</i>	SE

Table 10. Continued.

GROUP		
common name	<i>Scientific name</i>	Status
Long beech fern	<i>Phegopteris connectilis</i>	SE
Northern grape fern	<i>Botrychium multifidum</i>	SE

FE = Federal Endangered, FT = Federal Threatened, SE = State Endangered, ST = State Threatened

Natural Vegetation Communities

The description of the vegetation for the Upper Rock River Assessment Area (URRAA) is organized into nine sections:

1. Introduction to the Area
2. Threatened and Endangered Species
3. Disturbance, Habitat Quality, and Restoration Potential
4. Natural Areas and Nature Preserves
5. Natural Community Descriptions
6. Summary Recommendations
7. Definiton of Terms

Comparison of Biodiversity Trends

Approximately 136.75 acres of undegraded habitats (i.e., natural area quality) remain in the URRAA. This is about 0.026% of the assessment area compared with a proportion of 0.07% for statewide high-quality land as identified by the Illinois Natural Areas Inventory (White 1978). This total suggests that habitat degradation, among all community types combined, is greater in the URRAA than statewide. In general, it is difficult to provide precise estimates for some trend data in the URRAA at the level of the community class because the region historically was characterized by a complex mixture of dynamic habitat types. Nevertheless, with the data available, trends among community classes are outlined below.

Prairie — About 0.01% (2,300 acres) of the original area of prairie in the state persists in a high-quality condition (White 1978); no data are available for the total acreage of all prairie remaining in Illinois, including degraded remnants. The approximately 48.5 acres of high-quality prairie remaining within the assessment area is about 0.02% of the original extent of about 312,439 acres (Table 2, Figure 4). Most acreage of relatively undisturbed prairie in the state is from agriculturally less suitable lands such as sand deposits (~47%) or steep loess hills (~16%) (Taft 1995). It is likely that this region maintains more high-quality prairie as compared to rest of the state (Table 2), because most of the remaining prairies in the region are in gravel prairies and gravel hill prairie which are historically less tillable than a deep loam mesic prairie (Table 5).

Forest — About 30% of the original area of forest remains statewide (Iverson et al. 1989), though only about 0.3% of this, and therefore 0.1% of the original forest remains in a high-quality condition. About 10.4% (54,833 acres) of the URRAA currently is forest (IGIS database) compared with an estimated 41% (218,522 acres) for presettlement forest in the URRAA (Table 2, Figure 4). Based on these estimates, forest cover is about 25% of the original extent found in the URRAA. Since forest-savanna-prairie boundaries varied considerably over time prior to settlement, interpretation of these estimates requires some caution. However, both the percentage of forest cover and the percentage of high-quality

forest are proportionally less than the rest of the state (Table 2).

Savanna — Savannas have declined in area throughout Illinois and the Midwest, perhaps more than any other community class (Nuzzo 1986; Taft 1997), and the URRAA is no exception to this trend. According to the results of the Illinois Natural Areas Inventory (INAI), no areas of savanna remain in the URRAA in an undegraded condition (Table 5). Significant areas of the URRAA are mapped as potential areas for historical savanna (Nuzzo 1986) indicating that it was a widespread community type, but specific area estimates for the region do not exist. East of the URRAA, Lake County was composed of about 51% savanna as of 1840 (Moran 1978). It is likely that areas of former savanna that have restoration potential are present in the assessment area.

Wetlands—Natural wetlands in Illinois have declined from presettlement statewide estimates of about 23% of the land area to about 2.6% (Havera et al. 1994), or about 11% of the original total. Only about 6,000 acres remain in a high-quality condition (White 1978), representing about 0.65% of the remaining and 0.07% of the original wetland area (Havera et al. 1994). The approximately 7,899 acres (1.5%) of the URRAA remaining as wetlands are about 19% of original extent, and indicates that wetland loss in the assessment area is greater than statewide trends. Including 1.4 acres of sedge-meadow and 14.3 acres of wet and wet-mesic prairie communities, a total of 15.7 acres of wetland remain in a relatively undegraded condition in the assessment area (about 0.2% of remaining wetlands and 0.04% of original extent). These figures indicate that rates of wetland degradation appear to be greater in the URRAA than statewide.

Plant diversity—The species richness of vascular plants within the URRAA at the time of European settlement is unknown. About 1,262 plant taxa have been reported from within the assessment area (Appendix 1); about 222 of these (18%) are non-native to the assessment area and most of these adventive species are not native to North America. This should be considered an incomplete listing of species as it probably underestimates species richness of both native and non-native taxa in the URRAA. This estimate of species richness compares to about 2,200 native taxa and 3,102 total taxa reported from Illinois (Mohlenbrock 1986). Based on available information, about 41% of the native vascular plants from Illinois occur in the URRAA, which comprises only 1.5% of the area of the state. A disproportionately large amount of the diversity of native plants is captured in the 0.026% of the URRAA that is high-quality natural area.

Habitat diversity—The extraordinary loss of most habitat types in the URRAA also results in reduction in population sizes for species, particularly those sensitive to habitat degradation. As populations decline in size, they become more likely to undergo local extinctions. Indeed, a very strong correlation exists between size of habitat area and the number of species extinctions which will occur within it (MacArthur and Wilson 1968). The number of native species probably has declined in the URRAA since European settlement as a result of habitat destruction and degradation, reduced population sizes, and local extirpations while non-native taxa have increased. At the statewide scale, prairie species appear to form a somewhat resistant species pool. Despite the tremendous loss of prairie habitat in Illinois, only about

five taxa have been extirpated from the state. However, numerous prairie species now occur at low population levels in Illinois, and about 103 are listed as threatened or endangered (Taft 1995).

Illinois Threatened and Endangered Species

Forty-one plant species presently listed by the Illinois Endangered Species Protection Board (IESPB) as threatened or endangered (T or E) have been reported to exist in the URRRA. These are taxa that have populations considered to be extant and are listed in the Illinois Department of Natural Resources (IDNR) Natural Heritage biological database (Table 11). Based on recent revisions (Herkert 1991, 1994; IESPB 1999), the list includes 11 threatened and 30 endangered plant species, including one (prairie bush clover) listed by the U.S. Fish and Wildlife Agency as federally threatened. Six of these State-listed taxa, (false tarragon, large fruited star sedge, Pipsissewa, horsetail, hairy woodrush, American mountain ash), are known in Illinois only from the URRRA. There are records for an additional 37 T & E species occurring just outside the URRRA but within the region shown in Figure 2. Of these, the white fringed prairie orchid is federally listed as threatened (Table 12).

In addition to these species, an additional 4 species listed as threatened or endangered have been reported from habitats within the URRRA but have not been confirmed extant in recent years. These species include: small yellow lady's slipper orchid, bog clubmoss, queen-of-the-prairie, and yellow monkey flower. Some of these taxa may persist within the assessment area at undetected stations or unreported localities.

This high concentration of threatened and endangered species largely is due to a combination of widespread habitat destruction/degradation and the presence of unique habitat conditions that support many taxa at the edge of their distribution ranges. The habitats supporting the most T & E species in the URRRA seem to be sandy/gravelly prairies, mesic glacial refugia forests, sand forests, and outcrops. Most of the T & E species have ranges that are primarily north of Illinois.

Disturbance, Habitat Quality, and Restoration Potential

While outright habitat loss has been extensive within the URRRA, plant communities remaining in the assessment area also have experienced anthropogenic disturbances resulting in habitat degradation to different degrees. Fragmentation, fire absence, and exotic species introductions are typical secondary consequences of intensive habitat conversion that have implications for habitat restoration potential. These issues are discussed below.

Disturbance—Disturbance is a general term referring to any perturbation. Some disturbances can be natural and healthy to ecosystems and some are not. Plant communities (or ecosystems) are *degraded* when recovery to original condition is unlikely under normal circumstances. Degraded lands can be distinguished further by those that can be *restored* to

Table 11. Plant species listed by the Illinois Endangered Species Protection Board as threatened or endangered in Illinois that occur in the Upper Rock River Assessment Area (URRAA).

Common Name <i>Scientific Name</i>	Status	Habitat in Illinois	Range in U.S. URRAA	in	near
Shadbush <i>Amelanchier sanguinea</i>	SE	Wooded lake and river bluffs	NE U.S. & adj. Canada, Appalachian Mts. Known from 5 counties in N IL, Incl. Ogle Co.	1	
Bearberry <i>Arctostaphylos uva-ursi</i>	SE	Sand dunes, sand outcrops, sand prairies	Circumpolar, N U.S. Known in 3 counties, Incl. Ogle & Winnebago, Historically 6 counties	1	1
False Tarragon <i>Artemesia dracunculus</i>	SE	Dry sand and gravel prairies, barrens	N Mex., cent. U.S. adj. Canada., 1 population Winnebago County, Historically 7 counties	1	1
Milkweed, woolly <i>Asclepias lanuginosa</i> (<i>A. otariodes</i>)	SE	Rocky, sandy or gravel prairies	North-central U.S., Known from 6 cos., 9 Populations, Including Ogle, Winnebago, Formerly Lee, Boone	4	
Aster, forked <i>Aster furcatus</i>	ST	Seepage zones of north facing wooded bluffs and stream banks	East central U.S. Known from 17 populations in 9 counties, mostly in N IL. Known from Boone, Lee, Ogle. Formerly Winnebago,	4	1
Kitten tails <i>Besseyia bullii</i>	ST	Dry-mesic sand prairies and savannas, hill prairies, gravel prairies along Miss, IL, and Rock Rivers	South MI to MN, south to OH, IN, and IA. Known from 27 populations in 7 Illinois counties. Known from Lee, Ogle, Winnebago counties. See Robertson et al. 1997.	17	4
Birch, yellow <i>Betula alleghaniensis</i>	SE	Sandstone outcrops and sphagnum bogs	Eastern Canada, NE U.S., Appalachian Mts. Known from 5 locations in 3 counties, including Lee and Ogle counties.	3	
Birch, gray <i>Betula populifolia</i>	SE	Thickets, upland woods	NE U.S. & adj. Canada. 1 pop. indigenous to IL. in Winnebago Co., Introduced elsewhere	1	

Table 11. Continued.

Common Name <i>Scientific Name</i>	Status	Habitat in Illinois	Range in U.S. URRAA	in	near
Fern, northern grape <i>Botrychium multifidum</i>	SE	Mesic forests, sand savannas, successional habitats	Circumboreal, NE U.S. Known from a few populations in 5 cos. Including Winnebago, and Ogle cos. Historically in 10 cos.	2	?
Sedge, large fruited star <i>Carex echinata</i>	SE	Sedge meadows	Greenland & Labrador, south to New Foundland, E Quebec, N Ontario. Known from 2 pops, Ogle and Winnebago counties	1	
Sedge, pretty <i>Carex woodii</i>	ST	Mesic calcareous forests	NE U.S. & adj. Canada; Known from 8 populations, in 4 counties, Including Ogle County, Historically in 6 counties	1	
Downy yellow painted cup <i>Castilleja sessiliflora</i>	SE	Dry-mesic gravel and sand prairies	Central U.S. and Canada. Known from seven populations in 5 northern IL counties. Including Winnebago, Ogle & Lee cos. Historically occurred across northern IL	2	1
Redroot <i>Ceanothus herbaceus</i>	SE	Sand prairies, sand savannas, dolomite hill prairies	E & Central U.S. & adj. Canada. Known from 5 populations in 5 counties Including Ogle & Winnebago cos., Historically in 7 counties	2	
Pipsissewa <i>Chimaphila umbellata</i>	SE	Dry-mesic upland sand forests	Eastern Canada & NE U.S., South into the Appalachian Mts. Known from 3 populations in 1 county. Historically from 3 counties.	1	2

Table 11. Continued.

Common Name <i>Scientific Name</i>	Status	Habitat in Illinois	Range in U.S. URRAA	in	near
Hill's thistle <i>Cirsium hilli</i>	ST	Dry and dry-mesic prairies, hill prairies, sand prairies; especially grazed sites.	Southern Ontario, west to MN and SD. Historically in 39 cos. Known from about 40 extant populations in 22 counties. Including Winnebago County. See Ostlie & Bender 1990; Robertson et al. 1995.	3	1
Fern, sweet <i>Comptonia peregrina</i>	SE	Acidic sand prairies and savannas	Canada, NE U.S., Appalachian Mts. Known from 4 populations in 3 counties, Including Winnebago Co. Historically in 6 counties.	1	
Orchid, spotted coral-root <i>Corallorhiza maculata</i>	ST	Mesic upland forests	S Canada & adj. NE U.S. Known from 5 pops. from 4 N counties. Including Winnebago Co. Historically in 8 counties, including Ogle Co.	2	1
Bunchberry <i>Cornus canadensis</i>	SE	Forested bogs, sandstone canyons	Circumboreal, NE U.S. & Rocky Mts. Known from 6 populations in 3 counties, Including Ogle County, Historically in 2 other counties	4	
Pink corydalis <i>Corydalis sempervirens</i>	SE	Sandstone outcrops	Boreal Canada, adj. NE U.S. & Appalachian Mts. Known in IL in Ogle County. Historically in 5 counties, incl. Winnebago	1	
Orchid, pink lady's slipper. Moccasin flower <i>Cypripedium acaule</i>	SE	Forests, bogs, acidic substrates	Boreal Canada, E U.S. Known from 3 populations in 3 counties. Including Ogle County. Historically in 4 counties	1	
Orchid, white lady's-slipper <i>Cypripedium candidum</i>	ST	Wet-mesic prairies, fens, gravel prairies	North-central and NE U.S. Known from 6 counties, including Winnebago County. Historically abundant across Northern IL	1	

Table 11. Continued.

Common Name <i>Scientific Name</i>	Status	Habitat in Illinois	Range in U.S. URRAA	in	near
Grass, bearded wheat <i>Elymus trachycaulum</i> (<i>Agropyron</i> <i>subsecundum</i>)	SE	Mesic prairies & wet dolomite outcrops	S Canada & adj. N U.S.; Known from 6 populations in 3 counties. Including Winnebago County. Historically in 7 counties.	1	
Horsetail, meadow <i>Equisetum pratense</i>	ST	Sand forests	Circumboreal, N U.S. 5 populations in 2 counties, incl. Ogle.	3	
Horsetail <i>Equisetum sylvaticum</i>	SE	Bottom canyon slopes, seeps	NE U.S. & Canada. Known from 2 populations in Ogle County	2	
Fern, oak <i>Gymnocarpium</i> <i>dryopteris</i>	SE	Sandstone, dolomite cliffs & ledges	Circumpolar, Appalach. mts. & NE U.S. Known from 5 pops. in 4 cos, incl. Ogle. Historically in 6 cos., incl. Winnebago	2	
Pale vetchling <i>Lathyrus ochroleucus</i>	ST	Upland savannas and ravines, dolomite prairie	Boreal Canada, adj. NE U.S. Known in IL in 4 counties, over 7 populations, incl. Ogle Co., historically in 8 counties.	2	
Bush clover, prairie <i>Lespedeza leptostachya</i>	FT, SE	Dry or dry-mesic gravel and sand praries	IL, WI, IA, and MN. Known from 11 populations in seven Illinois counties, incl. Ogle and Winnebago.	3	3*, 1
Woodrush, hairy <i>Luzula acuminata</i>	SE	Forested St. Peter's sandstone outcrops	Central & E Canada, Ncentral & E U.S. Known from 3 pops. in Ogle Co. Historically in 2 counties.	3	
Clubmoss, running pine <i>Lycopodium clavatum</i>	SE	N facing, sandstone slopes, talus, and ledges.	Circumboreal, N U.S. Known from 4 populations, in 4 counties. Including Ogle County. Historically in 5 counties.	1	
Clubmoss, ground pine <i>Lycopodium</i> <i>dendroideum</i>	SE	Mesic sand forest, sand prairie, and forested ravines	Boreal Canada & Alaska, N U.S., Appalachian mts. Known from 5 pops. in 4 cos, incl. Ogle & Winnebago; historically in 5 cos.	2	

Table 11. Continued.

Common Name <i>Scientific Name</i>	Status	Habitat in Illinois	Range in U.S. URRAA	in	near
Dandelion, prairie <i>Nothocalais cuspidata</i>	SE	Dry-mesic prairies and hill prairies	North-central U.S. Known from 8 populations in four counties in the northern half of Illinois. Known from Ogle Co.	3	1
Grass, northern panic <i>Dichanthelium boreale</i>	SE	Sand prairies, sand savannas	E Canada & adj, U.S. Known from 2 populations in 2 counties, including Ogle County. Historically in Lake County.	1	
Buttercup, prairie <i>Ranunculus rhomboideus</i>	ST	Dry gravel & dolomite prairies, tolerates disturbance	North-central U.S. & adj. Canada. Known from 4 populations in 3 counties. Including Winnebago Co., Historically from 8 counties. Canada, N U.S., Appalachian	2	
Elder, red-berried <i>Sambucus pubens</i>	SE	Rocky forested slopes, occasionally bogs	Mts. Known from 7 populations in 5 counties, Including Boone and Winnebago counties	3	
Ash, American mountain <i>Sorbus americana</i>	SE	Rocky woods and bogs	E Canada, NE U.S. & the Appalachian mts. Known from 1 population in IL, Ogle County, Historically occurred in 3 counties.	1	
Bur-reed, American <i>Sparganium americanum</i>	SE	Marsh, shallow water	E. U.S. & adj. Canada. Known from 2 populations in 2 counties, including Winnebago County. Historically from 8 cos.	1	
Sullivantia <i>Sullivantia renifolia</i>	ST	Moist, shaded, dolomite cliffs	Wisc., IL., Minn., and Missouri. Known from 5 populations in 4 counties, including Ogle County. Historically in 6 counties.	2	
Fern, long beech <i>Phegopteris connectilis</i>	SE	North facing sandstone ledges	Circumboreal, N U.S., Appalachian mts. Known from 2 pops. in 2 counties, incl. Ogle. Historically widely scattered in IL.	1	

Table 11. Continued.

Common Name <i>Scientific Name</i>	Status	Habitat in Illinois	Range in U.S. URRAA	in	near
Star-flower <i>Trientalis borealis</i>	ST	Bogs, mesic sand forests, Lake Mich. ravine bluffs	Boreal E & Cent. Canada, NW U.S. Known from 5 pops. in 4 counties, including Ogle. Historically in 6 counties, incl. Winnebago	2	
Elm, rock <i>Ulmus thomasi</i>	SE	Mesic forests, on calcareous slopes & floodplain terraces	Quebec, NE & N Central U.S. Known from 4 populations in 4 counties. Including Winnebago. Historically in 7 counties.	1	
Fern, rusty woodsia <i>Woodsia ilvensis</i>	SE		Circumpolar, Appalachian mts., NE U.S. Known from 4 populations in 2 northern IL counties, incl. Ogle. Historically in 3 cos.	2	

SE = state endangered, ST = state threatened, FT = federally threatened. Element occurrence **in** = known occurrence within URRAA, **near** = known occurrence within area mapped in Figure 1

* within a one-mile border of the URRAA boundary.

For the most current info on T/E species contact the area IDNR Heritage Biologist.

For Illinois distribution, only presumed extant populations are considered.

? Indicates taxon not seen in recent surveys, not confirmed, or not reported to the IDNR biological database.

Range and habitat information mostly from Herkert 1991, 1994.

Table 12. Species known from near the Upper Rock River Assessment Area Boundary, or historically within the URRAA

Common Name <i>Scientific name</i>	Status	Habitat in Illinois	Range in and near U.S. URRAA
Alder, speckled <i>Alnus rugosa</i>	SE	Swamps, bogs, stream banks	E & Central Canada, NE U.S. Known from Winnebago, historically Boone Co.
Shadbush <i>Amelanchier interior</i>	SE	Sand, dolomite stream bluffs and bogs	WI, MN, IL, IO, SD. Known in Winnebago Co.
Fern, daisy leaf grape <i>Botrychium matricariifolium</i>	SE	Successional areas, old fields, sand forests	Circumboreal, Rocky Mts. NE U.S. Known from 1 pop. in Winnebago Co.
Fern, dwarf grape <i>Botrychium simplex</i>	SE	Sand prairie and sand forest	Cicumboreal, south into Rocky Mtns and northern U.S. In Illinois, known from two populations in two counties—Lee & Winnebago.
Orchid, grass pink <i>Calopogon tuberosus</i>	SE	Mesic to wet sand prairies; also bogs and fens	Eastern U.S. and adjacent Canada. Presently extant from 18 populations in six counties, mostly in northeastern Illinois. Known from Lee Co. Historically in Ogle Co. See Sheviak 1974 .
Sedge, shaved <i>Carex tonsa</i>	SE	Dry to dry-mesic sand prairies and savannas and associated blowouts; seems to increase with grazing	Eastern and central Canada and northern U.S. Known from about 13 populations in 10 Illinois counties. Known from Whiteside and Lee counties. See Robertson, Phillippe et al. 1997.
Sedge, beaked <i>Carex uticulata</i> (<i>C. rostrata</i> var. <i>utriculata</i>)	SE	Peatlands, lakeshores, marshes, sedge meadows, calcareous floating mats, wet prairie	Circumpolar, northern U.S. Known from 13 sites in 4 counties. In Winnebago County near URRAA Rockton Nature Preserve
Golden Corydalis <i>Corydalis aurea</i>	SE	Sandy, shores, gravel slopes, sandstone outcrops	Boreal Canada & Alaska, NE U.S. and Rocky Mts. Known from 1 N IL county, Historically in Winnebago and Ogle cos.
Orchid, small yellow lady's slipper <i>Cypripedium calceolus</i> var. <i>parviflorum</i>	SE	Forested and graminoid fens, prairies	Boreal Canada, NE U.S. Appalachian Mts. Known from 2 cos. Historically collected in URRAA in, Winnebago Co.
Orchid, showy lady's slipper <i>Cypripedium reginae</i>	SE	Praires, forests, barrens, bogs, fens	E Canada, NE U.S. Appalachian Mts. Historically throughout N IL. including Winnebago Co.

Table 12. Continued

Common Name <i>Scientific name</i>	Status	Habitat in Illinois	Range in and near U.S. URRAA
Laurentian fragile fern <i>Cystopteris laurentiana</i>	SE	Calcareous rocky habitat, such as limestone cliffs	Northeastern U.S. and adjacent Canada. Known in Illinois only from a station with about 10 plants in Lee Co.
Trout-lily, prairie <i>Erythronium mesochoreum</i>	SE	Mesic prairies and sand prairies	West-central U.S. to TX. In Illinois, now known from at least 15 populations in seven Illinois counties. Known from Whiteside Co. See Robertson et al. 1983.
Queen-of-the-prairie <i>Filipendula rubra</i>	ST	Moist to wet calcareous areas, such as sedge meadows, seeps, and fens	Eastern U.S. Known from seven populations in seven counties in northern and central Illinois. Known from Lee Co. See Aspinwall & Christian 1992a,b; Lichman 1980; Robertson 1974; Shimizu 1961. May be present in URRAA.
Sunflower, tall <i>Helianthus giganteus</i>	SE	Fens, sedge meadows	Central and E. Canada & adj. NE U.S. Known from 3 pops. 2 in Winnebago county.
Heather, false <i>Hudsonia tomentosa</i>	SE	Blowouts in dry and dry- mesic sand prairies	Central and eastern Canada, south along Atlantic coast. Known from four populations in four northwestern Illinois counties. Known from Lee Co.
Water-pennywort <i>Hydrocotyle ranunculoides</i>	SE	Shores of wet places, such as marshes	Southern U.S. north along Pacific coast. Known from four populations in three Illinois counties. Known from Whiteside Co.
Sedge, Vasey's <i>Juncus vaseyi</i>	SE	Wet prairies, sedge meadows, stream banks	E and Central Canada, adj. U.S. Known from 1 population in IL, in Winnebago County.
Juniper, ground <i>Juniperus communis</i>	ST	Glacial till bluffs, Ravines, Lake Mich. Dunes	Circumpolar, NE U.S. N IL. Known from 2 counties, including Winnebago. Historically from Ogle Co.
Pinweed <i>Lechea intermedia</i>	SE	Dry sand prairies	Northeastern U.S. Known from seven populations in four Illinois counties. Known from Lee Co.

Table 12. Continued

Common Name <i>Scientific name</i>	Status	Habitat in Illinois	Range in and near U.S. URRAA
Clubmoss, bog <i>Lycopodium inundatum</i>	SE	Wet-mesic to wet sand prairies	Cicumboreal, south into northern U.S. Known in Illinois only from Lee County. The specific locality for this species in Lee Co. was searched in 1997 by K.R. Robertson and L.R. Phillippe — no plants found, area is badly overgrown. Last seen 1962 Ogle Co.
Yellow monkey flower <i>Mimulus glabratus</i>	SE	Calcareous seeps	Mexico, central U.S. and adjacent Canada. Known from 5 counties in northern and central Illinois. Known from Lee Co. Purported to be present Nachusa Grasslands. See Vickery 1990.
Sundrops, small <i>Oenothera perennis</i>	SE	Sand, gravel prairies on dry rocky prairie slopes and knobs	E U.S. & adj. Canada. Known from Winnebago Co.
Broomrape, clustered <i>Orobancha fasciculata</i>	SE	Dry sand prairies- root parasitic	Boreal Canada, NW & N central U.S. Historically scattered in N IL, from Ogle Co.
Broomrape <i>Orobancha ludoviciana</i>	SE	Blowouts in dry sand prairies, hill prairies, and sand savannas	Central Canada and U.S. Known from 12 populations in seven counties in the northern half of Illinois. Known from Lee and Whiteside counties.
Grass, hemlock panic <i>Panicum columbianum</i>	SE	Sandstone outcrops, Sand deposits	E U.S. & adj. Canada. Occurs in 1 county, Historically in Ogle County.
Beard tongue, large flowered <i>Penstemon grandiflorus</i>	SE	Dry sand and gravel prairies	Central U.S. 3 populations in IL, 1 in Winnebago Co.
Pine, Jack <i>Pinus banksiana</i>	SE	Sandstone outcrops	Boreal Canada, south into the Great Lakes. Known historically only from Ogle Co., Is likely planted in the URRAA.
Orchid, tuberculed <i>Platanthera flava</i> var. <i>herbiola</i>	SE	Wet-mesic sand prairies and associated thickets	Northeastern U.S. and adjacent Canada. Known from eight populations in five Illinois counties, mostly in the northeast. Known from Lee Co. See Sheviak 1974.

Table 12. Continued

Common Name <i>Scientific name</i>	Status	Habitat in Illinois	Range in and near U.S. URRAA
Orchid, prairie white fringed <i>Platanthera leucophaea</i>	FT, SE	Mesic to wet prairies	East-central and eastern U.S., also Ontario. Known from 25 populations in nine Illinois counties. Historically throughout URRAA. See Sheviak 1974, Bowles 1983; Bowles et al. 1992.
Milkwort, pink <i>Polygala incarnata</i>	SE	Sand prairies, hill prairies, and barrens	Central and eastern U.S.; southern Ontario. Known from nine populations in seven Illinois counties. Known from Lee Co.
Shinleaf, round-leaved <i>Pyrola americana</i>	SE	Sandstone ravine	Boreal Eastern Canada, into northeastern U.S. & Appalachian Mts. Historically known from Ogle co.
Gooseberry, northern <i>Ribes hirtellum</i>	SE	Sandstone cliff, also bogs and wet forests	Boreal eastern Canada, into northeastern U.S. Known from three populations in two northern Illinois counties. Known from Lee Co. Historically in URRAA, Winnebago Co.
Blackberry, bristly <i>Rubus setosus</i>	SE	Wet-mesic sand prairies	NE U.S. and adj. Canada. Known from Winnebago County.
Bulrush, Torrey <i>Scirpus torreyi</i>	SE	Shores of acidic sand ponds	Northeastern and east-central North America. Known historically from Winnebago County in URRAA. Last collected in Lee Co. in 1959; see Bowles et al. 1991.
Goldenrod, cliff <i>Solidago sciaphilla</i>	ST	Dolomite and sandstone cliffs	MI, MN, IL, IA. Historically in Ogle Co.
Bur-reed, green fruited <i>Sparganium chlorocarpum</i>	SE	Muddy shores and shallow water	Eastern Canada and northeastern U.S., south to IL. Known from four counties in Illinois, including Lee Co.
Foxglove, ear-leaved <i>Tomenthera auriculata</i>	ST	Sand prairie and sand savanna	OH to MN, south to KS and MO. Known from 25 populations in 16 Illinois counties. Known from Lee, and Ogle counties.
Blueberry, highbush <i>Vaccinium corymbosum</i>	SE	Wet acidic sand prairies, and acidic bogs	E U.S. & adj. Canada. Known from Winnebago Co. Historically in Lee and Ogle cos.

original condition through management efforts and those which, at best, can be *reclaimed* for only limited use in severe examples (e.g., strip mining), or *rehabilitated* to a condition somewhat similar to the original but where species compositional differences remain (Lovejoy 1975). Perturbations that exceed the intensity, frequency, or duration of the natural disturbance regime can result in loss of species lacking tolerance to the new levels. When certain “keystone”(i.e., integral, essential) species, or assemblages of taxa, are extirpated from a community, the system’s capability for restoration is diminished and integrity is lowered. Although common source of degradation from disturbance in Illinois plant communities is over grazing, multiple factors often interact. Therefore excessive or non-natural disturbances can lead to degradation of the community.

Fragmentation—Fragmentation is a process describing landscape patterns where habitat remnants become isolated by land-cover conversions (Wilcove et al, 1986, Schwartz and Hermann 1997). Fragmentation of habitats often causes alterations in environmental conditions. Increased surface area of the edges compared to the interior of forest communities can result in drier soil moisture conditions and increased levels of solar radiation, as well as increased opportunity for exotic species invasions (Luken 1997) and wind damage. Fragmented habitats typically support fewer species and species at lower population levels compared to less fragmented habitats. Species at lower population levels are more prone to undergo local extirpation. Generally, a small number of generalist species thrive in fragmented communities (e.g., white-tailed deer, raccoons), but most others become rare or extirpated (Primack 1993)(see Birds/Mammal section in this volume). In much of the state, where only fragmented communities exist, edge loving species alone are present. Another effect of fragmentation is the interruption of species migration patterns. Consequently, high levels of fragmentation limit the recovery potential of degraded sites since the species immigration needed to compensate for the local extirpations because of low population levels is lessened (Taft 1995, 1997). Fragmentation also results in alterations in seed dispersal and natural disturbance regimes such as fire.

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

Exotic species- (non-native or adventive taxa)—Exotic species introductions also often result in lowered integrity. Adventive taxa in a system often sort themselves into disturbance or habitat niches that result in the replacement of native taxa. The establishment of adventive taxa can result in arrested development and interfere with rates of recovery processes. The recovery potential of plant communities with ecological restoration and management is an area in need of additional research. Specific and general recommendations for restoration of natural communities in the URRRA, including exotic

species control measures, are offered in the Summary Conclusions section following descriptions of natural communities.

Natural Areas and Nature Preserves

The Illinois Natural Areas Inventory (INAI) was conducted over a three-year period during the mid 1970's to document remaining significant and exceptional examples of the natural communities and other features in Illinois (White 1978). The INAI established seven categories of natural areas based on significant features. The categories were: I - High Quality Natural Communities; II - Habitat for Endangered Species; III - Habitat for Relict Species; IV - Outstanding Geological Areas; V - Approved Natural Areas and Restoration Sites; VI - Unique Natural Areas; and VII - Outstanding Aquatic Areas. The INAI established a grading system to rank natural quality (White 1978). The natural quality of a community type was graded from A (undegraded), B (nearly undegraded), to E (very severely degraded). In general, only A and B communities were designated as significant or exceptional features, although many natural areas included some Grade C quality habitats. Estimates and comparisons of natural areas acreage within the URRAA and statewide are based on the best available data (Table 2, Table 6). In some cases, recent data for natural communities within the assessment area are compared to 20 year old statewide data from White (1978). Consequently, if discoveries of natural areas do not equal the area of recently degraded or destroyed natural areas, some numbers may be slightly over or under estimated.

The INAI has recognized 35 natural areas occurring within the URRAA boundaries (Table 7, Figure 12). Thirteen of these are Category I (high-quality, essentially undegraded) sites and nine of these include populations of species listed by the IESPB as threatened or endangered. An additional 25 sites are Category II natural areas (containing threatened and endangered species but no high-quality natural communities). Among the thirteen Category I sites identified within the URRAA are 21 occurrences of 12 different natural community types (some sites have multiple high-quality natural communities). The Category I natural areas comprise a total of about 136.8 acres (Table 6), or about 0.026% of the total area of the URRAA. This compares to 0.07% of Category I acreage for the entire state (White 1978). Some natural communities at the Category II sites also may include areas that are relatively high-quality thus having restoration potential. These areas, if restored, ultimately may meet INAI standards for Category I natural communities. The area of all INAI natural areas, including their buffer areas, totals about 2,732 acres in the assessment area (about 0.51%).

Comparison of the area of Category I natural communities in relation to the total remaining in Illinois for each community type is summarized in Table 6 and described in the following section 'Terrestrial Natural Community Descriptions'. An additional 43 natural areas (Table 7) occur outside the URRAA boundary but within the region included in Figure 2. Two of these occur within a one-mile buffer zone around the URRAA boundary.

Illinois Nature Preserves are areas of land or water that are formally dedicated to receive maximum protection of significant natural features. The central goal of the nature preserve

system, currently with about 300 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 aesthetic 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 private land owners (McFall and Karnes 1995). Many nature preserves are quite small representing mere fragments of once large natural communities; however, these are still important for conservation (Schwartz and van Mantgem 1997).

There presently are 13 nature preserves within the URRAA (Table 6, Figure 11) totaling 1,237.96 acres (about 0.23% of the URRAA). Eighteen additional nature preserves occur outside the URRAA but within the area shown in Figure 11. One of these occurs just one mile from the boundary of the assessment area (Table 6, Figure 11). The brief descriptions below are summaries from McFall and Karnes (1995) and unpublished INPC nature preserve dedication proposals. The data presented are based on best available information as additional acreage is occasionally added for individual preserves. These nature preserves are floristically very rich because the sites generally include a great variety of habitat conditions related to the different soil parent materials and different levels of available soil moisture. (Acreages used below are derived from the Illinois Geographic Information System).

Beach Cemetery Prairie — This nature preserve is about 3.9 acres. It is a dry hill prairie located on a gravel kame. Although quite small it maintains a rich assemblage of plant species.

Douglass E. Wade Nature Preserve — This site is an approximately 13-acre site. Original dry-mesic gravel prairie and dry-mesic dolomite prairie exist on a low Rock River valley bluff where glacial deposits consist of calcareous sand and cobbly sediments, and are covered by loess. This creates a rich, well drained prairie.

George B. Fell Nature Preserve — This relatively large (685.5 acre) preserve is located within Castle Rock Nature Preserve. It borders the Rock River and contains some of the greatest elevation changes in the area. It contains a tremendous diversity of natural communities including ravine forest, upland forest, floodplain forest, prairie, river creeks, and sandstone outcrops. The preserve contains some of the best remaining examples of natural communities in the Rock River Hill Country. The most significant features are mesic upland forest and sandstone cliffs, where acidic, sandy soil, and heavy shade provide unique conditions for relict boreal plants. These plants probably were common in portions of northern Illinois some 10 to 15 thousand years ago. The range of this vegetation is now much further north in Wisconsin, Minnesota, Michigan and areas with cooler climates such as the Appalachian Mountains. Thirteen T & E plant species and two watch-list species occur at Castle Rock State Park. Garlic mustard is a problematic non-native weed at this preserve.

Harlem Hills Nature Preserve — Located near Rock Cut State Park adjacent to Rockford, this site is noted for impressive spring wildflower displays and for containing several threatened

and endangered plants. Despite being embedded within urban lands this 58.7 acre site is one of the largest and finest remaining gravel hill prairie in Illinois

Heeren Prairie Nature Preserve — This 2 acre dry-dolomite prairie is located in north-central Ogle County just south of the Stephenson County line. Surrounded by the Heeren family farm it has escaped tillage because of its rocky conditions and shallow exposed dolomite bedrock. Dominant plants present are little bluestem, prairie dropseed, porcupine grass, side oats gramma grass, Canada wild rye, pale purple coneflower, flowering spurge, leadplant, short green milkweed, butterfly weed, and the threatened downy yellow painted cup. This site is privately owned and access requires the owner's permission.

Howard D. Coleman Dells Nature Preserve — This preserve is six miles southwest of Rockford, known historically as the Dells of Rockford. It's 55 acres includes a winding section of Hall Creek and its narrow floodplain, three dells (dolomite exposures supporting dolomite cliff vegetation), 40 acres of dry-mesic forest, and populations of the rare rice grass. It is owned by the Natural Land Institute of Rockford, and is immediately adjacent to Severson Dells Nature Preserve, together these 2 areas protect the unique dells area.

Jarrett Prairie Nature Preserve — Located within the Byron Forest District Prairie Preserve, this 127.4-acre site is a large complex of dry dolomite and dry-mesic dolomite prairie remnants. The ridge and swale topography is defined by underlying dolomite, where prairie is present on the thin soils, ridges, and upper slopes. Large bur oaks with open grown, spreading branches suggest savanna may have been present. Much of the site has been degraded in the past but is recovering with restoration management efforts.

Kinnikinnick Creek Nature Preserve — This 111.3 acre preserve is typical of the forests found in the Rock River Valley at the prairie-forest border. It contains a spring-fed creek, upland forest, floodplain forest, and bedrock outcrops. Some savanna remnants are present typical of those which were once common in Boone County. The Kinnikinnick Creek is spring-fed and although draining 11,500 acres maintains a high water quality status, and is home to rare fish species and abundant wildlife.

Pine Rock Nature Preserve — This 58 acre preserve contains dry upland black oak forest/savanna on the bluff. The Pine Rock is an outcropping of St. Peter sandstone rising 40 feet above the bluffs. The plain below is mesic and wet-mesic prairie. This area is owned and managed by Northern Illinois University.

Piros Prairie Nature Preserve — This is a 7.8 acre tract of rare wet-mesic prairie and sedge meadow in Ogle County. It is privately owned and contains 2 acres of surrounding buffer. It contains numerous rare prairie plants.

Plum Grove Nature Preserve — Located within Rock Cut State Park, the 20 acre preserve supports the best dry-mesic upland forest of its kind in the area. Canopy trees of oak, hickory, and cherry are mature to old second growth. The area has an especially diverse fauna of mammals and birds.

Searls Park Prairie Nature Preserve — This preserve is 68.7 acres of black soil prairie within Searls Memorial Park in northwest Rockford. Mesic, wet-mesic, and wet prairie are all present with their associated grass and sedge plant communities of dropseed, little bluestem, Indian grass, tussock sedge, cord grass, and blue-joint grass. It is owned and managed by the Rockford Park District.

Severson Dells Nature Preserve — This 43.6-acre preserve which lies within a larger tract of Winnebago County Forest Preserve. It contains remnants of the original dry-mesic upland forest, mesic floodplain forest, dry dolomite prairie, and dolomite cliff communities. The “dells” are cliffs which were formed by receding glacial meltwaters. Many unique plants are present including northern relicts such as white pine and the Canada yew. The spring fed Hall Creek runs through the creek. It is owned by the Winnebago County Forest Preserve.

Natural Community Descriptions

The natural communities within the URRAA (Table 13) were determined by examining data from several sources. Sources confirming occurrence of natural communities include descriptions of presettlement vegetation, descriptions of existing community types, or inferences of plant communities which may occur (or have occurred) based on environmental conditions present in the area. Published descriptions of vegetation in the assessment area are limited in number and are often too general or regional in scope to provide detailed community descriptions. Specific data sources used for the following accounts include database records on community types found in natural areas (IDNR Natural Heritage database records), descriptions of vegetation in unpublished technical reports (Phillippe 1971; Ecological Services 1986; Jones 1994a, 1994b; Hill 1996; Taft 1989, 1990, 1992; Field surveys conducted by Division of Natural Heritage staff at the IDNR 1986-1997), a graduate thesis (DeForest 1922), general flora publications (Gleason 1910, Fell and Fell 1956, 1958), and community descriptions and species lists in nature preserve proposals (Bronny and Alesandrini 1992, Heim and Bitner 1994, Meyer 1981, Nyboer 1980, Smith 1970).

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

Forest

The forests of the URRAA belong to the Forest/Prairie transition area of the Northern Division of the Oak-Hickory Forest Region as described by Braun (1950). Most forests are concentrated on the uplands associated with the Rock River and its major tributaries (DeForest 1922, Fell 1955, IGIS database using GLO records, Figure 8). According to

historical accounts prairie extended to the water's edge in only a few places. Other areas of historical forest were the so called "groves", or patches of forest along minor water courses, and forested areas in the vicinity of springs (DeForest 1922). According to the Illinois Plant Information Network (ILPIN), over 68% of the native vascular flora of the state are forest associated species (Iverson and Schwartz 1994).

Forest subclasses in Illinois include Upland forest, Floodplain forest, Sand forest, and Flatwoods (White and Madany 1978) all may possibly occur (or formerly occurred) in the URRRA. Community types within each subclass are described briefly below. Of the existing forest in the URRRA, none remains in a state of high ecological integrity (i.e. is Type I-A; White 1978; IDNR Natural Heritage Database; Table 6). However, some existing forest stands have restoration potential and with appropriate protection and management may meet the criteria for inclusion as Category I natural areas for the INAI (see Summary Recommendations).

Table 13. Terrestrial natural communities of the Upper Rock River Assessment Area. Adapted from the Illinois Natural Areas Inventory's natural community classification (White and Madany 1978). Communities listed are known to occur or believed to have occurred formerly in the region. Natural communities shown in *italics* are communities that are listed based on speculation; their occurrence has not been confirmed.

FOREST	PRAIRIE	WETLAND
Upland Forest	Prairie	Marsh
Dry upland forest	Dry prairie	Marsh
Dry-mesic upland forest	Dry-mesic prairie	Fen
Mesic upland forest	Mesic prairie	Graminoid fen
<i>Wet-mesic upland forest</i>	Wet-mesic prairie	<i>Bog</i>
Floodplain Forest	Wet prairie	<i>Graminoid Bog</i>
Mesic floodplain forest	Hill Prairie	Seep
Wet-mesic floodplain forest	Glacial drift hill prairie	Seep (sandstone)
Wet floodplain forest	Sand Prairie	Seep (calcareous-neutral)
Sand Forest	Dry sand prairie	Sedge Meadow
Dry-mesic sand forest	Dry-mesic sand prairie	Sedge meadow
Mesic sand forest	Mesic sand prairie	
	Wet-mesic sand prairie	
	Wet sand prairie	
FLATWOODS	Gravel Prairie	LAKE AND POND
<i>Sand flatwoods</i>	Dry gravel prairie	Pond
	Dry-mesic gravel prairie	Pond
	Mesic gravel prairie	
SAVANNA	Dolomite Prairie	
Dry-mesic savanna	Dry dolomite prairie	
<i>Mesic savanna</i>		PRIMARY
<i>Wet-mesic savanna</i>		
Sand Savanna		Cliff
<i>Dry sand savanna</i>		Sandstone cliff community
<i>Dry-mesic sand savanna</i>		Dolomite cliff community

Common ecological problems (i.e., threats to habitat integrity) associated with forest communities generally include fragmentation, exotic species invasions, fire absence, altered hydrology, and increased siltation in floodplains. Another typical source of habitat degradation in Illinois forests is over-grazing by domestic livestock and white-tailed deer which, in recent years, have increased substantially in numbers (Anderson 1997). This grazing often produces changes in forest compositional and structural characteristics. As in much of Illinois grazing-sensitive species may have been eliminated from some forest remnants in the URRRA (orchids, trilliums, etc.). In contrast, species that increase with grazing (e.g., thorn-bearing taxa exotic species, and certain weedy native species) are often abundant in grazed forests. In many cases abundance of exotic species appears to be directly proportional to the historic grazing intensity. Recovery of these sites following cessation of grazing appears to be slow. Many of these exotics are particularly abundant and pernicious and represent great threats to the long-term sustainability of biodiversity. Complete restoration of these degraded sites may not be possible without intensive management including efforts at reintroduction of native species. Finally, fire absence in upland forest communities typically results in compositional and structural changes in more mesic sites and structural changes in drier sites. Structural changes include increases in both stem density of woody plants and shade. The result is often a reduction in cover and diversity of the herbaceous ground flora, which is typically the most diverse stratum in Illinois woodlands (e.g., Taft et al. 1995).

Upland Forest—The total extent of upland forest in the URRRA is estimated to be about 50,288 acres (Table 3), or about 9.5 % of the total assessment area (IGIS data). Upland forest communities can be classified further into community types according to soil-moisture characteristics. *Xeric, dry, dry-mesic, mesic, and wet-mesic upland forest* communities are present in Illinois depending on available soil moisture (White and Madany 1978). Major tree species respond in predictable ways along these soil-moisture gradients (Adams and Anderson 1980; Fralish 1994; Taft et al. 1995).

Parent material and bedrock type also influence species composition in the URRRA. Some fairly consistent species associations in forests tend to occur based on the type of substrate which the community is over, namely sandstone and limestone (gravel, dolomite, loess, etc.). Taxa which tend to prefer or are most often found on sandstone include: yellow birch (SE), eastern red cedar, big tooth aspen, Juneberry, shadbush, bearberry (SE), witch hazel, prickly ash, American mountain ash, roses, black huckleberry, black chokeberry, high bush blueberry, running strawberry bush, coralberry, Canada blueberry, bunchberry (SE), wild sarsaparilla, pipsissewa (SE), spreading dogbane, spinulose wood fern, wood anemone, Canada mayflower, pale Indian plantain, Pennsylvania sedge, fragile fern, poverty oat grass, pointed tick trefoil, rattlesnake plantain orchid, hairy woodrush, shining clubmoss, interrupted fern, fragile fern, pale beardstongue, shinleaf, shining clubmoss, and early buttercup.

Taxa which tend to prefer limestone substrates include: chinkapin oak, Basswood, black walnut, black maple, blue ash, paw paw, bladdernut, leatherwood, ninebark, yellow honeysuckle, white baneberry, maidenhair fern, jack-in-the-pulpit, blunt scaled wood sedge, blue cohosh, white trout lily, nodding fescue, great waterleaf, ginseng, leafcup, bloodroot,

broadleaved goldenrod, early meadow rue, large white trillium, nodding pogonia, wild ginger, Solomon's seal, and bellwort.

Dry upland forest—Dry upland forest occurs on dry, excessively drained soils, and shallow-soil habitats where bedrock, gravel, or sand occur at or near the surface. In the URRRA they typically are found on south to southwestern-facing slopes (which receive the most intense solar radiation). Trees make slow growth but are not as stunted as in a xeric forest. Dry upland forests occur on steep ridges at the crests of river bluffs and at the edges of escarpments. Some of what can be classified as upland forest today were most likely open grassy fire maintained barrens or savannas in the past. Significant areas of this forest type are found at Lowden-Miller State Forest, although none meet the criteria for category I natural areas. Indeed throughout Illinois there are only 27 acres of high-quality dry upland forest. The nearest high quality representatives of this type are found just south of Apple River Canyon State Park (Jo Davies County).

Dominant **canopy species** for dry upland forests in the URRRA are black oak and Hill's/scarlet oak (see discussion regarding nomenclature of this species in Swink and Wilhelm 1994). **Occasional canopy species** include burr oak, white pine, and possibly pignut hickory. **Subcanopy and shrub species** include shadbush, red cedar, and low-bush blueberry (only on sandstone). Characteristic **herbaceous ground cover** species include: false tarragon (SE), kittentails (ST), six-weeks fescue, cat's foot, pussytoes, hawkweed, false dandelion, goat's rue, poison ivy, and hair grass. The desiccation tolerant broom moss (*Dicranum scoparium*) and white pincushion moss (*Leucobryum glaucum*) are characteristic as well.

Ecological problems are typically long term changes in structure of the community, and composition with long term fire-free intervals. Oak-hickory species can become very dense, along with increases in species which aren't fire adapted (eastern red cedar, and on occasion sugar maple). Although no threatened or endangered species are reported to exist in dry upland forest in the URRRA, species found on cliffs, barrens, ledges, or savanna could be found in openings present.

Dry-mesic upland forest—This forest community type is the most prevalent in Illinois and was likely the dominant forest cover type in the area. It primarily occurs in the URRRA on the upper slopes and ridges of the dissected terrain bordering the major streams. About 74-acres in the assessment area meet the criteria for Category I (Grade B) dry-mesic forest natural area. Criteria for Type I forest state that stands must be at least 90 years old, greater than 20 acres, and in a nearly undegraded condition (White 1978). A 20-acre area of this type of forest can be found at Lowden-Miller state park, as well as Rock Cut state park.

Dominant canopy species for dry-mesic upland forests in the URRRA are white oak, black oak, and red oak. In general, although these species rarely form pure stands, red oak occurs most frequently on lower-to-mid slope positions and white oak occurs most frequently on the upper slopes and nearly level to rolling uplands, and black occurs in the driest areas. **Occasional canopy species** include burr oak, Hill's oak, chinquapin oak, basswood, shagbark hickory, and white ash. Common to occasional **subcanopy species** include sugar

maple, shadbush, hop hornbeam, white ash, shagbark hickory, black cherry, hawthorns, basswood, and slippery elm. Typical **shrubs** include arrowwood, gray dogwood, American hazelnut, Carolina rose, choke cherry, low-bush blueberry, coralberry, dwarf honeysuckle, prickly gooseberry, black haw, alternate leafed dogwood, hazelnut, prickly ash, and common blackberry. Non-native shrub species can be numerous and abundant (see below). **Woody vines** include poison ivy, Virginia creeper, common dewberry, bristly greenbrier, and summer grape.

Characteristic **herbaceous ground-cover** species include: enchanter's nightshade, white avens, common blue violet, heart leaved skullcap, wild yam, cat's-foot, pussytoes, wild sarsaparilla, hog peanut, Drummond's aster, Short's aster, short-leaved bracted sedge, Pennsylvania sedge, curly styled wood sedge, poverty oat grass, shooting-star, shining bedstraw, woodland sunflower, white snake root, common wood rush, common cinquefoil, black-eyed Susan, black snakeroot, mayapple, elm-leaved goldenrod, false Solomon's seal, sweet cicely, nodding fescue, and beggar-ticks.

The major ecological problems associated with dry-mesic upland forests in the URRAA are degradation from grazing, habitat fragmentation, elimination of natural regional disturbance regimes (e.g., fire), and invasion by non-native species. Fire absence has resulted in the closure of the canopy and the increased importance of sugar maple in the subcanopy stratum and potentially lesser importance of oaks in the canopy. Additionally, where oaks have been removed by selective logging practices, black cherry, shagbark hickory, slippery elm, white ash, and possibly sugar maple are among the species that have gained prominence. Thus the composition of canopy trees in Illinois has been dramatically altered (Whitney 1994). Many of the remaining upland forest that is currently of lower-quality can be characterized by an abundance of grazing increasers such as the thorn bearing shrubs; prickly gooseberry, blackberry, Japanese barberry, multiflora rose, prickly ash, hawthorn, honey locust, black locust, Osage orange, and buckthorn. Problematic invasive exotics not listed above include: garlic mustard, various bush honeysuckles, burning bush, and European high-bush cranberry. Almost any of the T & E species in the area which occur in wooded areas can occur within dry-mesic forest because it is widespread in the URRAA and often borders other forest types.

Mesic upland forest— Mesic upland forests primarily are found in ravines, north-facing slopes, lower slopes, and on high terraces of the major streams and tributaries. The total extent of mesic upland forest in the assessment area is unknown. Mesic forests are known for their prominence of spring ephemerals. Because this forest grows where soil moisture is ideal for tree growth, mesic forests typically produce the most diverse forests with the largest trees, and have historically been logged the most preferentially and intensively (Whitney 1996). No remnants of mesic upland forest in the URRAA currently are recognized as high quality natural areas; some areas may qualify in the future as stand age matures. Examples of this community type can be found at Severson Dells Nature Preserve.

Species composition is relatively rich, often with numerous taxa at each forest stratum. Often no species are dominant. **Characteristic canopy tree species** include sugar maple, basswood, and red oak. **Occasional canopy species** include shagbark hickory, bitternut

hickory, black maple, hackberry, rock elm (SE), white ash, black walnut, white pine, blue ash, American elm, chinquapin oak and burr oak. **Common subcanopy species** include sugar maple, basswood, blue beech, witch hazel, black cherry, choke cherry, hop-hornbeam, red mulberry, blue ash, and slippery elm. Numerous **native shrub species** typically are present including: bladdernut, elderberry, wahoo, Canada yew, leatherwood, gray dogwood, alternate leaved dogwood, hazelnut, black raspberry, common blackberry, maple-leaved arrowwood, black haw, nannyberry, downy arrowwood, dwarf honeysuckle, bristly gooseberry, and prickly ash. Woody vines include Virginia creeper, upright carrion flower, poison ivy, and riverbank grape.

Herbaceous ground-cover composition includes a rich assortment of species, particularly spring ephemerals. Selected taxa reported from the URRRA include: fragile fern, lady fern, rattlesnake fern, maidenhair fern, red trillium, large white trillium, white baneberry, red baneberry, American spikenard, leafcup, Jack-in-the-pulpit, Dutchman's breeches, wild ginger, bloodroot, Pennsylvania sedge, pretty sedge (ST), blunt scaled wood sedge, enchanter's nightshade, blue cohosh, spring beauty, wild yam, nodding fescue, annual bedstraw, wild geranium, white trout lily, white snakeroot, sharp-leaved hepatica, great waterleaf, miterwort, sweet cicely, mayapple, lopseed, Jacob's ladder, bloodroot, Canadian black snakeroot, early figwort, starry campion, false Solomon's seal, smooth Solomon's seal, broad-leaved goldenrod, early meadow rue, bellwort, ginseng, and downy yellow violet.

The major ecological problems associated with mesic upland forests are degradation from grazing, habitat fragmentation, and exotic species invasion. Among the more abundant exotic species within mesic upland forest are the shrubs: multiflora rose, Japanese barberry, burning bush, common buckthorn, European high-bush cranberry, the bush honeysuckles (especially *Lonicera maackii*), and the herb garlic mustard. The latter four taxa are extremely pernicious ecologically and pose among the most severe threats to community integrity in the assessment area and Illinois. Dame's rocket (*Hesperis matronalis*) is an exotic herbaceous species that occurs in the region and appears to fit the model of a potentially serious invasive pest in mesic upland and floodplain forest systems. This attractive and fragrant species easily escapes from cultivation and may become a serious pest within the URRRA. Natural fires may have been relatively infrequent compared with other upland forest communities because mesic forests occur in somewhat protected locations, such as bordering natural fire breaks or on lower slopes adjacent to floodplains. Because mesic upland forests are less dependent on periodic fire, the effects of fire absence are less pronounced and canopy composition tends to be more stable compared with dry-mesic upland forest. Endangered species which have been found in mesic forests include spotted coral-root orchid, pretty sedge, northern grape fern, and rock elm.

Wet-mesic upland forest—Poor drainage on level topography within an upland forest causes this community. Often drainage is limited by a slowly permeable subsoil horizon. Local areas of seepage may contribute to locally saturated soils and can support this natural community. Shallow drainageways, or depressions in an upland forest that create ponding can also produce this community type. While this community type very likely occurred in the URRRA, no examples are known or reported.

Characteristic **canopy** or dominant **species** can include swamp white oak, American elm, slippery elm, hackberry, shagbark hickory, and burr oak, while the subcanopy often is absent. **Ground cover species** may include a few wetland sedge and shrub species.

Sand Forest—This subclass occurs where there are deep sand deposits, but permeability of soil is not too drastic, and fire breaks allow forest development. Depending on soil-moisture conditions, *dry sand forest* (on the tops of dunes), *dry-mesic sand forest* (intermediate slope and soil moisture conditions), and *mesic sand forest* (humus content of soil is relatively high, mainly on riparian or ravine slopes) may be present. Sand forest often merges gradually and imperceptibly with other community types such as sand savanna and sand flatwoods. The boundaries are variable over time between sand forest and sand savanna depending on fire history, while the boundary between sand forest and sand flatwoods depends on differences in soil drainage properties. ‘Forested areas’ on sandy soils are present locally in the URRRA; however, this community type (as well as any occurrences of sand flatwoods) probably has increased relatively recently from sand prairie and sand savanna following a long fire-free interval (Jones 1994a). No areas of high-quality sand forest have been identified within the URRRA, but sand forest does occur over significant areas of northern Winnebago County in Shirland and Rockton townships. There are dry/dry-mesic/mesic sand forests in western Winnebago County along the Sugar River. It is likely that there are areas of sand forest in Ogle County where deep sandstone bedrock breakdown deposits are present, because of highly weathered bedrock. This should not be confused with most forests in the URRRA which occur on sandstone bedrock where sand deposits are shallow and typical upland forest develops.

Dry-mesic sand forest—There is no estimate for the amount of dry-mesic sand forest in the URRRA. The extent, if present, would be very local and limited. The **dominant canopy species** in this community type typically is black oak. **Occasional canopy species** can include white oak, Hill’s oak, and black cherry. **Subcanopy species** can include serviceberry, choke cherry, black cherry, hazelnut, sassafras, and witch hazel. **Shrub species** can include New Jersey tea, gray dogwood, shining sumac, smooth sumac, pasture rose, gooseberry, black raspberry, blackberry, common dewberry, and early low blueberry. **Herbaceous ground cover species** can include white snakeroot, three-seeded mercury, spreading dogbane, sand bracted sedge, Pennsylvania sedge, enchanter’s nightshade, pointed tick-trefoil, hairy pinweed, horsemint, pale beard-tongue, common cinquefoil, slender mountain-mint, kittentails (ST), bracken fern, dwarf grape fern, and ebony spleenwort.

Ecological problems can include over-grazing, sand mining, and exotic species invasion. Common non-native species are Amur honeysuckle, Tartarian honeysuckle, garlic mustard, European highbush cranberry, common buckthorn, and multi-flora rose.

Mesic sand forest—This community occurred historically in northern Winnebago County in depressions between sand ridges. Because there is no accumulation of organic soils and the water table generally is low, the area is well drained. However, the accumulation of forest humus, and protection from sunlight and desiccating wind because of surrounding sand ridges affords mesic soil conditions. Gleason referred to this community as ‘The Burr Oak

Association' (1910). This rare community merged spatially and temporally with dry-mesic sand savanna and dry-mesic sand forest. It mostly is extirpated from the assessment area. The **dominant species** is almost exclusively burr oak, with some white oak. Uncommon species are quaking aspen, big tooth aspen, and shagbark hickory. **Shrub species** include, black cherry, chokecherry, red osier dogwood, black raspberry, red raspberry, and hazelnut. **Vines** are not common but include frost grape, poison ivy, bristly green briar, and yellow honeysuckle. **Ground -cover species** include bracken fern, large leaved shinleaf, starry false Solomon's seal, wild geranium, hog peanut, yellow lady's slipper orchid, shooting star, Culver's root, starry campion, rattlesnake fern, bronze fern, Solomon's seal, false Solomon's seal, alumroot, enchanter's nightshade, shining bedstraw, lion's foot, clustered black snakeroot, and blunt leaved sandwort.

Floodplain Forest—Bottomland forest is distributed along the major waterways throughout the region and mostly is restricted to riparian border strips. The total extent of floodplain forest in the URRRA is estimated to be about 4,545 acres (Table 3), or about 0.9% of the total area (IGIS database).

Floodplain forests are characterized by edaphic conditions of poor drainage and slow permeability. Local areas of sand and gravel increase permeability. Floodplain forest communities in Illinois include mesic, wet-mesic, and wet floodplain forest and are classified according to characteristics of flooding (White and Madany 1978). Wet floodplain forest occurs in the floodplain bordering streams and usually includes the stream bank. They often are seasonally flooded and/or have perched water during a portion of the year, often in late winter and spring. Wet-mesic to mesic floodplain forests occur on low and high terraces, respectively. In general, the flooding regime, including depth and duration of flooding is a strong selective force on composition and species richness in floodplain forests (Bell 1974) and also in regulating tree growth (Robertson 1992). Generally, flooding is of shorter duration and less frequency in mesic floodplain forests while wet-mesic floodplain forests have intermediate levels of flooding frequency and duration. Diversity of species composition tends to increase from wet to mesic floodplain forest. The best examples of floodplain forest in the area are found west of the assessment area at Pecatonica Bottoms, which contains fairly high quality mesic floodplain forest as well as some wet floodplain forest.

The amount of floodplain forest in this region has been greatly reduced by conversion to agriculture. This practice has been carried out to an even greater degree in the URRRA than in Illinois as a whole. Compositional changes favoring more flood-tolerant tree species like silver maple and box elder appear to have occurred since settlement along many Illinois streams (e.g., King and Johnson 1977, Nelson et al. 1994). For example, in the Chicago region willows with scattered thickets of buttonbush formerly occurred in riparian zones within meadows; by the early 20th century some floodplain meadows were undergoing replacement by a floodplain forest of cottonwood, silver maple, sycamore, hackberry, black walnut, and other species (Cowles 1901). Siltation, channelization, and altered flooding hydrology likely have promoted such changes in floodplain vegetation (Middleton 1999, Taft 1999).

Ecological problems in floodplain forest involve siltation from silt-laden flood waters, grazing, exotic species invasion, and changes in the hydrological regime. The narrowness of remaining riparian forest strips and their proximity to agriculture appears to have led to increased sedimentation. Changes in hydrology are generally complex but include stream entrenchment and increased flooding duration and frequency due to changes in the upper watershed. These conditions have allowed understory to often be dominated by invasive, disturbance tolerant alien species, such as reed canary grass, ground ivy, and moneywort. In more well-drained portions of these forests garlic mustard is an especially troublesome species. A description of the composition of floodplain forests for the URRRA follows. These descriptions, however, are based more on contemporary than historical vegetation.

Mesic floodplain forest—There is no estimate of the proportion of the approximately 872 acres of floodplain forest within the URRRA that is mesic floodplain forest. No areas of mesic floodplain forest within the URRRA have been identified as high-quality undegraded natural communities, and little descriptive information is available. Examples of this community type can be found at Severson Dells Nature Preserve. In general, compared with other floodplain forest communities, a relatively greater importance of upland tree species often can be found in this mid-to-high terrace community since the relatively brief flooding duration and lower flooding frequency pose fewer limitations to these species. This can be because of relatively higher elevation or coarse textured soils. **Common to occasional canopy tree species** may include sugar maple, bitternut hickory, hackberry, basswood, green ash, white ash, black walnut, red oak, swamp white oak, burr oak, white oak, American elm, and slippery elm. **Subcanopy species** may include: hawthorns (e.g., *Crataegus mollis*, *C. pruinosa*), slippery elm, black cherry, box elder, and hop hornbeam. Shrubs may include gray dogwood, bristly gooseberry, black raspberry, common blackberry, and elderberry. Typical **woody vines** include Virginia creeper, poison ivy, bristly greenbrier, and riverbank grape. **Ground-cover species** may include these taxa: wild leek, hog-peanut, Jack-in-the-pulpit, rattlesnake fern, tall bellflower, bulbous cress, blue cohosh, nodding fescue, wild geranium, white avens, Virginia waterleaf, moonseed, hairy sweet-cicely, smooth sweet cicely, woodland phlox, mayapple, false Solomon's seal, and bloodroot.

Ecological problems include changes in the watershed that alter the flooding regime, grazing, and exotic species invasions. Exotic species are abundant and include garlic mustard, Amur honeysuckle, Tartarian honeysuckle, self-heal, common buckthorn, multiflora rose, bittersweet nightshade, reed canary grass, and European high-bush cranberry.

Wet-mesic floodplain forest—This is the most common floodplain forest community. There is no estimate of the proportion of floodplain forest within the URRRA that is wet-mesic floodplain forest. No undegraded remnants of wet-mesic floodplain forest have been identified in the URRRA. Canopy composition of this community type can be relatively rich, compared with wet floodplain forest, because it includes some species from mesic as well as wet floodplain forest. **Common to occasional canopy species** include: silver maple, hackberry, green ash, black walnut, sycamore, cottonwood, swamp white oak, burr oak, slippery elm, and American elm. **Subcanopy species** include box-elder maple, black willow, elderberry, hawthorn, and slippery elm. **Shrubs and vines** include elderberry, Virginia

creeper, bristly catbrier, poison ivy, and riverbank grape. **Ground-cover species** include: Virginia wild rye, rice cut grass, white grass, white avens, wood nettle, glade mallow, white snakeroot, common wood reed, yellow ironweed, hairy aster, panicked aster, false nettle, rattlesnake fern, tall bellflower, spring-beauty, honewort, annual bedstraw, white avens, fowl manna grass, Virginia waterleaf, spotted touch-me-not, fringed loosestrife, sweet cicely, woodland phlox, mayapple, swamp buttercup, goldenglow, and common blue violet.

Ecological problems are similar to those for mesic floodplain forest; however, changes to the watershed that alter the flooding regime can have a relatively greater impact in wet-mesic floodplain forests. As with mesic floodplain forest, exotic species can be numerous and locally abundant because of opportunities for establishment from flooding and rich soils. Some additional species to those listed for mesic floodplain forest that are common in this habitat include ground ivy and moneywort.

Wet floodplain forest—There is no estimate of the proportion of the floodplain forest within the URRRA that is wet floodplain forest. No areas have been identified as high-quality, undegraded remnants. This community occurs in the most flood prone floodplain zones. Compared with other floodplain forest communities, they usually have an more open canopy and lower diversity due to the frequent/extended flooding and scouring of the vegetation. Nettles and vines often are prominent. These forests usually occur in small depression areas within major floodplains or behind a natural levee. Common to occasional canopy species include: silver maple, green ash, cottonwood, and sycamore. Subcanopy species include box elder maple and black willow. Shrubs and vines include buttonbush, elderberry, sandbar willow, bristly catbrier, poison ivy, and riverbank grape. Ground-cover species include giant ragweed, panicked aster, hairy aster, false nettle, Virginia wild-rye, annual bedstraw, fowl manna grass, spotted touch-me-not, clearweed, mild water pepper, common smartweed, smartweed, small-flowered buttercup, swamp buttercup, goldenglow, and tall nettle.

Ecological problems include changes in the watershed that alter the flooding regime, severe grazing, and exotic species introductions. Exotic species include many listed for mesic and wet-mesic floodplain forest.

Flatwoods—Flatwoods are open woodlands of level uplands and terraces that occur on impervious subsoil horizons or claypans. Soil moisture varies seasonally from very wet due to perched water tables to very dry (White and Madany 1978, Taft et al. 1995). Flatwoods are distinguished from other forests on level sites with poorly drained and slowly permeable soils by having argillic horizons. Argillic horizons (= claypans) are subsurface horizons distinguished from overlying soil horizons by a sharp increase in clay content. The claypan limits plants from receiving soil moisture from capillary action and restricts the depth of rooting. Microdepressions often retain water during wet periods and wetland species can be locally common. Three different flatwoods community types have been distinguished in Illinois (White and Madany 1978) based on bioregional and edaphic factors. These include *southern flatwoods*, *sand flatwoods*, and *northern flatwoods*. Local patterns in available water-holding capacity including soil textural differences and depth to the claypan, as well as cation availability of the soil, are important variables explaining tree species composition,

diversity, and density in southern flatwoods (Taft et al. 1995) and these patterns may hold for the other flatwoods community types. Sand flatwoods may occur in the URRRA but have not been verified. Maintenance of ground-cover species diversity in all flatwoods communities appears to be dependent on periodic fire.

Sand flatwoods—Sand flatwoods are distinguished among other flatwoods types by sandy to sandy-loam surface soil horizons (above claypan, or old lakebed). The total distribution of sand flatwoods in Illinois is uncertain. Prior to settlement, based on regional edaphic characteristics there may have been minor areas of sand flatwoods in several natural divisions (e.g., the Oregon Section of the Rock River Hill Country, the Green River Lowland Section of the Grand Prairie Division, the Upper Mississippi River and Illinois River Bottomlands, and the Bottomland Section of the Wabash Border Natural Division [White 1978]); however, no sand flatwoods have been verified extant in these areas. Remnants are reported from the Kankakee Sand Area Section of the Grand Prairie Natural Division and the Chicago Lake Plain Section of the Northeastern Morainal Division (White 1978), the latter being the only sand flatwoods recognized by the INAI as a statewide-significant natural area. A few flatwoods on the Southern Till Plain Natural Division near the lower Kaskaskia River, also on an old lakebed, have considerable sand content in the surface soil horizons (Taft et al. 1995) and perhaps also could be considered sand flatwoods.

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

Sites throughout the state with sandy soils and high organic matter support populations of several rare plant taxa listed by the IESPB as threatened and endangered, including several orchid species (Armstrong 1963, Sheviak 1974). Structural and compositional characteristics of sand flatwoods are described below. Since no descriptive information is available from sites within the URRRA, this description is a generalized summary of sand flatwoods occurring in the Thorn Creek Ecosystem Partnership Assessment Area (Jones 1994a).

The **dominant canopy species** on drier sites is black oak; in these areas, sand flatwoods merges with dry-mesic sand forest and sand savanna. Pin oak is locally common on moist-to-wet sites. **Occasional canopy species** include cottonwood, white oak, and burr oak

depending on local soil moisture conditions. **Common to occasional subcanopy species** are black cherry, sassafras, trembling aspen, purple chokeberry, choke cherry, pin oak, and slippery elm. **Shrubs** include gray dogwood, pale dogwood, American hazelnut, black huckleberry, low-bush blueberry, meadow-sweet, blackberry, and black raspberry. **Woody vines** include swampy dewberry, Virginia creeper, upright carrion flower, and riverbank grape. **Common and characteristic herbaceous ground-cover species** include bluets, bluntleaf sandwort, cinnamon fern, royal fern, cowbane, downy green sedge, fen thistle, tall thistle, partridge berry, small Solomon's seal, Pennsylvania sedge, swamp agrimony, swamp saxifrage, wood anemone, Culver's root, and wild sarsaparilla. Many rare and potentially endangered species may be confined to small openings in the sand flatwoods community.

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

Prairie

Prairies are plant communities dominated by herbaceous plants, especially grasses; trees are either absent or only widely scattered on the landscape. Illinois lies within an area called the "prairie peninsula" an eastward extension of prairies that borders deciduous forests and woodlands to the north, east, and south. This is part of the tallgrass prairie region, sometimes called the true prairie, with the landscape dominated by grasses such as big bluestem and Indian grass as well as a large number of other species of grasses and wildflowers, the latter called forbs. The vegetation sometimes reaches a height of 10 feet or more (Anderson 1991, Risser 1984, Risser et al. 1981, Robertson and Schwartz 1994, Robertson et al. 1997, Steinauer and Collins 1996).

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

Prairies developed and were maintained under the influence of three major stresses: climate, grazing, and fire. Occurring in the central part of North America, prairies are subject to extreme ranges of temperatures, with hot summers and cold winters. There are also great fluctuations of temperatures within growing seasons. Rainfall varies from year to year and within growing seasons as well. The prairie region is also subject to droughts. Usually

there is a prolonged dry period during the summer months, and there are often 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 once every one to five years. These prairie fires moved rapidly across the landscape, and damaging heat from the fire did not penetrate the soil to any great extent. Fire kills back many saplings of woody species, removes thatch aiding in some nutrient cycling, and if timed during the dormant season promotes early flowering spring species. A considerable portion of the above ground biomass of a prairie was consumed each year by the grazing of a wide range of browsing animals, such as bison, elk, deer, rabbits, and grasshoppers. This grazing was an integral part of the prairie ecosystem, and to grasslands in general. Grazing increases growth in prairies, recycles nitrogen through animal wastes, and the trampling by herds opens up habitat for plant species that prefer some disturbance of the soil.

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

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

Six prairie subclasses are recognized in Illinois: Prairie (tall-grass prairie on silt-loam soils, or black-soil), Sand Prairie, Gravel Prairie, Dolomite Prairie, Hill Prairie, and Shrub Prairie (White and Madany 1978). With the exception of Shrub Prairie, the prairie subclasses are further distinguished into natural communities by soil-moisture characteristics (dry, dry-mesic, mesic, wet-mesic, and wet). Approximately 59% of the URRRA was tall-grass prairie at the time of European settlement (IGIS database). Based on remnant prairies in the URRRA and inferring from soil-moisture conditions that were prevalent prior to extensive development, all of the above community subclasses are/were present. Despite extensive loss of prairie habitat, the URRRA supports a greater proportion of original prairie than

the statewide proportion of 0.01% (Table 6, White 1978). The approximately 61.4 acres of undegraded prairie remaining within the assessment area is about 0.02% of the original extent of about 312,439 acres. The remaining prairie vegetation is mainly on sites that are not conducive to most agricultural activities because of topographic or moisture limitations. The most common now are gravel prairie and sand prairie. At least 15 distinct prairie community types are found in the URRRA (Table 13), with one more (shrub prairie) potentially being historically present. These occurrences are concentrated at 13 different natural areas and some support more than one prairie community type. All of these natural community types occur within dedicated Illinois Nature Preserves in the URRRA.

Additional acres of degraded (grades C and D) prairie are reported from the assessment area. An example of this is approximately 324 ha. (800.6 acres) (Partly Category II, Grade C, prairie) in the Nachusa Grasslands restoration owned by the Nature Conservancy. Eight threatened and endangered species are known from this site, which is partly contained within the URRRA. According to ILPIN, 29% of the native vascular flora of the state are prairie associates (Robertson and Schwartz 1994).

The Land Cover Database of Illinois (IGIS 1995) reports that 133,128-acres (25%) of the URRRA is in grassland cover (grassland, pastureland, prairie, rights-of-way, and strip mine reclamation) (Table 3). Very little of this classification resembles the vegetational characteristics (species, structure, ecological function) of native prairie. However, the structure of these communities can provide suitable nesting cover and habitat for some wildlife species.

Common ecological problems associated with remnant prairies, in general, include fragmentation, exotic species invasions, fire absence, woody plant encroachment, and habitat degradation. Small, isolated fragments tend to support many species at low population levels (thus prone to local extinction) too remote to be enhanced through natural mechanisms of species dispersal. Small, isolated prairie remnants also may be lacking appropriate pollinator species for successful sexual reproduction of many out-crossing species, limiting seed recruitment. The greater edge-to-volume ratios of small sites offer greater opportunities for exotic species invasions since the matrix areas typically are dominated by non-native vegetation. Highly fragmented and developed landscapes also lead to altered fire regimes often eliminating fire from prairie remnants until restoration efforts commence. Fire absence results in ecological changes such as encroachment of woody plants that can eliminate many shade-intolerant prairie species. Fire absence also can lead to a severe invasion of exotic cool-season grasses such as the ubiquitous species meadow fescue, smooth brome, and Kentucky bluegrass. Exotic species and woody encroachment pose some of the most severe threats to the integrity of existing high-quality prairie remnants in the URRRA. Over-grazing by domestic stock and deer can degrade prairie remnants by eliminating many species and promoting the increase of several weedy native and non-native taxa. Soil disturbances such as past efforts at cultivation, grazing by hoofed mammals, or soil scraping (typical of many railroad rights-of-way) result in loss of species and opportunities for the establishment of weedy taxa. All of these factors, and combinations of factors, tend to result in loss of species diversity and ecological integrity for all prairie community types.

Prairie—This natural community includes the typical deep “black soil” prairies. Soils are generally deep and fine-textured, usually silt loam or clay derived from loess or glacial till and sometimes alluvium. The soils have a well developed dark A horizon. Other types of prairies (e.g., sand prairies) can have a dark A horizon due to the accumulation of organic matter but it is not as deep. Within the URRAA the soil moisture ranges from dry-mesic to wet.

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

Dry-mesic prairie —Dry-mesic prairie occurs in the URRAA on slopes, or well-drained and somewhat permeable soils with moderate water-holding capacity. A total of 1.0 acre of high-quality dry-mesic prairie is known in the URRAA from Silver Creek Prairie in Winnebago County. Degraded remnants with potential for rehabilitation are present in the URRAA. The following description is based largely on a compilation list of species known to be present from the assessment area containing this community type. The diversity of plant species usually is fairly high.

Common grass species include big bluestem, Canada wild rye, June grass, little blue stem, switch grass, prairie panic grass, side oats gramma grass, porcupine grass, northern prairie dropseed, and Indian grass. **Characteristic forbs** include: pale coneflower, rough blazing star, false boneset, wild petunia, bastard toadflax, flowering spurge, downy gentian, prairie cinquefoil, prairie coreopsis, tall green milkweed, prairie milkweed, butterfly weed, short green milkweed, horsetail milkweed, western sunflower, sky-blue aster, heath aster, New England aster, white wild indigo, false toadflax, showy tick trefoil, rattlesnake master, flowering spurge, prairie sunflower, round-headed bush clover, rough blazing star, pale spiked lobelia, wild bergamot, wild quinine, white prairie clover, purple prairie clover, hoary puccoon, field milkwort, whorled milkwort, slender mountain mint, rosin weed, prairie dock, common blue-eyed grass, black eyed Susan, early goldenrod, old-field goldenrod, common spiderwort, and wild strawberry. **Shrubs** include: leadplant, New-Jersey tea, smooth sumac, pasture rose, and prairie willow.

The federally threatened prairie bush clover can occur in dry-mesic prairie. The state endangered prairie dandelion and threatened Hill’s thistle also occur in dry-mesic prairie.

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

Mesic Prairie—Mesic prairie occurs in an intermediate soil-moisture zone on the landscape between dry-mesic prairie and wet-mesic prairie. Soils can be moderately well drained but often are saturated during short periods of the growing season (White and Madany 1978). Grass and forb height is often over 2 meters tall, but can be only 1 meter tall if prairie dropseed is dominant. Undegraded mesic tallgrass prairie are among the most species rich plant communities per unit area in North America. Typical remnants contain from 12 to 25 species of vascular plants in a quarter-meter-square sampling quadrat. About 100 to 130 species can be found in individual, small (5 acre) remnants. Currently no high-quality mesic tall grass prairie remains in the URRRA. Degraded mesic prairie exists at Nachusa Grasslands and Searls Prairie along the Pecatonica Prairie Path.

Common grass species include: big bluestem, northern prairie dropseed, nodding wild rye, prairie brome, switch grass, and Indian grass. **Common sedges** include: plains oval sedge, Mead's sedge, and common fox sedge. Numerous **forb species** typically are present. Species recorded from mesic prairie in the URRRA include: Sullivant's milkweed, smooth blue aster, New England aster, white wild indigo, cream wild indigo, prairie Indian plantain, wild hyacinth, Indian paintbrush, false toadflax, prairie coreopsis, shooting star, round headed bush clover, rattlesnake master, flowering spurge, grass-leaved goldenrod, wild strawberry, prairie gentian, downy sunflower, false sunflower, prairie sunflower, sawtooth sunflower, prairie alumroot, prairie blazing star, Michigan Lily, hoary puccoon, wild bergamot, wild quinine, prairie phlox, prairie cinquefoil, rough white lettuce, slender mountain mint, common mountain mint, Culver's root, yellow coneflower, black-eyed Susan, rosinweed, compass-plant, prairie dock, pale purple coneflower, prairie violet, common blue-eyed grass, compass plant, prairie dock, rosin weed, starry false Solomon's-seal, stiff goldenrod, common spiderwort, prairie violet, and golden Alexanders. **Shrubs** include leadplant, New Jersey tea, gray dogwood, pasture rose, prairie willow, and smooth sumac.

Five species listed as state threatened or endangered are known from the region and, while not known from the URRRA, could occur in mesic prairie habitats. These include prairie trout lily, ear-leaved foxglove, bearded wheat grass, small sundrops, and the prairie white-fringed orchid (Table 12).

Typical ecological problems in mesic prairie are similar to dry-mesic prairie. Common exotic species include: yarrow, quack grass, white sweet clover, yellow sweet clover, wild parsnip, wild carrot, Canada blue grass, Kentucky bluegrass, smooth brome, and wild asparagus. Many other exotic species can be present, including woody plants.

Wet-mesic prairie—This prairie community is transitional between mesic prairie and wet prairie. It occurs on somewhat poorly drained sites where inundation periods can occur but typically are brief. A total of about 6.3 acres of high-quality (Grades A and B) wet-mesic tallgrass prairie remains in the URRRA among 3 sites representing about 2.3% of the statewide total (Table 6). Wet-mesic prairie and wet prairie often merge with sedge meadow, marsh, and occasionally graminoid fen or seep communities forming diverse wetland/prairie complexes. This community type is present at Searls Park Nature Preserve and Piros Prairie.

Graminoid species can be dominant including the grasses big blue stem, blue-joint grass, fowl manna grass, northern prairie dropseed, Indian grass, and prairie cord grass; numerous **sedges** also can be present including common tussock sedge, dark-scaled sedge, crested-oval sedge, broad-leaved woolly sedge, and fox sedge. **Characteristic forbs** include swamp milkweed, closed gentian, Culver's root, golden Alexander's, Indian paintbrush, prairie blazing star, panicled aster, northern willow herb, grass-leaf goldenrod, northern bedstraw, rough avens, sawtooth sunflower, Michigan lily, Dudley's rush, marsh vetchling, marsh blazing star, water hemlock, monkey flower, New England aster, winged loosestrife, smooth phlox, prairie phlox, common mountain mint, Riddell's goldenrod, woundwort, smooth hedgenettle, purple meadow rue, narrow leaved loosestrife, and waxy meadow rue. Fell and Fell (1956) consider common valerian to be the best general indicator of wetter prairies in the region. **Shrubs** may include pasture rose, swamp rose, elderberry, false indigo bush, pale dogwood, prairie willow, and pussy willow.

Two orchid species, white lady's slipper and prairie white-fringed orchid, listed by the IESPB as threatened and endangered, respectively, occur in wet-mesic prairie habitats and are known from localities adjacent to the URRRA. The biology of these orchids, which can occur in a variety of wetland habitats, has been described by Bowles (1983). Populations levels of prairie white-fringed orchid appear to coincide directly with regional rainfall (Bowles et al. 1992).

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

Wet prairie—Wet prairies occur on poorly drained and slowly permeable soils. Surface water is usually present. A total of about 8 acres of high-quality (Grades B) wet tallgrass prairie remains in the URRRA at Searls Park Prairie, representing about 3.4% of the statewide total (Table 6). Some degraded areas may occur at Piros Prairie as well. Undegraded wet prairie is among the rarest- formerly common- natural community types in Illinois. Wet prairie and the preceding community type, wet-mesic prairie, often merge with sedge meadow, marsh, and graminoid fen or seep communities forming diverse wetland/prairie complexes.

The **characteristic grass species** for the community type are prairie cord grass and blue-joint grass. Sedges are often common, particularly where wet prairie merges with sedge meadow. **Common to occasional sedge species** can include: hairy lake sedge, crested-oval sedge, broad-leaved woolly sedge, fox sedge, and tussock sedge. **Common forbs** include: marsh aster, swamp milkweed, common boneset, sawtooth sunflower, common mountain mint, blue flag, marsh vetchling, common water horehound, water knotweed, smartweed, late goldenrod, swamp saxifrage, monkey flower, winged loosestrife, obedient plant, hedge nettle, waxy meadow rue, purple meadow rue, rough avens, and common ironweed. **Shrubs** include: meadow sweet, elderberry, red-osier dogwood, prairie willow, swamp rose, and pussy willow.

No threatened and endangered species presently are known from wet prairie within the URRRA boundary, although prairie white-fringed orchid is a species found typically in wet-mesic prairie that could occasionally occur in wet prairie.

Ecological problems in wet prairie include altered hydrology due to urbanization affecting the soil water table and flooding regime. Another common problem in wet/wet-mesic prairie is overgrazing which leads to a few unpalatable species dominating these areas. Fire was an occasional occurrence even in wet prairie associated with the Lake Calumet region (Meyer 1950) and it probably also occurred in the URRRA. Fire absence probably has resulted in conversion of some wet prairie in the assessment area to young floodplain forest and thickets of re-growth woody vegetation. Exotic species include purple loosestrife, self-heal, Kentucky bluegrass, glossy buckthorn, and reed canary grass, the latter a species that can become dominant when flooding duration and siltation increases.

Sand Prairie—This prairie subclass occurs on coarse textured sandy soils (sandy loams, loamy sands, and sand) and natural community types are distinguished by characteristics of available soil moisture. The wetter sites tend to have limits to soil permeability, such as the presence of a historic lake bed or claypan, and have high water tables during a portion of the year. These wetter sites typically have accumulations of organic matter in the surface soil horizons. Hydrogen ion concentration can increase in moist or wet sand prairies leading to the development of acidic soils. Acidic, peaty sands can support prairie communities that include a few bog species. With fire absence in moist sand prairies, shrubs often increase resulting in formation of shrub prairie and eventually other community types. A complex of natural communities including moist sand prairie, shrub prairie, sand savanna, sand flatwoods, and bogs may have existed in the area at times grading into one another. This complex can support numerous rare species typically associated with acidic sandy areas. Documented sand prairie community types in the assessment area include dry sand prairie, dry-mesic sand prairie, mesic sand prairie, wet-mesic sand prairie, and wet sand prairie. There are no recognized high-quality sand prairies in the URRRA. Significant degraded and restored sand prairie of this type can be found at Nachusa Grasslands, where eight threatened and endangered plants are known from this habitat: Indian paintbrush, hill's thistle, kittentail, prairie bush clover, prairie dandelion, and rusty Woodsia fern. Sand prairie in the assessment area occur in northern Winnebago, central Ogle, and Lee counties. Those of Ogle County and northern Lee County are derived from St. Peters sandstone parent material, which creates local sandy areas from weathered bedrock. Sand prairie in northern Winnebago County occur on recent glacial deposits and outwash along existing or ancient waterways. The sand prairies of northern and west-central Illinois were studied by Gleason (1907, 1910) who included a number of photographs of these areas. These are valuable historical records that document the extent and nature of sand prairies in the early 20th century.

Sand prairies are disturbance-adapted communities when disturbance is present they commonly have less problems with exotic vegetation than other prairies. Adaptation to disturbance also makes this one of the more resilient community types, and with proper management it can often be restored after extensive disturbance. The majority of the threatened and endangered species found in the URRRA occur in sand prairie (Table 11).

The characteristic composition of each community type found in the URRAA is described briefly below.

Dry sand prairie— The soil in this community is characterized by the absence of a dark A horizon, and the grass is less than 3 ft. tall. Blowouts are common. This community typically occurs on the tops of sand dunes and is often ephemeral, as extended periods of fire absence can allow sand savanna to develop. A number of annual plant species occur in dry sand prairie. It is not known to what extent this community type still exists in the URRAA, although, representatives of this community type can be found outside the URRAA at Atwood Park and Colored Sands Bluff Nature Preserve.

Typical **grass species** are little bluestem, June grass, porcupine grass, witch grass, six-weeks fescue, plains three awn grass, and white-haired panic grass. **Sedges** include rough sand sedge, sand bracted sedge, and slender sand sedge. **Forbs** include beach wormwood, blue toadflax, clustered poppy mallow, dwarf dandelion, fame flower, flax leaved aster, fringed puccoon, goat's rue, green milkweed, hairy puccoon, horsemint, old field goldenrod, rock Selaginella, sand milkweed, stiff sandwort, western sunflower, and eastern prickly pear cactus. Fragrant sumac and the creeping shrub bearberry (SE) would be typical **shrubs** present. Giant sand reed, broomrape, clustered broomrape, sand croton, and shaved sedge are all typical of this community though they are not reported from the URRAA.

Dry-mesic sand prairie—This community has soil with a dark A horizon. The height (i.e. up to 6 feet) and diversity of plants approaches that of dry-mesic prairie. Dry sand prairie and sand blowouts can occur as part of a mosaic with dry-mesic sand prairie. No high-quality dry-mesic sand prairie occurs in the URRAA. Examples of this community type can be found at Nachusa Grasslands, and potentially at the northwest edge of the URRAA in Rockton township where Gleason (1910) described it. **Trees** such as black oak, black locust, honey locust, Iowa crab apple and red cedar may be established in dry-mesic sand prairie either because of the presence of small wet areas, or because of fire suppression, thus initiating the formation of sand savanna. Boundaries between sand prairie and sand savanna probably were dynamic depending on regional fire history.

Typical **grass species** are little bluestem, big bluestem, Indian grass, June grass, porcupine grass, witch grass, purple love grass, side oats gramma, plains three awn grass, and white-haired panic grass. **Sedges** include rough sand sedge, sand bracted sedge, and slender sand sedge. **Forbs** include beach wormwood, blue toadflax, clustered poppy mallow, dwarf dandelion, fame flower, flax leaved aster, fringed puccoon, cream wild indigo, hairy petunia, lupine, prairie coreopsis, purple prairie clover, silky aster, goat's rue, green milkweed, hairy puccoon, fringed puccoon, horsemint, old field goldenrod, showy goldenrod, bird's foot violet, rock Selaginella, sand milkweed, stiff sandwort, western sunflower, cylindric blazing star, flowering spurge, bracken fern, and eastern prickly pear cactus. Fell and Fell (1956) consider sand primrose to be the best indicator for sand prairie in the region. Fragrant sumac, lead plant, New Jersey tea, and prairie willow would be typical **shrubs** present. When shrubs are dominant (more common under mesic soil conditions), the community is termed shrub prairie (White and Madany 1978). Giant sand reed, broomrape, clustered broomrape, sand

croton, shaved sedge are all typical of this community though they are not reported in the URRRAA.

Numerous threatened and endangered plant species could have occurrences in the URRRAA in sand prairie habitats. Bush prairie clover, pink corydalis, downy yellow painted cup, redroot, kittentails, woolly milkweed, bearberry and false tarragon. Sweet fern is an endangered actinorhizal shrub species known from the URRRAA in this habitat. Other species that can occur in dry-mesic sand prairie (more typically mesic sand prairie) are grape fern and bristly blackberry. Other species not known from the URRRAA but potentially present include ear-leaved foxglove, pink milkwort, large flowered beard tongue, hemlock panic grass, broomrape, clustered broomrape, small sundrops, pinweed, false heather, and shaved sedge.

Ecological problems in this community type include the disruption of natural disturbance regimes (i.e., fire absence and subsequent woody encroachment), sand mining, and exotic species invasion. Common exotic species in dry-mesic sand prairie include yarrow, thyme-leaved sandwort, field sorrel, common buckthorn, rough dropseed, Canada blue grass, and Kentucky blue grass.

Mesic sand prairie—This community type occurs where soils are usually moist, but not wet or dry for long periods. The soil characteristically has a deep A horizon with organic matter accumulation in the surface horizon affording some water-holding capacity. There are no high quality mesic sand prairies in the URRRAA. The best examples of this community type occur at Nachusa Grasslands. An example of this community type outside the URRRAA occurs at Kishwaukee Crossing (Winnebago County- see Jones 1994a). Some mesic sand prairies in the URRRAA have acidic soils and support a unique assemblage of species, including several that also occur in bogs and sand flatwoods. **Ferns** can be common, particularly in local wet depressions, including cinnamon fern, royal fern, marsh shield fern, and sensitive fern. **Common graminoid species** include the grasses big bluestem, switch grass, little bluestem, Indian grass, June grass, rough dropseed, bead grass, and prairie dropseed. **Common to occasional sedges** include Pennsylvania sedge, Bicknell's sedge, and tall nutrush. **Rushes** can be common, but typically increase in abundance in wetter sites. Some species in mesic sand prairie include sharp-fruited rush and Dudley's rush. **Common forbs** include butterfly milkweed, flat-topped aster, downy sunflower, goat's rue, white wild indigo, rockrose, bastard toadflax, white prairie clover, western sunflower, shooting star, rattlesnake master, showy goldenrod, and wild quinine. **Shrubs** include leadplant, black chokeberry, New Jersey tea, huckleberry, swamp dewberry, prairie willow, pasture rose, Canada blueberry, and early low blueberry.

There are numerous threatened and endangered species that occur in moist sand prairies and associated natural communities within the URRRAA (Table 11). However, it is unclear how many occur specifically in mesic sand prairie.

Once again, fire absence in this community has a prominent impact on vegetation structure, composition, and level of diversity. Mesic sand prairies convert to shrub prairie without frequent fire and if fire exclusion is prolonged, trees such as trembling aspen invade. The

increasing levels of shade eventually eliminates the many shade-intolerant prairie species. Other ecological problems include over-browsing by deer and exotic species invasion. Exotic species include yarrow, common buckthorn, glossy buckthorn, white sweet clover, Kentucky bluegrass, and Canada bluegrass.

Wet-mesic sand prairie—The average water table is closer to the surface in this community type and wetland species increase in abundance. Surface water is often present for short periods and the soil has a deep and dark A horizon. Wet-mesic sand prairie can occur in local depressions within other natural communities such as mesic sand prairie. Wet-mesic sand prairies also can occur as a transition in gradients from mesic to wet sand prairie. The community type considered here includes seasonally flooded moist sand habitats such as swales in dune and swale topography. No areas of high-quality wet-mesic sand prairie have been recognized in the URRAA, but a small area of disturbed wet-mesic sand prairie exists at Pine Rock Natural Area. Just outside of the URRAA this community type can be found at Rockton Bog Nature Preserve, Williams Tree Farm, along the northern part of Raccoon Creek, and Ford Ponds (Winnebago County- see Jones1994a).

Shrub species include willows, meadowsweet, blueberrys, chokeberry, and swamp dewberry. **Ferns** occurring in wet-mesic sand prairie include several listed for mesic sand prairie plus adder's tongue fern and bog. **Characteristic grasses** include big bluestem, blue-joint grass, Indian grass, switchgrass, and cordgrass. Several **sedge and rush species** can be present including woolly sedge, tall nut rush, dark scaled sedge, long scaled tussock sedge, running marsh sedge, and sharp-fruited rush. **Characteristic forbs** include false foxglove, lance leaved violet, flat topped aster, Riddell's goldenrod, and yellow-eyed grass. The presence of common mountain mint appears to be a good plant to distinguish a wet-mesic from mesic sand prairies. Threatened and endangered species with populations in the URRAA that possibly occur in wet-mesic sand prairie include dwarf grape fern, bog clubmoss, bristly blackberry, highbush blueberry, grass pink orchid, and tubercled orchid (Table 11). Ecological problems are similar to mesic sand prairie.

Wet sand prairie—This community type is floristically similar to wet prairie and is characterized by surface water present for up to a third of the year (White and Madany 1978). No high-quality wet sand prairie has been identified from the URRAA. Wet sand prairie probably often occurred associated with marsh. A **typical fern** is marsh shield fern; clubmoss may be present locally on exposed moist sand. **Common grasses** include prairie cordgrass, blue-joint grass, and rice cut grass. **Sedges** can include several species listed for wet-mesic sand prairie. **Forbs** may include swamp milkweed, nodding bur marigold, false nettle, common boneset, wild madder, sawtooth sunflower, blue flag, northern bugle weed, cowbane, water knotweed, common cattail, and blue vervain. Shrubs can include pale dogwood, pussy willow, blue-leaved willow, sandbar willow, and meadowsweet.

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

Gravel prairie—This community occurs on gravelly soils. These prairies form where gravelly glacial outwash or till are exposed (often kames, eskers, or river terraces), usually on

slopes. Gravels are usually of limestone or dolomite materials and thus impart a calcareous quality to the soils. In some areas, pockets of aeolian sand provide species more typical of sand prairies. Water moves through the soil rapidly because of high permeability of the gravelly substrate. All three soil moisture classes, dry, dry-mesic, and mesic of this community type occur in the URRRA with mesic being the most rare. The more hydric moisture classes usually occur on lower slopes from drier areas, or at the bases of slopes. High quality dry and dry-mesic gravel prairie occur in the URRRA. Douglas E. Wade Nature Preserve contains a significant proportion of the high-quality gravel prairie (11 acres) in Illinois (Table 6). Gravel prairie mainly occurs along the east side of the Rock River valley in Winnebago and northern Ogle counties; local occurrences also occur in the southern portion of the assessment area (e.g., Nachusa Grasslands).

Dry gravel prairie—Typically occurring on steep slopes, this prairie contains grasses which average less than 1 meter tall. **Dominant grasses** include side oats gramma grass, little bluestem, prairie dropseed, porcupine grass, and Indian grass. **Common forbs** include pasque flower, stiff sandwort, woolly milkweed (SE), grooved yellow flax, fringed puccoon, prairie buttercup (ST), kittentails (ST), cowbane, bird's foot violet, cat's foot, common blue-eyed grass, western sunflower, hoary vervain, prairie blue-eyed grass, prairie bush clover (SE, FT), prairie cinquefoil, prairie smoke, purple prairie clover, showy goldenrod, silky aster, spiked lobelia, stiff gentian, stiff sandwort, tall boneset, yellow star grass, and purple oxalis. Pasture rose may also be present. Less than one acre of high-quality dry gravel prairie exists in the URRRA. Examples of this community may be found at Hamborg Railroad Prairie and Adeline Prairie. Outside the URRRA it may be found at Bell Bowl Prairie, and at the southwest end of the Rockford Airport.

Threatened and endangered species that may be found on dry and dry-mesic gravel prairie not listed above include: false tarragon, downy yellow painted cup, prairie bush clover, small sundrops, and large flowered beard's tongue.

Dry-mesic gravel prairie—This community is found on lower slopes and consequently has more soil moisture. The URRRA contains over 90% of the high-quality acreage of this community type in Illinois (Table 6). **Common grasses** include porcupine grass, prairie drop seed, side-oats gramma grass, little bluestem, and Indian grass. **Characteristic forbs** include those occurring in dry gravel prairie and these species: pale coneflower, stiff aster, small skullcap, short green milkweed, sky-blue aster, prairie dandelion (SE), heart leaved meadow parsnip, and false pennyroyal. Though not documented in the URRRA, prairie satin grass and scurf pea appear to be a good indicators of this community type. Excellent examples of this community occur at Douglas E. Wade Memorial Prairie, and Harlem Hills Nature Preserve. Canadian blue grass and yarrow are often problematic weeds.

Ecological problems in dry-mesic gravel prairie are described from the Chicago region, but they are relevant in the URRRA because Harlem Hills Nature Preserve is surrounded by urban development. Altered hydrology due to surrounding urban land, fire absence, gravel mining, and the removal of rare plants all threaten the community. Orchids are often poached

from protected areas to eventually perish in private gardens. Such plant theft is a continuing problem in both urban and rural natural areas.

Mesic gravel prairie—This community is found near the base of gravel ridges, which accounts for its relatively high soil moisture. Diversity of plant species and grass height approach those of mesic prairies. Calciphilic plants are common. **Dominant graminoids** include: big bluestem, Indian grass, Canada wild rye, prairie panic grass, Scribner's panic grass, early oak sedge, dark scaled sedge, and prairie dropseed. **Forbs** present include many listed for dry-mesic gravel prairie in addition to common valerian, compass plant, daisy fleabane, field goldenrod, flowering spurge, heath aster, hoary puccoon, prairie coreopsis, prairie dock, round-headed bush clover, rough blazing star, rattlesnake master, shooting star, prairie lily, Indian plantain, rosinweed, prairie phlox, pale beard tongue, wild bergamont and American feverfew. **Shrubs** include lead plant, prairie willow, New Jersey tea, and pasture rose.

There are no high-quality remnants of this community remaining in the URRRA. Degraded examples of this community type occur at Harlem Hills Nature Preserve. Outside the URRRA, Heidenrich Prairie in Winnebago County contains mesic gravel prairie. Other high quality examples occur in Cook County on gravelly valley train deposits on the terrace of Stony Creek (Keibler 1993). This community was no doubt once common in the extensive deposits of gravel terraces up to 50 feet above the river water, which occur all along the Rock River bottomlands in Winnebago County.

Ecological problems in mesic gravel prairie are the same as dry-mesic gravel prairies.

Hill prairie—Hill prairies are grassland/forb communities that occur on slopes typically with exposure to the south and/or south-west and usually occur as openings in a forest rather than as part of a continuous prairie. In Illinois, hill prairies appear intermittently along most of the western border of the state formed by the Mississippi River and along the Illinois River from north of Peoria south to its junction with the Mississippi (Evers 1955, Bland and Kilburn 1966). A few hill prairies also occur in east-central Illinois and other scattered localities. Soil moisture conditions are usually very dry on these well drained sites. For classification, hill prairies are distinguished not by soil moisture type but by substrate. Loess, glacial drift, gravel, and sand hill prairies are in Illinois (White and Madany 1978); the glacial drift and gravel types are present in the URRRA. Hill prairies often occur as islands of prairie vegetation surrounded by forest. The floristic composition of hill prairies is a combination of species that also occur in other prairie types (e.g., dry, blacksoil, sand, and gravel prairies) with only a few taxa largely restricted to hill prairies (Kilburn and Ford 1963; Robertson, Schwartz, et al. 1995; Schwartz et al. 1997). A review of the gravel hill prairies along the Rock River Valley and their vegetation is presented by Fell and Fell (1956).

Because of their relative inaccessibility and often steep slope, hill prairies have rarely been cleared for crop production. Thus, a higher proportion of original hill prairie remains in Illinois than most other prairie types, leaving hill prairies as some of the last remnants of the prairie biome that dominated Illinois for 8,000 years prior to European settlement. Of the

446 hill prairies examined during field work for the Illinois Natural Areas Inventory only 127 sites were of high quality (Grades A and B), containing about 400 acres (White 1978, Nýboer 1980). Most of the remaining hill prairies are severely degraded as a result of grazing pressure (Nýboer 1981). It is thought that, under present climate conditions, hill prairies are readily invaded by trees in the absence of fire (Kilburn and Warren 1963, McClain 1983). While often degrading habitats, grazing may retard the process of woody invasion of hill prairies. The diminution of grazing in Illinois during the latter half of the 20th century, and lack of fire management, exposes these islands of very diverse hill prairies to secondary forest succession. A number of reports have suggested that the remaining high-quality sites are being lost at an alarming rate (White 1978, Werner 1994). In a study of hill prairies in Pierre Marquette State Park in Jersey County, McClain (1983) compared aerial photographs of the area taken in 1937 and 1974 and calculated that 62% of the prairie area had been lost during that 37 year interval, largely due to the encroachment of native woody vegetation. Another study based on aerial photographs taken over a 50-year span was made of nine hill prairies in Illinois (Robertson and Schwartz 1994; Robertson et al. 1995; Schwartz et al. 1997). Medium- and large-sized hill prairies were reduced in size an average of 63%, while small hill prairies lost an average of 72% of their area. A few endangered and threatened plant species grow on hill prairies, including prairie dandelion, pink milkwort and, rarely, broomrape. Non-native plant species are often less of a problem in hill prairies than in other types of prairies in Illinois because of less disturbance from their inaccessibility. White sweet clover is a serious problem in many hill prairies, as is black locust. Blackberry-lily, native to China and Japan, is a fairly frequent herbaceous plant on hill prairies, as are Korean clover and woolly mullein. Some non-native grasses frequently observed include; Kentucky bluegrass, Canadian bluegrass, downy brome, smooth brome, and tall fescue. Woody non-native species include: multiflora rose, autumn olive, common buckthorn, the bush honeysuckles, and Osage orange.

Glacial drift hill prairie—This type of hill prairie occurs on eroded glacial drift, usually where a river valley cuts through an end moraine and there are many deep, steep-sided ravines. Elsewhere in Illinois, glacial drift hill prairies are found in the Grand Prairie section primarily along the Illinois River and tributaries from Tazewell to Putnam counties, with a few in Coles and Vermilion counties in east central Illinois. An excellent example within the URRRA of glacial drift hill prairie is Stronghold Hill Prairie, a 2-acre site one mile north of Oregon in Ogle County. The INAI recognized 0.12 ha (0.3 acres) of this site where the Rock River has cut through the edge of a Wisconsinian-aged moraine (Fell and Fell, 1956; Willman et al., 1975) as natural area quality. **Typical graminoids** include little bluestem, side oats gramma grass, prairie dropseed, Scribner's panic grass, rough dropseed, porcupine grass, and Mead's sedge. In wetter pockets Canada wild rye, big bluestem, and Indian grass occur. **Typical forbs** are silky aster, yellow puccoon, pasque flower, pale coneflower, purple prairie clover, thimbleweed, tall anemone, spreading dogbane, whorled milkweed, sky-blue aster, heath aster, aromatic aster, false boneset, pale Indian plantain, prairie coreopsis, flowering spurge, woodland sunflower, western sunflower, rough blazing star, grooved yellow flax, hoary puccoon, spiked lobelia, whorled milkwort, prairie cinquefoil, small skullcap, wild petunia, blue-eyed grass, gray headed coneflower, bastard toadflax, cylindric blazing star, and spiderwort. **Shrubs** include lead plant, red cedar, American hazelnut, gray dogwood, New

Jersey tea, and smooth sumac. In addition to those species listed above, the state threatened Hill's thistle can occur on glacial drift hill prairies.

Canada and Kentucky bluegrass can be problematic weeds.

Gravel hill prairie—These prairies are similar to dry and dry-mesic gravel prairies, but the hill prairies occur as openings in a forest rather than as part of a continuous prairie, though at times this distinction can be subtle (see Fell and Fell 1956). Similar plant species occur on gravel prairies and gravel hill prairies. This community type is well documented in Fell and Fell (1956). The **dominant grasses** include little bluestem, prairie dropseed, and side oats gramma grass. June grass and switch grass are common only in localized sandy areas. Big bluestem, hummock sedge, and Indian grass are present only in patchy areas such as in draws or other damp spots. Porcupine grass, early oak sedge, long awned bracted sedge, and squirrel tail grass are irregularly distributed. The following are described as understory grasses: three-awn grass, fall witch grass, purple love grass, Scribner's panic grass, old field panic grass, long stalked panic grass, and Wilcox's panic grass. **Notable and distinguishing forbs** are prairie smoke, prairie buttercup (ST), grooved yellow flax, rock jasmine, woolly milkweed (SE), pale beard tongue, kittentails (ST), harebell, cylindric blazing star, stiff gentian, round stemmed foxglove, western wild lettuce, downy yellow painted cup (SE), downy gentian, rough false foxglove, rough pennyroyal, stiff aster goldenrod, and prairie dandelion (SE). Shrubs include leadplant, New Jersey tea, Iowa crab apple, blackberry, pasture rose, prairie rose, prairie willow, wild plum, smooth sumac, wolfberry and coralberry. Pasque flower is considered an indicator of this community type in the region.

The State Endangered and Federally Threatened prairie bush clover can occur in gravel hill prairie, in addition to those species listed in dry and dry-mesic gravel prairie. Almost 75% of the high quality examples of this natural community known to be present within Illinois exist in the URRRA (Table 6). The best example can be found at Beach Cemetery Prairie Nature Preserve, a 2-acre site in Ogle County. This community once also occurred in Winnebago and Ogle counties. Other gravel hill prairies outside the region include Lankin Hill Prairie in Kane County, Ski Hill prairie in McHenry county, and Cary Junior High Prairie in McHenry County.

Yarrow, Ox-eye daisy, Canadian, and Kentucky bluegrass can be a problematic weeds.

Dolomite prairie—This community exists where dolomite is less than 1.5 meters below the surface thus influencing soil chemistry, permeability, and drainage. Certain common prairie plants are absent because of shallow soils and high pH, and calciphiles are usually present. Dolomite prairies often occur on 'ice shoves', large blocks of rock that were broken off and moved by glaciers. These sometimes appear as a lone hill in the landscape. Dolomite prairie is local within the URRRA and is associated with dry to dry-mesic gravel prairie, with which it shares many species in common.

Dry dolomite prairie—The soil in this community type is extremely shallow to negligible, with patches of exposed dolomite pavement, and significant slope often being common.

Grass is less than 1 meter tall. High quality dry dolomite prairie occurs at Heeren prairie in Ogle County. It also is found outside the URRRA in northwestern Winnebago County at Shirland Township Prairie and Colored Sands Bluff Nature Preserve. **Typical grasses** are little bluestem, prairie dropseed, porcupine grass, prairie brome, Canada wild rye, and side oats gramma grass. Lead plant is a **common shrub**. **Forbs** often present include; pale purple coneflower, flowering spurge, short green milkweed, butterfly weed, Ohio horse mint, false boneset, hairy beard tongue, pasque flower, stiff sandwort, woolly milkweed (SE), sky-blue aster, downy yellow painted cup (SE), prairie smoke, cylindric blazing star, prairie phlox, prairie violet, and heart-leaved meadow parsnip, Though not reported from the URRRA, purple satin grass appears to be indicative of this community type (Swink and Wilhem 1994).

Ecological problems include overgrazing, woody encroachment, and invasion by exotics such as wild parsnip.

Savanna

Savanna habitats occur throughout many parts of North America (McPherson 1997). The Midwest, intermediate between the eastern forests and grasslands of the great plains, has the environmental conditions and fire history that supported many savanna habitats (Anderson 1983, Bowles et al. 1994, DeLong and Hooper 1996, Nuzzo 1986, Taft 1997). They were among the most widespread and characteristic communities of Illinois. Savannas are characterized by scattered, open-grown trees, with or without shrubs, and a continuous herbaceous ground cover typically dominated by graminoid species (grasses and sedges) and numerous forbs. Density and percent cover of trees varies and is intermediate between open prairie and closed woodland or forest. In this discussion, savannas are defined as having 1–50 mature trees per hectare or 10–50% canopy cover by trees (Bowles and McBride 1995); other figures are often used (see discussion in DeLong and Hooper 1996). In the dissected terrain of major river valleys, savannas often occurred associated with a mixture of vegetation types including prairie, woodland-barrens, and forest (Zawacki and Hausfater 1969, Nelson et al. 1994). Midwestern savanna-like habitats have several unifying characteristics including:

- 1) open-canopied structure (relative to closed forest);
- 2) canopy dominance by a few species of oaks;
- 3) a ground cover usually rich in species associated with tallgrass prairie;
- 4) a majority of floristic diversity contained in the ground-cover; and
- 5) dependence on fire and other disturbances for maintenance of diversity and stability.

Oak-dominated systems particularly appear dependent on periodic fire for persistence (Lorimer 1985; Abrams 1992). In a period of a few decades of fire absence, savannas in the Midwest were altered through vegetational changes and habitat destruction. There was a rapid conversion of open savanna to closed woodland and forest. This is called the “Prairie–Forest Continuum” by Packard and Mutel (1997). The following recent quote is pertinent when discussing the savanna and forest communities at within the URRRA:

“The conspicuous trees of the savannas were the open-grown oaks, but another, less visible size class was well represented. The groves of large oaks were surrounded by and intermingled with large numbers of oaks of a different size class — multi-stemmed grubs, mostly white and black oak, that were annually top-killed by fire, but whose roots continued to increase in size. These were the nascent oak woodlands and oak forests of the future, awaiting a break in the fire regime that would release them and change that part of the mosaic from sparse to dense trees. The widespread cessation of fire accompanying settlement allowed large numbers of these grubs to grow into even-aged oak woods — the last instance of widespread oak forest regeneration to take place in the region....”
(Kline 1997).

The once widespread oak savannas have become among the rarest plant communities (e.g., Curtis 1959, White 1978, Nelson 1987). Presently in the Midwest, former savanna and open-woodland areas can still be recognized locally by the form and density of the oldest trees in closed woodland. Some small remnants persist where woody encroachment has been retarded (though not stopped) by droughty edaphic conditions. In addition, many savanna-like areas have been structurally maintained by livestock grazing, and in these instances the ground cover is floristically degraded and dominated by non-native species. The suppression of fire, fragmentation, habitat degradation, and non-native species are primary ecological problems associated with savanna habitats. Some problem non-native species found in savannas include common buckthorn, burdock, and garlic mustard.

Compared with other habitat types, relatively few threatened and endangered plant species appear to be dependent on savanna habitats (Taft 1997). Floristically, savannas contain species of both prairie and open woodlands, though many taxa appear to reach their greatest frequency in transitional (ecotonal) areas such as savannas. Numerous rare plant species are known from the region of the URRRA that may have occurred in savanna habitats. These include ear-leaved false foxglove, broomrape, pale vetchling, sweet fern, redroot, northern grape fern, pink milkwort, and kittentails. Populations of some of these taxa may be present but undetected in degraded savanna remnants in the URRRA.

Additionally, localized throughout the region are features in the surface geology that have promoted the persistence of savanna/barrens-like habitats. Droughty conditions found where bedrock is near the surface have slowed vegetational changes characterized on more mesic sites by the encroachment of woody vegetation in the absence of fire. These local openings with scattered, open-grown oaks usually occur within a complex of dry upland forest, sandstone cliff communities, and even sand prairies and thus have a similar floristic composition.

Three savanna subclasses are recognized in Illinois: *savanna* (generally on fine-textured, silt-loam soils), *sand savanna*, and *barren* (local inclusions of a prairie flora within an otherwise forested landscape) (White and Madany 1978, Madany 1981). The least disturbed remnants are on sandy land that is still frequently burned, and on the driest slopes where woody encroachment has been slow. Silt-loam savannas and sand savannas occur in the

URRAA, although there are no high quality examples of either type. Prior to European settlement, savanna was likely a frequent feature of the landscape in the URRAA (Nuzzo 1986). A few areas of former savanna occur in the URRAA that could be restored or at least rehabilitated with prompt vegetation management (see Apfelbaum and Haney 1991, Packard and Balaban 1994, Packard and Mutel 1997). Bronny (1989) described the restoration of a savanna remnant in western Illinois that had been severely overgrazed. The cattle were removed, a controlled burn was conducted and a surprising number of prairie and savanna species returned after only one year. The second year even more species appeared, including conservative species such as Turk's cap lily, New Jersey tea, short green milkweed, and yellow star grass. Due to limited floristic data, the descriptions of savanna composition for the URRAA are based on characteristic species throughout the region of central and western Illinois and are generalized depictions of the (former) undegraded condition.

Savanna (silt-loam)—Typical savanna occurs on fine-textured soil on till plains. Several types of savanna natural communities can be distinguished, based on differences in soil moisture.

Dry-Mesic Savanna—In this natural community, the soil moisture levels are comparable to dry-mesic upland forest while the understory layer is much the same as dry-mesic prairie. Dry-mesic savanna occurred in the URRAA on the upper slopes and ridge tops of areas dissected by the Rock River and major tributaries. Dry-mesic savanna and dry-mesic barrens are somewhat synonymous terms to describe the open woodland/hill prairie complex that characterized the uplands bordering the major river valleys. These savannas were ecotonal between upland prairies and the upland forests found in more mesic and fire protected ravines bordering the major river valleys (Zawacki and Hausfater 1969) and probably contained many species of loess hill prairies. In the absence of fire, these areas rapidly developed into closed woodlands. Most areas of dry-mesic savanna/barrens have been destroyed, degraded, or have undergone vegetational changes. The nearest representatives of dry-mesic savanna can be found at Sprindale Cemetery in Peoria and Harvard Savanna Natural Area in McHenry County,

No references are available for this community type in the URRAA, but probable species of this community are as follows. Typical **trees** include black oak, burr oak, Hill's oak, shagbark hickory and white oak. **Shrubs** consist of American hazelnut, common blackberry, gray dogwood, New Jersey tea, pasture rose, and prairie willow. **Sedges** might include Mead's stiff sedge, Pennsylvania oak sedge, graceful sedge, hairy wood sedge, and tall nut sedge. Typical **grass species** are big bluestem, Indian grass, porcupine grass, old-field panic grass, poverty oat grass, white-haired panic grass, bottlebrush grass, and silky wild rye. Common forbs include bracken fern, early buttercup, Canadian milkvetch, common carrion flower, forked chickweed, cream wild indigo, Culver's root, false dandelion, hog peanut, Indian paintbrush, lousewort, pale gentian, pale Indian plantain, partridge pea, prairie phlox, purple coneflower, purple milkweed, pussy toes, robin's plantain, Seneca snakeroot, shooting star, showy goldenrod, sky-blue aster, spiked lobelia, starry campion, starry false Solomon's seal, wild hyacinth, wild strawberry, yellow false foxglove, and yellow pimpernel.

Ecological problems of any remnants would include fire absence and a great deal of woody encroachment resulting in loss of ground-cover species diversity and cover. Grazing damage by livestock may be persistent and over-browsing by deer herds can also be a cause of degradation. Exotic species may be common. Typical exotics include common burdock, sour dock, orchard grass, smooth brome, Queen Anne's lace, meadow fescue, Canada bluegrass, Kentucky bluegrass, and common buckthorn. Restoration activities for savanna-like habitats include brush and tree cutting, prescribed fire, and exotic species control.

Mesic Savanna—Mesic savannas typically were associated with prairie groves on level to slightly rolling terrain, at the base of moraine ridges, or as an island surrounded by wetland vegetation. Mesic savannas also may have occurred as ecotonal areas between upland prairie and bottomland forest along riparian corridors. Mesic savannas are particularly dependent on recurrent fire for maintenance. Without periodic fire, the soil-moisture conditions allow rapid development of woody vegetation. Consequently, due to several factors (e.g., fire absence, habitat loss, and over-grazing) undegraded remnants, though formerly widespread, are among the rarest plant communities in the Midwest. While there is no documented evidence that mesic savanna is extant in the URRRA, degraded remnants could still remain. The nearest examples of this habitat type are Bystricky Prairie Nature Preserve in McHenry County and Middle Fork Savanna in Lake County.

In general, the compositional characteristics for mesic savannas is imprecisely known since so few remain. Typically, the most characteristic **tree species** of mesic savanna is burr oak; however, other species may be more important at individual sites including black oak, shagbark hickory, and white oak. **Shrubs** might include American hazelnut, gray dogwood, New Jersey tea, wild plum, common blackberry, lead plant, prairie willow, and wafer ash. Common **grass species** include big bluestem, broad-leaved panic grass, Canadian wild rye, Indian grass, little bluestem, poverty oat grass, and prairie cord grass. Typical **sedges** would be curly-styled wood sedge, long-awned bracted sedge, Mead's stiff sedge, plains oval sedge, and wood gray sedge. **Forbs** which could occur include late figwort, common carrion flower, Ohio spiderwort, rough blazing star, starry campion, starry false Solomon's seal, golden Alexanders, false sunflower, poke milkweed, purple milkweed, prairie dock, tall coreopsis, purple prairie clover, wild hyacinth, woodland sunflower, Culver's root, and western sunflower.

Wet-mesic and Wet savanna—While there are no documented occurrences of this natural community in the URRRA, it probably did occur in the floodplains of the Rock River. As in the case of wet and wet-mesic prairies of floodplains, bottomland savannas were probably maintained by a combination of factors including flooding and fire regime, topography, and soil moisture differences. Since no undegraded remnants are known from the URRRA and no detailed descriptions are available, the following account is general and based, in part, on GLO (General Land Office) data compiled by Nelson et al. (1994). **Tree species** probably included hackberry, American elm, cottonwood, pin oak, burr oak, black walnut, silver maple, and willows. **Subcanopy and shrub layers** probably were not well established but may have included box elder and elderberry. Characteristic **ground-cover species** may have included prairie cord grass, Virginia wild rye, stout wood reed, sawtooth sunflower, Jerusalem artichoke, and wild golden glow. The primary habitat for the now rare glade

mallow may have been savannas that occurred on river terraces (Robertson and Phillippe 1992); this habitat essentially has been destroyed in Illinois.

Sand savanna—Sand savannas are associated with dune and swale topography. Undulating topography of sand savanna limited the severity of historical fires allowing this community to develop in place of sand prairie. Soils are very sandy and contain little humus. Because of the extensive areas of sand deposits in the assessment area, it can be inferred that sand savanna was once rather abundant. Unfortunately, it largely has been destroyed or developed into sand forest. While no high quality, Category 1 remnants of sand savanna are extant, degraded examples do occur in Bureau, Lee, Rock Island, and Whiteside counties. Other examples exist at Colored Sand Forest Preserve, and Illinois Beach State Park. Herbaceous vegetation is quite similar to that of sand prairies.

Dry sand savanna—This community type occurred on the tops and upper slopes of large sand dunes. Areas are excessively dry, with scattered blowouts. There is little or no A horizon development in the soil (topsoil). Grass height is less than 3 ft., and overall species diversity is low. The vegetation is a mixture of species of dry sand prairie and sand forests. The **dominant tree** is black oak. Fragrant sumac is a **characteristic shrub**. The **herbaceous layer** includes little bluestem, June grass, hairy panic grass, Pennsylvania oak sedge, June grass, porcupine grass, horsemint, day flower, rock Selaginella, western ragweed, goat's rue, fame flower, butterfly weed, and cleft phlox. Although it is not reported in the region sand reed is also typical.

Dry-mesic sand savanna—This community occurs on the lower slopes of dunes (particularly north and east facing slopes) and in flat inter-dunal areas, where soil moisture is greater than in dry sand savanna. There can be some development of a dark A horizon in the soil. The **dominant tree** is again black oak, while other species such as black cherry, burr oak, white oak, and red cedar may be present. **Herbaceous layer plants** of dry sand savanna also occur, along with bracken fern, plains three awn grass, panic grass, sand bracted sedge, slender sand sedge, rough sand sedge, tall nutrush, Indian grass, big bluestem, hairy puccoon, kittentails (ST), late figwort, bearberry (SE), wild lupine, plains oval sedge, shaved sedge, flax-leaved aster, Ohio spiderwort, rough blazing star, slender corydalis, starry campion, starry false Solomon's seal, American feverfew, hog peanut, spreading dogbane, wild sarsaparilla, beach wormwood, Venus' looking glass, butterfly milkweed, pointed tick-trefoil, flowering spurge, rockrose, woodland sunflower, hairy pinweed, round-headed busy clover, cat's foot, clammy false foxglove, whorled milkweed, prairie coreopsis, flowering spurge, hoary vervain, Pipsissewa (SE), wild strawberry, northern grape fern (SE), slender knotweed, old field goldenrod, showy goldenrod, Virginia spiderwort, and bird's foot violet. Typical **shrubs** include New Jersey tea, pasture rose, lead plant, early low blueberry, Canada blueberry, prairie willow, winged sumac, black chokeberry, black huckleberry, dwarf honeysuckle, swamp dewberry, and New Jersey tea. Though it has not been reported from the URRRA beach three awn grass (*Aristida tuberculosa*) also is typical.

Ecological problems are similar to those discussed for the Savanna subclass and dry-mesic savanna.

Wetland

The wetland class is characterized by having hydric soils or by being flooded for significant periods during the growing season and having a vegetative cover. There are about 7,900 acres of wetland remaining in the URRRA, or about 1.5% of the total assessment area (Table 4); this total is estimated to be about 19% of original extent. Wetland community types in the URRRA, following natural community classification of White and Madany (1978), include floodplain forests (about 46% of total wetland area), shrub-scrub wetlands (5%), marsh (37%), and open-water wetland (about 10%) including ponds, lakes, lake shore habitat, and open-water zones of marshes (Table 4). Floodplain forests were described previously under the Forest community class. Wetlands in the URRRA are scattered throughout and are mapped in Figure 10.

About 15.7 acres of wetland (0.2% of remaining wetland total and approximately 0.04% of original extent) are recognized as high-quality and undegraded natural communities, mostly wet-mesic and wet prairie. Other high-quality wetland community types include sedge meadows and possibly seeps (Table 6).

Typical ecological problems for wetlands other than drainage include altered hydrology resulting in increased or reduced flooding, increased run-off from cultivated uplands, run-off from urban pavement and roadway de-icing salts, grazing, and invasion of non-native species.

Marsh—Marshes are palustrine wetlands characterized by having freshwater at or near the surface during most of the growing season, dominance by herbaceous vegetation, and featuring organic or mineral soils (White and Madany 1978). Two marsh community types are recognized in Illinois: *marsh* and *brackish marsh*. Only *marsh* is found in the URRRA, although ditches bordering highways, due to run-off of roadway salts, can support species of brackish marsh. Community structure is controlled largely by water depth. In general, the deeper the water the lower the diversity. Shallow-water zones are dominated by emergent, rooted herbaceous vegetation. In deeper-water zones, floating aquatics and open water become more prominent. In transitional zones, a combination of these species exists and vegetation cover is intermediate between deep and shallow-water zones. Marsh communities are also greatly effected by fluctuations in water levels, fire frequency, and muskrat populations. Shores of marshes often are dominated by superior competitors such as cattail and common reed.

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

interpretation of natural community type based solely on these general indicator species should be done with caution. Over 2,947 acres of the URRRA are classified as marsh or wet meadow (Table 4); however wet meadow also includes wet prairie and sedge meadow. There are no INAI characterized high-quality marshes present in the area, though Nachusa Grasslands contains 60 acres of marsh that is either outside the URRRA or degraded. In Winnebago County, Rockton Nature Preserve, Williams Tree Farm, and Moody marsh all contain marsh.

Common to occasional **fern and fern allies** include common horsetail, scouring rush, marsh fern, and sensitive fern. Characteristic **graminoid species** include creeping bent grass, blue-joint grass, rice cut grass, floating manna grass, common reed grass, fowl manna grass, and common satin grass. Common to occasional **sedges and rushes** include hairy lake sedge, hop sedge, common lake sedge, running marsh sedge, red-rooted spike rush, river bulrush, soft stemmed bulrush, dark green rush, wool grass, bulrush, great bulrush, and Dudley's rush. Characteristic **aquatics** include: pondweeds and duckweed. Common **forb and other monocot species** include sweet flag, swamp agrimony, water plantain, swamp milkweed, marsh aster, several beggar's ticks species (*Bidens* spp.), false nettle, marsh bellflower, ditch stonecrop, marsh purslane, northern bugle weed, tall waterhemp, bulbous cress, bulblet-bearing hemlock, water hemlock, cinnamon willow herb, spotted Joe-pye-weed, common boneset, wild madder, blue flag, cardinal flower, yellow avens, rough avens, sawtooth sunflower, spotted tough-me-not, common water horehound, winged loosestrife, wild mint, cowbane, water knotweed, water pepper, heartsease, common smartweed, pale dock, marsh skullcap, water parsnip, late goldenrod, bur-reed, woundwort, germander, cattail, common arrowhead, and blue vervain. **Shrubs** include buttonbush, American black currant, buttonbush, pale dogwood, meadow sweet, red-osier dogwood, and pussy willow. Black willow, silver maple, petioled willow, cottonwood, green ash, are **common trees** often associated with marshes.

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

Bog—Bogs are low-nutrient, acid peatlands and in Illinois mostly are oligotrophic wetlands (Taft and Solecki 1990). Bogs are nearly always in glacial depressions, and drainage is

usually restricted; see Reichle (1969) for a detailed account of bog development in Illinois; for a broader perspective see Crum (1988) and Johnson (1985). 'Bog' like plant communities have also been created where sand mining created depressions that seasonally intercepts the water table and provide conditions that result in peat accumulation; inadequate buffering cations in the sandy soils permits hydrogen ion concentrations to rise and increases soil acidity (lowering soil pH)(Taft, in press). All bogs in Illinois evidently developed from fens in glacial potholes (Sheviak 1974) and are thus originally calcareous and become acidic only if sphagnum moss becomes established and dominant. Without constant recharge by mineralized ground water, hydrogen ion concentration increases among the sphagnum hummocks thus increasing acidity in the wetland. As discussed by Taft and Solecki (1990), these sites are characterized by the presence of several shrubs belonging to the heather family (Ericaceae). Most bogs in Illinois are peat filled basins so that there is no longer an open pond. Volo Bog, a National Natural Landmark and state nature preserve in the adjacent Fox River Assessment Area, is the only "classic" open pond bog remaining in Illinois. Bogs are often characterized by a "moat" along the periphery surrounding the actual bog vegetation. This zone of open water, marsh, sedge meadow, or fen may be caused by calcareous (alkaline) seepage from a mineral rich substrate. A layer of *Sphagnum* (peat moss) is characteristic of nearly all bog communities.

Bogs are much more common to the north of Illinois, and many plants reach their southern limits of midwestern distribution in the bogs of northern Illinois. Consequently, a number of plants occurring in bogs are listed as Endangered or Threatened in Illinois (e.g., Taft and Solecki 1990). Peatlands formerly occurred throughout much of the northern third of Illinois (Havera et al. 1994); however, habitat destruction, peat mining, and other sources of degradation have reduced their size, number, and integrity. Presently, bogs are restricted in Illinois to the Morainal Section of the Northeast Morainal Natural Division and most occur in the Fox River basin. Only 12 high-quality, undegraded remnants were identified by the Illinois Natural Areas Inventory (White 1978). Four bog communities are recognized in Illinois: *forested bog*, *tall-shrub bog*, *low-shrub bog*, and *graminoid bog* (White and Madany 1978). Remnants of bog communities, even degraded sites, can contain numerous species listed by the IESPB as threatened or endangered such as yellow birch, pink lady's slipper orchid, red berried elder, American mountain ash, star flower, speckled alder, shadbush, northern gooseberry, grass pink orchid, showy lady's slipper orchid, and high bush blueberry. There are no known intact bog communities present in the URRAA.

Although none of the URRAA's wetlands contain true bogs, the term bog is commonly used in reference to many wetlands with peat or muck soils. The areas identified by Fell and Fell (1956) are classified here as sedge meadows. Fell described some areas in Winnebago County as having much *Sphagnum*, which today is only found as small and widely scattered patches in these areas. It is likely that drainage has lowered the water table and has made conditions so dry that *Sphagnum* nearly has been eliminated (Jones 1994a). Small areas of bog communities may occur locally in the assessment area within a complex of other, more widespread, natural communities (e.g., sand prairie, shrub prairie, sedge meadow, marsh, shrub swamp) (Ecological Services 1996).

Ecological problems typically associated with bogs include changes to the hydrological regimes, mining for peat, and invasion by non-native plant species such as bittersweet nightshade and glossy buckthorn.

Seep—Seeps are wetland communities characterized by a constant diffuse flow of ground water at the surface that saturates the soil. Seeps are unusual in that they are wetlands on slopes. They are most common along the lower portions of slopes of glacial moraines, ravines, and terraces (White and Madany 1978). The water chemistry of the ground water controls to some extent species composition and is influenced by the material it flows through. Seep water runs off rather than collecting and therefore provides habitat for plants that require permanent wetness (saturated), but cannot tolerate being flooded (inundated). Seeps are typically smaller than one acre, and are differentiated from *springs*, which are smaller, and have more concentrated water flow from a definite opening. Seeps may have local areas of concentrated flow where water collects in spring runs. The Illinois Natural Areas Inventory (White 1978) identified about 30 high-quality seeps in the state. The majority of these seeps were in the Fox, Des Plaines, Illinois, and Vermilion river valleys. Many smaller and lower-quality seeps occur in the state and around the URRRA are well mapped and described by Ecological Services (1996). Many seeps occur concentrated along certain creeks in the assessment area: Pine Creek, Franklin Creek (Nachusa Grasslands), Kyte River downstream of Flagg Road, Kilbuck Creek where it flows through a narrow, steep-walled valley downstream from Lindenwood, and the headwater area of Stillman Creek in White Rock Township (Ecological Services 1996).

In Illinois, five different seep community types are recognized: *seeps(typical)* are circumneutral and occur where the ground water is not strongly influenced by bedrock or parent material chemistry; *acid (gravel) seeps* occur associated with sandstone bedrock or gravel; *calcareous seeps* occur where the ground water is mineralized by alkaline bedrock (e.g., limestone) and/or soil parent materials like glacial drift; *sand seeps* emerge from sand deposits and may be calcareous, acid, or neutral; *spring communities* occur where a channel is formed. Two types of seeps occur in the URRRA, sand seeps and calcareous-neutral seeps although all 4 types may have been present. None of the seeps are Category I.

Well developed seepage areas provide a stable, cool, moist microclimate allowing some northern plants and aquatic invertebrates which were common during the last ice age to survive far south of their present range (e.g., the state endangered horsetail). Temperature of water is around 50 degrees F year round, so seeps are slow to freeze in winter. Snow falling on seeps tends to melt, so seeps provide open water and snow-free foraging areas for wildlife during the coldest months of winter. The most typical plant of sunny seeps is marsh marigold, and of shaded seeps is skunk cabbage. Skunk cabbage is the region's earliest blooming plant, providing food for the first pollinating insects that emerge in February. Indicators of alkaline groundwater seeps include grass-of-Parnassus and Riddell's goldenrod (Ecological Services 1996).

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

Calcareous-neutral seeps (typical)—This seep has water that is nearly neutral, or slightly calcareous, and cold. Seeps can be dominated by herbaceous species (known as graminoid seeps) or forested (known as forested seeps). This seep community occasionally occurs near the contact zone between St. Peter's sandstone and overlying dolomite bedrock. Seepage mineralized by the overlying dolomite in this area may become more neutral as it passes through sandstone prior to discharge, explaining a somewhat weak floristic expression. Muck (highly decomposed plant material) accumulation in the wetland produce can produce 'quaking ground', a floating area of vegetation.

Typical seep plants include alternate-leaved dogwood, American black current, wild sarsaparilla, willows, American plum, elderberry, early wild rose, gray dogwood, black ash, bulb bittercress, bottlebrush sedge, cinnamon willow herb, clearweed, common horsetail, common tussock sedge, fen star sedge, river bulrush, fowl manna grass, goldenglow, grass-of-Parnassus, great angelica, hooked buttercup, marsh fern, marsh marigold, rice cut grass, blue-joint grass, scouring rush, side-flowered aster, rosinweed, skunk cabbage, spotted Joe-Pye weed, spotted touch-me-not, stout wood reed grass, swamp aster, swamp goldenrod, swamp rose, swamp saxifrage, swamp wood betony, common boneset, common mountain mint, late boneset, sweet scented bedstraw, blue flag, rice cut grass, great blue lobelia, rough avens, sneezeweed, ground nut, swamp milkweed, New England aster, false nettle, Maryland senna, hairy sweet cicely, common arrowhead, germander, wingstem, broad leaved cattail, white turtlehead, marsh bellflower, northern willow herb, smooth sheathed lake sedge, and wood anemone.

State threatened or endangered species occurring in and around the URRRA include: yellow monkey flower, Queen-of-the-prairie, and forked aster. Seeps occur at Blackhawk Springs Forest Preserve (Winnebago County), Rock Cut State Park, south of Severson Dells Forest Preserve, White Pines State Park, Lowden-Miller State Forest, Nachusa Grasslands, and many other localities (Jones 1994a, Ecological Services 1996).

Kentucky blue grass, multiflora rose, and reed canary grass are problematic weeds of these communities. Willows and dogwoods can be invasive as well.

Acid-sandstone seep—The ground water is usually mineralized by the local bedrock. Only a few acid seeps are known for the region, one is in the George Fell Nature Preserve in Castle Rock State Park. Species characteristic of sandstone seeps in the URRRA include: Skunk cabbage, spotted joe-pye weed, interrupted fern, and cinnamon fern. Other species include: ground nut, American bellflower, bristly sedge, stout wood reed grass, pale dogwood, honewort, spinulose wood fern, wild cucumber, cinnamon willow herb, spotted touch-me-not, wood nettle, white grass, great blue lobelia, royal fern, arrow leaved tearthumb, swamp saxifrage, mad dog skullcap, purple meadow rue, swamp fern, wingstem, great water dock,

ostrich fern, sensitive fern, and nannyberry. The state threatened starflower and endangered running pine club moss, and horsetail often exist in this habitat.

Fen—Bogs and fens are similar in that they are peatlands and the peat at each community type typically is constantly saturated. In general, bogs are acidic, deficient in minerals, most nutrients come from rainfall and runoff, and the basin in which the bog occurs has limited drainage to the outside. Much of the upper horizon of peat in bogs is derived from sphagnum mosses while lower strata typically are composed of sedge peat. In contrast, fens usually are minerotrophic; meaning slightly to strongly calcareous, are constantly recharged with mineral-rich groundwater that has percolated through calcareous gravel in adjacent moraines, and most peat comes from sedges (see Bowles et al. 1996, Johnson 1988, Moran 1981, Sheviak and Haney 1973, Stynoff and Hess 1986, Stynoff 1993, Taft and Solecki 1990). Some fens occur within basins largely surrounded by moraines; typically, cool, calcareous, artesian ground water seeps up through the fen. Other fens form on level to slightly sloping areas where calcareous water seeps out of the bases of moraines. Floristically, these can resemble the seep natural community, however there is considerable peat deposition. Spring runs can be found within many fens, and grass-of-Parnassus, beaked spikerush, and marsh marigold are associated with this feature. Areas of spring runs or where artesian ground water seeps into the fen can contain quite high levels of calcium carbonate, manganese, and sodium; these are called marl flats. Few species in the state can tolerate these extreme conditions; such calciphiles include bush cinquefoil, fen star sedge, hair beak rush, Kalm's lobelia, swamp goldenrod, prairie dock (small and stunted), and beaked spikerush. Though fens are characterized by a specialized flora (including several threatened or endangered species), many of these taxa also occur in seep, sedge meadow, and wet to wet-mesic prairie communities.

Within Illinois, fens are most common in the upper Fox River basin; however, a few fens occurred in the URRRA. Fens frequently occur near gravely moraines, and they are often associated with strongly calcareous seeps, sedge meadows, marl flats, and marshes. Dry gravel and dry-mesic gravel prairies sometimes can be found on kames and eskers adjacent to fen formations. There are five fen communities in Illinois: calcareous floating mat, graminoid fen, low shrub fen, tall shrub fen, and forested fen. Only graminoid fen likely occurred in the URRRA.

Ecological problems associated with fens include grazing by domestic livestock, lowering of water the table caused by ditching and other drainage activities, increased flooding, exotic species invasion, and fire suppression. Some management recommendations have been suggested (e.g., Natural Resource Management Staff 1996) regarding burning brush piles in fens. Moran (1981) gives lists of herbaceous and woody plant species that increase with disturbance (American bindweed, bittersweet nightshade, fen star sedge, late goldenrod, saw-toothed sunflower, spotted Joe-Pye weed, swamp aster, and wiry panic grass, beaked willow, gray dogwood, hawthorns, nannyberry, pussy willow, quaking aspen, red-osier dogwood, and slippery elm). Non-native species are also a major problem today, especially purple loosestrife, glossy buckthorn, and common buckthorn.

Graminoid fen—This community type is a minerotrophic, alkaline peatland dominated by herbaceous vegetation. Typically, the peat is formed on a slope at the edge of a moraine; more rarely, the peat forms as a raised island in a marsh or sedge meadow. In some instances, mesic prairie grasses are the dominant species and in other cases the dominants are sod-forming sedges. Although the peat can be elevated slightly, it resists decay due to the high levels of calcium and magnesium carbonate, and the constant flow of cold water. Overall diversity of plant species can be quite high as a number of prairie, sedge meadow, and seep species occur in addition to typical fen species. No high-quality graminoid fen occurs in the URRRA. The closest representatives occur at Kieselburg Prairie in Winnebago county, and one small fen at Nachusa Grasslands.

Common to occasional **graminoid species** include the grasses big bluestem, leafy satin grass, upland wild timothy grass, prairie brome, blue-joint grass, Indian grass, sweet grass, prairie cord grass, and prairie dropseed, and the **sedges** Hayden's sedge, fen star sedge, bristly sedge, bottlebrush sedge, porcupine sedge, Bebb's oval sedge, beaked sedge, dark-scaled sedge, wedge-fruited oval sedge. Common to occasional **forbs** include slender foxglove, nodding onion, marsh aster, flat-top aster, prairie Indian plantain, low calamint, marsh marigold, bulbous cress, white turtlehead, swamp thistle, fen-willow herb, northern willow herb, Robin fleabane, spotted Joe-pye-weed, common boneset, small fringed gentian, grass-of-Parnassus, swamp betony, smooth phlox, common mountain mint, false dragonhead, Ohio goldenrod, Riddell's goldenrod, tall goldenrod, late goldenrod, Angelica, forked aster (ST), narrow-leaved loosestrife, marsh vetchling, marsh skullcap, marsh fern, common valerian, northern bedstraw, northern bugle weed, cowbane, cup plant, great bullrush, flat-stemmed bullrush, cotton sedge, Fraser's St. John's Wort, and purple meadow rue.

Numerous rare plant species can be present in graminoid fens including several listed as threatened or endangered by the IESPB (1999). Examples are, showy lady's slipper orchid, small yellow lady's slipper, grass pink orchid, tall sunflower, queen of the prairie, and white lady's slipper orchid.

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

Sedge meadow—This community type, typically, is characterized by a predominance of the hummock sedge. Hummock sedge characteristically forms mounds, or hummocks, that are somewhat difficult to walk through. In fact, where sedge meadows occur within pastures, it appears that cattle avoid these wetlands somewhat, presumably due to the difficulty in walking, but also because other more palatable forage may be available. A total of 1.4 acres of high-quality sedge meadow occur in the URRRA at Piros Prairie representing about 0.18%

of the total undegraded sedge meadow in Illinois (Table 6). Other sedge meadows may be present within the assessment area that with management and removal of the degradation factors may improve in quality. Examples of sedge meadow outside of the URRAA can be found at Rockton Nature Preserve, Kieselburg Forest Preserve, Sugar River Forest Preserve, Ford Ponds, Anna R. Page Conservation Area, Williams Tree Farm, Blackhawk Tree Farm, and Blackhawk Springs Forest Preserve.

Floristic composition of sedge meadows can include the **ferns and fern allies** sensitive fern, marsh fern, interrupted fern, horsetail, and smooth scouring rush. **Graminoid species** are prominent in sedge meadows including blue-joint grass, prairie cord grass, fowl manna grass, rice cut grass, large yellow fox sedge, common fox sedge, bottlebrush sedge, hairy fruited lake sedge, long-scaled tussock sedge, common lake sedge, prairie star sedge, wooly sedge, running marsh sedge, fox sedge, red-rooted spike rush, dark green rush, wool grass, bulrush, and Dudley's rush. Common to occasional **forbs** include common swamp agrimony, swamp milkweed, marsh aster, tall swamp marigold, marsh bellflower, cinnamon willow-herb, fen willow-herb, Fraser's St. John's wort, spotted Joe-Pye weed, common boneset, purple meadow rue, reed canary grass, wild madder, rough avens, marsh vetchling, common mountain mint, marsh skullcap, late goldenrod, blue flag, wild mint, bulblet water hemlock, common cattail, common water whorehound, lady's thumb, pale smartweed, Riddell's goldenrod, rough avens, saw tooth sunflower, slender false foxglove, marsh marigold, Michigan lily, spotted Joe pye weed, mild water pepper, swamp goldenrod, great blue lobelia, wild golden glow, swamp thistle, swamp dock, spotted jewelweed, sneezeweed, monkey flower, white turtlehead, water parsnip, winged loosestrife, great angelica, marsh bellflower, marsh fleabane, cowbane, and blue vervain. Common **shrubs** include buttonbush, red-osier dogwood, pussy willow, heart-leaved willow, pale dogwood, and sandbar willow.

Threatened and endangered species such as the large fruited star sedge and tall sunflower have been reported from sedge meadows in the assessment area. Additionally, Queen-of-the-prairie, prairie white-fringed orchid, and Vasey's sedge could potentially be found within sedge meadows in the region.

Ecological problems for sedge meadows include altered hydrology such as lowering the level of groundwater, as by ditching. Other problems include disturbance from past efforts at cultivation or other developments, over-grazing, siltation, and exotic species invasion. These disturbances have turned most sedge meadows in the URRAA into badly degraded wet meadows. Exotic species including Kentucky bluegrass, glossy buckthorn, reed canary grass, cattails and in wetter areas purple loosestrife have all become dominant in degraded communities.

Lake and Pond

Lake and ponds are open-water habitats, with lakes being larger bodies of water and ponds covering less than 20 acres. They are separated from wetlands by the general lack of emergent woody or graminoid vegetation. Common plant species of aquatic habitats

include American water plantain, arum-leaved arrowhead, blue flag, common arrowhead, common bur-reed, sweet flag, sweet grass, common cattail, common water plantain, common watermeal, dark green bulrush, eelgrass, duckweeds, great bulrush, marsh yellow cress, mild water pepper, rice cut grass, swamp milkweed, water cress (introduced), water smartweed, water star grass, waterweed, white water lily, and yellow pond lily.

Ecological problems with ponds and lakes include drainage, degradation from livestock use, and siltation. Non-native plant species, such as curly pondweed, European water milfoil, narrow-leaved cattail, and purple loosestrife, can become common to abundant.

Pond (natural)—Natural ponds are usually shallow enough to allow rooted aquatic plants to grow throughout. Natural ponds are shallow-water wetlands that are not excavated or impounded. Natural ponds in the URRAA can occur in abandoned stream channels (oxbows), low areas between sand dunes, swales on glacial moraines, and where beavers have dammed water courses. Ponds in Illinois can be classified as *permanent ponds*, *ephemeral ponds*, or *ephemeral sand ponds*. Most ponds in Illinois appear to be eutrophic (nutrient rich). Natural ponds have a limited water supply such as local rainwater and snowmelt, or with a floodplain pond (e.g. oxbow) when streams overflow their banks. Thus, they usually dry out each growing season. They also can be called temporary ponds, vernal pools, or seasonal ponds. This intermittent cycle of inundation and drying can be extremely important for certain wildlife species. For example, fish free ponds (a consequence of the dry-down cycle) allow frogs, toads, and salamanders to breed free from fish predation. Floodplain ponds may become restocked with fish during early spring floods, and as they dry up fish become accessible to predators including mink and wading birds such as herons and egrets which rely on them to feed their fast growing young.

Most of the present day ponds are artificial. No high-quality, undegraded natural ponds occurs in the URRAA. Natural ponds that do occur in the area have been mapped (Ecological Services 1996). Total acreage of lacustrine wetlands in the URRAA, including ponds, is about 45 acres. The Rock River and its tributaries is bordered by many natural ponds in the form of long linear sloughs which occupy former river channels. These carry water when the river overflows its banks. In addition to natural ponds, there are artificial ponds in the assessment area. These include impoundments, sewage-treatment lagoons, and excavated ponds. Descriptive data are lacking on the floristic composition of such natural ponds. Outside of the URRAA, Coon Club Pond in north-central Winnebago County along the Sugar River is a relatively undegraded natural pond. Natural ponds often occur in association with marsh and/or sedge meadow natural communities. Like in marshes, vegetation associated with ponds can be described in terms of the organization of the community with particular species associated with shore habitats, and others sorting into near-shore shallow-water habitats and deeper-water habitats more distant from the shore. The state threatened Torrey bulrush is found on the shores of acidic sand ponds; the state endangered American bur-reed, green fruited bur-reed, and water pennywort grow on muddy shores and shallow water.

Lake (natural) – Lakes are distinguished from ponds by several characteristics. Lakes are larger (>20 acres) and deeper (> 2 meters) than ponds, thermal stratification is more prominent in lakes compared with ponds, wave action typically produces a locally semi-barren shore zone, and portions of lakes generally are too deep to support rooted aquatic plants. Natural lakes were once present throughout Illinois, but most have been drained or drastically altered. Most natural lakes that remain in Illinois are in the Northeastern Morainal Division. No high-quality natural lakes have been identified within the URRRA and it is doubtful that lakes were historically present.

Floristic composition of lakes can be sorted into three categories: shore and mud flat species, emergent wetland species (grow in water most of season), and aquatics. Typical **shore and mudflat species** include nodding bur marigold, purple stemmed tickseed, false nettle, American bindweed, buttonbush, water hemlock, barnyard grass, common horsetail, creeping love grass, green ash, eastern cottonwood, silver maple, honey locust, ditch stonecrop, fog fruit, Virginia knotweed, marsh yellow cress, peach-leaved willow, sandbar willow, black willow, river bulrush, prairie cord grass, and cocklebur. Common to occasional **emergent wetland species** include marsh purslane, seedbox, American lotus, water knotweed, pickerel weed, mild water pepper, swamp dock, common arrowhead, and common bur reed. Typical aquatic species include coontail, common and southern naiad, small duckweed, water meal, and American, comb, and leafy pondweed.

Stream

Streams are natural communities with permanently flowing water throughout the year and have been classified, according to White and Madany (1978) as Creek and River subclasses. Creeks are distinguished from rivers by having watersheds less than 200 square miles.

Creek—Creeks are classified into three natural community types based on gradient. High-gradient (10 or more feet per mile), medium gradient (1 to 10 feet per mile), and low-gradient creeks (less than 1 foot per mile) are recognized in Illinois (White and Madany 1978). All three stream types occur in the assessment area. Low-gradient creeks have slow current and lack riffles, sediments consist of fine silt and organic matter. They are often characteristic of prairie uplands and bottomlands of major rivers. High-gradient creeks are characterized by riffles, pools, sand/gravel beds, and are often headwater streams. Representatives include Kent and South Kinnikinnick Creek.

River—The Rock River is considered a medium-gradient river with a gradient of one to five feet per mile. Gravel riffles, raceways, and sand bars are characteristic of this community.

Primary

Primary communities in Illinois include three community subclasses: Cliff, Glade, and Lake Shore (White and Madany 1978). Primary communities are characterized by either;

thin or absent soil (parent material at the surface), or the maintenance of the area at a early successional stage because of substrate or natural disturbance.

Cliff—This primary community is formed on either sandstone or dolomite bedrock outcroppings in the URRRA. Vertical exposures of bedrock define a cliff. Aspect and degree of shading typically are significant factors in explaining variation in these plant communities.

These communities typically exist within a complex of other community types including forest. Additionally, locally xeric conditions (e.g., south-to-southwest exposures, shallow soil depth) maintain barrens or savanna-like habitats for many shade-intolerant species including several prairie species. Within this matrix, sand prairie/savanna complexes can occur where the bedrock residuum is weathered into a sandy soil. Two species endemic to the upper midwest, fame flower and kittentails (ST), are locally common in dry, shallow-soil habitats associated with the St. Peter's sandstone. Several ferns and fern allies that are rare in Illinois are present and include oak fern (SE), long beech fern (SE), rusty Woodsia fern (SE), horsetail (SE), meadow horsetail, running pine club moss (SE), ground pine club moss (SE), shining club moss, ground pine club moss, and rock Selaginella. Several of these are limited in distribution to areas of exposed sandstone bedrock. Interestingly, many of the uncommon species found in the region associated with these cliff communities and sandy residuum (e.g., Canada blueberry, pink corydalis, black huckleberry, black chokeberry, starflower, Canada mayflower, pink lady's slipper orchid, and bunchberry) also are species of bogs in Illinois (e.g., Taft and Solecki 1990) and to the north.

Dolomite is also exposed locally, particularly in White Pine State Park and along the Rock River north of Oregon. At localized areas along the Rock River, steep slopes have dolomite outcroppings with cliffs up to 6 meters tall. Taller cliffs occur in the White Pines State Park. The soils derived from this parent material, such as the Sogn loam where slopes are steep, and the bedrock outcrops support a flora distinct from the flora associated with the sandstone though not as rich in rare or uncommon species. Interestingly, white pine and Canada yew are present on both bedrock types. A few rare plants are found in prairie remnants associated with calcareous soils formed where loess is eroded exposing calcareous, gravelly glacial outwash and till, mostly in the eastern portion of the URRRA. Examples include woolly milkweed (SE), downy yellow painted cup (SE), redroot (SE), prairie bush clover (FT,SE), and prairie dandelion (SE).

Sandstone Cliff—Sandstone bedrock outcrops most common in the Oregon Section of the Rock River Hill Country Natural Division. As noted previously, outcroppings of St. Peter's sandstone provide habitat for numerous rare plant species under a variety of environmental conditions (e.g., exposed xeric sites and more moderate/mesic canyon walls and north facing sites). Particularly noteworthy examples of sandstone cliff communities occur at Castle Rock State Park, including Castle Rock itself. Other outcroppings with high quality plant communities include the following INAI natural areas: Rock River Yellow Birch Stand, Grand Detour Yellow Birch Site, Sinnissippi Bunchberry Site, Little Tract at Castle Rock, Sinnissippi River Bluff, and Nachusa Marsh. Characteristic species include: white pine, black oak, yellow birch (SE), shadbush, bearberry (SE), wild sarsaparilla, black chokeberry,

bunchberry (SE), hairy wood ruchs (SE), witch hazel, black huckleberry, cliff fern, beach wormwood, kittentail (ST), harebell, fragile fern, rattlesnake plantain, common rockrose, common pineweed, narrow-leaved pinweed, cylindric blazing star, blue toadflax, ground pine clubmoss, Canada Mayflower, interrupted fern, cinnamon fern, polypody fern, bracken fern, rock Selaginella, six-weeks fescue, rusty Woodsia fern (SE), fame flower, marginal shield fern, and hairy lip fern.

Problematic invasive species include common milfoil, garlic mustard, Kentucky blue grass, Canadian blue grass, and field sorrel.

Dolomite Cliff— Outcroppings of dolomite are primarily along the Rock River bluffs on the west side of the Rock River north of Oregon, at Franklin Creek Nature Preserve, Severson Dells Nature Preserve, Coleman Dells Nature Preserves and at White Pines State Park. Species found on dolomite cliff faces include: three-seeded mercury, columbine, toothed cress, American spikenard, walking fern, berry bladder fern, ninebark, harebell, purple cliff brake fern, pale leafcup, rice grass, Canada yew, Sullivantia (ST), yellow honeysuckle, leatherwood, bladdernut, broad-leaved goldenrod, late figwort, elderberry, black raspberry, prickly wild gooseberry, wafer ash, white pine, clearweed, Virginia creeper, eastern red cedar, spotted touch-me-not, Virginia waterleaf, shooting star, hydrangea, and alternate-leaved dogwood.

Cultural

This class describes communities formed entirely by human activities and disturbances and includes cropland, pastureland, old fields, developed land (e.g., urban), tree plantations, artificial lakes and ponds, and prairie reconstructions (White and Madany 1978). Cultural habitats generally do not provide habitat for threatened or endangered species except for a few species. The endangered alkali bulrush is a halophyte which in the Chicago Region occurs locally in ditches and degraded moist ground bordering salted highways. The gray birch which is endangered in the URRAA is a small tree which is sometimes planted in yards and along fence-rows. Another species, ear-leaved foxglove (ST), occasionally occurs in highly disturbed situations (e.g., roadway rights-of-way), but has not been reported in the assessment area. Cultural areas impose some of the most challenging ecological problems for natural habitats in the URRAA (see discussion below). Exceptions include the prairie reconstructions, termed prairie restoration by the INAI (White and Madany 1978) and wetland reconstructions. Prairie restoration is mentioned below as an example of habitat reconstruction efforts.

Prairie restoration—Typically, prairie reconstructions are plantings of prairie species on grassland soils where the original natural community has been destroyed. Prairie species are planted, sometimes in an effort to produce a warm-season grassland and sometimes with the goal of attempting to recreate the original prairie community. Prairie reconstructions often are species poor and strongly dominated by only a few taxa. The total area of prairie reconstruction within the URRAA is unknown. None have developed into communities that

mimic undegraded tall-grass prairie in species richness or structure. Reconstructed prairies require considerable time (>5 years and probably >20 years) to develop into systems that structurally and compositionally resemble natural communities.

Summary Recommendations

Trends in the Upper Rock River Assessment Area among natural communities indicate that the amount of land remaining in an undegraded, high-quality condition is about 0.026% of the area, less than the statewide total of about 0.07%. However, a slightly greater proportion of prairie remains in a high-quality condition (0.02%) compared with statewide trends (0.01%) (Table 2). Although the URRRA comprises only 1.5% of the land area of the state, 41% of the native vascular plants from Illinois occur in the URRRA. Much of this is contained in the 0.026% of the area recognized as high quality habitat by the Illinois Natural Areas Inventory. This remarkable species richness can be attributed to the presence of a great diversity of habitats. Within the URRRA there is a unique concentration of distinct surface and bedrock geological features and available-moisture habitat conditions. Exposures of sandstone, dolomite, gravel, and glacial till and drift are present. Habitats associated with exposures of the St. Peter's Sandstone, which is exposed mostly near the Rock River and associated minor drainages in the region, are particularly rich in rare species. In the URRRA there exists significant areas of native vegetation that are not INAI sites but that contribute greatly to supporting this floristic diversity. These somewhat disturbed remnants provide a buffer for the INAI sites against stochastic losses due to small populations sizes and thus warrant attention and care.

Despite the availability of some descriptive information regarding natural communities in the URRRA, there remain many knowledge gaps. We generally do not understand diversity and species abundance patterns over time, long-term trends among many remnant natural communities, and many issues related to ecological management (i.e. control of exotic species, maintenance of biodiversity). Further, since remnants of any community type tend to have floristic differences (no two natural areas are the same), and very few undegraded remnants exist for each community type, there is an incomplete knowledge of floristic characteristics for many community types that historically were widespread in the assessment area. Examples where detailed floristic data particularly are limited include the pond, savanna, and wetland communities.

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

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

2. Map—All results from natural community inventory efforts should be categorized and mapped to provide a spatial context for the locations of habitats with differing ecological condition. This will aid in identifying concentrations of noteworthy natural communities which can serve as focus areas for establishing large preserve complexes or macrosites. Figure 12 in this report shows locations of high-quality natural areas and nature preserve within the URRRAA thus indicating the considerable effort already established in this regard within the assessment area. Trends in total area of qualitative classes for each community type would serve as an aid in measuring success in restoration efforts.

3. Protection—The natural communities with the greatest integrity need to be protected from further anthropogenic degradation (e.g., urban sprawl, grazing, off-road vehicle impacts, siltation). Inventory and mapping in the assessment area will aid in the prioritization of protection efforts. Highly isolated remnants pose distinct conservation and protection challenges compared with clusters of restorable natural communities. Staff of the Illinois Nature Preserves Commission (524 S. Second St., Springfield, IL 62701) 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 URRRAA (e.g., habitat fragmentation, habitat degradation, exotic species invasion, and fire absence). Some problems can be addressed more readily than others. *Habitat fragmentation* is a widespread problem with potentially devastating consequences for ecological integrity often resulting in an interruption of biological interactions, ecological processes, species migrations, and a reduction in habitat heterogeneity (Wilcove et al. 1986). High levels of fragmentation often result in a loss of species richness because species immigration, needed to compensate for local extirpation (and emigration) of species, is seriously challenged. However, “solutions” to restoring biological connectivity and ecosystem-level processes are extraordinarily complex and costly if the goal is to re-create corridors for all species among regional habitats. If functional dispersal corridors can not be established for most species, maintaining biodiversity in the highly fragmented landscape

of the URRRA may require distinct management actions among several remnants of each community type in order to simulate the landscape-scale heterogeneity needed to accomplish this goal. Unfortunately, where habitat loss is pronounced, that option seldom is available.

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

Exotic species invasion can be considered a species-level, a community-level, and a landscape-level problem. There are often solutions to mitigate their effects on all three of these levels. Glossy buckthorn, common buckthorn, European high-bush cranberry, the bush honeysuckles (e.g., *Lonicera maackii*, *L. tartarica*), garlic mustard, bittersweet nightshade, and purple loosestrife are so ubiquitous that it is difficult to imagine eliminating them from natural communities in the region. However, some community-level management activities address more than one ecological problem. For example, garlic mustard abundance possibly can be reduced with appropriately timed applications of fire (Nuzzo 1991; Schwartz and Heim 1996). Additionally, managing the natural vegetation within the URRRA with a landscape-scale approach would provide for the spatial and temporal heterogeneity required to maintain habitat and species diversity in the dynamic systems, such as the open woodlands, savanna-like areas, and prairies, that are present. Other serious exotic pests such as purple loosestrife require direct treatment or biological control (Thompson et al. 1987; Malecki et al. 1993). Recommended control measures for several of the most threatening and abundant exotic species are summarized in Table 14 (modified from Solecki 1997).

Fire is an ecological force that historically influenced many aspects of natural communities in the URRRA. Many community types require fire for maintenance of community characteristics and diversity. Fire absence has resulted in changes in forest structure, composition, and diversity. Invasion of mesophytic species such as sugar maple into oak-hickory forests is a statewide phenomenon related to fire absence. Many forests in Illinois are dominated in the canopy by oaks but have few oak saplings. Rather, shade-tolerant (and fire intolerant) species like sugar maple often are extraordinarily more common and occur at higher density than prior to settlement. An obvious consequence of this change is the possible loss of oak woodlands and the plant and wildlife species that depend on them. A rich assemblage of spring wildflowers still can be found in some woodlands because

Table 14. List of selected invasive exotic species known or suspected to occur in the Upper Rock River Assessment Area and recommended eradication methods. The recommended herbicide, typically, is Round-up (glyphosate) except for black locust (Solecki 1997). Asterisk (*) indicates plant has phototoxic properties and skin contact should be avoided.

Species	Cut & Apply Stump-Treatmt Herbicide	Foliar Herbicide Application	Prescribed Fire	Cut &/or Hand Pull (get root)	Dig Root	Bio- Control
<i>Achillea millefolium</i>		X		X		
<i>Ailanthus altissima</i>	X			X		
<i>Alliaria petiolata</i>		X	X	X		
<i>Arctium minus</i>		X		X	X	
<i>Asparagus officinale</i>	X				X	
<i>Bromus inermis</i>		X				
<i>Daucus carota</i>		X		X		
<i>Dipsacus laciniatus</i>		X		X	X	
<i>Dipsacus sylvestris</i>		X		X	X	
<i>Elaeagnus umbellatus</i>	X					
<i>Euphorbia cyparissius</i>				X	X	
<i>Festuca pratensis</i>		X	X		X	
<i>Glechoma hederacea</i>		X		X		
<i>Hemerocallis fulva</i>		X			X	
<i>Leonurus cardiaca</i>		?		X	X	
<i>Lonicera maackii</i>	X					
<i>Lysimachia nummularia</i>		X				
<i>Lythrum salicaria</i>		X		X		X
<i>Maclura pomifera</i>	X					
<i>Melilotus alba</i>			X	X		
<i>Melilotus officinale</i>			X	X		
<i>Morus alba</i>	X					
<i>Pastinaca sativa</i>		X		X*	X*	
<i>Phalaris arundinacea</i>		X	X	X		
<i>Poa compressa</i>			X			
<i>Poa pratensis</i>			X			
<i>Populus alba</i>	X		X			
<i>Rhamnus cathartica</i>	X		X			
<i>Rhamnus frangula</i>	X		X			
<i>Robinia pseudoacacia</i>	X - Garlon 4					
<i>Rosa multiflora</i>	X					
<i>Vinca minor</i>		X				

these spring ephemerals largely escape the ensuing shade of the dense over-story and thus selectively persist while typically only a few shade-tolerant species can be found in the summer and fall. Infrequent application of prescribed fire may be inadequate to reverse these trends. Rather, a long-term program of repeated applications of prescribed fire is often necessary before compositional stability is achieved in fire-dependent communities. Fire absence in prairie communities typically results in invasion by woody plants leading to reduction in area of the prairie and in species richness; eventually, entire prairie remnants can be eliminated by ensuing shrub thickets and re-growth forest with great loss of biodiversity. Prescribed fires can be implemented to a wide variety of remnants and community types, at little cost, and achieve measurable improvements in many parameters of ecosystem integrity. However, consideration needs to be given to the whole natural community. Spatially heterogeneous burns appear most effective at maintaining viable populations of fire-dependent and fire-sensitive species.

5. Application of appropriate vegetation management and monitoring—Once the ecological problems for a natural community are identified and prioritized according to restoration effort and gain, a program of vegetation management needs to be implemented. Record keeping is vital to tracking activities and levels of success in implementing each treatment plan. Floristic Quality Assessment methods may provide a framework useful in measuring progress of each restoration activity. Methods for making spatial and time-series comparisons and statistical analysis using Floristic Quality data have been described (Taft et al. 1997).

Acknowledgments

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Definition of Terms

- Alkaline - Often used interchangeably with basic. We use it here to refer to soil or water with a pH greater than 7.3. This is usually present where calcium or magnesium is present in the parent material. *Alkali* soil has a very high degree of alkalinity (greater than pH 8.5), this soil typically has a high percentage of sodium, or other cations (Ca, Mg) such that growth is reduced. *Saline-alkali* soil have a combination of salts and alkalinity such that plant growth is reduced.
- Anthropogenic - caused by man.

- Aolian - wind blown. These processes are usually more active in dry glacial periods.
- Biodiversity - the sum total of all species present. Sometimes genetic diversity and community diversity are included within this definition. Often diversity is used as a synonym.
- Calciphile - a species which prefers to grow in substrates high in calcium.
- Dolomite - a bedrock type in Illinois containing calcium and magnesium carbonate. It is a sugary textured dense gray rock. It occurs irregularly as patches throughout limestone.
- Dry-mesic - well drained. Water is removed from the soil readily, but not rapidly. This moisture class is intermediate between Dry and Mesic.
- Endangered (federally or state) - Wild species with so few individual survivors the species could soon become extinct or extirpated. These species are often referred to as is 'T & E', or 'Listed'.
- Exotic - non-native species; others synonyms include adventive, alien (many exotics can become problematic *invasives*).
- Extant - present and still existing within a certain range.
- Extinction - the complete disappearance of a species from earth.
- Extirpation - the elimination of a species from an area (i.e. Illinois; local extinction).
- Glacial refugia species (Relict) - species present as relicts of a more boreal climate in northern Illinois following Wisconsin Glacial Episode. During cold glacial periods migration of coniferous forest south left these species behind as climate warmed and glaciers retreated to the north. Example include white pine, Canada yew, yellow birch, and hairy wood rush. These species are present at the southernmost limit of their midwestern range in Illinois; many of these occur further south in mountains to the east.
- Graminoid - grass-like; sedges, rushes, grasses, etc.
- Halophyte - a plant which tolerates salty or saline medium.
- High-Quality (Undegraded, Natural Area) - High-quality undegraded areas are defined as stable natural vegetation communities that reflect as nearly as possible their natural condition at the time of settlement (species present, appearance, soil, hydrology, etc.). They retain an ecological character typical of pre-settlement communities typically lacking exotic species, heavy grazing, agriculture, and logging and are categorized as Category I natural areas by the Illinois Natural Areas Inventory (White 1978, White and Madany 1978).
- Lacustrine - having to do with lakes or lake deposits.
- Loess - Geological deposit of relatively uniform, fine material, mostly silt, presumably transported by wind. Much of the soils of Illinois developed from loess blown out of river valleys during post-glacial periods when a lot of soils were unprotected from dry winds by vegetative cover.
- Mesic - moderately well drained. Water is removed from the soil slowly enough to keep it wet for significant periods but not a large part of the time.
- Muck - water saturated, highly decomposed organic matter. Organic matter in muck has decomposed so much that plant structures are no longer apparent. Peat often has a fibrous spongy consistency, whereas muck can be fluid and pasty.

- Oligotrophic - used here to refer to water inputs into wetlands that are solely from rain and surface water, but not primarily of groundwater origin; such wetlands are intermediate in nutrient content compared to *ombrotrophic* (poorly fed - rainfall only) and *minerotrophic* (highly fed from mineralized seepage) wetlands.
- Palustrine - shallow fresh water habitat dominated by persistent emergent vegetation including trees, shrubs, and/or herbaceous cover.
- Peat - incompletely decomposed plant material produced when growth exceeds decomposition. Such conditions are favored by cold, aerobic conditions such as found in fens and bogs. Fens are peatlands where peat largely is derived from sedges while bogs contain peat that on the surface largely is derived from *Sphagnum* moss. The dead plant material is partly decayed yet still has individual parts distinguishable (e.g., roots and stems).
- Presettlement (historical) vegetation - the distribution and character of vegetation prior to European settlement and large-scale alteration of these patterns; for most of Illinois this was before the beginning of the 18th century.
- Species Richness - the number of species present. Richness is a type of diversity.
- Spring Ephemeral - forest herbs that emerge, flower, fruit and become senescent early in the growing season before tree canopy shading limits photosynthesis.
- St. Peter sandstone - a crumbly, cross-bedded Ordovician aged rock that often bears brown or rusty tints. It is made of a very pure, well sorted, fine grained quartz which was deposited near the shoreline of a shallow sea that covered much of central North America about 470 mya. When newly exposed it is often almost pure white, making it highly prized by fine glassmakers and mining operations. This makes a fragile bedrock that is easily weathered, and may form valleys, cliffs, and ravines (e.g. Castle Rock State Park). Many rare plants species are associated with outcroppings.
- Taxa (taxon) - a taxonomic unit usually at the species level or finer (e.g., variety, form).
- Threatened - a species which is in danger of or likely to become endangered because of decline in population and/or habitat.
- URRRA - Upper Rock River Assessment Area; see Figures 1 & 2
- Xeric - excessively drained. Water is removed from the soil rapidly, because sloping bedrock or gravel are at or near the surface.
- Wet-mesic - imperfectly or somewhat poorly drained. Intermediate between Wet and Mesic.

BIRDS

Introduction

Much of the information in this section is derived from standard references of Illinois, including the Illinois Natural Heritage Database (INHD) (Illinois Department of Natural Resources 1997), The Illinois Breeding Bird Atlas (IBBA) (Illinois Department of Natural Resources, in prep), Avian Ecological Investigations (AEI) (Illinois Department of Natural Resources, unpublished reports), The Birds of Illinois by H. David Bohlen, and the results of extensive field work by personnel from the Illinois Natural History Survey (much of it ongoing and not yet published).

Local amateur ornithologists such as Jack Armstrong, Alan Branhagen, David Cederstrom, Lee Johnson, and Dan Williams and several others have contributed substantially to the more recent ornithological record of the URRRA area since at least the mid-1950s. Many of their records appear in this report. As a result, we know far more about the birds of this area than we do about many other areas and we have a far better grasp of how we can improve habitat even in areas that will always be at least somewhat urbanized.

The Upper Rock River Assessment Area (URRAA) contains some excellent examples of a variety of natural communities, although most are relatively small in size. These varied communities help create a wide variety of habitats for an equally diverse group of birds. Much of the URRRA was formerly part of the Grand Prairie region, although the vast majority of the prairie has been converted to cropland. Much of the rest of the area is forested, especially along the streams and rivers, which traverse the area. The city of Rockford is the only significant urbanized area within the URRRAA.

The native habitats in the URRRAA are chronically fragmented. For many birds of forested habitats, these are likely population “sinks” in which there is insufficient reproductive success to replace adults that die each year of natural causes. For these reasons, the best management strategy may be to focus on enhancing habitat for birds of agricultural habitats, wetlands, grasslands, and shrublands, and for improving stopover habitat for migrating birds en route to northern breeding areas or southern wintering areas.

With only about 11,300 acres in public lands in the entire URRRAA, there are few opportunities to reduce the negative effects of fragmentation and loss of natural habitats. Rock Cut State Park (RC), Lowden-Miller State Forest (LM), and Castle Rock State Park (CR) are notable exceptions in the URRRAA. There are also a number of smaller state and county forest preserves including White Pines Forest (WP) and Lowden (LSP) State Parks in Ogle County, and Byron, Kieselberg (K) and Severson Dells (SD) Forest Preserves in Winnebago County (to name a few), as well as the Kinnikinnick Conservation Area (KCA) in

Boone Co. A very small portion of the Nachusa Grasslands also lies within the boundaries of the URRAA area. These preserves protect some of the best and largest remaining examples of forest and grassland habitat left in the URR for the area's avifauna.

There are 35 areas totaling 1,577 acres, or about .29% of the total land area within the URR, that are designated as Illinois Natural Areas Inventory sites. There is also a 6.8 mile stretch of the Rock River (between Honey and Clear creeks) that is designated as a biologically significant stream segment. Despite widespread habitat loss and degradation throughout the URR, these small pockets of natural habitat that are left help retain some of the avian diversity that remains. Although most areas of the URR have a fairly depauperate bird community, the presence of a fairly wide array of habitats including examples of both tallgrass, hill, and sand prairies, shallow marsh, Rock River bottomland areas, and upland forests of the Northwestern Morainal/ Winnebago Drift and Rock River Hill Country Natural Divisions, accounts for the varied breeding bird community to be found in the area. Approximately 274 bird species regularly occur in the URRAA (Table 15). This represents about 91% of the approximately 300 species that regularly occur in the state (Illinois Ornithological Records Committee 1999). Of these 274 species, at least 145 breed or formerly bred in the area (Table 15). Of these, 41 are either locally extinct, or are rare during the breeding season (species with a "®" in Table 15), which suggest that some habitats may be in short supply in the URRAA.

Several nesting species have been extirpated from the URRAA, including at least two that are globally extinct (Passenger Pigeon *Ectopistes migratorius* and Carolina Parakeet *Conuropsis carolinensis*) and some that are extinct or are nearly so in Illinois (Swainson's Hawk *Buteo swainsoni*, Peregrine Falcon *Falco peregrinus*, Greater Prairie Chicken *Tympanuchus cupido*, Sharp-tailed Grouse *Tympanuchus phasianellus*, Yellow Rail *Coturnicops noveboracensis*, Black Tern *Chlidonias niger*, Bewick's Wren *Thryomanes bewickii*, and Bachman's Sparrow *Aimophila aestivalis*). The Green River Conservation Area, just to the south of the URR, was originally purchased in 1940 by IDNR (formally IDOC) as Illinois' first prairie chicken sanctuary (Westemeier 1985). However, the population there quickly dwindled until the last one seen in all of northern Illinois was reported there on April 12, 1959 (Bohlen 1978). In addition, there are historic accounts of Trumpeter Swan *Olor buccinator*, Whooping Crane *Grus americana*, and Ruffed Grouse *Bonasa umbellus* for the area and some or all may have bred, especially the grouse. Several species of ducks, King Rail, Virginia Rail, Common Snipe, Wilson's Phalarope, Short-eared Owl, Common Raven, and Yellow-headed Blackbird also likely nested before settlement, but many of these disappeared as the wetlands were drained and the extensive grasslands were converted to monoculture agriculture. Some of these species could still occasionally nest in the area although verified breeding records are lacking.

The bird species that live in the URR 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 15). The following sections describe the bird communities typically found in the major habitat types within the URRAA, as well as unique environmental problems and management solutions for bird communities in each habitat.

Table 15. Bird species that regularly occur in the Upper Rock River Assessment Area. These are species that are likely to be present all or most years. This list excludes extinct species and the many wandering or “vagrant” species that have been recorded in the area. The purpose is to list only those species that have or could have significant populations in the area. The table also lists the habitats that are most likely to be occupied during each season.

Common Name ^{1, 2} <i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Common Loon <i>Gavia immer</i>			L
Pied-billed Grebe - ST <i>Podilymbus podiceps</i>	W [®]		L W
Horned Grebe <i>Podiceps auritus</i>			L
Eared Grebe <i>Podiceps nigricollis</i>			L
American White Pelican <i>Pelecanus erythrorhynchos</i>			L
Double-crested Cormorant <i>Phalacrocorax auritus</i>	Fs L		L
+ American Bittern - SE <i>Botaurus lentiginosus</i>	W [®]		W
+ Least Bittern - ST <i>Ixobrychus exilis</i>	W [®]		W
Great Blue Heron <i>Ardea herodias</i>	F Fs L W	L W	L W
Great Egret <i>Ardea alba</i>			L W
Snowy Egret - SE <i>Egretta thula</i>			W
Little Blue Heron - SE <i>Egretta caerulea</i>			L W
Cattle Egret <i>Bubulcus ibis</i>			C G W
Green Heron <i>Butorides virescens</i>	Fs L W		Fs L W
Black-crowned Night-Heron - SE <i>Nycticorax nycticorax</i>			Fs W
Yellow-crowned Night-Heron - SE <i>Nyctanassa violacea</i>			Fs
Turkey Vulture <i>Cathartes aura</i>	F Fs C G Sav	F Fs C G Sav	F Fs C G S Sav
Greater White-fronted Goose <i>Anser albifrons</i>		L W	L W
Snow Goose <i>Chen caerulescens</i>		C L	C L W
Ross's Goose <i>Chen rossii</i>			C L W

Table 15. Continued.Common Name^{1, 2}

<i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Canada Goose	C L W	C L R W	C L R W
<i>Branta canadensis</i>			
* Mute Swan			L W
<i>Cygnus olor</i>			
Tundra Swan			L W
<i>Cygnus columbianus</i>			
Wood Duck	Fs W		Fs L W
<i>Aix sponsa</i>			
Gadwall			L W
<i>Anas strepera</i>			
American Wigeon			L W
<i>Anas americana</i>			
American Black Duck			Fs C L W
<i>Anas rubripes</i>			
Mallard	Fs C G L W	Fs C L W	Fs C L W
<i>Anas platyrhynchos</i>			
Blue-winged Teal	G W		L W
<i>Anas discors</i>			
Northern Shoveler			L W
<i>Anas clypeata</i>			
Northern Pintail			C L W
<i>Anas acuta</i>			
Green-winged Teal			L W
<i>Anas crecca</i>			
Canvasback			L W
<i>Aythya valisineria</i>			
Redhead			L W
<i>Aythya americana</i>			
Ring-necked Duck			L W
<i>Aythya collaris</i>			
Greater Scaup			L W
<i>Aythya marila</i>			
Lesser Scaup			L W
<i>Aythya affinis</i>			
Surf Scoter			L
<i>Melanitta perspicillata</i>			
White-winged Scoter		L	L
<i>Melanitta fusca</i>			
Oldsquaw			L
<i>Clangula hyemalis</i>			
Bufflehead		L	L W
<i>Bucephala albeola</i>			
Common Goldeneye		L	L
<i>Bucephala clangula</i>			

Table 15. Continued.

Common Name ^{1, 2} <i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Hooded Merganser <i>Lophodytes cucullatus</i>	Fs [®]		Fs L W
Common Merganser <i>Mergus merganser</i>		L	L
Red-breasted Merganser <i>Mergus serrator</i>			L W
Ruddy Duck <i>Oxyura jamaicensis</i>			L W
+ Osprey - SE <i>Pandion haliaetus</i>			L
Bald Eagle - ST <i>Haliaeetus leucocephalus</i>	Fs L[®]	Fs L	Fs L
+ Northern Harrier - SE <i>Circus cyaneus</i>	G W [®]	C G W	C G W
Sharp-shinned Hawk <i>Accipiter striatus</i>	F [®]	F Fs R S Sav	F Fs R S Sav
Cooper's Hawk <i>Accipiter cooperii</i>	F S Sav	F R S Sav	F R S Sav
Northern Goshawk <i>Accipiter gentilis</i>		F S	F L S W
Red-shouldered Hawk - ST <i>Buteo lineatus</i>	Fs[®]	Fs	Fs
Broad-winged Hawk <i>Buteo platypterus</i>	F [®]		F
Swainson's Hawk <i>Buteo swainsoni</i>	F G Sav [®]		F G Sav
Red-tailed Hawk <i>Buteo jamaicensis</i>	F C G R S Sav	F C G R S Sav	F C G R S Sav
Rough-legged Hawk <i>Buteo lagopus</i>		C G	
Golden Eagle <i>Aquila chrysaetos</i>			F G S
American Kestrel <i>Falco sparverius</i>	C G R Sav	C G R Sav	C G R Sav
Merlin <i>Falco columbarius</i>			All
Peregrine Falcon - SE, FT <i>Falco peregrinus</i>			All
* Gray Partridge S <i>Perdix perdix</i>	C G S	C G S	C G
* Ring-necked Pheasant <i>Phasianus colchicus</i>	C G S	C G S	C G S
Wild Turkey <i>Meleagris gallopavo</i>	F Fs S Sav	F Fs C S Sav	F Fs C S Sav

Table 15. Continued.Common Name^{1, 2}

<i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Northern Bobwhite <i>Colinus virginianus</i>	C G S Sav	C G S Sav	C G S Sav
Yellow Rail <i>Coturnicops noveboracensis</i>	W [®]		G W
Black Rail - SE <i>Laterallus jamaicensis</i>			G W
King Rail - SE <i>Rallus elegans</i>			G W
Virginia Rail <i>Rallus limicola</i>			G W
Sora <i>Porzana carolina</i>	W [®]		G W
Common Moorhen - ST <i>Gallinula chloropus</i>			W
American Coot <i>Fulica americana</i>	W [®]	L W	L W
Sandhill Crane - ST <i>Grus canadensis</i>	W [®]		C G W
Black-bellied Plover <i>Pluvialis squatarola</i>			L W
American Golden-Plover <i>Pluvialis dominica</i>			C G L W
Semipalmated Plover <i>Charadrius semipalmatus</i>			W
Killdeer <i>Charadrius vociferus</i>	C G R W		C G R W
American Avocet <i>Recurvirostra americana</i>			W
Greater Yellowlegs <i>Tringa melanoleuca</i>			W
Lesser Yellowlegs <i>Tringa flavipes</i>			W
Solitary Sandpiper <i>Tringa solitaria</i>			W
Willet <i>Catoptrophorus semipalmatus</i>			W
Spotted Sandpiper <i>Actitis macularia</i>	L		W
Upland Sandpiper - SE <i>Bartramia longicauda</i>	G [®]		G
Hudsonian Godwit <i>Limosa haemastica</i>			W
Ruddy Turnstone <i>Arenaria interpres</i>			W

Table 15. Continued.

Common Name ^{1, 2}	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
<i>Scientific name</i>			
Sanderling			W
<i>Calidris alba</i>			
Semipalmated Sandpiper			W
<i>Calidris pusilla</i>			
Western Sandpiper			W
<i>Calidris mauri</i>			
Least Sandpiper			W
<i>Calidris minutilla</i>			
White-rumped Sandpiper			W
<i>Calidris fuscicollis</i>			
Baird's Sandpiper			G W
<i>Calidris bairdii</i>			
Pectoral Sandpiper			C G W
<i>Calidris melanotos</i>			
Dunlin			W
<i>Calidris alpina</i>			
Stilt Sandpiper			W
<i>Calidris himantopus</i>			
Buff-breasted Sandpiper			G W
<i>Tryngites subruficollis</i>			
Short-billed Dowitcher			W
<i>Limnodromus griseus</i>			
Long-billed Dowitcher			W
<i>Limnodromus scolopaceus</i>			
Common Snipe			G W
<i>Gallinago gallinago</i>			
American Woodcock	F Fs S		F Fs S
<i>Scolopax minor</i>			
Wilson's Phalarope - SE			L W
<i>Phalaropus tricolor</i>			
Red-necked Phalarope			L W
<i>Phalaropus lobatus</i>			
Franklin's Gull			C L W
<i>Larus pipixcan</i>			
Bonaparte's Gull			C L W
<i>Larus philadelphia</i>			
Ring-billed Gull		C L W	C L W
<i>Larus delawarensis</i>			
Herring Gull		L	C L W
<i>Larus argentatus</i>			
Caspian Tern			L
<i>Sterna caspia</i>			
Common Tern - SE			L
<i>Sterna hirundo</i>			

Table 15. Continued.

Common Name ^{1, 2} <i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Forster's Tern - SE <i>Sterna forsteri</i>			L W
Black Tern - SE <i>Chlidonias niger</i>			L W
* Rock Dove <i>Columba livia</i>	C R	C R	C R
Mourning Dove <i>Zenaida macroura</i>	C R S	C R S	C R S
Black-billed Cuckoo <i>Coccyzus erythrophthalmus</i>	S		F S Sav
Yellow-billed Cuckoo <i>Coccyzus americanus</i>	F Fs S Sav		F Fs S Sav
+ Barn Owl - SE <i>Tyto alba</i>	C G Sav [®]	C G Sav	C G Sav
Eastern Screech-Owl <i>Otus asio</i>	R S Sav	R S Sav	R S Sav
Great Horned Owl <i>Bubo virginianus</i>	F Fs C R Sav	F Fs C R Sav	F Fs C R Sav
Snowy Owl <i>Nyctea scandiaca</i>		C	
Barred Owl <i>Strix varia</i>	F Fs	F Fs	F Fs
Long-eared Owl <i>Asio otus</i>		F S	F S
Short-eared Owl - SE <i>Asio flammeus</i>		G	G
Northern Saw-whet Owl <i>Aegolius acadicus</i>		F S	F S
Common Nighthawk <i>Chordeiles minor</i>	G R Sav		C G R
Whip-poor-will <i>Caprimulgus vociferus</i>	F Sav		F Sav
Chimney Swift <i>Chaetura pelagica</i>	F Fs R S Sav		All
Ruby-throated Hummingbird <i>Archilochus colubris</i>	F Fs R S Sav		F Fs R S Sav
Belted Kingfisher <i>Ceryle alcyon</i>	L W	L W	L W
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i>	Fs C R	F Fs Sav	F Fs C R Sav
Red-bellied Woodpecker <i>Melanerpes carolinus</i>	F Fs R S Sav	F Fs R S Sav	F Fs R S Sav
Yellow-bellied Sapsucker <i>Sphyrapicus varius</i>	F Fs [®]	F Fs R Sav	F Fs R Sav

Table 15. Continued.Common Name^{1, 2}

<i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Downy Woodpecker <i>Picoides pubescens</i>	F Fs R S Sav	F Fs R S Sav	F Fs R S Sav
Hairy Woodpecker <i>Picoides villosus</i>	F Fs R Sav	F Fs R S Sav	F Fs R S Sav
Northern Flicker <i>Colaptes auratus</i>	F Fs R S Sav	F Fs R S Sav	F Fs R S Sav
Pileated Woodpecker <i>Dryocopus pileatus</i>	F Fs Sav [®]	F Fs R Sav	F Fs R Sav
Olive-sided Flycatcher <i>Contopus cooperi</i>			F Fs R S Sav
Eastern Wood-Pewee <i>Contopus virens</i>	F Fs R Sav		F Fs R Sav
Yellow-bellied Flycatcher <i>Empidonax flaviventris</i>			F S Fs
Acadian Flycatcher <i>Empidonax virescens</i>	F Fs		F Fs
Alder Flycatcher <i>Empidonax alnorum</i>			S W Sav
Willow Flycatcher <i>Empidonax traillii</i>	S W		S W Sav
Least Flycatcher <i>Empidonax minimus</i>	F Fs Sav [®]		F Fs R S Sav
Eastern Phoebe <i>Sayornis phoebe</i>	Fs R		Fs R
Great Crested Flycatcher <i>Myiarchus crinitus</i>	F Fs Sav		F Fs R S Sav
Eastern Kingbird <i>Tyrannus tyrannus</i>	C G S Sav		F A C G S Sav
Loggerhead Shrike - ST <i>Lanius ludovicianus</i>	C G S[®]	C G S	C G S
Northern Shrike <i>Lanius excubitor</i>		C G S	
White-eyed Vireo <i>Vireo griseus</i>	Fs S Sav		Fs S Sav
Bell's Vireo <i>Vireo bellii</i>	G S		G S
Yellow-throated Vireo <i>Vireo flavifrons</i>	F Fs		F Fs R
Blue-headed Vireo <i>Vireo solitarius</i>	F Fs [®]		F Fs Sav
Warbling Vireo <i>Vireo gilvus</i>	Fs R S Sav		F Fs R S Sav
Philadelphia Vireo <i>Vireo philadelphicus</i>			F R S Sav

Table 15. Continued.

Common Name^{1, 2}

<i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Red-eyed Vireo <i>Vireo olivaceus</i>	F Fs Sav		F Fs R S Sav
Blue Jay <i>Cyanocitta cristata</i>	F Fs C R S Sav	F Fs C R S Sav	F Fs C R S Sav
American Crow <i>Corvus brachyrhynchos</i>	All	All	All
Horned Lark <i>Eremophila alpestris</i>	C G	C G	C G
Purple Martin <i>Progne subis</i>	G L R W		G L W
Tree Swallow <i>Tachycineta bicolor</i>	Fs G L W		Fs G L W
Northern Rough-winged Swallow <i>Stelgidopteryx serripennis</i>	Fs G L W		G L W
Bank Swallow <i>Riparia riparia</i>	G L W		G L W
Cliff Swallow <i>Petrochelidon pyrrhonota</i>	G L W		G L W
Barn Swallow <i>Hirundo rustica</i>	C G L R S W		C G L R S W
Black-capped Chickadee <i>Poecile atricapillus</i>	F Fs R S Sav	F Fs R S Sav	F Fs R S Sav
Tufted Titmouse <i>Baeolophus bicolor</i>	F Fs R Sav	F Fs R Sav	F Fs R Sav
Red-breasted Nuthatch <i>Sitta canadensis</i>	F R [®]	F R	F R
White-breasted Nuthatch <i>Sitta carolinensis</i>	F Fs R Sav	F Fs R Sav	F Fs R Sav
Brown Creeper - ST <i>Certhia americana</i>	F Fs[®]	F Fs R	F Fs R
Carolina Wren F Fs R S <i>Thryothorus ludovicianus</i>		F Fs R S	F Fs R S
Bewick's Wren - SE <i>Thryomanes bewickii</i>			F R S Sav
House Wren <i>Troglodytes aedon</i>	F R S Sav		F R S Sav
Winter Wren <i>Troglodytes troglodytes</i>		F Fs W	F Fs W
Sedge Wren <i>Cistothorus platensis</i>	G W		G W
Marsh Wren <i>Cistothorus palustris</i>	W		W
Golden-crowned Kinglet <i>Regulus satrapa</i>	F Fs [®]	F Fs R Sav	F Fs R Sav

Table 15. Continued.Common Name^{1, 2}

<i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Ruby-crowned Kinglet <i>Regulus calendula</i>			F S Sav
Blue-gray Gnatcatcher <i>Poliophtila caerulea</i>	F Fs S Sav		F Fs S Sav
Eastern Bluebird <i>Sialia sialis</i>	C G R S Sav	F C R S Sav	F C G R S Sav
Veery <i>Catharus fuscescens</i>	F Fs		F Fs R Sav
Gray-cheeked Thrush <i>Catharus minimus</i>			F Fs R Sav
Swainson's Thrush <i>Catharus ustulatus</i>			F Fs S R Sav
Hermit Thrush <i>Catharus guttatus</i>		F Fs R S Sav	F Fs R S Sav
Wood Thrush <i>Hylocichla mustelina</i>	F		F Fs R Sav
American Robin <i>Turdus migratorius</i>	F Fs R S Sav	F Fs R S Sav	F Fs C G R S Sav
Gray Catbird <i>Dumetella carolinensis</i>	Fs R S Sav		Fs R S Sav
Northern Mockingbird <i>Mimus polyglottos</i>	R S ®	R S	R S
Brown Thrasher <i>Toxostoma rufum</i>	C G R S Sav		C R S Sav
* European Starling <i>Sturnus vulgaris</i>	F Fs C R Sav	C R	C R
American Pipit <i>Anthus rubescens</i>			C W
Cedar Waxwing <i>Bombycilla cedrorum</i>	F Fs R S Sav	F Fs R S Sav	F Fs R S Sav
Blue-winged Warbler <i>Vermivora pinus</i>	S		F Fs R S Sav
Golden-winged Warbler <i>Vermivora chrysoptera</i>	S ®		F Fs R S Sav
Tennessee Warbler <i>Vermivora peregrina</i>			F Fs R S Sav
Orange-crowned Warbler <i>Vermivora celata</i>			F Fs R S Sav
Nashville Warbler <i>Vermivora ruficapilla</i>			F Fs R S Sav
Northern Parula <i>Parula americana</i>	F Fs ®		F Fs R Sav
Yellow Warbler <i>Dendroica petechia</i>	S W		Fs R S W Sav

Table 15. Continued.Common Name^{1, 2}

<i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Chestnut-sided Warbler <i>Dendroica pensylvanica</i>	S [®]		F Fs R S Sav
Magnolia Warbler <i>Dendroica magnolia</i>			F Fs R S Sav
Cape May Warbler <i>Dendroica tigrina</i>			F Fs R Sav
Black-throated Blue Warbler <i>Dendroica caerulescens</i>			F Fs R Sav
Yellow-rumped Warbler <i>Dendroica coronata</i>		F Fs Sav	F Fs R S Sav
Black-throated Green Warbler <i>Dendroica virens</i>	F [®]		F Fs R Sav
Blackburnian Warbler <i>Dendroica fusca</i>			F Fs R Sav
Yellow-throated Warbler <i>Dendroica dominica</i>	Fs [®]		F Fs
Pine Warbler <i>Dendroica pinus</i>			F Fs R Sav
Palm Warbler <i>Dendroica palmarum</i>			F Fs C G R S W Sav
Bay-breasted Warbler <i>Dendroica castanea</i>			F R Fs S Sav
Blackpoll Warbler <i>Dendroica striata</i>			F Fs R S Sav
Cerulean Warbler <i>Dendroica cerulea</i>	F Fs		F Fs R Sav
Black-and-white Warbler <i>Mniotilta varia</i>	F Fs [®]		F R Fs Sav S
American Redstart <i>Setophaga ruticilla</i>	Fs		F Fs S R Sav
Prothonotary Warbler <i>Protonotaria citrea</i>	Fs [®]		Fs
Worm-eating Warbler <i>Helmitheros vermivorus</i>			F
Ovenbird <i>Seiurus aurocapillus</i>	F		F R S Sav
Northern Waterthrush <i>Seiurus noveboracensis</i>			Fs R
Louisiana Waterthrush <i>Seiurus motacilla</i>	F [®]		F Fs
Kentucky Warbler <i>Oporornis formosu</i>	F		F Sav Fs
Connecticut Warbler <i>Oporornis agilis</i>			F Fs R S Sav

Table 15. Continued.

Common Name ^{1, 2} <i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Mourning Warbler <i>Oporornis philadelphia</i>	S [®]		F Fs R S Sav
Common Yellowthroat <i>Geothlypis trichas</i>	C G R S W Sav		C G R S W Sav
Hooded Warbler <i>Wilsonia citrina</i>	F [®]		F R
Wilson's Warbler <i>Wilsonia pusilla</i>			F Fs R S Sav
Canada Warbler <i>Wilsonia canadensis</i>	F S [®]		F Fs R S Sav
Yellow-breasted Chat <i>Icteria virens</i>	S		S Sav
Summer Tanager <i>Piranga rubra</i>	F Sav [®]		F R Sav
Scarlet Tanager <i>Piranga olivacea</i>	F Fs Sav		F Fs R Sav
Spotted Towhee <i>Pipilo maculatus</i>			F Fs R S
Eastern Towhee <i>Pipilo erythrophthalmus</i>	F S	F S	F Fs R S
American Tree Sparrow <i>Spizella arborea</i>		C G R S W Sav	C G R S W Sav
Chipping Sparrow <i>Spizella passerina</i>	F R Sav		F G R S Sav
Clay-colored Sparrow <i>Spizella pallida</i>			S
Field Sparrow <i>Spizella pusilla</i>	C G S Sav	G S W Sav	C G S W Sav
Vesper Sparrow <i>Pooecetes gramineus</i>	C G		C G
Lark Sparrow <i>Chondestes grammacus</i>	C G S		C G S
Savannah Sparrow <i>Passerculus sandwichensis</i>	G	G	C G W
Grasshopper Sparrow <i>Ammodramus savannarum</i>	G		G
+ Henslow's Sparrow - SE <i>Ammodramus henslowii</i>	G [®]		G
Le Conte's Sparrow <i>Ammodramus leconteii</i>			G W
Nelson's Sharp-tailed Sparrow <i>Ammodramus nelsoni</i>			W
Fox Sparrow <i>Passerella iliaca</i>		F Fs S	F Fs R S Sav

Table 15. Continued.

Common Name ^{1, 2} <i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Song Sparrow <i>Melospiza melodia</i>	C G R S W	R S W C G	R S W C G
Lincoln's Sparrow <i>Melospiza lincolnii</i>			S W Fs R
Swamp Sparrow <i>Melospiza georgiana</i>	W	Fs G S W	Fs G S W
White-throated Sparrow <i>Zonotrichia albicollis</i>		F Fs R S Sav	F Fs R S Sav
Harris's Sparrow <i>Zonotrichia querula</i>			G R S
White-crowned Sparrow <i>Zonotrichia leucophrys</i>		G R S	G R S
Dark-eyed Junco <i>Junco hyemalis</i>		F Fs C G R S Sav	F Fs C G R S Sav
Lapland Longspur <i>Calcarius lapponicus</i>		C G	C G
Snow Bunting <i>Plectrophenax nivalis</i>		C G	
Northern Cardinal <i>Cardinalis cardinalis</i>	F Fs C R S Sav	F Fs C R S Sav	F Fs C R S Sav
Rose-breasted Grosbeak <i>Pheucticus ludovicianus</i>	F Fs Sav S		F Fs R S Sav
Blue Grosbeak <i>Guiraca caerulea</i>	S Sav [®]		S Sav
Indigo Bunting <i>Passerina cyanea</i>	F Fs S Sav		F Fs C S Sav
Dickcissel <i>Spiza americana</i>	C G		C G
Bobolink <i>Dolichonyx oryzivorus</i>	G		G W
Red-winged Blackbird <i>Agelaius phoeniceus</i>	C G R S W Sav	F Fs C G	C G R S W Sav
Eastern Meadowlark <i>Sturnella magna</i>	C G	C G	C G
Western Meadowlark <i>Sturnella neglecta</i>	C G		C G
Yellow-headed Blackbird - SE <i>Xanthocephalus xanthocephalus</i>			W
Rusty Blackbird <i>Euphagus carolinus</i>		F Fs C	Fs C R W
Brewer's Blackbird <i>Euphagus cyanocephalus</i>	C G [®]		C G
Common Grackle <i>Quiscalus quiscula</i>	F Fs R W	F Fs C R	F Fs C R Sav

Table 15. Continued.Common Name^{1, 2}

<i>Scientific name</i>	Breeding ^{3,6,7}	Winter ^{4,6}	Migrant ^{5,6}
Brown-headed Cowbird <i>Molothrus ater</i>	All	F Fs C R	All
Orchard Oriole <i>Icterus spurius</i>	R S W Sav		F Fs R S W Sav
Baltimore Oriole <i>Icterus galbula</i>	F Fs R S Sav		F Fs R S Sav
Purple Finch <i>Carpodacus purpureus</i>		F Fs R	F Fs R S Sav
* House Finch <i>Carpodacus mexicanus</i>	R S	R S	F Fs R S Sav
Red Crossbill <i>Loxia curvirostra</i>		F R	F R
White-winged Crossbill <i>Loxia leucoptera</i>		F R	F R
Common Redpoll <i>Carduelis flammea</i>		F G R S	
Pine Siskin <i>Carduelis pinus</i>	F R [®]	F R S	F R S
American Goldfinch <i>Carduelis tristis</i>	G R S	F Fs G R S Sav	F Fs G R S Sav
Evening Grosbeak <i>Coccothraustes vespertinus</i>		F Fs R	F Fs R
* House Sparrow <i>Passer domesticus</i>	C R	C R	C R

¹ Bold type indicates: state threatened - ST, state endangered - SE, and/or federally endangered - FE that still breeds in the URRAA.

² * designates an introduced species.

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

⁴ Winter = species present from December through February.

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

⁶ The following habitat codes are used:

L = Lakes, ponds, impoundments, rivers, larger streams

C = Crops

G = Grassland (including pasture and hayfield)

W = Wetland (seasonally flooded, open habitats such as marshes and sedge meadows)

Fs = Forested swamp (forested wetland, including wet floodplain forest)

Sav = Savannah

F = Upland and mesic forest

R = Residential areas (including urban centers and the “urban forest”)

S = Shrublands (open habitats dominated by shrubs, including old fields).

⁷ (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.

+ = Historic breeding records.

Forest Habitats

Regularly Occurring Species

Typical Species – A fair amount of botanical data and information has been collected on this interesting area of the state, and fairly extensive species lists have been provided for the upland and mesic forests of the region (Eikenberry 1913, De Forest 1921, Henderson 1928, Fuller et al. 1949, Fell et al. 1955, Fell and Fell 1958, Iverson et al. 1989). Virtually all forest songbirds characteristic of this latitude have at least a remnant breeding population in the remaining forested areas. These include such common, widespread species as the Red-tailed Hawk, Wild Turkey, Yellow-billed Cuckoo, Great Horned Owl, Barred Owl, Ruby-throated Hummingbird, Red-bellied, Hairy, and Downy Woodpeckers, Great Crested Flycatcher, Eastern Wood-Pewee, Blue Jay, Black-capped Chickadee, Tufted Titmouse, White-breasted Nuthatch, House Wren, Wood Thrush, Yellow-throated and Red-eyed Vireos, Scarlet Tanager, Northern Cardinal, Rose-breasted Grosbeak, Indigo Bunting, and Brown-headed Cowbird. Many other less common species also breed or have bred in the area, including the Cooper's Hawk (found in virtually all large forested tracts and many small woodlots), Broad-winged Hawk (CR, LM, KCA & RC), Sharp-shinned Hawk (nest found near Rockford), Black-billed Cuckoo (CR & LM), Yellow-bellied Sapsucker (nested at LM, 1994), Pileated Woodpecker (rare at LM, CR, and near Rockford), Carolina Wren, Acadian Flycatcher (in most mesic ravines), Veery (especially at LM, CR, and occasionally at RC), Yellow-throated Warbler (in sycamores along the Rock River & especially in the pines at LM), American Redstarts (in bottomland forest along the Rock River), Louisiana Waterthrush (a few pairs at SD & CR), Hooded Warbler (RC, CR, & LM), Cerulean Warbler (esp. at CR but also a few records for SD, RC, KCA) and Kentucky Warbler (CR, LM, RC, and SD). Black and white Warbler, Worm-eating Warbler, Northern Parula, and Summer Tanager are absent or nearly so most years in the area, but are found more or less commonly in the southern 1/2 to 2/3 of the state, and can also be found in very small numbers in the nearby Driftless Area. Long-eared Owls (recently delisted as an endangered species in the state) have nested near Franklin Grove in Lee Co. (Baumgardner and Baumgardner 1994) and a calling bird was heard on several occasions in June near Durand in Winnebago Co. (Kleen 1995), both areas just outside the URR. This species occasionally forms winter roosts in cedar glades and pine plantations adjacent to forests in the URR.

Threatened and Endangered Species—The Red-shouldered Hawk (ST) is a rare breeder in the area. The Brown Creeper (ST) has bred at LM and is probably a regular breeder in small numbers there. Both Black-crowned (SE) and Yellow-crowned (SE) Night-Herons have been noted in forested wetlands in the area during the breeding season but nesting has not been confirmed.

Exotic Species—European Starlings were introduced from Europe in the late nineteenth century and reached Illinois by 1922 (Bohlen 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 mid-west (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 URR are predation on eggs or young in nests, and brood parasitism by Brown-headed Cowbirds (Robinson 1995a). 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 becomes more fragmented, creating more feeding habitat for cowbirds and travel corridors for mammalian predators such as raccoons that often inhabit the edges of open country (Robinson et al. 1995). Recently completed studies suggest that levels of nest predation and brood parasitism are high in this region of Illinois (Robinson 1995a). Most forests in the URR are probably population sinks for many species. However, it is interesting that many of these populations are relatively stable, or at least haven't been declining consistently (Robinson, unpubl. data). This suggests that their populations depend upon productivity from outside the region, which demonstrates a need to monitor nesting success as well as populations (Brawn and Robinson 1996).

With the small, highly fragmented forests that remain in the URR, predation and parasitism rates are likely to remain very high (Robinson 1995a). Few sites in the area have the potential to become or presently are population sources for most species (where productivity will be greater than the amount needed to replace the adults). Large, forested macro-sites are not likely to become a reality in the region, except as additions to the Castle Rock / Lowden-Miller sites. However, 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). Given the nature of most upland, forested tracts in the region, public sites would best be managed as stopover habitat for migrants passing through the area. 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.

One interesting aspect of the Lowden-Miller S.F. was the discovery of a number of forest nesting species which represent some of the only kind of their species to nest within the boundaries of Illinois. This "artificial" forest is rather unusual in that it has extensive, old, pine plantations with numerous clear-cuts. While conducting research on various species of neotropical passerines in 1993-94, scientists from the Illinois Natural History Survey discovered small populations of several species more typical of a more northern, boreal forest affiliation. For several of these species, this was the first or some of few, positive nesting evidence for the species in the state (see Robinson 1995b). This unusual mix of forested habitats have attracted no less than 14 species with more northern or boreal forest affiliations including Broad-winged Hawk, Yellow-bellied Sapsucker, Least Flycatcher, Blue-headed Vireo, Red-breasted Nuthatch, Brown Creeper, Winter Wren, Golden-crowned Kinglet, Veery (largest population in the state), Canada Warbler, Mourning Warbler, Golden-winged

Warbler, Pine Siskin, and the first state records for nesting Black-throated Green Warbler. Red Crossbills have likely attempted nesting here as well. The area also has fair numbers of more southerly species, which are rare or absent at most other locations this far north including Acadian Flycatcher, Yellow-throated Warbler (mainly in pines), Yellow-breasted Chat (clear-cuts), and Summer Tanager, and there are even a few pairs of breeding Worm-eating Warblers, Prothonotary Warblers, Kentucky Warblers and Louisiana Waterthrushes. Several of these southern species appear to have been “lured” north by the unusual mix of habitats in this area, and will likely continue to return as long as these habitats persist. Although such populations are artificial and many of these species will probably disappear as the pines are replaced by native hardwoods, it illustrates how the introduction of non-native species can affect the diversity of avian species which decide to colonize such habitat.

Wetland Habitats

Although wetlands historically accounted for considerably more of the land in the URR, especially in the Grand Prairie portions of Winnebago and Ogle counties, only about 8,000 acres of wetland habitat remains. This represents only about 1.5% of the URR (Table 4, Figure 10). Most of the wetlands have been drained for agricultural purposes (see the discussion of wetlands in the introduction to this report). Little wetland habitat is left, and even fewer non-forested wetlands are represented in any of the public lands in the area. There are excellent wetland areas however, just outside of the URR in the Kishwaukee and Sugar/Pecatonica River drainages in Winnebago Co. The lack of wetlands can be seen in the bird list and in the actual number (or lack thereof) of confirmed breeding records for many species.

Regularly Occurring Species

Typical Species—The few small areas of wetland left in the area, with the exception of some of the larger forested wetlands along the Rock River, make it slightly difficult to characterize a “typical” wetland in the URR. However, breeding species do include Great Blue Heron (rookeries present), Green Heron, Canada Goose, Wood Duck, Mallard, Blue-winged Teal, Northern Harrier (especially at Nachusa), Killdeer, Spotted Sandpiper (strip-mine ponds and gravel pits), Barred Owl (forested) Belted Kingfisher, Red-headed 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 (uncommon), Blue-gray Gnatcatcher (forested), Veery (forested), Gray Catbird (shrubby), White-eyed Vireo (old clearcuts at LM ;uncommon this far north), Warbling Vireo (riparian willows and cottonwoods), Yellow Warbler (shrubby), American Redstart (young forested wetlands), Common Yellowthroat, Indigo Bunting, Song Sparrow (shrubby), Swamp Sparrow (marsh), Red-winged Blackbird, Common Grackle, and Orchard Oriole (shrubby; uncommon). Other less common species which are found occasionally or have been documented at least once include Double-crested Cormorant (forested wetlands with dead snags for nest sites), Hooded Merganser (forested; probably more common than records suggest), Pileated Woodpecker (forested; LM, CR, & near Rockford), Sora (marshes), and

American Coot (marshes; a few recent records). Species which are noticeably absent from the list as breeding species, but for which there are nesting records or populations a few miles away in the Kishwaukee and Sugar-Pecatonica drainages and in areas just to the south in Lee County include several duck species, King and Virginia Rails, and Common Moorhen. In addition there are very few, if any, modern nesting records for either bittern, Red-shouldered Hawk and Brown Creeper. The Sandhill Crane has only returned to the area as a breeding species within the last 5-10 years.

Threatened and Endangered Species—There are numerous state threatened or endangered species that nest or have bred in the wetlands of the URRRA. These include the Pied-billed Grebe (ST), Least Bittern (ST), American Bittern (SE), Bald Eagle (ST) [nests along the Rock River near Rockton and Oregon], Red-shouldered Hawk (ST) [near Caledonia in Boone Co.], Sandhill Crane (ST) [near Rockford and RC], and Brown Creeper (ST) [mainly at LM]. Several other threatened or endangered species could re-colonize restored wetlands in the area including Black-crowned Night-Heron (SE) and Yellow-crowned Night-Heron (SE), Osprey (SE) [pr. noted in summer along nearby Kishwaukee River s. of Rockford], King Rail (SE), Common Moorhen (ST), and possibly Black Tern (SE).

Exotic species—European Starling is the only exotic species that is commonly found in the wetlands of the URRRA (particularly among the dead snags in flooded, forested wetlands). Introduced Mute Swans have also been found in the area, and could eventually breed here. The expansion and increase in numbers of this species as a breeder in other areas of Illinois, could be detrimental to native wetland species if they were to become established in the URRRA (see Ciaranca et al. 1997). Trumpeter Swans have been seen in the area and are likely birds from the re-introduced populations in Wisconsin, Minnesota and Michigan. This species likely formerly nested in the area before settlement (see Schorger 1964 and Mitchell 1994), and could possibly return as a nesting species as the populations grow in neighboring Wisconsin and other areas.

Population Dynamics and Management

The major conservation problem for wetland birds in the URRRA has been and continues to be the loss of habitat. Like most areas in Illinois, the counties represented in the URRRA have lost between 80-90% of their pre-settlement wetlands (Suloway and Hubbell 1994). Many of the remaining wetlands in the area are small, fragmented and highly degraded, usually overrun with reed canary-grass which is a widespread and common invasive in the area and throughout northern Illinois (pers. obs.) However, the continued presence and diversity of wetland species, including many threatened and endangered species, in relatively small areas, demonstrate the fact that wherever wetland habitat is provided, wetland bird species are present or will quickly re-colonize. This has been dramatically shown at wetland restoration projects in Lake Co., Il. (Hickman 1992a & b), in Vermilion Co., Il. (Campbell 1991), and more locally through efforts of the Richardson Wildlife Foundation in the nearby Lower Rock River Assessment Area in Lee Co. Additional efforts to restore habitat in other areas of the URRRA, especially in Ogle Co., including field tile removal, conservation easements to farmers, and creation of man-made ponds and marshes could further enhance areas already present.

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 other 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 formerly occurred along the dissected terrain of the major river valleys in the area, especially along the Rock Rivers and some of its larger tributaries such as the Leaf and Kyle Rivers and Pine and the North and South branches of Kinnikinnick Creek. In recent decades since fire has been effectively suppressed, savanna habitats have been greatly altered through vegetation changes and habitat destruction. Other areas have become overtaken by suburban sprawl. Savannas are now one of the rarest plant communities in the region (see the chapter on vegetation communities).

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 URRRA, perhaps the most typical species are the Whip-poor-will, Red-headed Woodpecker, Great Crested Flycatcher, Eastern Wood-Pewee, Eastern Kingbird, Blue Jay, American Robin, Eastern Bluebird, Yellow-throated Vireo, Baltimore Oriole, and Indigo Bunting. Least Flycatchers have been found in several areas in the URRRA and usually prefer open woodlands (structurally similar to savanna-type areas). Other species that remain common in savannas include Red-tailed Hawk, Cooper's Hawk (quickly regaining former numbers), Great Horned Owl, Wild Turkey, Ruby-throated Hummingbird, Northern Flicker, Red-bellied, Hairy, and Downy woodpeckers, Black-capped Chickadee, Tufted Titmouse, White-breasted Nuthatch, House Wren, Scarlet Tanager, Northern Cardinal, Rose-breasted Grosbeak, Field Sparrow, and Brown-headed Cowbird. Savannas with shrub thickets will attract birds of successional communities (e.g., Blue-winged Warbler, Yellow-breasted Chat, Eastern Towhee, Indigo Bunting, and American Goldfinch).

Threatened and Endangered Species—Historically, the Barn Owl (SE) may have been associated with this habitat, but not recently. Swainson's Hawks (SE) nested near Rockford in Winnebago County in 1947 (Prentice 1949), and again in the late 1950's and was termed a "regular breeder" at that time (Nolan 1958). The area involved in the later nestings was an area of oak savanna, which was eventually usurped by housing development (D. Williams, pers. comm.).

Exotic Species—European Starlings are now one of the most abundant species in Illinois. They are detrimental to some native savanna species because they compete with resident birds (such as woodpeckers and bluebirds) for nesting cavities.

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, which should address this issue. Results of those studies have already shown that savannas are associated with high populations of Brown-headed Cowbirds (Brawn 1998). 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.

Savannas also appear to be very favorable habitat for migrants, especially vireos and warblers. The heavy use of oaks by spring migrants (Graber and Graber 1983) and by mast-consuming species such as Wild Turkeys suggests that savanna restoration should be a high priority for birds in this region. Oak restoration on upland ridges might also enhance populations of Cerulean Warblers.

Prairie/Grassland Habitats

Native prairie habitat is extremely rare in the URRRA, although there are several excellent examples still remaining outside the area. Besides the relatively large Nachusa Grasslands, smaller areas such as Searls Park Prairie, Jarret Prairie, Douglas E. Wade Prairie, and a few smaller parcels still retain remnant populations of most of the more typical grassland/prairie associated bird species. There are also fair amounts of “non-native” grasslands within the URRRA, including at KCA and RC. Such rare and varied species as the Short-eared Owl, Upland Sandpiper, and Henslow’s Sparrow still persist in some of these areas. In addition, many bird species that historically lived in prairies are also able to live in grassland habitat such as hay fields, and sometimes pastures, which are still available, especially in rural areas throughout Ogle Co. However, these habitats are still relatively uncommon in the URRRA. There are about 133,000 acres of “grassland” left in the URRRA (25% of the URRRA). Much of this is pastureland that is mostly moderately to heavily grazed and is not extensively used by grassland birds. In addition, many areas 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 URRRA are fairly small and heavily used, some areas still have some potential for restoration, especially in south-central Ogle County near the Nachusa Grasslands.

Regularly Occurring Species

Typical Species—The restored prairies and grasslands in this region have a relatively rich bird community. Typical nesting species include: Red-tailed Hawk, American Kestrel, Northern Bobwhite (grasslands with shrubs), Gray Partridge (uncommon ; grasslands with

shrubs), Eastern Kingbird (scattered trees), Barn Swallow, Sedge Wren (locally common : tall, dense grass), Horned Lark (newly burned), Brown Thrasher (shrubs), Bell's Vireo (shrubs; especially at RC), Common Yellowthroat, Dickcissel, Savannah Sparrow (short grass), Grasshopper Sparrow, Vesper Sparrow (open grasses), Field Sparrow (shrubs), Lark Sparrow (uncommon; shrubs in sandy soils), Bobolink (taller grass), Eastern and Western Meadowlarks, and Red-winged Blackbird.

Threatened and Endangered Species—Several threatened and endangered species still occasionally nest in grasslands in the area, including the Northern Harrier (SE) at Nachusa and possibly RC (Lufty and Southern 1983), Upland Sandpiper (SE) at Nachusa and occasionally elsewhere (IBBA), Loggerhead Shrike (ST) at several locations (IBBA), and Henslow's Sparrow (SE) at RC and Nachusa. In addition, Short-eared Owls (SE) probably occasionally nest in rural grasslands, especially in Ogle County, but nesting has never been confirmed in the area.

Exotic Species—Several introduced species are found in the grasslands of the URRAA. The Ring-necked Pheasant, which is native to Asia, was first released in Illinois in about 1890 (Bohlen 1989) and they continue to be released. Pheasants are common in grasslands in the northern 2/3 of Illinois and they will commonly nest in many restored prairies. Gray Partridge, although uncommon, have become permanent residents after the release of 12,000 birds from 1906 through 1927. The only quantitative, statewide study conducted on the Gray Partridge in Illinois determined Lee County as having the highest relative abundance in the state of this species with approximately 6 birds per 100 miles of roadside surveying (Farris 1970). European Starlings also feed in grasslands following grazing, mowing, or burning.

Population Dynamics and Management

Some grassland habitat in the URRAA 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 extensive grassland areas like the Savana Army Depot in nearby Carroll Co. and the Midewin National Tallgrass Prairie (formerly the Joliet Arsenal) in Will Co. (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, Loggerhead Shrike, Eastern and Western Meadowlarks, Henslow's and Grasshopper Sparrows, and Bobolink. Most of the grassland acreage in the URRAA is in private landholdings that are mainly used for hay and grazing. By reducing the intensity of haying on private landholdings, along with some restoration, the success of nesting areas for these species (Bollinger et al. 1990) could be greatly increased and function much as a native grassland area.

In spite of the success of some sites in the URRAA for attracting birds, their nesting success may be low. Nesting success of grassland species may be low in very small grassland fragments, but there is only limited data from this region (S.Robinson, unpubl. data). A recent study in the Rock River valley showed that cowbird parasitism levels in grasslands

were significantly lower than in forests (Robinson et al. 1999a) Studies from elsewhere in the state should provide valuable clues about enhancing restoration. For example, it may be necessary to reduce woody vegetation within restorations because they are associated with higher levels of nest predation and parasitism. 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 grassland bird species that are most sensitive to grassland fragmentation 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 detailed guidelines for restoring grassland areas for birds.

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

Lakes, Ponds, Impoundments, Creeks, and Rivers.

Compared to the rest of the state, the creeks and rivers of the URRAA are in relatively good condition (see aquatic section); 6.8 miles of the Rock River between Honey and Clear Creeks in the URRAA are designated as Biological Significant Stream segments (Table 9, Figure 12). Nonetheless, as with several other habitats, creeks and rivers have been greatly altered. There are few natural lakes or ponds in the URRAA, and all open water combined accounts for only about 1.1% (5,770 acres) of the area (Table 3, Figure 9).

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 Great Blue Heron, Green Heron, Canada Goose, Mallard, Wood Duck (forested bottomlands especially along the Rock River), Cooper's Hawk (riparian corridors), Killdeer, Spotted Sandpiper (strip-mine ponds and gravel pits), Belted Kingfisher, Eastern Phoebe (streams), Willow Flycatcher (willows), all swallows and martins, House Wren, Blue-gray Gnatcatcher, Warbling Vireo (willows), Yellow Warbler (willows), American Redstart (forested bottomlands), Louisiana Waterthrush (rare; forested streams), Common Yellowthroat, Song Sparrow, Swamp Sparrow, Red-winged Blackbird, Common Grackle (shores), Orchard Oriole (willows), and Baltimore Oriole (riparian corridors). Double-crested Cormorants have bred but nesting colonies are currently restricted to only a few locations along the Rock River near the Winnebago/Ogle County line (D. Williams, pers. comm.).

Threatened and Endangered Species—There are several threatened or endangered species breeding in these aquatic habitats in the URRAA, and enhancement of marshy lake borders would probably attract many more wetland species. These species are regularly found in the URR and most are restricted to areas along and near the Rock River and include Pied-billed Grebe (ST), Bald Eagle (ST) [nests along the Rock River], Red-shouldered Hawk (ST), and Brown Creeper (ST) [forested bottomlands mainly near the Rock River].

Exotic Species—The only exotic species found in these habitats in the URRAA are the Mute Swan and Cattle Egret, both of which occasionally may visit ponds in the area. The swans could eventually 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 detailed data on population size and nesting success of birds in these 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 valuable 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 a 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 URRAA because much of the land within the URRAA has been usurped for agricultural purposes. Over 276,800 acres or 52% of the URRAA acreage is currently used for crop production (Table 3, 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 in the URR include the Mallard (grassy areas), American Kestrel, Killdeer, Mourning Dove, American Crow, Common Grackle, Red-winged Blackbird, Savannah Sparrow (grassy strips), Grasshopper Sparrow (fallow stubble fields), Lark Sparrow (uncommon in some

sand areas), and Vesper Sparrow. Where there are wooded or shrubby areas along streams within cropland, other nesting species include 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 URR. Upland Sandpipers (SE), which are rare in the area, will forage in agricultural fields but also need relatively large grasslands to successfully breed.

Exotic Species—A number of exotic species are abundant in cropland in the URR, 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. Farris (1970) shows Ogle County as having the second highest concentration of these birds, although they have apparently become much more reduced in numbers since that time (pers. obs.).

Population Dynamics and Management

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

Several studies in central Illinois and other parts of the midwest have shown for some time that many of the changing farm practices, especially in intensively row-cropped areas such as can be found in the URR, can have serious, negative effects on both game (Warner et al. 1984, Hallett et al. 1988, Mankin and Warner 1992) and non-game species (Good and

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

Cultural Habitats: Successional Fields

Successional habitats, such as abandoned fields and pastures, are fairly common in the URRAA. 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 (uncommon), American Woodcock (wet areas), Mourning Dove (especially with conifers), Yellow-billed Cuckoo, Black-billed Cuckoo (uncommon), Ruby-throated Hummingbird, Northern Flicker, Downy Woodpecker, Eastern Kingbird, Willow Flycatcher (wet), Blue Jay, Black-capped Chickadee, House Wren, Gray Catbird, Brown Thrasher, Northern Mockingbird (rare), American Robin, Eastern Bluebird, Blue-gray Gnatcatcher, Cedar Waxwing, White-eyed (uncommon this far north) and Bell’s Vireos (esp. RC), Yellow Warbler, Blue-winged Warbler (uncommon), Chestnut-sided Warbler (rare; regular at LM), Common Yellowthroat, Yellow-breasted Chat (uncommon), Red-winged Blackbird, Orchard Oriole, Baltimore Oriole (scattered trees), Northern Cardinal, Rose-breasted Grosbeak, Indigo Bunting, House Finch, American Goldfinch, Eastern Towhee, Lark Sparrow (sandy soil), Field Sparrow, and Song Sparrow.

Threatened and Endangered Species—Loggerhead Shrikes (ST) use successional areas, especially fence and treerows, to place their nests as well as for hunting.

Exotic Species—Ring-necked Pheasants can be common 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 URRRA, where they often nest in successional fields.

Population Dynamics and Management

Successional habitats add greatly to local diversity and 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, White-eyed Vireo). For these reasons, maintaining successional vegetation may be an important part of a conservation strategy in the URRRA.

A recent study of shrubland birds was just completed in central Illinois (Robinson et al. 1999b) and the results should be fully applicable to similar areas in the URRRA. The information gathered from this study will help land managers to design management strategies that will benefit both game and non-game species and provide relatively stable habitat for some declining species. Nest predation rates in successional fields are very high for most, but not all species, whereas brood parasitism levels are usually low for all but a few species (Robinson et al. 1999b). A recent study in the Rock River valley showed cowbird parasitism levels were lower in shrublands than in forested areas (Robinson et al. 1999a). 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 (Robinson 1999b). The RC, LM, and CR areas, in particular, have a high potential to manage for early successional species, especially Bell's Vireos, Blue-winged Warbler and Chestnut-sided Warbler (mainly LM).

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, Palm Warbler, Canada Warbler, and Lincoln's, Harris's, White-throated, 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 10.7% of the URR (Table 3, Figure 7). 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 [rare in URR], 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.

Use by Threatened and Endangered Species—Now that the Bewick’s Wren (SE) is practically absent from the region, there are no threatened or endangered species in the developed habitats of the URR other than the Loggerhead Shrike (ST), 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. Although there have been no reports of the Eurasian Collared Dove from the URR as of this time, the species has been seen in numerous other locations throughout Illinois and will likely colonize most residential, urban, and suburban areas throughout the state within the next decade (see Bohlen 1998).

Population Dynamics and Management

High populations of predatory birds and domestic cats (Warner 1985) 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).

Overall Habitat Quality, Management Issues, and Concerns for Partnerships

Outside of Rockford, the Upper Rock River area is one of the more rural regions of the state. Unfortunately, because much of the area has been converted to row crops, there are few opportunities to expand existing public acreage in the area. However, any opportunity for restoration should be encouraged, especially where this would enhance or enlarge existing natural areas.

For breeding birds, we recommend the following strategy 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. Small woodlots and wooded corridors, especially along streams, should be managed as important stopover habitat for migrants.

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. Removing of old farm field tiles has had success in several areas in restoring former wetlands.

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

Developed and Agricultural Areas—Any plantings that add cover and nest sites should be encouraged, especially to provide habitat during the non-breeding season.

Mammals

Information in this section was compiled largely from range maps and historical records in Hoffmeister (1989). The Illinois Natural Heritage Database (INHD; Illinois Department of Natural Resources) was checked for recent records (as of August 2000) of threatened and endangered species. Taxonomy follows Wilson and Reeder (1993).

Mammal species known or likely to occur in the Upper Rock River Assessment Area (URRAA) are listed in Table 16. The 45 species in this table represent 76% of the 59 mammal species that currently occur in Illinois (Hoffmeister 1989). Eight species of bats are included in the table, but the silver-haired bat may be present only during spring and autumn migration periods. Five species of bat hibernate in Blackball Mine in nearby LaSalle County (Illinois Department of Natural Resources Cave Survey records), but only the big brown bat is likely to remain in the URRAA during the winter. Of the eight mammal species listed as endangered or threatened in Illinois (Illinois Endangered Species Protection Board 1999, U.S. Fish and Wildlife Service 1991), only two, the federally endangered Indiana bat (*Myotis sodalis*) and state-threatened river otter (*Lontra canadensis*) are widely distributed (Herkert 1992). There are no summer records of the Indiana bat in the URRAA in spite of the fact that hundreds of Indiana bats hibernate at Pecumsaugan Creek/Blackball Mine Nature Preserve, 1.5 mi east of LaSalle, in an adjacent county. It is possible that Indiana bats sometimes occur in the wooded riparian habitats in the URRAA. There are several records of the river otter for the URRAA (INHD). The mammal fauna of the URRAA has not been surveyed extensively. Records are not available for many species (Hoffmeister 1989), and the population status of many mammal species in the URRAA is unknown; in these cases, designations in Table 16 are projections based on their status in other parts of Illinois.

About half (52.1%) of the URRAA consists of cropland, and another 10.7% is urban or suburban development, primarily the metropolitan area around Rockford. Many mammals are generalists that use a variety of habitat types and have adapted to living in areas that have been altered by humans. Larger mammals that now commonly occur in agricultural, urban, and suburban areas include the Virginia opossum, eastern cottontail, fox and gray squirrels, woodchuck, coyote, red fox, raccoon, striped skunk, and white-tailed deer. Several species of small mammals, including the eastern mole, least shrew, northern short-tailed shrew, deer mouse, meadow and prairie voles, and thirteen-lined ground squirrel can occupy fencerows, pastures, railroad embankments, and other maintained areas such as roadsides, cemeteries, parks, and lawns in agricultural and residential areas. Big brown and little brown bats commonly roost in buildings and other small mammals (such as the white-footed mouse) sometimes enter buildings in search of food and shelter. Forested habitats occupy only 10.4% of the URRAA and upland forest remnants are extremely fragmented, offering few opportunities for conservation of mammal species associated with forests. Most forest is concentrated along riparian habitat, which may enhance its use as a dispersal corridor by species such as bobcats. These areas also may provide habitat for species of mammals associated primarily with forest such as eastern chipmunks, southern flying squirrels, or gray foxes that may not be common elsewhere in the URRAA. About 25.1% of the URRAA is grassland, suggesting considerable habitat might be available for grassland mammals,

possibly including Franklin's ground squirrel. The mammalian fauna of the URRRA is therefore likely to include most species that are expected in the northern part of Illinois

The Norway rat and house mouse are the only exotic, non-domesticated mammals that occur regularly in Illinois. These species are strongly associated with human structures (e.g. houses, barns, warehouses), but both can be found in natural habitats near buildings. The house mouse, in particular, can sometimes reach substantial numbers in grasslands near structures (Hoffmeister 1989). These species are now so widespread that they are part of the mammalian fauna throughout the United States. They could not be eliminated easily from natural habitats and their presence is not a matter of great concern. Large numbers of free-roaming and feral domestic cats (*Felis silvestris*) occur in Illinois as elsewhere (Warner 1985, Coleman and Temple 1996). They can have a negative impact on populations of birds (especially ground-nesting birds) and small mammals and reduce prey availability for native predators (Warner 1985, Churcher and Lawton 1987, Coleman and Temple 1996). Unvaccinated cats and dogs (*Canis familiaris*) have the potential to transmit diseases to wild mammals or humans (Coleman and Temple 1996).

Table 16. List of mammal species known or likely to occur in the Upper Rock River Assessment Area, compiled primarily from records in Hoffmeister (1989) and the Illinois Natural Heritage Database. Bold type indicates a federally endangered (FE), state endangered (SE), or state threatened (ST) species.

Common name	Species name	Habitat	Population status
Marsupials	Didelphimorphia		
Virginia opossum	<i>Didelphis virginiana</i>	F, W, G	C
Insectivores	Insectivora		
masked shrew	<i>Sorex cinereus</i>	G, F, W	C?
northern short-tailed shrew	<i>Blarina brevicauda</i>	F, G, W	C
least shrew	<i>Cryptotis parva</i>	G	U?
eastern mol	<i>Scalopus aquaticus</i>	F, G	C
Bats	Chiroptera		
little brown bat	<i>Myotis lucifugus</i>	F, caves, buildings	C
northern long-eared bat	<i>Myotis septentrionalis</i>	F, caves, buildings	U?
silver-haired bat	<i>Lasionycteris noctivagans</i>	F, caves (hibernation)	C/R ¹
eastern pipistrelle	<i>Pipistrellus subflavus</i>	F, caves	U?
big brown bat	<i>Eptesicus fuscus</i>	F, caves, buildings	C
red bat	<i>Lasiurus borealis</i>	F	C
hoary bat	<i>Lasiurus cinereus</i>	F	C?

Table 16. Continued.

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

Bold type indicates a state endangered (SE) or State Threatened (ST) species.

* = exotic species. Habitats: W = wetland, G = grassland, F = forest. Population status (subjective estimates based largely on experience of E. J. Heske and J. E. Hofmann in Illinois): C = common, U = uncommon, R = rare, ? = uncertain.

¹C during migration, but R or absent during summer

²C in some urban/suburban areas but R or absent in most rural, agricultural areas

Forest

Typical Species

Mammal species known or likely to occur in the URRRA that are restricted to forested habitats are the hoary bat, eastern chipmunk, southern flying squirrel, woodland vole, and gray fox. Species that are primarily associated with forests but also utilize other types of habitat include the Virginia opossum, red bat, fox and gray squirrels, white-footed mouse, raccoon, and white-tailed deer. The little brown bat, big brown bat, northern long-eared bat, eastern pipistrelle, and evening bat forage in forested habitats, but roost in buildings or other man-made structures as well as trees. Some species, such as the eastern cottontail and woodchuck, specialize in the use of forest edges. Other habitat generalists that would typically occur in forests in the URRRA are listed in Table 16.

Most species of mammals associated with forests are not restricted to a specific type of forest (i.e. upland or bottomland). Species that hibernate (e.g. woodchuck, eastern chipmunk) or are primarily fossorial (e.g. eastern mole, woodland vole) need well-drained soils in sites that are not subject to flooding. Gray squirrels inhabit 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 declined in Illinois. Yet, they have increased over the past years in Lee County (Mike Brady, pers. comm.). Gray squirrels, however, also live in city parks and residential areas. Nixon et al. (1978) considered gray squirrels rare in or absent from parts of the URRRA away from the riparian zones, but common in the city of Rockford and the forested riparian areas near Oregon, Ogle County. Rosenblatt et al. (1999) found eastern chipmunks and flying squirrels to be sensitive to fragmentation and isolation of forest patches, thus these species are likely to be absent from isolated woodlots in the URRRA and found primarily in the riparian forests as well. Fox squirrels occur in most woodlots in the agricultural regions of the URRRA. 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). The gray fox also requires extensive forest cover and has become less common in parts of Illinois (Hoffmeister 1989), but Hoffmeister (1989) reported a record near St. Charles in Kane County and T. Gosselink (unpublished data) recently trapped two gray foxes in wooded parks in Champaign, Champaign County. Gray foxes therefore may be less sensitive to human activity than previously supposed. There are fewer records of gray foxes in northern than in southern Illinois (Hoffmeister 1989). The forest tracts along the Rock River in the URRRA may support gray foxes, but this possibility should be confirmed. The bobcat has recently increased in numbers in Illinois (Woolf 1996) and several sightings have been reported in the URRRA in the past two decades (Woolf et al. 2000).

Threatened and Endangered Species

None of the mammal species associated with forests that are known to occur in the URRAA is listed as threatened or endangered. Indiana bats hibernate in Blackball Mine in LaSalle County (INHD). A total of 1455 Indiana bats occupied the mine during the winter of 1998-99 (INHD), and it is possible that some of these individuals might use forested areas in the URRAA in summer. A limited number of bat surveys have been conducted in the URRAA, and surveys of potential habitat for Indiana bats should be done. We therefore describe habitat requirements for Indiana bats below.

Habitat Requirements and Distribution of Listed Forest-dwelling Species

Indiana bats congregate in a limited number of caves and abandoned mines for hibernation, but are more widely dispersed during the summer (Barbour and Davis 1969). 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 non-reproductive females may roost in caves or mines as well as trees during the summer. Roost trees used by this species have been located in both upland and floodplain forests; most are relatively large with a diameter at breast height of at least 30 cm (Gardner et al. 1991; Kurta 1993a, 1996; Callahan et al. 1997). Tree species that have been used by Indiana bat maternity colonies in Illinois are slippery elm (*Ulmus rubra*), northern red oak (*Quercus rubra*), shagbark hickory (*C. ovata*), silver maple (*Acer saccharinum*), cottonwood (*Populus deltoides*), post oak (*Q. stellata*), bitternut hickory (*C. cordiformis*), white oak (*Q. alba*), American elm (*U. americana*), sycamore (*Platanus occidentalis*), sweet pignut hickory (*C. ovalis*), and green ash (*Fraxinus pennsylvanica*) (Gardner et al. 1991; Kurta et al. 1993a; INHS, unpublished data). Indiana bats forage both in and along the canopy of riparian and upland forests (Humphrey et al. 1977, LaVal et al. 1977, Brack 1983, Clark et al. 1987, Gardner et al. 1991). Indiana bats hibernate in several caves and abandoned mines in Illinois; the most significant of these hibernacula are abandoned mines in La Salle and Alexander counties and caves in Jackson and Monroe counties (INHD). There are recent records for 23 counties in central and southern Illinois (Gardner et al. 1996, INHD).

Information Gaps

Information on the distribution and population status of several forest-dwelling species in the URRAA is limited. Surveys should be conducted to determine the status of the gray fox in the URRAA. Woolf (1996) compiled nine records of recently reported sightings of bobcats for Ogle County and one for Winnebago County; additional surveys should be conducted to determine the status of this species in the URRAA. There are few or no records for the northern long-eared bat, silver-haired bat, eastern pipistrelle, hoary bat, and evening bat in the URRAA (Hoffmeister 1989, INHS Bat Survey Database). Information on the distribution

and abundance of these bats would be of interest, and also might reveal the presence of Indiana bats during the summer. There are no records of the woodland vole or southern flying squirrel from this area, and few records of eastern chipmunks. As noted above, flying squirrels and eastern chipmunks appear to be absent from small, isolated patches of forest in east-central Illinois (Rosenblatt et al. 1999). The status of these species, and their ability to maintain viable populations and to disperse between forested tracts in the URRRA, should be examined. The pygmy shrew (*Sorex hoyi*) was not detected in northwestern Illinois in a survey using pitfall traps (Kelt 1991), but four specimens have recently been collected in northeastern Illinois in Cook and McHenry counties (Mierzwa 1991, Sliwiski 1994). The URRRA is within the geographic range of the pygmy shrew (Hoffmeister 1989) and might be detected in surveys employing pitfall traps. Finally, a growing concern is the impact of overabundant species such as raccoons or white-tailed deer on the fauna and flora of forest remnants and nature preserves.

Enhancement and Restoration Potential

Preservation of native prairie remnants and other types of grassland habitats, coupled with prairie restoration or creation, would provide habitat for the badger and red fox as well as several species of small mammals. If they prove to be rare in the URRRA, Franklin's ground squirrels could be introduced into suitable grasslands such as Nachusa Grasslands in Lee County. Vegetation along abandoned railroad rights-of-way in the URRRA should be preserved or restored to provide habitat and dispersal or travel corridors for mammals.

Grassland

Typical Species

Mammal species occurring or likely to occur in the URRRA that are restricted to grassland habitats are the least shrew, thirteen-lined and Franklin's ground squirrels, western harvest mouse, deer mouse, prairie and meadow voles, least weasel, and badger. Other species strongly associated with grassland habitats include the masked shrew, northern short-tailed shrew, eastern cottontail, woodchuck, southern bog lemming, meadow jumping mouse, and red fox. Additional habitat generalists of the URRRA that use grasslands are listed in Table 16.

Most mammals designated as grassland species are not restricted to native or undisturbed grasslands. Rather, the vegetative composition and structure of rights-of-way, hayfields, pastures, crop field edges, old fields, and prairie restorations provide suitable habitat for many of these species. The masked shrew, meadow vole, southern bog lemming, and meadow jumping mouse generally prefer more mesic grasslands (Hoffmeister 1989). The thirteen-lined ground squirrel inhabits sites with closely mowed grass such as roadsides, cemeteries, golf courses, and lawns, but Franklin's ground squirrel is restricted to vegetation of intermediate height (Hoffmeister 1989). Eastern cottontails and woodchucks are most abundant where grassland habitat is adjacent to forested areas and can be considered edge

species. The white-footed mouse, which is a forest species, can be found in grasslands if scattered trees or shrubs are present.

Threatened and Endangered Species

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

Information Gaps

Information is needed on the current distribution and abundance of several grassland mammals in the URRRA. No records of Franklin's ground squirrel in the URRRA were reported by Hoffmeister (1989) but a specimen was collected near Oregon, Ogle County, in 1907 (INHS Mammal Collection) and two unconfirmed reports were made of sightings near Rockford, Winnebago County (E. J. Heske and J. E. Hofmann, unpublished data). This species is thought to have declined in the eastern portion of its range, including Illinois (Lewis and Rongstad 1992). In a recent survey, only one Franklin's ground squirrel was caught at 15 sites in Champaign, Piatt, and Vermilion counties (Hofmann 1998). The status of this species in the URRRA should be studied further. There are no published records of the southern bog lemming for the northeastern part of Illinois, and the presence of this species in the URRRA also should be confirmed. The status of the badger in Illinois was reported Ver Steeg and Warner (2000) who documented its presence in each of the counties in the URRRA, but its population status in the URRRA should be determined more precisely. Although the red fox is not strictly a grassland species, it is most often associated with open habitats and its status in the URRRA should be evaluated. The persistence of grassland small mammal populations in small patches of grassland surrounded by agricultural land and the ability of small mammals to disperse between such habitat islands, perhaps using highway and railroad rights-of-way as travel corridors, should be investigated.

Wetland

Typical Species

Mammal species in the URRRA that require wetlands or aquatic habitats (lakes, ponds, streams, and rivers) are the beaver, muskrat, mink, and river otter. Beavers, muskrats, and river otters are highly specialized for aquatic life and need open water, whereas mink are more terrestrial but typically occur near water. Raccoons and opossums are most abundant in proximity to water. Bats would forage above wetlands and aquatic habitats in the URRRA as well. The masked shrew, northern short-tailed shrew, southern bog lemming, and meadow jumping mouse use emergent wetlands (marshes, sedge meadows, and wet meadows) extensively in addition to other types of habitats. Small mammals such as these are not adapted for aquatic life and occupy the vegetation along the edges of wetlands or move into wetlands when standing water is not present. Additional habitat generalists that use wetlands opportunistically are listed in Table 16.

Threatened and Endangered Species

The INHD includes several records for the state-threatened river otter in the URRRA. While the river otter may still be uncommon in the URRRA, this species probably utilizes the upper Rock River on a regular basis as portions of individual and family group home ranges which may be centered on tributaries to the river. The restoration of the riparian zone and wetlands (even small ones) adjacent to the river should benefit the species (Ed Anderson, pers. comm.).

Habitat Requirements and Distribution of Listed Wetland Species

River otters occupy a variety of aquatic habitats, from coastal swamps and marshes to high mountain lakes (Toweill and Tabor 1982). They can be 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). Areas used by river otters in northwestern Illinois shared 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). At the Lamine River Wildlife Area in Missouri otter home ranges were 11 to 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, except for females with pups in a den (Melquist and Hornocker 1983). The main breeding population of native river otters in Illinois inhabits the backwaters and tributaries of the Mississippi River in the northwestern corner of the state (Anderson 1995). Smaller populations occur in the Cache and Big Muddy river systems in southern Illinois and the numbers of reports along the Rock River and the middle section of the Mississippi River have been increasing (Anderson 1995). Since 1994 the Illinois Department of Natural Resources has released 346 river otters at 15 locations in the Kaskaskia, Wabash, and Illinois river systems (Bluett 1997).

Information Gaps

Aquatic habitat in the URRRA should be monitored regularly for river otters. The presence of beavers is considered favorable for otters, but the impact of beaver populations on the physical structure of riparian systems in the URRRA should be evaluated. Only 0.6% of the URRRA remains as non-forested wetland, and many of these remaining emergent wetlands are small and isolated. It would be interesting to determine if these wetlands are used by small mammal species other than those occupying surrounding habitat types and assess the ability of these mammals to move between wetlands.

Enhancement and Restoration Potential

Intensive row-crop agriculture around most existing forest tracts away from river systems in the URRAA, as well as their small size, will probably limit their ability to support large, forest-associated mammals. Efforts to establish and retain wildlife movement corridors along river systems, however, could increase their value as habitat for forest-dwelling species such as the bobcat and gray fox. Retaining large snags with exfoliating bark would provide potentially suitable roost trees for bats, including Indiana bats if any were to occupy the area. Preservation or restoration of riparian forests also is necessary if the URRAA is to provide suitable habitat for the river otter. Streambank stabilization and the reduction of silt and chemical runoff into aquatic habitats and wetlands would enhance their ability to support river otters and minks.

Amphibians and Reptiles

Information in this section has been compiled from range maps in Smith (1961), the Illinois Natural Heritage Database, the Illinois Amphibian and Reptile Vouchered Database (an INHS computer database that contains information on 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 Upper Rock River Assessment Area (URRAA). The URRAA contains portions of four of Smith's (1961) eleven Herpetofaunal Divisions for the state; Prairie, Western Division Woodlands, Northeastern Mesic Woodlands, and Sand Areas.

Amphibian and reptile species that are known or likely to occur in the URRAA are listed in Table 17. The 14 amphibian species and 22 reptile species in Table 17 represent 35% of the amphibian species and 37% of the reptile species of the State. The state threatened four-toed salamander, *Hemidactylium scutatum* and western hognose snake, *Heterodon nasicus*, are known to exist in the URRAA. The state threatened Blanding's turtle, *Emydoidea blandingii*, may occur in the URRAA, but no verified records are available.

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

When referring to the habitat designations in Table 17, 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 western hognose snake requires sand prairie, but individuals forage in both forests and grasslands. On the other hand, some species have narrower habitat requirements than the designations in Table 17 might suggest. For example, the Blanding's turtle is listed as occurring in wetlands, but it is only found in prairie marshes and floodplain sloughs of larger rivers.

Table 17. Amphibian and reptile species known or likely to occur in the Upper Rock River Assessment Area with an indication of habitat preference and relative abundance.

Common Name	Scientific Name	Habitat ¹	Relative Abundance ²
Amphibians			
tiger salamander	<i>Ambystoma tigrinum</i>	F,W,P,L	U
mudpuppy	<i>Necturus maculosus</i>	L,R	U
four-toed salamander ST	<i>Hemidactylium scutatum</i>	F,W	R
eastern newt	<i>Notophthalmus viridescens</i>	F,W,L	U
American toad	<i>Bufo americanus</i>	U	C
cricket frog	<i>Acris crepitans</i>	W,L,R	C
Cope's gray treefrog	<i>Hyla chrysoscelis</i>	F,W	C
eastern gray treefrog	<i>Hyla versicolor</i>	F,W	C

Table 17. Continued.

Common Name	Scientific Name	Habitat ¹	Relative Abundance ²
spring peeper	<i>Pseudacris crucifer</i>	F,W	U
western chorus frog	<i>Pseudacris triseriata</i>	U	C
bullfrog	<i>Rana catesbeiana</i>	U	C
green frog	<i>Rana clamitans</i>	F,W,R	C
pickerel frog	<i>Rana palustris</i>	F,W,R	U
northern leopard frog	<i>Rana pipiens</i>	F,W,L,P	C
Reptiles			
snapping turtle	<i>Chelydra serpentina</i>	W,L,R	C
painted turtle	<i>Chrysemys picta</i>	W,L,R	C
Blanding's turtle ST	<i>Emydoidea blandingii</i>	W	?
map turtle	<i>Graptemys geographica</i>	L,R	C
ornate box turtle	<i>Terrapene ornata</i>	P	U/R
common musk turtle	<i>Sternotherous odoratus</i>	W,L,R	
red-eared slider	<i>Trachemys scripta</i>	W,L,R	U
spiny softshell turtle	<i>Apalone spinifera</i>	W,L,R	C
slender glass lizard	<i>Ophisaurus attenuatus</i>	P,C	?
six-lined racerunner	<i>Cnemidophorus sexlineatus</i>	P	U
racer	<i>Coluber constrictor</i>	U	C
fox snake	<i>Elaphe vulpina</i>	W,P,C	C
western hognose snake ST	<i>Heterodon nasicus</i>	P	R
eastern hognose snake	<i>Heterodon platirhinos</i>	F,W,P	U
milk snake	<i>Lampropeltis triangulum</i>	F,W,P	U
northern water snake	<i>Nerodia sipedon</i>	W,R,L	C
smooth green snake	<i>Opheodrys vernalis</i>	F,W,P	C
bullsnake	<i>Pituophis catenifer</i>	P	U
queen snake	<i>Regina septemvittata</i>	R	R/?
brown snake	<i>Storeria dekayi</i>	U	C
common garter snake	<i>Thamnophis sirtalis</i>	U	C
plains garter snake	<i>Thamnophis radix</i>	U	C

¹ F = forest W = wetland P = prairie and savanna L = lakes, ponds, impoundments

R = rivers & creeks C = cultural U = ubiquitous (all habitats)

² C = common U = uncommon R = rare ? = status uncertain

Bold type indicates a state endangered (SE) or state threatened (ST) species

Forest

Typical Species

Amphibian species of the URRAA 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 URRAA, the black rat snake is typical of forested areas.

Enhancement and Restoration Potential

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

Wetland

Typical Species

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

Endangered and Threatened Species

Blanding's Turtle—Prairie marshes and floodplain sloughs of larger rivers are the primary habitat of this semi-aquatic turtle. They are most commonly found in shallow (10-20 cm) open water areas of cattail marshes, sloughs, ponds, and flooded ditches. Aquatic plants, especially emergent vegetation and a mud bottom are important habitat components. The activity period in northern Illinois is probably late March to October. Nesting occurs in June in sandy, well-drained soil near the aquatic habitat. Hatching usually takes place in September. No verified records exist for this species in URRAA, but several unverified reports have been received.

Four-toed Salamander—This primarily terrestrial salamander is associated with undisturbed forests containing seeps or bogs. Recently, however, Illinois specimens have been taken in wooded ravines near rocky, spring-fed creeks. In the URRAA, three specimens (INHS 9700, UIMNH 56597-8) are known from Castle Rock State Park. This population was discovered by John Lynch in 1964 but repeated efforts by Ron Brandon and Randy Nyboer (Brandon & Ballard, 1991; Nyboer, pers. com.) have failed to document its continued presence in the area. However, based on the suitability of the habitat, both Brandon and Nyboer (pers. com.) believe that this population still exists. This population is in a protected area.

Enhancement and Restoration Potential

Maintaining even small, temporary wetlands in the URRRA 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. Species such as the northern leopard frog, western chorus frog and American toad can often utilize small, seemingly isolated wetlands. These species have excellent dispersal abilities and can move from wetland to wetland across inhospitable terrain such as agricultural fields and vacant lots. For most amphibians, however, agricultural fields and vacant lots are barriers to dispersal. For these species to persist in the landscape, small wetlands must be connected to other wetlands by corridors of natural vegetation. For this reason, mowing in the vicinity of wetlands should be avoided and grassy filter strips should be planted and greenways developed, especially along rivers and creeks.

Information Gaps

One of the most pressing questions concerning wetland amphibians and reptiles in the URRRA is the distribution of the Blanding's turtle in this area. This large aquatic turtle was once widely distributed in prairie marshes and floodplain sloughs of the Mississippi, Rock, and Green rivers, but wetland destruction have reduced its numbers dramatically. In the URRRA, the Blanding's turtle is most commonly found in shallow (10-20 cm) open water areas of cattail marshes, sloughs, ponds, and flooded ditches. An effort should be made to determine the current range of this species in the URRRA.

Prairie

Typical Species

Of the amphibian species listed in Table 17, the tiger salamander and western chorus frog are typical of prairie habitats in the URRRA. 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 URRRA. 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 URRRA 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.

Endangered and Threatened Species

Western hognose snake— This slow-moving snake is restricted to sand areas and adjacent woodlots along the upper Mississippi, and lower Rock and Green rivers. 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 URRRA. The IDNR Natural Heritage Database lists two occurrences in the Rock RRA; 1.5 mi SW Daysville (Lowden-Miller State Forest), Ogle Co., 1987 and the George B. Fell Nature Preserve, S of Oregon, 1995. Both records are believed valid. Both populations are in a protected area.

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 URRRA would benefit a variety of amphibians and reptiles especially the state threatened western hognose snake and Blanding's turtle. In the case of the western hognose snake, it is especially important to maintain loose sand habitats such as blowouts and shifting dunes as part of the sand prairie restoration.

Lakes, Ponds, and Impoundments

Typical Species

Of the amphibian species listed in Table 17, the bullfrog and cricket frog are typical of lakes, ponds, and impoundments in the URRRA. Both of these species have developed strategies for co-existing with fish and are usually more widely distributed than other amphibians. Among the reptiles of the URRRA 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 is vital for most amphibians because it provides cover and refugia from predators. Developing forest or grassland connections among ponds, lakes and impoundments in the URRRA would benefit a variety of amphibians and reptiles. By connecting the various ponds and lakes with each other and with larger blocks of natural vegetation, the effects fragmentation and small population size can be lessened. If individuals can move among ponds, this makes the whole complex of ponds effectively one large habitat. Restoration of wetlands, especially ponds, in sand prairies would benefit a variety of amphibians and reptiles in the URRRA, most importantly the Illinois mud turtle.

Creeks and Rivers

Typical Species

The cricket frog and green frog are typical of creeks and small rivers in the URRRA, while the mudpuppy is a typical inhabitant of the Rock river. Among the reptiles of the URRRA,

the northern water snake is typical of creeks and small rivers while the snapping turtle, map turtle, and spiny softshell turtle, are typical of the Mississippi and Rock rivers.

Enhancement and Restoration Potential

Restoring the riparian zone and associated floodplain forests and wetlands along the Rock River and its tributaries would benefit a variety of amphibians and reptiles. Water quality must also be improved if any significant progress is expected.

Cultural Habitats

Typical Species

Of the amphibian species listed in Table 17, the American toad, western chorus frog, and bullfrog are typical of cultural habitats in the URRRA. 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 URRRA, the common garter snake, brown snake, and northern water snake are typical of cultural habitats in the URRRA.

Enhancement and Restoration Potential

Small stock ponds and farm ponds can provide important breeding sites for amphibians of the URRRA 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

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

Current Management Concerns for Partnership

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

Aquatic Biota

Introduction

The Upper Rock River Assessment Area contains the upper Rock River and its smaller tributaries from the Wisconsin border to Pine Creek (below Grand Detour) in Ogle, Winnebago, Boone, Carroll, Lee, and Stephenson counties. Pecatonica and Kishwaukee rivers, two major tributaries of the upper Rock, are not included in this assessment area. Three natural divisions are encompassed—Rock River Hill Country (Freeport and Oregon sections), Northeastern Morainal (Winnebago Drift Section), and Grand Prairie (Grand Prairie Section) (Schwegman et al., 1973).

The Rock River originates in Horicon Marsh in Dodge County, Wisconsin, and flows in a south-southwesterly direction to join the Mississippi River at Rock Island, Illinois. In Illinois, the Rock is approximately 163 miles long and drains 5343 square miles. Its width varies from 500-800 feet and the substrate is gravel interspersed with sand, rubble, and silt (Brigham, 1978). Soil types in the basin range from thick to thin loess deposits on limestone and thin silty or loamy materials on gravelly Wisconsinan outwash, to sandy or clayey deposits on the bottomlands (Iverson, 1987).

Current and depth of the river have been significantly altered by the construction of dams. Channelization has been most extensive in the eastern and southern areas of the basin. Principal land use bordering the Rock River is cropland and pasture; less than 10% of the area is still forested and much of that is grazed forest. Drainage ditches and field tiles were used to convert the wetlands that covered major portions of the basin into cropland. Siltation has increased and the Rock has had a history of domestic and industrial pollution, especially below the cities of Rockford and Sterling. Boating, canoeing, and fishing are the primary water resource uses (Page et al., 1992).

The Rock River basin in Illinois drains an area of 1,361,365 ha - 9.5% of the total area of the state. The basin encompasses portions of 15 counties - Boone, Bureau, Carroll, DeKalb, Henry, Jo Daviess, Kane, Lee, McHenry, Mercer, Ogle, Rock Island, Stephenson, Whiteside, and Winnebago, which collectively total 23,540 km² (Brigham 1978).

Major tributaries in Illinois (from downstream to upstream) include Mill Creek 1, Green River, Big Slough, Meredosia Ditch, Rock Creek, Coon Creek, Walker Slough, Elkhorn Creek, Howland Creek, Pine Creek, Franklin Creek, Silver Creek, Leaf River, Mill Creek 2, Stillman Creek, Kishwaukee River, Keith Creek, Kent Creek, Kinnikinnick Creek, and the Pecatonica River.

Statewide Comparison of Aquatic Biota

The Upper Rock River Assessment Area supports a large diversity of aquatic species. Known from this portion of the Rock River drainage are 78 species of fishes, 36 species of bivalves, and 8 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 URRAA supports a moderate diversity of aquatic macroinvertebrate species. Unfortunately, existing data on the distribution and natural community associations of these species are inadequate to summarize typical, unique, rare species, or exotic species. Few extensive surveys of aquatic macroinvertebrate populations have been conducted in the upper Rock River basin.

During the months of April through July, 1974, Schacht (1974) surveyed the aquatic macroinvertebrate populations at 38 stream sites located on the South Branch Kishwaukee River. During summer and autumn 1976, INHS biologists surveyed the aquatic macroinvertebrate populations at 517 stream sites within the Rock River drainage (Brigham 1978). Both Schacht and INHS biologists utilized the Illinois Environmental Protection Agency Stream Classification System, discussed below.

Environmental Protection Agency Stream Classification System. Qualitative macroinvertebrate collections by Schacht (1974) and also by INHS biologists in 1976 (Brigham 1978) were taken at each stream site using a variety of collecting methods to sample all available microhabitats. Specimens were then identified in the field to the lowest certain taxonomic level. Classification of identified organisms was completed by assigning each taxon to one of four categories contained in a tolerance status list established by the IEPA - Intolerant, Moderate, Facultative, and Tolerant. Intolerant taxa are organisms whose life styles are dependent upon a narrow range of ideal environmental conditions. Taxa classified as moderate included organisms lacking the extreme sensitivities to environmental stress of intolerant species, but unable to adapt to severe environmental degradation. Taxa classified as facultative included organisms able to survive over a wide range of environmental conditions and possessing a greater degree of tolerance to adverse conditions than either intolerant or moderate species; some of the macroinvertebrates which utilize surface air for respiration are classified as facultative. Taxa classified as tolerant included organisms able to survive over a wide range of environmental extremes, including water of extremely poor quality.

Each site was then assigned to one of four classifications (Balanced, Unbalanced, Semi-Polluted, or Polluted) - determined by the percentage of organisms in each of the four tolerance categories. A balanced environment is one in which intolerant organisms are numerically important in both number and diversity. For a site to be classified as balanced, intolerant organisms comprised more than 50% of the specimens collected at a site; moderate, facultative, and tolerant organisms, together, comprised less than 50%.

An unbalanced environment is one in which intolerant organisms were numerically less important than other forms combined, but when combined with moderate forms, usually outnumbered tolerant forms. For a site to be classified as unbalanced, organisms classified as moderate, facultative, and tolerant comprised more than 50% of the sample, while intolerant organisms comprised more than 10% but less than 50% of the sample.

A semi-polluted environment is one in which intolerant organisms are few or absent, with moderate, facultative, and tolerant organisms predominating. For a site to be classified as semi-polluted, intolerant organisms comprised 10% or less of the organisms collected while moderate, facultative, and tolerant organisms, combined, comprised 90% or more of the sample. A polluted environment is one in which tolerant organisms were generally the only taxa present at a site, although some facultative forms might have been observed. For a site to be classified as polluted, either virtually all organisms collected were classified as tolerant, or no organisms were present.

Common Species

Seventy-eight species of fishes are known from the Upper Rock River Assessment Area (Tables 18 and 19). Common fishes throughout the drainage are the common shiner, bigmouth shiner, spotfin shiner, sand shiner, hornyhead chub, bluntnose minnow, central stoneroller, white sucker, green sunfish, bluegill, fantail darter and johnny darter. The headwaters are dominated by creek chubs, fathead minnows, blacknose dace, brook stickleback, southern redbelly dace, and green sunfish; the creeks by sand shiners, common shiners, bluntnose minnows, fantail darters and johnny darters; and the larger river habitats by pike, shad, carpsuckers, carp, white suckers and smallmouth bass.

Thirty-five species of native freshwater mussels have been reported from this assessment area (see Tables 20 and 21). Common species include the pimpleback, plain pocketbook, pink papershell, fragile papershell, paper pondshell, and fawnsfoot (Cummings and Mayer, 1997; INHS Mollusk Collection data). Of the 35 mussel species known from the assessment area, 15 have been collected alive in the past 20 years. Additional information on the mussels of the Rock River is available in Baker (1926), Matteson (1961), and Miller (1972).

Eight species of crayfishes, isopods, and amphipods are found in the basin (see Table 22 and 23). 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. *Gammarus pseudolimnaeus*, the most common amphipod, lives in springs and rocky spring-fed runs.

In general, the aquatic macroinvertebrate populations of the Upper Rock River Assessment Area appear to be as diverse as those of many other watersheds in Illinois that have been

Table 18. Freshwater fishes recorded from the Upper Rock River Assessment Area¹.

FAMILY <i>Scientific Name</i> ^{2,3,4}	Common Name	Headwaters	Creeks	Small Rivers	Med & Lg Rivers	Standing Water
LEPISOSTEIDAE						
<i>Lepisosteus osseus</i>	longnose gar				X	
CLUPEIDAE						
<i>Dorosoma cepedianum</i>	gizzard shad			X	X	X
CYPRINIDAE						
<i>Campostoma anomalum</i> #	central stoneroller	X	X	X		
<i>Campostoma oligolepis</i>	largescale stoneroller		X	X		
<i>Carassius auratus</i> *	goldfish		X	X	X	X
<i>Cyprinella spiloptera</i> #	spotfin shiner		X	X	X	
<i>Cyprinus carpio</i> *	common carp			X	X	X
<i>Erimystax x-punctatus</i>	gravel chub				X	
<i>Hybognathus hankinsoni</i>	brassy minnow	X	X			
<i>Luxilus cornutus</i> #	common shiner		X	X	X	
<i>Lythrurus umbratilis</i>	redfin shiner		X	X	X	
<i>Macrhybopsis storeriana</i>	silver chub				X	
<i>Nocomis biguttatus</i> #	hornyhead chub		X	X		
<i>Notemigonus crysoleucas</i>	golden shiner			X	X	X
<i>Notropis atherinoides</i>	emerald shiner				X	
<i>Notropis dorsalis</i> #	bigmouth shiner		X	X	X	
<i>Notropis hudsonius</i>	spottail shiner				X	
<i>Notropis ludibundus</i> #	sand shiner		X	X	X	
<i>Notropis nubilus</i>	Ozark minnow		X	X		
<i>Notropis rubellus</i>	rosyface shiner		X	X	X	
<i>Notropis texanus</i> SE	weed shiner		X			
<i>Phenacobius mirabilis</i>	suckermouth minnow		X	X	X	
<i>Phoxinus erythrogaster</i> #	southern redbelly dace	X				
<i>Pimephales notatus</i> #	bluntnose minnow	X	X	X	X	
<i>Pimephales promelas</i> #	fathead minnow		X	X		
<i>Pimephales vigilax</i>	bullhead minnow			X	X	
<i>Rhinichthys atratulus</i> #	blacknose dace	X	X			
<i>Semotilus atromaculatus</i> #	creek chub	X	X			
CATOSTOMIDAE						
<i>Carpionodes carpio</i>	river carpsucker			X	X	
<i>Carpionodes cyprinus</i>	quillback		X	X	X	
<i>Carpionodes velifer</i>	highfin carpsucker			X	X	
<i>Catostomus commersoni</i> #	white sucker		X	X	X	
<i>Hypentelium nigricans</i>	northern hog sucker		X	X	X	
<i>Ictiobus bubalus</i>	smallmouth buffalo				X	
<i>Ictiobus cyprinellus</i>	bigmouth buffalo				X	
<i>Minytrema melanops</i>	spotted sucker		X	X		
<i>Moxostoma anisurum</i>	silver redhorse			X	X	
<i>Moxostoma carinatum</i> ST	river redhorse			X	X	
<i>Moxostoma duquesnei</i>	black redhorse		X	X	X	
<i>Moxostoma erythrurum</i>	golden redhorse		X	X	X	

Table 18. Continued.

FAMILY <i>Scientific Name</i> ^{2,3,4}	Common Name	Headwaters	Creeks	Small Rivers	Med & Lg Rivers	Standing Water
<i>Moxostoma macrolepidotum</i>	shorthead redhorse			X	X	
ICTALURIDAE						
<i>Ameiurus melas</i>	black bullhead		X	X	X	X
<i>Ameiurus natalis</i>	yellow bullhead		X	X	X	X
<i>Ictalurus punctatus</i>	channel catfish			X	X	X
<i>Noturus exilis</i>	slender madtom		X	X		
<i>Noturus flavus</i>	stonecat		X	X		
<i>Noturus gyrinus</i>	tadpole madtom		X	X		
<i>Pylodictis olivaris</i>	flathead catfish			X	X	X
ESOCIDAE						
<i>Esox americanus</i>	grass pickerel	X	X	X		X
<i>Esox lucius</i>	northern pike			X	X	X
SALMONIDAE						
<i>Oncorhynchus mykiss</i> *	rainbow trout		X	X		
<i>Salmo trutta</i> *	brown trout		X	X		
ATHERINIDAE						
<i>Labidesthes sicculus</i>	brook silverside			X	X	X
GASTEROSTEIDAE						
<i>Culaea inconstans</i>	brook stickleback	X	X			X
COTTIDAE						
<i>Cottus bairdi</i>	mottled sculpin	X	X			
MORONIDAE						
<i>Morone chrysops</i>	white bass			X	X	
<i>Morone mississippiensis</i>	yellow bass		X	X	X	X
CENTRARCHIDAE						
<i>Ambloplites rupestris</i>	rock bass		X	X	X	
<i>Lepomis cyanellus</i> #	green sunfish	X	X	X	X	X
<i>Lepomis gibbosus</i>	pumpkinseed		X	X	X	X
<i>Lepomis humilis</i>	orangespotted sunfish		X	X	X	
<i>Lepomis macrochirus</i> #	bluegill		X	X	X	X
<i>Micropterus dolomieu</i> #	smallmouth bass		X	X	X	X
<i>Micropterus salmoides</i>	largemouth bass		X	X	X	X
<i>Pomoxis annularis</i>	white crappie		X	X	X	X
<i>Pomoxis nigromaculatus</i>	black crappie		X	X	X	X
PERCIDAE						
<i>Etheostoma caeruleum</i>	rainbow darter	X	X	X	X	
<i>Etheostoma flabellare</i> #	fantail darter	X	X	X		
<i>Etheostoma microperca</i>	least darter	X	X			X
<i>Etheostoma nigrum</i> #	johnny darter	X	X	X	X	
<i>Etheostoma zonale</i>	banded darter		X	X	X	
<i>Perca flavescens</i>	yellow perch		X	X		X
<i>Percina caprodes</i>	logperch		X	X	X	
<i>Percina maculata</i>	blackside darter	X	X	X	X	
<i>Percina phoxocephala</i>	slenderhead darter		X	X	X	

Table 18. Continued.

FAMILY <i>Scientific Name</i> ^{2,3,4}	Common Name	Headwaters	Creeks	Small Rivers	Med & Lg Rivers	Standing Water
<i>Stizostedion canadense</i>	sauger			X	X	
<i>Stizostedion vitreum</i>	walleye			X	X	
SCIAENIDAE						
<i>Aplodinotus grunniens</i>	freshwater drum			X	X	

¹Data from the Illinois Natural History Survey Fish Collection.

²Bold type indicates a State Endangered Species (SE); State Threatened Species (ST).

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

⁴Total number of species = 78 (74 native, 4 introduced).

Table 19. Freshwater fishes recorded from the Upper Rock River Assessment Area, by habitat¹.

FAMILY <i>Scientific Name</i> ^{2,3,4}	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
LEPISOSTEIDAE						
<i>Lepisosteus osseus</i>	longnose gar				X	
CLUPEIDAE						
<i>Dorosoma cepedianum</i>	gizzard shad		X			X
CYPRINIDAE						
<i>Campostoma anomalum</i> #	central stoneroller	X	X			
<i>Campostoma oligolepis</i>	largescale stoneroller	X	X			
<i>Carassius auratus</i> *	goldfish			X	X	
<i>Cyprinella spiloptera</i> #	spotfin shiner		X	X		
<i>Cyprinus carpio</i> *	common carp			X	X	
<i>Erimystax x-punctatus</i>	gravel chub	X	X			
<i>Hybognathus hankinsoni</i>	brassy minnow			X		
<i>Luxilus cornutus</i> #	common shiner		X	X		
<i>Lythrurus umbratilis</i>	redfin shiner		X	X		
<i>Macrhybopsis storeriana</i>	silver chub			X		
<i>Nocomis biguttatus</i> #	hornyhead chub		X	X		
<i>Notemigonus crysoleucas</i>	golden shiner			X	X	X
<i>Notropis atherinoides</i>	emerald shiner			X		
<i>Notropis dorsalis</i> #	bigmouth shiner		X	X		
<i>Notropis hudsonius</i>	spottail shiner			X	X	X
<i>Notropis ludibundus</i> #	sand shiner		X	X		
<i>Notropis nubilus</i>	Ozark minnow		X	X		
<i>Notropis rubellus</i>	rosyface shiner		X	X		X
<i>Notropis texanus</i> SE	weed shiner		X	X		

Table 19. Continued.

FAMILY <i>Scientific Name</i> ^{2,3,4}	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
<i>Phenacobius mirabilis</i>	suckermouth minnow	X	X			
<i>Phoxinus erythrogaster</i> #	southern redbelly dace	X	X			
<i>Pimephales notatus</i> #	bluntnose minnow		X	X		
<i>Pimephales promelas</i> #	fathead minnow			X		
<i>Pimephales vigilax</i>	bullhead minnow		X	X		
<i>Rhinichthys atratulus</i> #	blacknose dace	X	X			
<i>Semotilus atromaculatus</i> #	creek chub			X		
CATOSTOMIDAE						
<i>Carpionodes carpio</i>	river carpsucker		X	X		
<i>Carpionodes cyprinus</i>	quillback		X	X		
<i>Carpionodes velifer</i>	highfin carpsucker		X	X		
<i>Catostomus commersoni</i> #	white sucker		X	X		
<i>Hypentelium nigricans</i>	northern hog sucker	X	X			
<i>Ictiobus bubalus</i>	smallmouth buffalo			X		
<i>Ictiobus cyprinellus</i>	bigmouth buffalo			X		
<i>Minytrema melanops</i>	spotted sucker			X		
<i>Moxostoma anisurum</i>	silver redhorse		X	X		
<i>Moxostoma carinatum</i> ST	river redhorse		X	X		
<i>Moxostoma duquesnei</i>	black redhorse		X	X		
<i>Moxostoma erythrurum</i>	golden redhorse		X	X		
<i>Moxostoma macrolepidotum</i>	shorthead redhorse		X	X		
ICTALURIDAE						
<i>Ameiurus melas</i>	black bullhead			X		X
<i>Ameiurus natalis</i>	yellow bullhead			X		X
<i>Ictalurus punctatus</i>	channel catfish		X	X		X
<i>Noturus exilis</i>	slender madtom	X				
<i>Noturus flavus</i>	stonecat	X				
<i>Noturus gyrinus</i>	tadpole madtom		X	X		
<i>Pylodictis olivaris</i>	flathead catfish			X		X
ESOCIDAE						
<i>Esox americanus</i>	grass pickerel			X		X
<i>Esox lucius</i>	northern pike			X		X
SALMONIDAE						
<i>Oncorhynchus mykiss</i> *	rainbow trout		X	X		
<i>Salmo trutta</i> *	brown trout		X	X		
ATHERINIDAE						
<i>Labidesthes sicculus</i>	brook silverside			X	X	X
GASTEROSTEIDAE						
<i>Culaea inconstans</i>	brook stickleback			X	X	
COTTIDAE						
<i>Cottus bairdi</i>	mottled sculpin	X				
MORONIDAE						
<i>Morone chrysops</i>	white bass			X		
<i>Morone mississippiensis</i>	yellow bass			X	X	

Table 19. Continued.

FAMILY <i>Scientific Name</i> ^{2,3,4}	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	OpenWater
CENTRARCHIDAE						
<i>Ambloplites rupestris</i>	rock bass			X		
<i>Lepomis cyanellus</i> #	green sunfish			X		X
<i>Lepomis gibbosus</i>	pumpkinseed			X		
<i>Lepomis humilis</i>	orangespotted sunfish			X		
<i>Lepomis macrochirus</i> #	bluegill			X	X	
<i>Micropterus dolomieu</i> #	smallmouth bass			X	X	X
<i>Micropterus salmoides</i>	largemouth bass			X	X	X
<i>Pomoxis annularis</i>	white crappie			X	X	X
<i>Pomoxis nigromaculatus</i>	black crappie			X	X	X
PERCIDAE						
<i>Etheostoma caeruleum</i>	rainbow darter	X				
<i>Etheostoma flabellare</i> #	fantail darter	X				
<i>Etheostoma microperca</i>	least darter		X	X	X	
<i>Etheostoma nigrum</i> #	johnny darter		X	X		
<i>Etheostoma zonale</i>	banded darter	X				
<i>Perca flavescens</i>	yellow perch			X	X	
<i>Percina caprodes</i>	logperch		X	X		
<i>Percina maculata</i>	blackside darter			X		
<i>Percina phoxocephala</i>	slenderhead darter	X	X			
<i>Stizostedion canadense</i>	sauger			X		
<i>Stizostedion vitreum</i>	walleye			X		
SCIAENIDAE						
<i>Aplodinotus grunniens</i>	freshwater drum			X		

¹Data from the Illinois Natural History Survey Fish Collection.

²Bold type indicates a State Endangered Species (SE); State Threatened Species (ST).

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

⁴Total number of species = 78 (74 native, 4 introduced).

Table 20. Freshwater mussels recorded from the Upper Rock River Assessment Area¹.

FAMILY		Headwaters/ Creeks	Small Rivers	Medium & Large Rivers	Standing Water
Subfamily					
<i>Scientific Name</i> ^{2,3,4}					
UNIONIDAE					
Anodontinae					
<i>Alasmidonta marginata</i>	elktoe		X	X	
<i>Alasmidonta viridis</i> ST	slippershell mussel	X	X		
<i>Anodontoides ferussacianus</i>	cylindrical papershell	X	X		X

Table 20. Continued.

FAMILY		Headwaters/ Creeks	Small Rivers	Medium & Large Rivers	Standing Water
Subfamily	Scientific Name ^{2,3,4}				
	<i>Lasmigona complanata</i>	white heelsplitter	X	X	X
	<i>Lasmigona compressa</i>	creek heelsplitter	X	X	
	<i>Lasmigona costata</i>	flutedshell		X	
	<i>Pyganodon grandis</i>	giant floater	X	X	X
	<i>Strophitus undulatus</i>	squawfoot		X	X
	<i>Utterbackia imbecillis</i> #	paper pondshell		X	X
Ambleminae					
	<i>Amblema plicata</i>	threeridge	X	X	
	<i>Cyclonaias tuberculata</i> ST	purple wartyback		X	
	<i>Elliptio dilatata</i> ST	spike	X	X	
	<i>Fusconaia ebena</i> ST	ebonyshell		X	
	<i>Fusconaia flava</i>	Wabash pigtoe	X	X	
	<i>Plethobasus cyphus</i> SE	sheepnose		X	
	<i>Pleurobema rubrum</i> SE	pyramid pigtoe		X	
	<i>Pleurobema sintoxia</i>	round pigtoe	X	X	
	<i>Quadrula metanevra</i>	monkeyface		X	
	<i>Quadrula pustulosa</i> #	pimpleback	X	X	
	<i>Quadrula quadrula</i>	mapleleaf	X	X	
	<i>Tritogonia verrucosa</i>	pistolgrip	X	X	
Lampsilinae					
	<i>Actinonaias ligamentina</i>	mucket	X	X	
	<i>Epioblasma triquetra</i> SE	snuffbox	X	X	
	<i>Lampsilis cardium</i> #	plain pocketbook	X	X	
	<i>Lampsilis siliquioidea</i>	fatmucket	X	X	X
	<i>Lampsilis teres</i>	yellow sandshell	X	X	
	<i>Leptodea fragilis</i> #	fragile papershell	X	X	
	<i>Ligumia recta</i> ST	black sandshell		X	
	<i>Obliquaria reflexa</i>	threehorn wartyback		X	
	<i>Potamilus alatus</i>	pink heelsplitter	X	X	
	<i>Potamilus ohioensis</i> #	pink papershell	X	X	
	<i>Toxolasma parvus</i>	lilliput	X	X	X
	<i>Truncilla donaciformis</i> #	fawnsfoot		X	
	<i>Truncilla truncata</i>	deertoe		X	
	<i>Venustaconcha ellipsiformis</i>	ellipse	X	X	
CORBICULIDAE					
	<i>Corbicula fluminea</i> *	Asian clam	X	X	X

¹Data from the Illinois Natural History Survey Mollusk Collection.

²Bold type indicates a State Endangered Species (SE); State Threatened Species (ST).

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

⁴Total number of species = 36 (35 native, 1 introduced).

Table 21. Freshwater mussels recorded from the Upper Rock River Assessment Area, by habitat¹.

FAMILY	Subfamily <i>Scientific Name</i> ^{2,3,4}	Common Name	Streams			Standing Water
			Riffles	Runs	Pools	Littoral Zone
UNIONIDAE						
Anodontinae						
	<i>Alasmidonta marginata</i>	elktoe	X	X		
	<i>Alasmidonta viridis</i> ST	slippershell mussel	X	X		
	<i>Anodontoides ferussacianus</i>	cylindrical papershell		X	X	X
	<i>Lasmigona complanata</i>	white heelsplitter		X	X	X
	<i>Lasmigona compressa</i>	creek heelsplitter	X	X		
	<i>Lasmigona costata</i>	flutedshell	X	X		
	<i>Pyganodon grandis</i>	giant floater		X	X	X
	<i>Strophitus undulatus</i>	squawfoot		X	X	X
	<i>Utterbackia imbecillis</i> #	paper pondshell		X	X	X
Ambleminae						
	<i>Amblema plicata</i>	threeridge	X	X	X	
	<i>Cyclonaias tuberculata</i> ST	purple wartyback	X	X		
	<i>Elliptio dilatata</i> ST	spike	X	X		
	<i>Fusconaia ebena</i> ST	ebonyshell	X	X		
	<i>Fusconaia flava</i>	Wabash pigtoe	X	X		
	<i>Plethobasus cyphus</i> SE	sheepnose	X	X		
	<i>Pleurobema rubrum</i> SE	pyramid pigtoe	X	X		
	<i>Pleurobema sintoxia</i>	round pigtoe	X	X		
	<i>Quadrula metanevra</i>	monkeyface	X	X		
	<i>Quadrula pustulosa</i> #	pimpleback	X	X		
	<i>Quadrula quadrula</i>	mapleleaf	X	X	X	
	<i>Tritogonia verrucosa</i>	pistolgrip	X	X		
Lampsilinae						
	<i>Actinonaias ligamentina</i>	mucket	X	X		
	<i>Epioblasma triquetra</i> SE	snuffbox	X	X		
	<i>Lampsilis cardium</i> #	plain pocketbook	X	X	X	
	<i>Lampsilis siliquoidea</i>	fatmucket	X	X	X	X
	<i>Lampsilis teres</i>	yellow sandshell	X	X		
	<i>Leptodea fragilis</i> #	fragile papershell	X	X	X	
	<i>Ligumia recta</i> ST	black sandshell	X	X		
	<i>Obliquaria reflexa</i>	threehorn wartyback	X	X	X	
	<i>Potamilus alatus</i>	pink heelsplitter	X	X	X	
	<i>Potamilus ohioensis</i> #	pink papershell	X	X	X	
	<i>Toxolasma parvus</i>	lilliput	X	X	X	X
	<i>Truncilla donaciformis</i> #	fawnsfoot	X	X		
	<i>Truncilla truncata</i>	deertoe	X	X		
	<i>Venustaconcha ellipsiformis</i>	ellipse	X	X		

Table 21. Continued.

FAMILY		Common Name	Riffles	Streams		Standing Water Littoral Zone
Subfamily	<i>Scientific Name</i> ^{2,3,4}			Runs	Pools	
CORBICULIDAE						
	<i>Corbicula fluminea</i> *	Asian clam	X	X	X	X

¹Data from the Illinois Natural History Survey Mollusk Collection.

²Bold type indicates a State Endangered Species (SE); State Threatened Species (ST).

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

⁴Total number of species = 36 (35 native, 1 introduced).

Table 22. Freshwater crustaceans recorded from the Upper Rock River Assessment Area¹.

ORDER		Common Name	Caves & Springs	Streams			Standing Water
Family	<i>Scientific Name</i> ^{2, 3}			Hw ⁴	Creeks	Small Riv	Med & Lg Riv
ISOPODA (Isopods)							
Asellidae							
	<i>Caecidotea intermedia</i> #		X	X	X	X	
	<i>Caecidotea kendeighi</i>		X				
AMPHIPODA (Amphipods)							
Gammaridae							
	<i>Gammarus pseudolimnaeus</i> #		X	X			
DECAPODA (Crayfishes & shrimps)							
Cambaridae							
	<i>Orconectes immunis</i>	calico crayfish		X	X	X	X
	<i>Orconectes propinquus</i> #	clearwater crayfish		X	X	X	
	<i>Orconectes rusticus</i> *	rusty crayfish		X	X	X	X
	<i>Orconectes virilis</i> #	virile crayfish		X	X	X	X
	<i>Cambarus diogenes</i>	devil crawfish				burrower	

¹Data from the Illinois Natural History Survey Crustacean Collection.

²* = non-native species; # = common species.

³Total number of species = 8 (7 native, 1 introduced).

⁴Hw = Headwaters.

Table 23. Freshwater crustaceans recorded from the Upper Rock River Assessment Area, by habitat¹.

ORDER								
Family		Caves & Springs	Streams			Standing Water		
<i>Scientific Name</i> ^{2,3}	common name		Riffles	Runs	Pools	Littoral	Open Water	
ISOPODA (Isopods)								
Asellidae								
<i>Caecidotea intermedia</i> #		X	X		X			
<i>Caecidotea kendeighi</i>		X						
AMPHIPODA (Amphipods)								
Gammaridae								
<i>Gammarus pseudolimnaeus</i> #		X	X					
DECAPODA (Crayfishes & shrimps)								
Cambaridae								
<i>Orconectes immunis</i>					X	X		
calico crayfish								
<i>Orconectes propinquus</i> #			X					
clearwater crayfish								
<i>Orconectes rusticus</i> *			X			X		
rusty crayfish								
<i>Orconectes virilis</i> #			X	X		X		
virile crayfish								
<i>Cambarus diogenes</i>					burrower			
devil crawfish								

¹Data from the Illinois Natural History Survey Crustacean Collection.

²* = non-native species; # = common species.

³Total number of species = 8 (7 native, 1 introduced).

surveyed in a similar manner. Aquatic macroinvertebrate taxa known to or thought likely to occur in the URRAA are listed in Table 24; this information is based upon records from aquatic habitats within the counties located in the URRAA. Many of these species are considered relatively common in the state of Illinois.

Although many of the species listed in Table 24 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 Rock River Assessment Area 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.

Table 24. Aquatic macroinvertebrates, exclusive of the Crustacea and Unionacean Mollusca, recorded from the CTAP - Upper Rock River Assessment Area in Boone, Carroll, Lee, Ogle, Winnebago Counties, counties, Illinois. Data are from Malloch (1915a, b), Frison (1935), Ross (1944, 1947), Burks (1953), Wooldridge (1967), Lauck (1959), Pechumen et al. (1983), Taylor (1996), Wetzel (1992), Wetzel et al. (1998), W. Brigham (Unpubl.), and the INHS Annelida and Insect Collections. List compiled by M.J. Wetzel, D.W. Webb, and S.J. Taylor, INHS Center for Biodiversity.

Phylum NEMATODA
- Nematode Worms
 Species indeterminate

Phylum NEMATOMORPHA
- Horsehair Worms
 Parachordodidae
 Species indeterminate

Phylum TURBELLARIA
- Flatworms
Tricladida
 Planariidae
 Species indeterminate

Phylum ANNELIDA
- Segmented Worms

Class APHANONEURA
- Suction-Feeding Worms
Aeolosomatida

Aeolosomatidae
 Species indeterminate

Class BRANCHIOBELLA
- Crayfish Worms
Branchiobdellida
 Cambarincolidae
 Species indeterminate

Class OLIGOCHAETA
- Oligochaete Worms
Lumbriculida
 Lumbriculidae
 Species indeterminate

Enchytraeida
 Enchytraeidae
 Species indeterminate

Tubificida
 Naididae
Chaetogaster diaphanus
Dero digitata

Table 24. Continued.

<i>Dero nivea</i>	<i>Caenis hilaris</i>
<i>Nais behningi</i>	<i>Caenis latipennis</i>
<i>Nais bretscheri</i>	Ephemerellidae
<i>Nais communis</i>	<i>Ephemerella invaria</i>
<i>Nais elinguis</i>	<i>Timpanoga lita</i>
<i>Nais pardalis</i>	<i>Timpanoga simplex</i>
<i>Nais variabilis</i>	Ephemeridae
<i>Pristina aequiseta</i>	<i>Ephemera simulans</i>
<i>Pristina leidy</i>	<i>Hexagenia bilineata</i>
<i>Stylaria lacustris</i>	<i>Hexagenia limbata</i>
Tubificidae	<i>Hexagenia rigida</i>
<i>Aulodrilus pigueti</i>	<i>Pentagenia vittigera</i>
<i>Branchiura sowerbyi</i>	Heptageniidae
<i>Ilyodrilus templetoni</i>	<i>Heptagenia diabasia</i>
<i>Limnodrilus hoffmeisteri</i>	<i>Heptagenia flavescens</i>
	<i>Leucrocuta maculipennis</i>
Class HIRUDINEA - Leeches	<i>Nixe inconspicua</i>
Rhynchobdellida	<i>Raptoheptagenia cruentata</i>
Glossiphoniidae	<i>Rhithrogena pellucida</i>
<i>Gloiobdella elongata</i>	<i>Stenacron interpunctatum</i>
<i>Helobdella stagnalis</i>	<i>Stenacron minnetonka</i>
<i>Helobdella triserialis</i>	<i>Stenonema luteum</i>
<i>Placobdella multilineata</i>	<i>Stenonema mediopunctatum arwini</i>
<i>Placobdella parasitica</i>	<i>Stenonema mediopunctatum</i>
Pharyngobdellida	<i>mediopunctatum</i>
Erpobdellidae	<i>Stenonema mexicanum integrum</i>
<i>Erpobdella punctata</i>	<i>Stenonema modestum</i>
	<i>Stenonema pulchellum</i>
Phylum ARTHROPODA	<i>Stenonema terminatum terminatum</i>
- Arthropods	Isonychiidae
Class ARACHNIDA	<i>Isonychia bicolor</i>
Hydrachnida	<i>Isonychia rufa</i>
- Aquatic Mites	<i>Isonychia sayi</i>
Species indeterminate	<i>Isonychia sicca</i>
	Polymitarciidae
Class INSECTA - Insects	<i>Ephoron leukon</i>
Order Ephemeroptera - Mayflies	Potamanthidae
Baetidae	<i>Anthopotamus myops</i>
<i>Baetis brunneicolor</i>	<i>Anthopotamus verticis</i>
<i>Baetis flavistriga</i>	Pseudironidae
<i>Baetis intercalaris</i>	<i>Pseudiron centralis</i>
<i>Callibaetis ferrugineus ferrugineus</i>	Siphonuridae
<i>Pseudocloeon propinquum</i>	<i>Siphonurus alternatus</i>
Baetiscidae	
<i>Baetisca lacustris</i>	Order Odonata - Damselflies and
Caenidae	Dragonflies
	Zygoptera - Damselflies

Table 24. Continued.

Calopterygidae	<i>Isoperla bilineata</i>
<i>Calopteryx aequabilis</i>	<i>Isoperla richardsoni</i>
<i>Calopteryx maculata</i>	Pteronarcyidae
Coenagrionidae	<i>Pteronarcys pictetii</i>
<i>Argia apicalis</i>	Taeniopterygidae
<i>Argia moesta</i>	<i>Strophoteryx fasciata</i>
<i>Argia tibialis</i>	<i>Taeniopteryx burksi</i>
<i>Enallagma carunculatum</i>	<i>Taeniopteryx nivalis</i>
<i>Ischnura verticalis</i>	<i>Taeniopteryx parvula</i>
Lestidae	Order Heteroptera - True Bugs
<i>Lestes rectangularis</i>	Belostomidae
<i>Lestes unguiculatus</i>	<i>Belostoma flumineum</i>
Anisoptera - Dragonflies	<i>Lethocerus americanus</i>
Aeshnidae	Corixidae
<i>Anax junius</i>	<i>Corisella edulis</i>
Gomphidae	<i>Hesperocorixa obliqua</i>
<i>Gomphus externus</i>	<i>Ramphocorixa acuminata</i>
<i>Gomphus lentulus</i>	<i>Sigara alternata</i>
<i>Gomphus notatus</i>	<i>Sigara grossolineata</i>
<i>Gomphus vastus</i>	<i>Sigara hubbelli</i>
Libellulidae	<i>Trichocorixa calva</i>
<i>Erythemis simplicicollis</i>	<i>Trichocorixa kanza</i>
<i>Libellula pulchella</i>	<i>Trichocorixa maias</i>
<i>Perithemis tenera</i>	Gerridae
<i>Sympetrum internum</i>	<i>Aquarius remigis</i>
<i>Sympetrum rubicundulum</i>	<i>Gerris comatus</i>
<i>Sympetrum vicinum</i>	<i>Gerris marginatus</i>
Macromiidae	<i>Limnoporus dissortis</i>
<i>Didymops transversa</i>	Mesoveliidae
 	<i>Mesovelia mulsanti</i>
Order Plecoptera - Stoneflies	Nepidae
Capniidae	<i>Ranatra fusca</i>
<i>Allocapnia granulata</i>	<i>Ranatra kirkaldyi</i>
<i>Allocapnia vivipara</i>	Notonectidae
Nemouridae	<i>Notonecta raleighi</i>
<i>Shipsa rotunda</i>	<i>Notonecta undulata</i>
Perlidae	Pleidae
<i>Acroneuria abnormis</i>	<i>Neoplea striola</i>
<i>Agnetina capitata</i>	Veliidae
<i>Agnetina flavescens</i>	<i>Microvelia americana</i>
<i>Attaneuria ruralis</i>	<i>Rhagovelia oriander</i>
<i>Perlesta decipiens</i>	
<i>Perlesta shabuta</i>	Order Coleoptera - Beetles
<i>Perlinella drymo</i>	Dryopidae
<i>Perlinella ephyre</i>	<i>Helicus striatus</i>
Perlodidae	Dytiscidae

Table 24. Continued.

<i>Agabus</i> sp.	Hydropsychidae
<i>Anaceena</i> sp.	<i>Ceratopsyche bronta</i>
<i>Copelatus glyphicus</i>	<i>Ceratopsyche slossonae</i>
<i>Heterosturnuta wickhami</i>	<i>Cheumatopsyche analis</i>
<i>Hydroporus oppositus</i>	<i>Cheumatopsyche aphanta</i>
<i>Hydroporus pulcher</i>	<i>Cheumatopsyche campyla</i>
<i>Hydroporus</i> cf. <i>vitrosus</i>	<i>Cheumatopsyche pettiti</i>
<i>Ilybius pleurithicus</i>	<i>Hydropsyche arinale</i>
<i>Laccophilus maculosus maculosus</i>	<i>Hydropsyche betteni</i>
<i>Laccophilus fasciatus rufus</i>	<i>Hydropsyche bidens</i>
<i>Liodessus affinis</i>	<i>Hydropsyche hageni</i>
<i>Coptotomus longulus</i>	<i>Hydropsyche orris</i>
<i>Uvarus lacustris</i>	<i>Hydropsyche phalerata</i>
Elmidae	<i>Hydropsyche placoda</i>
<i>Dubiraphia minima</i>	<i>Hydropsyche simulans</i>
<i>Dubiraphia quadrinotata</i>	<i>Hydropsyche valanis</i>
<i>Optioservis fastiditus</i>	<i>Macronemum zebratum</i>
<i>Stenelmis crenata</i>	<i>Potamyia flava</i>
<i>Stenelmis grossa</i>	Hydroptilidae
Eubriidae	<i>Hydroptila consimilis</i>
<i>Dicranoselaphus variegatus</i>	<i>Hydroptila ajax</i>
Haliplidae	<i>Hydroptila waubesiana</i>
<i>Peltodytes duodecimpunctatus</i>	<i>Mayatrichia ayama</i>
<i>Peltodytes edentulus</i>	<i>Neotrichia falca</i>
<i>Peltodytes lengi</i>	<i>Neotrichia okopa</i>
<i>Haliplus immaculicollis</i>	<i>Ochrotrichia tarsalis</i>
<i>Haliplus triopsis</i>	<i>Orthotrichia cristata</i>
Hydrophilidae	<i>Oxyethira pallida</i>
<i>Anacaena limbata</i>	Leptoceridae
<i>Berosus aculeatus</i>	<i>Ceraclea cancellata</i>
<i>Berosus striatus</i>	<i>Ceraclea maculata</i>
<i>Chaetarthria</i> sp.	<i>Ceraclea mentieus</i>
<i>Hydrobius</i> sp.	<i>Ceraclea tarsipuncata</i>
<i>Enochrus ochraceus</i>	<i>Ceraclea transversa</i>
<i>Enochrus pygmaeus nebulosus</i>	<i>Dicosmoecus</i> sp.
<i>Paracymus confluens</i>	<i>Nectopsyche candida</i>
<i>Paracymus subcupreus</i>	<i>Oecetis avara</i>
<i>Tropisternus blatchleyi modestus</i>	<i>Oecetis inconspicua</i>
<i>Tropisternus glaber</i>	Limnephilidae
<i>Tripisternus lateralis nimbatus</i>	<i>Anabolia</i> sp.
<i>Tripisternus mexicanus striolatus</i>	<i>Limnephilus</i> sp.
<i>Tripisternus mixtus</i>	<i>Neophylax</i> sp.
<i>Tropisternus natator</i>	<i>Pycnopsyche</i> sp.
Scirtidae	Philopotamidae
<i>Cyphon</i> sp.	<i>Chimarra obscura</i>
Order Trichoptera - Caddisflies	Phryganeidae
	<i>Oligostomus</i> sp.

Table 24. Continued.

Ptilostomis postica
Ptilostomis semifasciata
Polycentropodidae
Paranyctiophylax vestitus
Uenoidae
Neophylax concinnus

Order Diptera - Flies

Chironomidae
Brillia sp.
Cladotanytarsus sp.
Conchapelopia or *Helopelopia* sp.
Corynoneura sp.
Cricotopus bicinctus
Cricotopus or *Orthocladus* sp.
Cryptochironomus fulvus
Glyptotendipes sp.
Microtendipes pedellus group
Natarsia sp. A
Parakiefferiella sp.
Phaenopsectra sp.
Polypedilum convictum group
Polypedilum halterale group
Polypedilum scalaenum group
Rheotanytarsus sp.
Smittia sp.
Stictochironomus sp.
Tanytarsus sp.
Thienemanniella sp.
Thienemannimyia group
Tvetenia sp.
Culicidae
Aedes sticticus
Aedes stimulans
Aedes triseriatus
Aedes vexans
Anopheles punctipennis
Anopheles quadrimaculatus
Culex pipiens
Culex restuans
Culiseta inornata
Psorophora horrida
Uranotaenia sapphirina
Dixidae
Dixa sp.
Empididae
Hemerodromia sp.

Tabanidae
Chrysops ater
Chrysops callidus
Chrysops cincticornis
Chrysops indus
Chrysops moechus
Chrysops niger
Chrysops pikei
Chrysops univittatus
Chrysops vittatus
Hybomitra tetrica hirtula
Tabanus lineola
Tabanus quinquevittatus
Tabanus reinwardtii
Tabanus sackeni
Tabanus similis
Tabanus subsimilis
Tabanus trimaculatus

Tipulidae
Erioptera sp.
Helius sp.
Limonia sp.
Ormosia sp.
Pilaria sp.
Tipula sp.

Phylum MOLLUSCA

- **Mollusks** (not including Unionidae)

Gastropoda - Snails
Bassomatophora
Lymnaeidae
Fossaria sp.
Pseudosuccinea columella
Physelidae
Physella sp.
Megagastropoda
Valvatidae
Valvata sp.
Pelecypoda - Bivalve Mollusks
Sphaeriidae
Pisidium sp.
Sphaerium sp.

Threatened and Endangered Species

Fishes:

State listed fishes known from the Upper Rock River Assessment Area are the state endangered weed shiner, last observed in the assessment area in 1877, and the state threatened river redhorse, last observed in 1901. Both species were found in the Rock River near Oregon. The largescale stoneroller and the gravel chub are on the Illinois Watch List.

Weed shiner: The weed shiner is one of the rarest fishes in Illinois and is known to maintain populations only in the Kankakee River in Kankakee County, in upper Beaver Creek, a tributary of the Iroquois River in Kankakee and Iroquois counties, and in three small streams in the Rock River drainage (outside of the assessment area). Weed shiners were found in 1990-91 in the Rock River drainage in Fairfield Union Special Ditch in Bureau County, and in Coon Creek in Whiteside County. It was observed in Fairfield Ditch No. 1 in Bureau County in 1999.

River redhorse: The river redhorse is present in only a few large streams in Illinois that have good water quality and clean rocky substrates. The only stream in which it is common is the Kankakee River. It once occurred in the Rock River near Oregon but now appears to be gone from the drainage.

Largescale stoneroller: The largescale stoneroller, currently on the Illinois Watch List and likely to be added to the threatened species list, is restricted in Illinois to a few clean rocky streams, including the Kyte and Leaf rivers in Ogle County.

Gravel chub: The gravel chub is not listed as endangered or threatened in Illinois but is on the Watch List and may be listed in the near future. Once fairly widespread in Illinois, the species now is restricted to the Rock River proper and isolated areas of the Vermilion River in Vermilion County and the Wabash River. The Vermilion River and Wabash River populations appear to be small; that in the Rock River is the only large population left in the state. The species requires fast-flowing water over clean gravel.

Mussels:

Three state endangered mussels (sheepnose, snuffbox, pyramid pigtoe) and five state threatened mussels (slippershell mussel, purple wartyback, spike, ebonyshell, black sandshell) have been reported from the Upper Rock River Assessment Area. A summary of the past occurrence of each threatened or endangered mussel in the area is given below. Data used in these summaries have been taken from Cummings and Mayer (1997) and the INHS Mollusk Collection database.

Sheepnose (SE): The sheepnose is a large river species and is very rarely encountered today. Like many of the species in this area it was historically widely distributed in the Mississippi and lower Rock rivers of Illinois. The only record of this species that might be attributed to

this assessment area was collected in Winnebago County sometime before 1921.

Snuffbox (SE): One subfossil shell was collected in the Rock River near Byron in 1996. The only remaining Illinois populations of this mussel occur in the Wabash River drainage in the southeastern part of the state.

Pyramid Pigtoe (SE): One subfossil shell was collected in the Rock River near Byron in 1996. The only remaining Illinois population of this mussel occurs in the Little Wabash River in Wayne County.

Slippershell mussel (ST): The slippershell is typically a small stream species. However, like many mussel species it can occasionally be found in atypical habitats. Several historical (mostly pre-1918) records exist in this area from the Rock River and Kent Creek. A dead shell was collected from North Fork Kent Creek near Rockford in 1998. The only potential populations of the slippershell in this area would be in the headwaters of the tributaries to the Rock River. Additional collecting in creeks in this area may reveal new localities for this species.

Purple wartyback (ST): No live purple wartybacks have been documented in over 70 years. It is most likely extirpated from the drainage.

Spike (ST): This mussel was widespread and common in Illinois as recently as the 1960s (Parmalee, 1967) but has since experienced a severe decline. In this area, it was found at over 20 localities in the Rock River and one locality on Kent Creek. In the past 30 years it has been found only as weathered-dead shells and it is likely extirpated from this area of the Rock River drainage.

Ebonyshell (ST): The ebony shell was historically widely distributed in the Upper Mississippi River. The only documented occurrence of this species in the assessment area was a shell collected near Castle Rock on 9 July 1905.

Black sandshell (ST): The black sandshell was historically widely distributed in the Rock River drainage but has experienced a severe decline in recent decades. The only known live occurrence of this mussel in the assessment area in the past 30 years was from below Grand Detour at the Illinois Route 2 bridge on 31 August 1986.

Eight species of crustaceans are known from this region (Table 22). None is considered threatened or endangered.

Current literature discussing federal and state listed threatened and endangered species, species under consideration for such listing, or other species considered rare or of special concern (Herkert 1992, 1994; Illinois Endangered Species Protection Board 1999; U.S. Department of Interior, Fish and Wildlife Service 1996, 1997) does not include any aquatic upper Rock River Assessment Area.

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) (Laird and Page 1996). It remains common in most areas of Illinois, including the Upper Rock River Assessment Area.

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

The rainbow trout is native to west coast drainages of North America. It has been stocked repeatedly in Lake Michigan (Laird and Page, 1996) in Lake Michigan (Laird & Page, 1996) Pine Creek and Kent Creek (Upper Rock), Waddams Creek and Yellow Creek (Pecatonica drainage) and the Kishwaukee drainage near Belvidere (Alec Pully, pers. comm.). Little suitable habitat exists for the species in Illinois.

The brown trout is native to Europe, Asia, and northern Africa. It has been stocked throughout much of the world, including Lake Michigan and streams in northern Illinois. It is stocked annually in Kent Creek at Page Park (Alec Pully, pers. comm.). It was collected in Rock River at Rockton in 1960 and in South Kinnikinnick Creek in 1999. There is little suitable habitat for the species in Illinois, and it is likely to remain uncommon (Laird and Page, 1996).

The Asian clam is widely distributed in the southeastern United States and is common in Illinois streams south of the Illinois River. The only known occurrence of the Asian clam in the Upper Rock River was collected from Pearl Lake in South Beloit in 1995. Effects of the Asian clam on native species and communities are difficult to measure, but some studies have suggested that it competes with native mussels for food (Leff et al., 1990).

The rusty crayfish was first reported in this region in 1977. The rusty crayfish is rapidly expanding its range and is contributing to declines in native crayfishes in Illinois, particularly the virile and clearwater crayfishes (Taylor and Redmer, 1996).

Of the aquatic macroinvertebrate taxa known or thought likely to occur in the Rock River Assessment Area (**Table 24**), 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, most likely introduced to the continent with imported aquatic and semiaquatic plants or other aquatic organisms. Originally thought to be restricted to thermally influenced habitats, *B. sowerbyi* is now commonly collected from a variety of stream and lake systems. This species is widespread throughout North America and Europe, and has been recorded from all continents except Antarctica. *Branchiura sowerbyi* does not appear to pose any threat to native populations of aquatic macroinvertebrates.

Unique Habitats Within the Upper Rock River Assessment Area

Four springs have been studied in the upper Rock River Assessment Area (Webb et al. 1998) - Meyers Spring and Wishing Spring (Ogle County), and Page Artesian Well and Rhule Spring (Winnebago County).

No caves are known to occur within the Rock River Assessment Area (Webb, Taylor, and Krejca 1993).

Information Gaps

The Upper Rock River Assessment Area has been well studied with respect to fishes, mussels, and crayfishes. However, additional survey work in the smaller tributaries would better define the limits of some of the species, and possibly uncover additional populations of state endangered and other rare species.

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

Major groups of aquatic macroinvertebrates known to occur in the upper Rock River Assessment Area (Table 24) have not been as well studied as the fishes, mussels, and crustaceans. Schacht (1974) and Brigham (1978) provided the most extensive surveys for aquatic macroinvertebrates in the Rock River Assessment Area basin, although over 25 years ago. Unfortunately, specimens were not usually identified below order or family level. Additional distributional records were provided by Wetzel et al. (1998) in their limited assessment of four sites in the upper Rock River basin; these have been included in Table 24.

Historical as well as recent faunal studies for aquatic macroinvertebrates occurring in Illinois include those for Coleoptera (beetles) (Wooldridge 1967; W. Brigham, unpublished), Ephemeroptera (mayflies) (Burks 1956), Plecoptera (stoneflies) (Frison 1935), Trichoptera (caddisflies) (Ross 1944), Hemiptera (true bugs) (Lauck 1959), Gerromorpha (Heteroptera) (Taylor 1996), Diptera (Malloch 1915a, b), mosquitoes (Ross 1947), Tabanidae (Pechumen et al. 1983), and Annelida (segmented worms) (Wetzel 1992). While historical and

recent collections of aquatic macroinvertebrates from Illinois streams are deposited in the permanent INHS Collections, much of this information is not easily retrievable because either specimens have not yet been identified, or the identified material has not yet been incorporated into searchable databases.

Once specimens have been identified and incorporated into appropriate databases, 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 2000 (IEPA, 2000) ranked the Rock River and most of the tributaries within the assessment area as having “Good Water Quality Conditions” (Full Support—water quality meets the needs of all designated uses protected by applicable water quality standards). Dry Creek, the headwaters of Mill Creek, and most of Mt. Morris Creek North have “Fair Water Quality Conditions” (Partial Support—water quality is impaired and the waterbody is only partially meeting the needs of its designated use). The remainder of the Upper Rock River Assessment Area was not rated.

The Biological Stream Characterization (Bertrand et al., 1996) rated Rock River upstream of U.S. Route 20 at Rockford, Kyte River upstream of Rocky Hollow Road, Leaf River upstream of Mud Creek, North Fork Kent Creek upstream of Springfield Avenue, Coon Creek, Mud Creek, North Kinnikinnick Creek, Pine Creek, and Prairie Creek as “Class B” Streams (Highly Valued Aquatic Resource). Rock River from its mouth up to U.S. Route 20 at Rockford, Kyte River from its mouth up to Rocky Hollow Road, Leaf River from its mouth up to Mud Creek, North Fork Kent Creek from its mouth up to Springfield Avenue, South Kinnikinnick Creek, Silver Creek, Steward Creek, and Willow Creek were rated as “Class C” Streams (Moderate Aquatic Resource). The remainder of the drainage within the assessment area was not rated

Smith (1971) rated the Rock River except where it borders or passes through highly urbanized or industrialized areas as “Good” and, in some areas as “Excellent.” He also rated the Leaf and Kyte rivers and Pine Creek as “Good” to “Excellent.”

Water Quality using Macroinvertebrates

Rock River Basin in Illinois—Of the 517 Rock River basin sites sampled by INHS biologists in 1976 (Brigham 1978), 54% of these were classified as unbalanced; 38% of the stations were classified as semi-polluted, 4% of the sites were classified as polluted, and 4% of the sites were classified as balanced. Of the nearly 300,000 macroinvertebrates collected from the 517 sites, only 6% of the taxa were classified as intolerant; 7% were classified as

moderate, 8% were classified as facultative. Of all the organisms collected during this study, 79% were classified as tolerant, with oligochaete worms (Annelida: Oligochaeta) and midges (Insecta: Diptera) predominating (74% of all organisms collected). Large concentrations of tolerant organisms were an artifact of sampling methodology - plate samplers, which often favor taxa occurring in silty conditions, were used at many of the stations (Brigham 1978). Sampling in the Rock River basin was conducted from mid- to late summer, and in early autumn of 1976. It is likely that low water levels from the drought conditions that year contributed to the substantial number of semi-polluted stations observed. As sampling progressed, small order 1 streams were virtually all discontinuous, or dry. An additional contributing factor to the high number of sites classified as semi-polluted was the infrequency of rock and gravel substrates, and riffle habitats. Many stations classified as semi-polluted did not lack or even have lower numbers of intolerant taxa, but rather had relatively extraordinary populations of taxa classified as moderate or facultative, such as caddisflies (Trichoptera: Hydropsychidae), beetles (Coleoptera), and true bugs (Heteroptera) (Brigham, 1978).

In 1995, Wetzel et al. (1998) conducted a limited survey for fishes, unionid mussels, and other aquatic macroinvertebrates at four sites in the upper Rock River basin. Two of these sites were located in Winnebago County: Rock River at Prairie Hill Road bridge, 1.7 mi S South Beloit, and Dry Creek (Rock River tributary) downstream of the Prairie Hill Road / Willowbrook Road intersection, 2.3 mi SE South Beloit. The other two sites were located on a tributary of Raccoon Creek in Rock County, Wisconsin, west of Beloit and just north of the state line. Raccoon Creek is a tributary of the Pecatonica River. Taxa identified from the two sites in Wisconsin occur within three miles of the Illinois state line and are known or presumed to occur in that drainage in Illinois and thus have been included in Table 24. During the study by INHS biologists in 1995 (Wetzel et al. 1998), qualitative collections from four sites yielded 2,864 aquatic macroinvertebrates constituting over 125 taxa. Dry Creek (Winnebago Co., Illinois) demonstrated the most evenly balanced community structure of the four sites. No taxon contributed over 20% the total collection. All other sites had one or two dominant taxa contributing greater than 20% representation. Notable among these were the two sites the unnamed tributary of the East Fork of Raccoon Creek (Rock Co., Wisconsin) — each had high proportions of *Pisidium* sp. (a peaclam) and *Physella* sp. (a physid snail). These are tolerant of organic enrichment and the low oxygen concentrations that often accompany enrichment (Hynes 1960; Pennak 1989). The chironomid midge, *Glyptotendipes* sp., a common inhabitant of organically polluted waters (Beck 1977), dominated the benthic community (26.6% of total) at the Rock River site. This taxon thrives in organic situations because it has a hemoglobin-like pigment that helps gather oxygen from the water, which confers a competitive advantage in organically enriched situations (Epler 1992). Dry Creek also displayed the highest total macroinvertebrate, Ephemeroptera/Plecoptera/Trichoptera (EPT), and chironomid taxa richness values of the four sites sampled. Though this site had the highest number of EPT taxa, none of them was particularly sensitive to organic enrichment or other watershed disturbances. Presently, no standard for EPT taxa richness exists for Illinois streams; nonetheless, the collection of 13 EPT taxa from a single visit would likely place this stream above the median EPT score for streams in the northern half of the state (R.E. DeWalt, INHS, unpublished data).

The Rock River also displayed high total taxa richness. Several pollution tolerant oligochaete worm taxa, chironomids, and aquatic beetles greatly augmented the total richness values here. Pollution sensitive EPT taxa were greatly under-represented for a stream of this size. Historically, the Rock River supported 18 species of Plecoptera alone (Frison 1935; INHS Plecoptera database). Half of these species have not been collected from the Rock River in over 30 years (DeWalt and Webb, in prep.). Historically, the Rock River also supported a large and in many ways unique Trichoptera and Ephemeroptera community (Ross 1944; Burks 1953). Many of the most sensitive species have not been recollected from historical localities, including South Beloit and Rockford, since the 1960s, although not for lack of effort (Brigham 1978).

Both sites on the unnamed tributary of the East Fork of Racoon Creek supported a very low diversity of taxa. This was not totally unexpected due to their small size and poor riparian habitat. These sites did, however, support several caddisfly species in the families Limnephilidae and Phryganeidae.

The INHS Plecoptera database provided historical stonefly records for six species that previously had been reported from this area. The two most sensitive species, *Agnetina capitata* and *Pteronarcys pictetii*, have not been collected in the area for 50 years; either they no longer occur there or only occur at low densities in isolated populations. The other four species are not particularly sensitive to stream disturbance. They all have an egg diapause that allows them to avoid the poorest water quality of the year, that of summer time (Stewart and Stark 1988). Hatching of eggs begins in the autumn and growth of immatures proceeds until spring. INHS databases for the mayflies and caddisflies in the Survey collections are incomplete at this time.

Historically (post-1900), seven species of winter stoneflies (*Allocapnia granulata*, *A. mystica*, *A. vivipara*, *Strophopteryx fasciata*, *Taeniopteryx burksi*, *T. nivalis*, and *T. parvula*) have been collected from the Rock River basin. Three of these - *Allocapnia mystica*, *S. fasciata*, and *T. parvula* - have not been collected since the 1930s, however. Although *Allocapnia vivipara* is the most common species of winter stonefly in Illinois, it has only been collected occasionally in the Rock River, Pecatonica River, and Green River drainages. *Allocapnia granulata* is well established along the Rock, Green, and Kishwaukee rivers. *Taeniopteryx burksi*, the most widespread winter stonefly in this area, occurs throughout the Rock River proper; populations of *T. burksi* are extant in the Green, the Pecatonica, and Kishwaukee rivers. *Taeniopteryx nivalis*, a northern species, was first collected in Illinois along the Fox River and its tributaries in 1960. During the past ten years, it has been collected widely along the upper Rock River, Green River, Pecatonica, River and Kishwaukee River (Webb, in prep.).

Most streams in the region have been moderately degraded by organic and inorganic enrichment due to municipal sewage, livestock wastes, and agricultural runoff. Few high quality stream reaches exist in the entire basin (Brigham 1978). Low dams, used to increase boat traffic on the Rock River, have created pools throughout most of the Illinois portion of the river, thus drastically altering natural current velocity and depth (Page et al. 1992).

Several stretches of the Rock River are listed by Page et al. (1992) as Biologically Significant Streams (BSS) — those known to support threatened, endangered, and watch list species of fishes, mussels, crustaceans, and/or aquatic vascular plants. No BSS segments, however, were in the vicinity of the proposed FAP 354 project corridor. Bertrand et al. (1996), of the Illinois EPA, listed no reaches of the Rock River as attaining their highest use value, Class A (a unique aquatic resource). They did, however, list the Rock River segment upstream of the U.S. Route 20 crossing at Rockford, north to the Wisconsin line, as Class B, a highly valued aquatic resource. Raccoon Creek, from the Wisconsin-Illinois state line downstream to its confluence with the Pecatonica River at Rockton, was rated a Class B resource. Page et al. (1992) categorized this stream as a BSS due to the presence of the Iowa darter, *Etheostoma exile*, listed as endangered in Illinois (Herkert 1994). They also noted that the stream was channelized with a silt and clay bottom and had little potential as a preservation site for the darter.

Biologically Significant Streams

Rock River from Honey Creek to Clear Creek in Ogle County was recognized as a Biologically Significant Stream because of the presence of the gravel chub in the large rocky riffles and runs (Page et al., 1992). This segment of the Rock River is a moderately large stream with gravel and cobble riffles and sandy pools and runs. In some areas, the shoreline is wooded. This stream segment provides the best opportunity in the assessment area for the protection of large numbers of native aquatic species.

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/m² in 1986 to 0/m² 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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*An asterisk indicates those records which were used to compile the flora of the URRAA in Appendices (1&2) and Threatened/Endangered Species Localities (Table 5).

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Appendix 1.

List of vascular plant species known from the Upper Rock River
Assessment Area and their known habitats in the area.

Common name ^{1,2}	Vegetation Type Specific Community Scientific Name ^{1,2}	FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
		Up	Fp	Sf	Pr	Sp	Hp	Gp/ Gp	S	Ss	Ma	Sm	Sp/ Se/Fe	Po/ Rv	Bo	Cliff	
Agrimony, roadside*	<i>Agrimonia striata</i> *																x
Agrimony, soft	<i>Agrimonia pubescens</i>	x		x													
Agrimony, swamp	<i>Agrimonia parviflora</i>	x	x								x						
Agrimony, tall	<i>Agrimonia gryposepala</i>	x	x	x					x	x	x						
Alder, black*	<i>Alnus glutinosa</i> *		x														x
Alfalfa*	<i>Medicago sativa</i> *																x
Allegheny vine*	<i>Adlumia fungosa</i> *																x
Alumroot, prairie	<i>Heuchera richardsonii</i>				x	x	x	x									
Alumroot, tall	<i>Heuchera americana</i>	x			x				x								
Amaranth, green	<i>Amaranthus hybridus</i>																x
American feverfew	<i>Parthenium integrifolium</i>				x	x	x	x	x	x							
American hazelnut	<i>Corylus americana</i>	x		x	x	x	x	x	x	x							
American spikenard	<i>Aralia racemosa</i>	x															
Anemone, Carolina	<i>Anemone caroliniana</i>						x										
Anemone, meadow	<i>Anemone canadensis</i>		x		x						x						
Anemone, tall	<i>Anemone virginiana</i>	x	x	x			x		x	x							

Vegetation Type		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Anemone, wood	<i>Anemone quinquefolia</i>	x		x						x							
Angelica	<i>Angelica atropurpurea</i>		x		x							x	x				
Anise root	<i>Osmorhiza longistylis</i>	x	x	x					x								
Apple*	<i>Malus pumila*</i>																x
Arrowhead, arum leaved	<i>Sagittaria cuneata</i>										x			x			
Arrowhead, common	<i>Sagittaria latifolia</i>										x		x	x			
Arrowleaf, short-beaked	<i>Sagittaria brevirostra</i>										x						
Arrowwood, downy	<i>Viburnum rafinesquianum</i>	x															
Ash, American	<i>Fraxinus americana</i>	x	x						x								
Ash, american mountain - SE	<i>Sorbus americana - SE</i>														x	x	
Ash, black	<i>Fraxinus nigra</i>		x										x				
Ash, blue	<i>Fraxinus quadrangulata</i>	x															
Ash, green	<i>Fraxinus pennsylvanica</i>		x								x						x
Ash, prickly	<i>Zanthoxylum americanum</i>	x		x			x		x	x							
Ash, wafer	<i>Ptelea trifoliata</i>	x		x		x	x			x						x	
Asparagus, garden*	<i>Asparagus officinalis*</i>				x												x
Aspen, big-tooth	<i>Populus grandidentata</i>	x		x			x		x	x							
Aspen, quaking	<i>Populus tremuloides</i>	x		x		x	x		x	x							
Aster, aromatic	<i>Aster oblongifolius</i>	x		x		x	x										
Aster, arrow-leaved	<i>Aster sagittifolius</i>	x															
Aster, bushy	<i>Aster dumosus</i>			x		x											
Aster, Drummond's	<i>Aster drummondii</i>	x			x				x								
Aster, flat-top	<i>Aster umbellatus</i>			x						x							
Aster, flax-leaved	<i>Aster linariifolius</i>			x		x				x							
Aster, forked – ST	<i>Aster furcatus – ST</i>	x											x				
Aster, golden	<i>Heterotheca camporum</i> - NG					x				x							

Vegetation Type Specific Community		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Aster, hairy	<i>Aster pilosus</i>		x								x						x
Aster, heart-leaved	<i>Aster cordifolius</i>	x		x													
Aster, heath	<i>Aster ericoides</i>				x	x	x	x	x								
Aster, New England	<i>Aster novae-angliae</i>				x				x								
Aster, Ontario	<i>Aster ontarionis</i>		x														
Aster, panicked	<i>Aster simplex</i>		x								x		x				
Aster, short's	<i>Aster shortii</i>	x				x			x								
Aster, side-flowering	<i>Aster lateriflorus</i>		x														
Aster, silky	<i>Aster sericeus</i>					x	x			x							
Aster, sky-blue	<i>Aster azureus</i>				x	x	x	x	x								
Aster, smooth blue	<i>Aster laevis</i>				x	x			x	x							
Aster, swamp	<i>Aster firmus</i>											x	x				
Aster, swamp	<i>Aster puniceus</i>										x	x	x				
Aster, willow-leaved	<i>Aster praealtus</i>				x												
Aunt Lucy	<i>Ellisia nyctelea</i>		x														x
Avens, rough	<i>Geum laciniatum</i>		x								x		x				
Avens, spring	<i>Geum verum</i>		x														x
Avens, white	<i>Geum canadense</i>	x	x	x													
Avens, yellow	<i>Geum aleppicum</i>										x	x	x				
Bachelor's button*	<i>Centaurea cyanus*</i>																x
Baneberry, red	<i>Actaea rubra</i>	x		x													
Barberry, common*	<i>Berberis vulgaris*</i>																x
Barberry, Japanese*	<i>Berberis thunbergii*</i>	x			x	x			x	x							x
Basswood, American	<i>Tilia americana</i>	x		x													
Bastard toad-flax	<i>Comandra umbellata</i>				x	x	x	x	x	x							
Bean, trailing wild	<i>Strophostyles helvula</i>			x		x				x							
Bearberry - SE	<i>Arctostaphylos uva-ursi</i>					x				x						x	

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Vegetation Type Specific Community		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Birdweed, black*	<i>Polygonum convolvulus</i> *	x															x
Bishop's cap	<i>Mitella diphylla</i>	x														x	
Bittersweet	<i>Celastrus scandens</i>	x								x							
Bittersweet, oriental*	<i>Celastrus orbiculatus</i> *	x															x
Black haw	<i>Viburnum prunifolium</i>	x															
Black medic*	<i>Medicago lupulina</i> *				x		x										x
Black snakeroot	<i>Sanicula marilandica</i>	x							x								
Black snakeroot, Canadian	<i>Sanicula canadensis</i>	x	x	x					x								
Black snakeroot, clustered	<i>Sanicula gregaria</i>	x	x	x													
Black-eyed Susan	<i>Rudbeckia hirta</i>				x	x	x	x	x	x							
Black-eyed Susan, sweet	<i>Rudbeckia subtomentosa</i>		x		x						x						
Blackberry, common	<i>Rubus allegheniensis</i>	x		x	x	x	x		x	x							x
Blackberry, highbush	<i>Rubus argutus</i>	x							x								
Blackberry, Yankee	<i>Rubus pensylvanicus</i> -NG	x		x	x	x	x		x	x							x
Bladdernut	<i>Staphylea trifolia</i>	x	x	x													
Blazing star, cylindrical	<i>Liatris cylindracea</i>				x		x										
Blazing star, prairie	<i>Liatris pycnostachya</i>				x			x					x				
Blazing star, rough	<i>Liatris aspera</i>				x	x		x	x	x							
Bleeding heart, wild*	<i>Dicentra eximia</i> *													x			
Bloodroot	<i>Sanguinaria canadensis</i>	x	x														
Blue curls	<i>Trichostema dichotomum</i>	x			x		x										
Blue flag	<i>Iris virginica</i> var. <i>shrevei</i>		x								x	x	x	x			
Blue vine	<i>Cynanchum laeve</i>		x														x
Blue-eyed-Mary	<i>Collinsia verna</i>		x														
Blueberry, Canada	<i>Vaccinium myrtilloides</i>	x								x						x	
Blueberry, early low	<i>Vaccinium angustifolium</i>	x		x						x						x	
Blueberry, late low-bush	<i>Vaccinium pallidum</i>	x		x						x						x	

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Vegetation Type Specific Community		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Butter-and-eggs*	<i>Linaria vulgaris</i> *																x
Buttercup, creeping*	<i>Ranunculus repens</i> *																x
Buttercup, early	<i>Ranunculus fascicularis</i>	x				x	x		x	x							
Buttercup, hooked	<i>Ranunculus recurvatus</i>	x	x	x													
Buttercup, little-leaf	<i>Ranunculus abortivus</i>	x	x	x													x
Buttercup, prairie - ST	<i>Ranunculus rhomboideus</i> - ST				x			x									
Buttercup, rough	<i>Ranunculus hispidus</i>		x										x				
Buttercup, swamp	<i>Ranunculus septentrionalis</i>		x								x						
Buttercup, tall*	<i>Ranunculus acris</i> *																x
Buttercup, yellow water	<i>Ranunculus flabellaris</i>										x			x			
Butterfly weed	<i>Asclepias tuberosa</i>				x	x	x	x	x	x							
Butternut	<i>Juglans cinerea</i>	x															
Buttonbush	<i>Cephalanthus occidentalis</i>		x								x	x		x			
Buttonwood	<i>Platanus occidentalis</i>		x														x
Calamint, low	<i>Calamintha arkansana</i>							x					x				
Campion, glaucous*	<i>Silene cserei</i> *					x	x										x
Campion, snowy	<i>Silene nivea</i>	x	x										x				
Campion, starry	<i>Silene stellata</i>	x		x					x	x							
Campion, white*	<i>Lychnis alba</i> * (<i>Silene latifolia</i>)																x
Canadian yew	<i>Taxus canadensis</i>	x														x	
Cancer-root	<i>Orobancha uniflora</i>	x															
Cardinal flower	<i>Lobelia cardinalis</i> - NG		x								x						
Carpet bugle*	<i>Ajuga reptans</i> *- NG													x			x
Carpet weed	<i>Mollugo verticillata</i>		x			x											x
Carrion flower, common	<i>Smilax lasioneuron</i>	x		x		x				x							

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Vegetation Type Specific Community Common name ^{1,2} Scientific Name ^{1,2}	FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Clover, yellow sweet*				x		x										x
Clubmoss, bog - SE					x											
Clubmoss, cliff	x														x	
Clubmoss, ground pine - SE	x		x		x										x	
Clubmoss, ground pine*	x															x
Clubmoss, running pine - SE	x														x	
Clubmoss, shining	x													x	x	
Cocklebur		x														x
Cohosh, black																x
Cohosh, blue	x															
Columbine	x		x					x	x						x	
Compass plant				x		x										
Coneflower, gray-headed				x	x	x		x	x							
Coneflower, pale				x	x	x	x									
Coontail													x			
Coontail, spiny													x			
Coralberry	x	x	x													x
Coreopsis, golden*										x						x
Coreopsis, prairie				x	x	x		x	x							
Coreopsis, sand					x				x							
Coreopsis, tall				x				x								
Corydalis, pale		x														
Corydalis, pink - SE															x	
Corydalis, slender					x											x
Cotton grass, narrow leaved												x				

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Vegetation Type Specific Community		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Dwarf fleabane	<i>Conyza ramosissima</i>					x											x
Early cudweed	<i>Gnaphalium purpureum</i>																x
Elder, red-berried - SE	<i>Sambucus pubens</i> - SE	x													x		
Elderberry	<i>Sambucus canadensis</i>	x	x								x	x	x	x			x
Elm, American	<i>Ulmus americana</i>		x														
Elm, rock - SE	<i>Ulmus thomasi</i> - SE	x															
Elm, Siberian*	<i>Ulmus pumila</i> *																x
Elm, slippery	<i>Ulmus rubra</i>	x	x	x													
Euonymus, winged	<i>Euonymus alata</i> *	x															x
Evening primrose, common	<i>Oenothera biennis</i>				x	x	x	x									x
Evening, toothed evening*	<i>Calylophus serrulatus</i> *																x
False arrow feather	<i>Aristida intermedia</i>					x											
False buckwheat, climbing	<i>Polygonum scandens</i>	x	x	x		x					x	x	x				
False Tarragon - SE	<i>Artemisia dracunculus</i> - SE					x		x		x							
Fame flower	<i>Talinum rugospermum</i>			x		x				x						x	
Fat-hen saltbush*	<i>Atriplex patula</i> *																x
Fern, berry bladder	<i>Cystopteris bulbifera</i>	x														x	
Fern, bracken	<i>Pteridium aquilinum</i> var. <i>latiusculum</i>	x		x		x				x						x	
Fern, broad beech	<i>Phegopteris hexagonoptera</i>	x															
Fern, bronze	<i>Botrychium dissectum</i>	x	x	x					x								
Fern, Christmas	<i>Polystichum acrostichoides</i>	x															
Fern, cinnamon	<i>Osmunda cinnamomea</i>	x		x		x				x						x	
Fern, cliff	<i>Woodsia obtusa</i>	x		x												x	
Fern, common wood, intermediate	<i>Dryopteris intermedia</i>	x															
Fern, crested shield	<i>Dryopteris cristata</i>												x		x		

Vegetation Type Specific Community Common name ^{1,2} Scientific Name ^{1,2}		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
		Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Fern, ebony spleenwort	<i>Asplenium platyneuron</i>	x		x					x	x						x	
Fern, fragile	<i>Cystopteris fragilis</i> var. <i>protrusa</i>	x		x													
Fern, grape - SE	<i>Botrychium multifidum</i> - SE					x				x					x		
Fern, hairy lip	<i>Cheilanthes lanosa</i>															x	
Fern, hybrid fragile	<i>Cystopteris</i> x <i>tenuis</i>	x														x	
Fern, interrupted	<i>Osmunda claytoniana</i>	x		x		x				x						x	
Fern, lady	<i>Athyrium angustum</i>	x		x													
Fern, long beech - SE	<i>Phegopteris connectilis</i> - SE	x														x	
Fern, maidenhair	<i>Adiantum pedatum</i>	x	x														
Fern, marginal shield	<i>Dryopteris marginalis</i>	x															
Fern, marsh	<i>Thelypteris palustris</i> var. <i>pubescens</i>										x		x				
Fern, northern adder's tongue	<i>Ophioglossum vulgatum</i> var. <i>pseudopodium</i>	x	x														
Fern, Oak- SE	<i>Gymnocarpium dryopteris</i> - SE	x														x	
Fern, Oneida grape	<i>Botrychium oneidense</i>	x															
Fern, ostrich	<i>Matteuccia struthiopteris</i>	x											x				
Fern, polypody	<i>Polypodium virginianum</i>	x														x	
Fern, purple cliff brake	<i>Pellaea atropurpurea</i>															x	
Fern, purple cliff brake	<i>Pellaea glabella</i>															x	
Fern, rattlesnake	<i>Botrychium virginianum</i>	x	x						x								
Fern, royal	<i>Osmunda regalis</i>			x		x				x							
Fern, rusty woodsia – SE	<i>Woodsia ilvensis</i> – SE															x	
Fern, sensitive	<i>Onoclea sensibilis</i>		x								x	x	x		x		

Vegetation Type Specific Community		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Fern, slender cliff-brake	<i>Cryptogramma stelleri</i>															x	
Fern, spinulose wood	<i>Dryopteris carthusiana</i>	x		x						x							
Fern, spleenwort silvery	<i>Athyrium thelypteroides</i>	x															
Fern, sweet - SE	<i>Comptonia peregrina</i> - SE			x		x				x							
Fern, walking	<i>Asplenium rhizophyllum</i>	x														x	
Fescue, meadow*	<i>Festuca pratensis</i> *				x												x
Fescue, nodding	<i>Festuca obtusa</i>	x		x						x							
Fescue, sheep*	<i>Festuca ovina</i> *																x
Fescue, six weeks	<i>Vulpia octoflora</i>					x	x			x						x	x
Fescue, tall*	<i>Festuca elatior</i> * (<i>F. arundinacea</i>)				x				x								x
Figwort, early	<i>Scrophularia lanceolata</i>	x		x						x							
Figwort, late	<i>Scrophularia marilandica</i>	x		x					x	x							
Fire-on-the-Mountain	<i>Poinsettia cyathophora</i>																x
Fireweed	<i>Epilobium angustifolium</i>														x		
Fireweed	<i>Erechtites hieracifolia</i>	x		x		x			x	x							
Flax, grooved yellow	<i>Linum sulcatum</i>				x	x		x		x							
Fleabane, annual	<i>Erigeron annuus</i>				x	x	x	x	x	x							x
Fleabane, marsh	<i>Erigeron philadelphicus</i>	x	x	x	x						x						
Fleabane, daisy	<i>Erigeron strigosus</i>			x	x	x	x	x	x	x							x
Flower-of-an-hour*	<i>Hibiscus trionum</i> *																x
Fog fruit	<i>Phyla lanceolata</i>										x	x	x				x
Forget-me-not, common*	<i>Myosotis scorpiodes</i> *		x														x
Forget-me-not, white	<i>Myosotis verna</i>	x															x
Foxglove, eared false - ST	<i>Tomanthera auriculata</i> -ST				x	x			x	x							
Foxglove, false	<i>Agalinis purpurea</i> -NG					x					x						

Vegetation Type Specific Community Common name ^{1,2} Scientific Name ^{1,2}		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
		Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Ginseng	<i>Panax quinquefolius</i>	x															
Goat's beard, common*	<i>Tragopogon pratensis</i> *																x
Goat's beard, sand*	<i>Tragopogon dubius</i> *					x	x			x							x
Golden Alexanders	<i>Zizia aurea</i>	x			x					x							
Golden seal	<i>Hydrastis canadensis</i>	x															
Goldenrod, bog	<i>Solidago uliginosa</i> -NG										x	x	x				
Goldenrod, broad-leaved	<i>Solidago flexicaulis</i>	x		x									x			x	
Goldenrod, Canada	<i>Solidago canadensis</i>				x	x	x		x								x
Goldenrod, early	<i>Solidago juncea</i>				x	x				x							x
Goldenrod, elm leaved	<i>Solidago ulmifolia</i>	x							x								
Goldenrod, hairy	<i>Solidago hispida</i>	x					x									x	
Goldenrod, hairy grass-leaved	<i>Euthamia graminifolia</i>				x	x					x	x					x
Goldenrod, late	<i>Solidago gigantea</i>		x		x				x		x	x	x				
Goldenrod, Missouri	<i>Solidago missouriensis</i>				x	x	x			x							x
Goldenrod, Ohio	<i>Solidago ohioensis</i> -NG												x				
Goldenrod, old field	<i>Solidago nemoralis</i>				x	x	x	x		x							x
Goldenrod, Riddell's	<i>Solidago riddellii</i>				x							x	x				
Goldenrod, rigid	<i>Solidago rigida</i>				x	x	x		x	x							
Goldenrod, showy	<i>Solidago speciosa</i>					x	x		x	x							
Goldenrod, stiff aster	<i>Solidago ptarmicoides</i>					x	x	x									
Goldenrod, swamp	<i>Solidago patula</i>										x		x				
Goldenrod, viscid grass-leaved	<i>Euthamia gymnospermoides</i>					x											
Gooseberry, Missouri	<i>Ribes missouriense</i>	x	x	x													
Gooseberry, prickly wild	<i>Ribes cynosbati</i>	x		x							x	x	x				
Goosefoot, maple-leaved	<i>Chenopodium gigantospermum</i>	x	x														
Goosefoot, Missouri	<i>Chenopodium missouriense</i>		x														
Goosefoot, narrow-leaved	<i>Chenopodium desiccatum</i>					x				x							x

Vegetation Type		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
	<i>var. leptophylloides</i>																
Goosefoot, oak leaved*	<i>Chenopodium glaucum*</i>																X
Goosefoot, woodland	<i>Chenopodium standleyanum</i>	X				X											
Grape, frost	<i>Vitis vulpina</i>	X															X
Grape, riverbank	<i>Vitis riparia</i>	X	X			X	X			X							X
Grape, summer	<i>Vitis aestivalis</i>	X															
Grass, alkali*	<i>Puccinellia distans*</i>																X
Grass, annual blue*	<i>Poa annua*</i>																X
Grass, arrow feather	<i>Aristida purpurescens</i>					X											
Grass, barnyard*	<i>Echinochloa crus-galli*</i>		X								X						X
Grass, bead	<i>Paspalum ciliatifolium</i>					X	X			X							
Grass, beak	<i>Diarrhena americana</i>	X	X														
Grass, bearded wheat - SE	<i>Elymus trachycaulum - SE</i>				X												
Grass, big bluestem	<i>Andropogon gerardii</i>				X	X	X		X								X
Grass, blue joint	<i>Calamagrostis canadensis</i>				X						X	X	X	X			X
Grass, blue-eyed	<i>Sisyrinchium angustifolium</i>		X		X												
Grass, blue-eyed	<i>Sisyrinchium mucronatum</i>					X											
Grass, bottlebrush	<i>Elymus hystrix</i>	X		X					X								
Grass, broad-leaved panic	<i>Panicum latifolium</i>	X							X								
Grass, buffalo	<i>Buchloe dactyloides</i>				X	X											
Grass, bulbous blue*	<i>Poa bulbifera*</i>																X
Grass, Canada wild rye	<i>Elymus canadensis</i>	X			X	X	X		X	X							
Grass, Canadian blue*	<i>Poa compressa*</i>					X	X			X							X
Grass, catchfly	<i>Leersia lenticularis</i>										X						
Grass, cheat*	<i>Bromus secalinus*</i>					X											X
Grass, common blue-eyed	<i>Sisyrinchium albidum</i>				X	X			X								
Grass, common reed	<i>Phragmites australis</i>										X						X

Vegetation Type Specific Community		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Grass, common satin	<i>Muhlenbergia frondosa</i>		x														x
Grass, creeping love	<i>Eragrostis hypnoides</i>		x								x		x	x			
Grass, cup*	<i>Eriochloa villosa</i> *																x
Grass, Curtiss' three awn	<i>Aristida curtissii</i>				x	x											
Grass, downy brome*	<i>Bromus tectorum</i> *					x				x							x
Grass, ear-leaved brome	<i>Bromus purgans</i>	x	x						x								
Grass, eel	<i>Vallisneria americana</i>													x			
Grass, fall panicum	<i>Panicum dichotomiflorum</i>													x			x
Grass, fall witch	<i>Leptoloma cognatum</i>					x				x							
Grass, floating manna	<i>Glyceria septentrionalis</i>										x			x			
Grass, forked-tip three-awn	<i>Aristida basiramea</i>					x	x			x							
Grass, fowl blue	<i>Poa palustris</i>										x	x					
Grass, fowl manna	<i>Glyceria striata</i>		x								x	x	x		x		
Grass, fringed brome	<i>Bromus ciliatus</i>											x	x				
Grass, hair	<i>Agrostis hyemalis</i>	x				x	x			x							
Grass, hairy brome*	<i>Bromus commutatus</i> *																x
Grass, hairy crab*	<i>Digitaria sanguinalis</i> *																x
Grass, hairy grama	<i>Bouteloua hirsuta</i> - NG					x	x										
Grass, ice cream	<i>Eragrostis trichodes</i>					x											
Grass, Indian	<i>Sorghastrum nutans</i>				x	x	x		x	x							
Grass, Italian rye*	<i>Lolium multiflorum</i> *				x												x
Grass, Japanese chess*	<i>Bromus japonicus</i> *																x
Grass, June	<i>Koeleria cristata</i>					x	x	x		x							
Grass, Kentucky blue*	<i>Poa pratensis</i> *				x	x	x										x
Grass, leafy satin	<i>Muhlenbergia mexicana</i>		x								x		x				
Grass, little bluestem	<i>Schizachyrium scoparium</i>				x	x	x	x	x	x							
Grass, long-awned wood	<i>Brachyelytrum erectum</i>	x							x								

Vegetation Type Specific Community		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Grass, long-stalked panic	<i>Panicum perlongum</i>					x	x										
Grass, love	<i>Eragrostis capillaris</i>																x
Grass, manna	<i>Glyceria grandis</i>				x						x						
Grass, marsh timothy	<i>Muhlenbergia glomerata</i>										x	x	x				
Grass, northern panic - SE	<i>Panicum boreale</i> - SE					x									x		
Grass, northern rush	<i>Sporobolus vaginiflorus</i>						x			x							
Grass, old field panic	<i>Panicum implicatum</i>	x				x			x	x							x
Grass, old witch	<i>Panicum capillare</i>					x											x
Grass, orchard*	<i>Dactylis glomerata</i> *				x												x
Grass, perennial rye*	<i>Lolium perenne</i> *				x												x
Grass, plains three awn	<i>Aristida oligantha</i>					x	x										x
Grass, porcupine	<i>Stipa spartea</i>				x	x	x	x	x	x							
Grass, poverty oat	<i>Danthonia spicata</i>	x							x								
Grass, prairie blue-eyed	<i>Sisyrinchium campestre</i>				x	x	x		x	x							
Grass, prairie brome	<i>Bromus kalmii</i>				x				x								
Grass, prairie cord	<i>Spartina pectinata</i>				x							x					x
Grass, prairie dropseed	<i>Sporobolus heterolepis</i>				x	x											
Grass, prairie panic	<i>Panicum leibergii</i>				x		x		x								
Grass, prairie switch	<i>Panicum virgatum</i>				x	x	x	x	x								x
Grass, prairie wedge	<i>Sphenopholis obtusata</i>	x			x		x		x								
Grass, purple love	<i>Eragrostis spectabilis</i>				x	x	x		x	x							
Grass, purpletop	<i>Tridens flavus</i>																x
Grass, quack*	<i>Agropyron repens</i> *		x			x	x										x
Grass, redtop*	<i>Agrostis alba</i> *	x			x												x
Grass, reed canary*	<i>Phalaris arundinacea</i> *		x								x						x
Grass, rice	<i>Oryzopsis racemosa</i>	x							x							x	
Grass, rice cut	<i>Leersia oryzoides</i>		x								x	x	x	x			

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Vegetation Type Specific Community		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Loosestrife, garden	<i>Lysimachia vulgaris</i> *																x
Loosestrife, lance-leaved	<i>Lysimachia lanceolata</i>				x	x											
Loosestrife, narrow-leaved	<i>Lysimachia quadriflora</i>		x								x	x	x				
Loosestrife, purple*	<i>Lythrum salicaria</i> *										x	x		x			
Loosestrife, river	<i>Lysimachia hybrida</i>											x		x			
Loosestrife, swamp	<i>Decodon verticillatus</i>										x				x		
Loosestrife, tufted	<i>Lysimachia thysiflora</i>										x	x					
Loosestrife, winged	<i>Lythrum alatum</i>										x		x				
Lopseed	<i>Phryma leptostachya</i>	x	x	x													
Lousewort	<i>Pedicularis canadensis</i>				x	x	x		x	x							
Lupine, wild	<i>Lupinus perennis</i>					x				x							
Madder, wild	<i>Galium obtusum</i>		x								x	x					
Mallow, clustered poppy	<i>Callirhoe triangulata</i> -NG					x				x							
Mallow, glade	<i>Napaea dioica</i>		x														x
Maple, black	<i>Acer nigrum</i>	x											x				
Maple, boxelder	<i>Acer negundo</i>		x														x
Maple, silver	<i>Acer saccharinum</i>		x														x
Maple, silver	<i>Acer saccharum</i>	x	x														
Marbleseed	<i>Onosmodium hispidissimum</i>	x						x									
Marbleseed, downy	<i>Onosmodium molle</i> <i>var. occidentale</i>	x															
Marigold, fetid*	<i>Dyssodia papposa</i> *																x
Marigold, nodding bur	<i>Bidens cernua</i>		x								x	x	x	x			
Marigold, tall swamp	<i>Bidens coronata</i>		x								x						
Marijuana*	<i>Cannabis sativa</i> *																x
Marsh marigold	<i>Caltha palustris</i>												x				
May apple	<i>Podophyllum peltatum</i>	x	x	x					x								

Vegetation Type Specific Community Common name ^{1,2} Scientific Name ^{1,2}		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
		Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Mayflower, Canada	<i>Maianthemum canadense</i>	x		x						x					x	x	
Meadowsweet	<i>Spiraea alba</i>				x	x					x	x	x				
Mermaid, false	<i>Floerkea proserpinacoides</i> -NG	x	x														
Milfoil, common*	<i>Achillea millefolium</i> *				x	x	x										x
Milkweed, common	<i>Asclepias syriaca</i>				x												x
Milkweed, green	<i>Asclepias viridiflora</i>				x	x	x	x		x							
Milkweed, horsetail	<i>Asclepias verticillata</i>				x	x	x	x	x	x							x
Milkweed, poke	<i>Asclepias exaltata</i>	x															
Milkweed, purple	<i>Asclepias purpurascens</i>	x		x			x		x	x							
Milkweed, sand	<i>Asclepias amplexicaulis</i>					x				x							
Milkweed, Sullivant's	<i>Asclepias sullivantii</i>				x												
Milkweed, swamp	<i>Asclepias incarnata</i>				x						x	x	x				
Milkweed, tall green	<i>Asclepias hirtella</i>					x	x										
Milkweed, whorled	<i>Asclepias quadrifolia</i>	x							x								
Milkweed, woolly – SE	<i>Asclepias lanuginosa</i> – SE							x									
Milkwort, cross	<i>Polygala cruciata</i> var. <i>aquilonia</i>					x				x							
Milkwort, field	<i>Polygala sanguinea</i>				x	x	x			x							
Milkwort, purple	<i>Polygala polygama</i> var. <i>obtusata</i>					x				x							
Milkwort, whorled	<i>Polygala verticillata</i> var. <i>isocycla</i>				x	x	x			x							
Mint, foxtail	<i>Mentha arvensis</i> var. <i>villosa</i>										x	x	x				
Mint, horse	<i>Monarda punctata</i> -NG			x		x				x							
Mint, Ohio horse	<i>Blephilia ciliata</i>	x							x								
Mint, spear*	<i>Mentha spicata</i> *										x		x				x

Vegetation Type		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Mint, wood	<i>Blephilia hirsuta</i>	x	x														
Moneywort*	<i>Lysimachia nummularia*</i>		x														x
Monkey flower	<i>Mimulus ringens</i>		x								x	x	x				
Monkey flower, yellow - SE	<i>Mimulus glabratus</i> - SE												x				
Moonseed	<i>Menispermum canadense</i>	x	x														
Morning glory, common*	<i>Ipomoea purpurea*</i>																x
Morning glory, ivy-leaved*	<i>Ipomoea hederacea*-NG</i>																x
Motherwort*	<i>Leonurus cardiaca*</i>		x														x
Mountain mint, common	<i>Pycnanthemum virginianum</i>				x	x					x	x	x				
Mountain mint, hairy	<i>Pycnanthemum pilosum</i>	x					x		x								
Mulberry, red	<i>Morus rubra</i>	x	x														
Mulberry, white*	<i>Morus alba*</i>	x															x
Mullein, moth*	<i>Verbascum blattaria*-NG</i>																x
Mullein, woolly*	<i>Verbascum thapsus*</i>				x	x	x										x
Mustard, black*	<i>Brassica nigra*</i>																x
Mustard, garlic*	<i>Alliaria petiolata*</i>	x	x	x													x
Mustard, hedge*	<i>Sisymbrium officinale*</i>																x
Mustard, indian*	<i>Brassica juncea*</i>																x
Mustard, tansy*	<i>Descurainia pinnata*</i>																x
Mustard, tower	<i>Arabis glabra</i>		x			x		x									
Mustard, tumble*	<i>Sisymbrium altissimum*</i>				x	x											x
Mustard, wormseed*	<i>Erysimum cheiranthoides*</i>																x
Nannyberry	<i>Viburnum lentago</i>	x															
Nettle, Canada wood	<i>Laportea canadensis</i>		x														
Nettle, false	<i>Boehmeria cylindrica</i>		x								x			x			
Nettle, smooth hedge	<i>Stachys tenuifolia</i>		x		x						x	x	x				
Nettle, tall	<i>Urtica dioica</i>		x								x	x	x				

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Vegetation Type Specific Community Common name ^{1,2} Scientific Name ^{1,2}		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
		Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Pea, scurf	<i>Psoralea tenuiflora</i>						x	x									
Pennsylvania pellitory	<i>Parietaria pensylvanica</i>	x	x														
Pennyroyal, American	<i>Hedeoma pulegioides</i>	x					x		x	x							
Pennyroyal, false	<i>Trichostema brachiatum</i>				x		x	x					x				
Pennyroyal, rough	<i>Hedeoma hispida</i>			x		x	x			x							
Peppergrass, common	<i>Lepidium virginicum</i>																x
Peppergrass, small*	<i>Lepidium densiflorum*</i>																x
Petunia, wild	<i>Ruellia humilis</i>	x			x	x	x										
Phlox, blue	<i>Phlox divaricata</i>	x	x														
Phlox, cleft	<i>Phlox bifida</i>					x	x			x							
Phlox, prairie	<i>Phlox pilosa</i>				x	x			x	x							
Phlox, smooth	<i>Phlox glaberrima</i>				x								x				
Pigweed, rough	<i>Amaranthus retroflexus</i>					x											x
Pigweed, spiny*	<i>Amaranthus spinosus*</i>																x
Pigweed, winged	<i>Cycloloma atriplicifolium</i>					x				x							x
Pimpernel, false	<i>Lindernia dubia</i>		x								x			x			
Pimpernel, yellow	<i>Taenidia integerrima</i>	x			x		x		x								
Pine, jack - SE (extirpated)	<i>Pinus banksiana</i> - SE																x
Pine, red*	<i>Pinus resinosa*</i>																x
Pine, white	<i>Pinus strobus</i>	x														x	
Pineapple weed*	<i>Matricaria matricarioides*</i>																x
Pinweed	<i>Hypericum gentianoides</i>					x				x						x	
Pinkweed	<i>Polygonum pensylvanicum</i>		x								x	x	x	x			
Pinweed, bushy	<i>Lechea stricta</i>			x		x	x			x							
Pinweed, hairy	<i>Lechea villosa</i>			x		x				x							
Pinweed, narrow-leaved	<i>Lechea tenuifolia</i>			x		x	x			x							
Pinweed, pretty	<i>Lechea pulchella</i>			x						x							

Vegetation Type Specific Community		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Pinweed, small	<i>Lechea minor</i>									x						x	
Pipes	<i>Equisetum fluviatile</i>										x			x			
Pipsissewa - SE	<i>Chimaphila umbellata</i> - SE			x													
Plantain, dwarf	<i>Plantago virginica</i>					x										x	
Plantain, English*	<i>Plantago lanceolata</i> *																x
Plantain, pale Indian	<i>Cacalia atriplicifolia</i>	x							x								
Plantain, prairie Indian	<i>Cacalia plantaginea</i>				x	x			x	x							
Plantain, rattlesnake	<i>Goodyera pubescens</i>	x		x												x	
Plantain, red-stalked	<i>Plantago rugelii</i>																x
Plantain, robin's	<i>Erigeron pulchellus</i>	x				x	x		x	x							
Plantain, sweet Indian	<i>Cacalia suaveolens</i>											x	x				
Plantain, woolly	<i>Plantago patagonica</i>					x	x			x							
Plantain, common*	<i>Plantago major</i> *																x
Plum, American	<i>Prunus americana</i>	x			x	x	x										
Pogonia, nodding	<i>Triphora trianthophora</i>	x															
Poison ivy	<i>Toxicodendron radicans</i>	x	x	x	x	x	x		x	x	x	x	x			x	x
Pokeweed	<i>Phytolacca americana</i>	x	x														x
Pondweed	<i>Potamogeton illinoensis</i>													x			
Pondweed	<i>Potamogeton natans</i>													x			
Pondweed	<i>Potamogeton pusillus</i>													x			
Pondweed	<i>Potamogeton zosteriformis</i>													x			
Pondweed, American	<i>Potamogeton nodosus</i>													x			
Pondweed, beginner's*	<i>Potamogeton crispus</i> *													x			
Pondweed, comb	<i>Potamogeton pectinatus</i>													x			
Pondweed, horned	<i>Zannichellia palustris</i>													x			
Pondweed, leafy	<i>Potamogeton foliosus</i>													x			

Vegetation Type Specific Community		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Pondweed, water-thread	<i>Potamogeton diversifolius</i>													x			
Poor Joe	<i>Plantago aristata</i>				x	x	x										
Poplar, white*	<i>Populus alba</i> *				x												x
Potato, wild sweet	<i>Ipomoea pandurata</i> - NG	x	x											x			
Prairie dock	<i>Silphium terebinthinaceum</i>				x		x										
Prairie parsley	<i>Polytaenia nuttallii</i>				x												
Prairie smoke	<i>Geum triflorum</i>							x									
Prickly-pear, eastern	<i>Opuntia humifusa</i>					x	x									x	
Primrose, evening*	<i>Oenothera parviflora</i> *																x
Primrose, ragged evening	<i>Oenothera laciniata</i>					x											
Primrose, sand	<i>Oenothera rhombipetala</i>				x					x							
Privet, amur*	<i>Ligustrum amurense</i> *																x
Puccoon, fringed	<i>Lithospermum incisum</i>						x	x									
Puccoon, hairy	<i>Lithospermum carolinense</i>					x				x							
Puccoon, hoary	<i>Lithospermum canescens</i>				x		x	x	x								
Purslane*	<i>Portulaca oleracea</i> *																x
Pussy toes	<i>Antennaria plantaginifolia</i>	x		x	x	x	x	x	x	x							x
Queen Anne's lace*	<i>Daucus carota</i> *				x	x											x
Ragweed, common	<i>Ambrosia artemisiifolia</i>	x			x		x										x
Ragweed, giant	<i>Ambrosia trifida</i>		x														x
Ragweed, western	<i>Ambrosia psilostachya</i>					x	x			x							
Ragwort, balsam	<i>Senecio pauperculus</i>	x			x	x	x	x			x						
Ragwort, golden	<i>Senecio aureus</i>												x				
Ragwort, prairie	<i>Senecio plattensis</i>				x	x	x		x	x							
Raspberry, black	<i>Rubus occidentalis</i>	x	x	x	x		x		x	x							x
Raspberry, cultivated*	<i>Rubus idaeus</i> *	x															x
Raspberry, red	<i>Rubus strigosus</i>												x		x		

Vegetation Type Specific Community Common name ^{1,2} Scientific Name ^{1,2}		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
		Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Rattlesnake master	<i>Eryngium yuccifolium</i>				x				x								
Redroot - SE	<i>Ceanothus ovatus</i> - SE					x		x		x							
Rockrose	<i>Helianthemum bicknellii</i>					x				x							
Rockrose, common	<i>Helianthemum canadense</i>					x				x							
Rose, early wild	<i>Rosa blanda</i>										x	x					
Rose, multiflora*	<i>Rosa multiflora</i> *	x	x		x												x
Rose, pasture	<i>Rosa carolina</i>	x		x	x	x	x	x	x	x							
Rose, prairie	<i>Rosa setigera</i>	x															
Rose, sunshine	<i>Rosa suffulta</i>				x			x									
Rose, swamp	<i>Rosa palustris</i>										x			x			
Rose, Sweetbrier*	<i>Rosa eglanteria</i> *				x												x
Rosin weed	<i>Silphium integrifolium</i>				x		x										
Rue anemone	<i>Thalictrum thalictroides</i>	x															
Rue anemone, false	<i>Isopyrum biternatum</i>	x		x													
Rue, early meadow	<i>Thalictrum diocium</i>	x														x	
Rue, goat's	<i>Tephrosia virginiana</i>					x				x							
Rue, purple meadow	<i>Thalictrum dasycarpum</i>		x		x						x	x	x				
Rue, waxy meadow	<i>Thalictrum revolutum</i>				x						x	x	x				
Rush, blunt spike	<i>Eleocharis obtusa</i>		x								x			x			
Rush, Canadian	<i>Juncus canadensis</i>										x				x		
Rush, chairmaker's	<i>Scirpus americanus</i>										x		x				
Rush, common	<i>Juncus effusus</i>										x			x			
Rush, common wood	<i>Luzula multiflora</i>	x															
Rush, dark green	<i>Scirpus atrovirens</i>										x	x	x	x			
Rush, Dudley's	<i>Juncus dudleyi</i>										x	x					
Rush, flat-stemmed spike	<i>Eleocharis compressa</i>										x	x	x				
Rush, golden-seeded spike	<i>Eleocharis elliptica</i>												x				

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Vegetation Type		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
	<i>var. lunelliana</i>																
Sedge	<i>Carex prairea</i>										x	x	x		x		
Sedge	<i>Carex projecta</i>	x	x														
Sedge	<i>Carex retrorsa</i>										x			x			
Sedge*	<i>Carex praegracilis*</i>				x												x
Sedge, aquatic	<i>Carex aquatilis</i> <i>var. substricta</i>																
Sedge, awl-fruited oval	<i>Carex tribuloides</i>	x	x								x		x				
Sedge, awned flat	<i>Cyperus aristatus</i>		x											x			x
Sedge, awned graceful	<i>Carex davisii</i>		x														
Sedge, Bebb's oval	<i>Carex bebbii</i>				x						x		x		x		
Sedge, Bicknell's	<i>Carex bicknellii</i>				x	x	x		x	x							
Sedge, blunt-scaled wood	<i>Carex albursina</i>	x	x														
Sedge, bottlebrush	<i>Carex lurida</i>										x				x		
Sedge, bristle stalked	<i>Carex leptalea</i>												x		x		
Sedge, bristly	<i>Carex comosa</i>										x	x	x		x		
Sedge, brome hummock	<i>Carex bromoides</i>												x				
Sedge, brook flat	<i>Cyperus rivularis</i>		x								x			x			
Sedge, brown fox	<i>Carex vulpinoidea</i>		x		x						x	x	x				x
Sedge, brown headed fox	<i>Carex alopecoidea</i>				x						x	x					
Sedge, common bur	<i>Carex grayii</i>		x														
Sedge, common fox	<i>Carex stipata</i>		x		x						x	x					
Sedge, common lake	<i>Carex lacustris</i>										x	x		x			
Sedge, common stiff	<i>Carex tetanica</i>				x												
Sedge, common tussock	<i>Carex stricta</i>											x					
Sedge, common wood	<i>Carex blanda</i>	x	x														
Sedge, Crawe's	<i>Carex crawei</i>							x					x				

[illegible]

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Vegetation Type Specific Community Common name ^{1,2} Scientific Name ^{1,2}		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
		Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
St. John's-wort, Fraser's	<i>Triadenum fraseri</i>										x						
St. John's-wort, sand	<i>Hypericum majus</i>			x										x			
Star-of-Bethlehem*	<i>Ornithogallum umbellatum*</i> -NG	x			x												x
Starflower - ST	<i>Trientalis borealis</i> - ST			x											x	x	
Stickseed	<i>Hackelia virginiana</i>	x	x						x	x							
Stonecrop, ditch	<i>Penthorum sedoides</i>		x								x		x				x
Strawberry, hillside	<i>Fragaria americana</i>															x	
Strawberry, running	<i>Euonymus obovatus</i>	x															
Strawberry, wild	<i>Fragaria virginiana</i>	x		x	x	x			x	x							
Sullivantia - ST	<i>Sullivantia renifolia</i> - ST															x	
Sumac, dwarf	<i>Rhus copallina</i>	x			x	x	x		x	x							
Sumac, fragrant	<i>Rhus aromatica</i>	x				x	x			x							
Sumac, smooth	<i>Rhus glabra</i>	x			x	x	x		x	x							x
Sumac, staghorn	<i>Rhus typhina</i>	x			x		x										
Sunflower, bristly	<i>Helianthus hirsutus</i>	x			x				x								
Sunflower, common*	<i>Helianthus annuus*</i>																x
Sunflower, downy	<i>Helianthus mollis</i> -NG				x				x								
Sunflower, false	<i>Heliopsis helianthoides</i>				x		x		x								
Sunflower, pale	<i>Helianthus decapetalus</i>		x	x			x		x	x							x
Sunflower, pale-leaved	<i>Helianthus strumosus</i>		x	x			x		x	x							x
Sunflower, petioled*	<i>Helianthus petiolaris*</i>					x											
Sunflower, prairie	<i>Helianthus rigidus</i>				x	x	x		x	x							
Sunflower, sawtooth	<i>Helianthus grosseserratus</i>		x		x						x		x				x
Sunflower, western	<i>Helianthus occidentalis</i>			x		x	x			x							
Sunflower, woodland	<i>Helianthus divaricatus</i>	x							x								
Swamp candles	<i>Lysimachia terrestris</i>		x								x	x					

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[illegible]

Vegetation Type		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Wallflower, western*	<i>Erysimum capitatum</i> *																X
Walnut, black	<i>Juglans nigra</i>	X	X	X													
Water hemlock	<i>Cicuta maculata</i>		X								X			X			X
Water hemlock, bulblet-bearing	<i>Cicuta bulbifera</i>										X	X					
Water hemp, common	<i>Amaranthus rudis</i>		X											X			X
Water horehound, common	<i>Lycopus americanus</i>										X	X		X			
Water horehound, stalked	<i>Lycopus rubellus</i>		X								X						
Water meal	<i>Wolffia columbiana</i>										X		X	X			
Water pepper*	<i>Polygonum hydropiper</i> *		X								X	X	X				X
Water pepper, mild	<i>Polygonum hydropiperoides</i>										X						
Water plantain, common	<i>Alisma plantago-aquatica</i> var. <i>parviflorum</i>										X	X	X				
Water plantain, large-flowered	<i>Alisma plantago-aquatica</i> var. <i>americanum</i>										X	X	X				
Waterhemp, tall	<i>Amaranthus tuberculatus</i>		X											X			X
Waterleaf, great	<i>Hydrophyllum appendiculatum</i>	X	X														
Waterleaf, Virginia	<i>Hydrophyllum virginianum</i>	X	X														
Waterweed	<i>Elodea nuttallii</i>													X			
Waterweed, common	<i>Elodea canadensis</i>													X			
Whitlow grass, common	<i>Draba reptans</i>					X		X									X
Wild four o'clock*	<i>Mirabilis nyctaginea</i> *																X
Wild golden glow	<i>Rudbeckia laciniata</i>		X						X								
Wild hyacinth	<i>Camassia scillioides</i>				X				X								
Wild indigo, blue*	<i>Baptisia australis</i> *	X															X
Wild indigo, cream	<i>Baptisia lecuophaea</i>				X	X	X		X								
Wild indigo, hybrid	<i>Baptisia</i> X <i>bicolor</i>				X												
Wild indigo, white	<i>Baptisia lactea</i>				X	X	X		X	X							

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Vegetation Type Specific Community		FOREST			PRAIRIE				SAV-ANNA		WETLAND					PRIM-ARY	CULT-URAL
Common name ^{1,2}	Scientific Name ^{1,2}	Up	Fp	Sf	Pr	Sp	Hp	Gp/Gp	S	Ss	Ma	Sm	Sp/Se/Fe	Po/Rv	Bo	Cliff	
Wormwood, beach	<i>Artemisia campestris</i>			x		x				x							
Wormwood, biennial	<i>Artemisia biennis</i>																x
Wormwood, roman	<i>Artemisia pontica*</i>																x
Woundwort	<i>Stachys palustris</i> <i>var. homotricha</i>		x		x						x	x	x				
Yam, wild	<i>Dioscorea villosa</i>	x		x					x								
Yerba de tajo	<i>Eclipta prostrata</i>		x											x			x

Appendix 2.

List of vascular plant species reported from locations within the Upper Rock River Assessment Area (from Appendix 1), sorted by scientific name with the corresponding common name.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Abutilon theophrasti</i> *	Velvet leaf*	<i>Alisma plantago-</i>	Water plantain,
<i>Acalypha gracilens</i>	Three-seeded mercury, slender	<i>aquatica</i> var. <i>parviflorum</i>	common
<i>Acalypha rhomboidea</i>	Three-seeded mercury	<i>Alliaria petiolata</i> *	Mustard, garlic*
<i>Acalypha virginica</i> - OC, WC	Three-seeded mercury	<i>Allium burdickii</i>	Leek, wild
<i>Acer negundo</i>	Maple, boxelder	<i>Allium canadense</i>	Garlic, wild
<i>Acer nigrum</i>	Maple, black	<i>Allium cernuum</i>	Onion, wild nodding
<i>Acer saccharinum</i>	Maple, silver	<i>Allium stellatum</i>	Onion, cliff
<i>Acer saccharum</i>	Maple, sugar	<i>Allium tricoccum</i>	Leek, wild
<i>Achillea millefolium</i> *	Milfoil, common*	<i>Allium vineale</i> *- OC	Garlic, field*
<i>Acorus americanus</i>	Sweet flag	<i>Alnus glutinosa</i> *	Alder, black*
<i>Actaea pachypoda</i>	Doll's eyes	<i>Alopecurus</i> <i>carolinianus</i>	Foxtail, annual*
<i>Actaea rubra</i>	Baneberry, red	<i>Alopecurus pratensis</i> *	Foxtail, meadow
<i>Adiantum pedatum</i>	Fern, maidenhair	<i>Alyssum alyssoides</i> *	Pale alyssum*
<i>Adlumia fungosa</i> *- OC	Allegheny vine*	<i>Amaranthus albus</i>	Tumbleweed
<i>Aemoracia rusticana</i> *- OC	Horse radish*	<i>Amaranthus hybridus</i>	Amaranth, green
<i>Agalinis aspera</i>	Foxglove, rough false	<i>Amaranthus retroflexus</i>	Pigweed, rough
<i>Agalinis gattereri</i>	Foxglove, round- stemmed false	<i>Amaranthus rudis</i> - OC	Water hemp, common
<i>Agalinis purpurea</i> - OC, NG	Foxglove, false	<i>Amaranthus spinosus</i> *- OC	Pigweed, spiny*
<i>Agalinis tenuifolia</i>	Foxglove, slender false	<i>Amaranthus</i> <i>tuberculatus</i>	Waterhemp, tall
<i>Agastache nepetoides</i>	Giant hyssop, yellow	<i>Ambrosia artemisiifolia</i>	Ragweed, common
<i>Agastache</i> <i>scrophulariaefolia</i> - NG	Giant hyssop, purple	<i>Ambrosia psilostachya</i>	Ragweed, western
<i>Agrimonia gryposepala</i>	Agrimony, tall	<i>Ambrosia trifida</i>	Ragweed, giant
<i>Agrimonia parviflora</i>	Agrimony, swamp	<i>Amelanchier arborea</i>	Juneberry
<i>Agrimonia pubescens</i>	Agrimony, soft	<i>Amelanchier humilis</i>	Shadbush, low
<i>Agrimonia striata</i>	Agrimony, roadside	<i>Amelanchier laevis</i>	Shadbush
<i>Agropyron repens</i> *	Grass, quack*	<i>Amelanchier</i> <i>sanguinea</i> - SE	Shadbush - SE
<i>Agropyron smithii</i> *	Grass, western wheat*	<i>Amorpha canescens</i>	Lead plant
<i>Agrostis alba</i> *	Grass, redbot*	<i>Amorpha fruticosa</i>	Indigo bush, false
<i>Agrostis hyemalis</i>	Grass, hair	<i>Amphicarpa bracteata</i>	Hog peanut
<i>Agrostis scabra</i>	Grass, tickle	<i>Andropogon gerardii</i>	Grass, big bluestem
<i>Ajuga reptans</i> *- NG	Carpet bugle*	<i>Androsace occidentalis</i>	Jasmine, rock
<i>Alisma plantago-</i> <i>aquatica</i> var. <i>americanum</i>	Water plantain, large- flowered	<i>Anemone canadensis</i>	Anemone, meadow
		<i>Anemone caroliniana</i>	Anemone, Carolina
		<i>Anemone cylindrica</i>	Thimbleweed
		<i>Anemone patens</i>	Pasque flower
		<i>Anemone quinquefolia</i>	Anemone, wood
		<i>Anemone virginiana</i>	Anemone, tall

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Angelica atropurpurea</i>	Angelica	<i>Asclepias</i>	Milkweed, sand
<i>Antennaria neglecta</i>	Cat's foot	<i>amplexicaulis</i>	
<i>Antennaria</i>	Pussy toes	<i>Asclepias exaltata</i>	Milkweed, poke
<i>plantaginifolia</i>		<i>Asclepias hirtella</i>	Milkweed, tall green
<i>Anthemis cotula*</i>	Dog fennel*	<i>Asclepias incarnata</i>	Milkweed, swamp
<i>Apios americana</i>	Ground nut	<i>Asclepias lanuginosa</i>	Milkweed, woolly – SE
<i>Aplectrum hyemale</i>	Orchid, putty root		
<i>Apocynum</i>	Dogbane, spreading	<i>Asclepias purpurascens</i>	Milkweed, purple
<i>androsaemifolium</i>		<i>Asclepias quadrifolia</i>	Milkweed, whorled
<i>Apocynum cannabinum</i>	Dogbane	<i>Asclepias sullivantii</i>	Milkweed, Sullivan's
<i>Apocynum sibiricum</i>	Indian hemp	<i>Asclepias syriaca</i>	Milkweed, common
<i>Aquilegia canadensis</i>	Columbine	<i>Asclepias tuberosa</i>	Butterfly weed
<i>Arabidopsis thaliana*</i>	Cress, mouse-eared*	<i>Asclepias verticillata</i>	Milkweed, horsetail
<i>Arabis canadensis</i>	Sicklepod	<i>Asclepias viridiflora</i>	Milkweed, green
<i>Arabis glabra</i>	Mustard, tower	<i>Asparagus officinalis*</i>	Asparagus, garden*
<i>Arabis hirsuta</i>	Cress, hairy rock	<i>Asplenium platyneuron</i>	Fern, ebony spleenwort
Ptrleft-30		<i>Asplenium rhizophyllum</i>	Fern, walking
<i>Arabis laevigata</i>	Cress, smooth rock	<i>Aster azureus</i> (A.	Aster, sky-blue
<i>Arabis lyrata</i>	Cress, lyre-leaved rock	<i>oolentangiensis</i>)	
<i>Arabis shortii</i>	Cress, toothed	<i>Aster cordifolius</i>	Aster, heart-leaved
<i>Aralia nudicaulis</i>	Sarsaparilla, wild	<i>Aster drummondii</i>	Aster, Drummond's
<i>Aralia racemosa</i>	American spikenard	<i>Aster dumosus</i>	Aster, bushy
<i>Arctium minus*</i>	Burdock, common*	<i>Aster ericoides</i>	Aster, heath
<i>Arctostaphylos uva-ursi</i>	Bearberry - SE	<i>Aster firmus</i>	Aster, swamp
<i>Arenaria serpyllifolia</i>	Sandwort, thyme-leaved	<i>Aster furcatus</i> – ST	Aster, forked – ST
		<i>Aster laevis</i>	Aster, smooth blue
<i>Arisaema dracontium</i>	Green dragon	<i>Aster lateriflorus</i>	Aster, side-flowering
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	<i>Aster linariifolius</i>	Aster, flax-leaved
<i>Aristida basiramea</i>	Grass, forked-tip three-awn	<i>Aster novae-angliae</i>	Aster, New England
		<i>Aster oblongifolius</i>	Aster, aromatic
<i>Aristida curtissii</i> - OC	Grass, Curtiss' three awn	<i>Aster ontarionis</i>	Aster, Ontario
		<i>Aster pilosus</i>	Aster, hairy
<i>Aristida intermedia</i>	False arrow feather	<i>Aster praealtus</i>	Aster, willow-leaved
<i>Aristida longespica</i>	Grass, three awn	<i>Aster puniceus</i>	Aster, marsh
<i>Aristida oligantha</i>	Grass, plains three awn	<i>Aster sagittifolius</i>	Aster, arrow-leaved
<i>Aristida purpurescens</i>	Grass, arrow feather	<i>Aster sericeus</i>	Aster, silky
<i>Aronia melanocarpa</i>	Chokeberry, black	<i>Aster shortii</i>	Aster, short's
<i>Artemesia biennis*</i>	Wormwood, biennial*	<i>Aster simplex</i>	Aster, panicked
<i>Artemesia dracunculus</i>	False Tarragon - SE	<i>Aster umbellatus</i>	Aster, flat-top
- SE		<i>Astragalus canadensis</i>	Vetch, Canadian milk
<i>Artemisia annua*</i> - OC	Wormwood, annual*	<i>Athyrium angustum</i>	Fern, lady
<i>Artemisia campestris</i>	Wormwood, beach	<i>Athyrium</i>	Fern, spleenwort silvery
<i>Artemisia ludoviciana</i>	Sage, white	<i>thelypteroides</i>	
<i>Artemisia pontica*</i>	Wormwood, roman	<i>Atriplex patula*</i>	Saltbush, fat-hen*
<i>Artemisia serrata</i>	Sagebrush, saw-toothed	<i>Aureolaria flava</i> - OC	Foxglove, smooth false
<i>Asarum canadense</i>	Ginger, canada wild	<i>Aureolaria grandiflora</i>	Foxglove, yellow false

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Baptisia australis</i> *	Wild indigo, blue*	<i>Bromus pubescens</i>	Grass, woodland brome
<i>Baptisia lecuophaea</i> (<i>B.bracteata</i>)	Wild indigo, cream	<i>Bromus purgans</i>	Grass, ear-leaved brome
<i>Baptisia leucantha</i> (<i>B. lactea</i>)	Wild indigo, white	<i>Bromus secalinus</i> *	Grass, cheat*
<i>Baptisia X bicolor</i>	Wild indigo, hybrid	<i>Bromus tectorum</i> *	Grass, downy brome*
<i>Barbarea vulgaris</i> *	Cress, winter*	<i>Buchloe dactyloides</i>	Grass, buffalo
<i>Bartonia virginica</i>	Screwstem	<i>Bulbostylis capillaris</i> - NG	Sedge, hair
<i>Berberis thunbergii</i> *	Barberry, Japanese*	<i>Cacalia atriplicifolia</i>	Plantain, pale Indian
<i>Berberis vulgaris</i> *- OC	Barberry, common*	<i>Cacalia plantaginea</i> (<i>C. tuberosa</i>)	Plantain, prairie Indian
<i>Berteroa incana</i> *	Hoary alyssum*	<i>Cacalia suaveolens</i>	Plantain, sweet Indian
<i>Besseyia bullii</i> – ST	Kittentails – ST	<i>Calamagrostis canadensis</i>	Grass, blue joint
<i>Betula alleghaniensis</i> - SE	Birch, yellow - SE	<i>Calamintha arkansana</i> - OC	Calamint, low
<i>Betula papyrifera</i>	Birch, paper	<i>Callirhoe triangulata</i> - NG	Mallow, clustered poppy
<i>Betula populifolia</i> - SE	Birch, gray - SE	<i>Caltha palustris</i>	Marsh marigold
<i>Betula pumila</i>	Birch, dwarf swamp	<i>Calylophus serrulatus</i> *	Evening, toothed evening*
<i>Bidens cernua</i>	Marigold, nodding bur	<i>Calystegia sepium</i>	Bindweed, American
<i>Bidens connata</i>	Tickseed, purple- stemmed	<i>Calystegia spithamea</i>	Bindweed, dwarf
<i>Bidens coronata</i>	Marigold, tall swamp	<i>Camassia scillioides</i>	Wild hyacinth
<i>Bidens frondosa</i>	Beggar's ticks, common	<i>Campanula americana</i>	Bellflower, American
<i>Bidens tripartita</i>	Tickseed, swamp	<i>Campanula aparinoides</i>	Bellflower, marsh
<i>Bidens vulgata</i>	Beggar's ticks, tall	<i>Campanula</i> <i>rapunculoides</i> *- OC	Bellflower, European*
<i>Blephilia ciliata</i>	Mint, Ohio horse	<i>Campanula rotundifolia</i>	Harebell
<i>Blephilia hirsuta</i>	Mint, wood	<i>Cannabis sativa</i> *	Marijuana*
<i>Boehmeria cylindrica</i>	Nettle, false	<i>Capsella bursa-</i> <i>pastoris</i> *	Shepherd's purse*
<i>Botrychium dissectum</i>	Fern, bronze	<i>Cardamine bulbosa</i>	Cress, bulbous bitter
<i>Botrychium multifidum</i> - SE	Fern, grape - SE	<i>Cardamine douglassii</i> - OC	Cress, bitter northern
<i>Botrychium oneidense</i> - OC	Fern, Oneida grape	<i>Cardamine parviflora</i> - WC	Cress, small-flowered bitter
<i>Botrychium virginianum</i>	Fern, rattlesnake	<i>Cardamine</i> <i>pennsylvanica</i>	Cress, bitter
<i>Bouteloua curtipendula</i>	Grass, side-oats grama	<i>Cardaria draba</i> *	Cress, hoary*
<i>Bouteloua hirsuta</i> - NG	Grass, hairy grama	<i>Carduus acanthoides</i> *	Thistle, acanthus bristle*
<i>Brachyelytrum erectum</i>	Grass, long-awned wood	<i>Carduus nutans</i> *	Thistle, musk bristle*
<i>Brassica juncea</i>	Mustard, indian	<i>Carex aggregata</i>	Sedge, smooth clustered
<i>Brassica nigra</i> *	Mustard, black*	<i>Carex albursina</i>	Sedge, blunt-scaled wood
<i>Brickellia eupatorioides</i>	Boneset, false		
<i>Bromus ciliatus</i>	Grass, fringed brome		
<i>Bromus commutatus</i> *	Grass, hairy brome*		
<i>Bromus inermis</i> *	Grass, smooth brome*		
<i>Bromus japonicus</i> *	Grass, Japanese chess*		
<i>Bromus kalmii</i>	Grass, prairie brome		

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Carex alopecoidea</i>	Sedge, brown headed fox	<i>Carex grisea</i>	Sedge, wood gray
<i>Carex amphibola</i>	Sedge, gray	<i>Carex haydenii</i>	Sedge, long-scaled tussock
<i>Carex annectens</i>	Sedge, large yellow fox	<i>Carex hirtifolia</i>	Sedge, hairy wood
var. <i>xanthocarpa</i>		<i>Carex hitchcockiana</i>	Sedge, Hitchcock's
(<i>C.brachyglossa</i>)		<i>Carex hystricina</i>	Sedge, porcupine
<i>Carex aquatilis</i> var.	Sedge, aquatic	<i>Carex interior</i>	Sedge, prairie star
<i>substricta</i> - WC		<i>Carex jamesii</i>	Sedge, grass
<i>Carex artitecta</i>	Sedge, blunt scaled oak	<i>Carex lacustris</i>	Sedge, common lake
<i>Carex atherodes</i>	Sedge, hairy leaved lake	<i>Carex laeviconica</i>	Sedge, long-toothed lake
<i>Carex bebbii</i>	Sedge, Bebb's oval	<i>Carex laevivaginata</i>	Sedge, smooth sheathed lake
<i>Carex bicknellii</i>	Sedge, Bicknell's	<i>Carex lanuginosa</i>	Sedge, woolly
<i>Carex blanda</i>	Sedge, common wood	<i>Carex lasiocarpa</i>	Sedge, hairy fruited
<i>Carex brevior</i>	Sedge, plains oval	<i>Carex leavenworthii</i> - WC	Sedge, Leavenworth's
<i>Carex bromoides</i> - WC	Sedge, brome hummock	<i>Carex leptalea</i>	Sedge, bristle stalked
<i>Carex buxbaumii</i>	Sedge, dark-scaled	<i>Carex longii</i> - WC	Sedge, Long's
<i>Carex cephaloidea</i>	Sedge	<i>Carex lupuliformis</i> - WC	Sedge, knobbed hop
<i>Carex cephalophora</i>	Sedge, short-headed bracted	<i>Carex lupulina</i>	Sedge, thick
<i>Carex comosa</i>	Sedge, bristly	<i>Carex lurida</i> - WC	Sedge, bottlebrush
<i>Carex conjuncta</i>	Sedge, green-headed fox	<i>Carex meadii</i>	Sedge, Mead's stiff
<i>Carex conoidea</i>	Sedge, prairie gray	<i>Carex molesta</i>	Sedge, field oval
<i>Carex crawei</i> - BC	Sedge, Crawe's	<i>Carex muhlenbergii</i>	Sedge, sand bracted
<i>Carex crinita</i>	Sedge, fringed	<i>Carex normalis</i>	Sedge, spreading oval
<i>Carex cristatella</i>	Sedge, crested oval	<i>Carex oligocarpa</i>	Sedge, sparse fruited
<i>Carex crus-corvi</i> - WC	Sedge, crowfoot fox	<i>Carex pedunculata</i>	Sedge, long stalked hummock
<i>Carex davisii</i>	Sedge, awned graceful	<i>Carex pensylvanica</i>	Sedge, Pennsylvania oak
<i>Carex deweyana</i>	Sedge, Dewey's	<i>Carex praegracilis</i>	Sedge
<i>Carex eburnea</i>	Sedge, ivory	<i>Carex prairea</i>	Sedge
<i>Carex echinata</i> - SE	Sedge, large fruited star - SE	<i>Carex projecta</i>	Sedge
<i>Carex emoryi</i>	Sedge, Emory's	<i>Carex retrorsa</i>	Sedge
<i>Carex festucacea</i>	Sedge, fescue oval	<i>Carex richardsonii</i>	Sedge, Hummock
<i>Carex gracilescens</i>	Sedge, slender wood	<i>Carex rosea</i>	Sedge, curly-styled wood
<i>Carex gracimila</i>	Sedge, graceful	<i>Carex sartwellii</i>	Sedge, running marsh
<i>Carex granularis</i>	Sedge, pale	<i>Carex scoparia</i>	Sedge, lance-fruited oval
<i>Carex granularis</i> var.	Sedge, Hale's	<i>Carex shortiana</i>	Sedge, Shot's
<i>haleana</i>		<i>Carex sparganioides</i>	Sedge, loose-headed bracted
<i>Carex gravida</i>	Sedge, long-awned bracted	<i>Carex sprengei</i>	Sedge, long-beaked
<i>Carex gravida</i> var.	Sedge		
<i>lunelliana</i>			
<i>Carex grayii</i> - WC	Sedge, common bur		

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Carex stenophylla</i> (C. <i>eleocharis</i>)	Sedge, needleleaf	<i>Cephalanthus occidentalis</i>	Buttonbush
<i>Carex sterilis</i>	Sedge, fen star	<i>Cerastium nutans</i>	Chickweed, nodding
<i>Carex stipata</i>	Sedge, common fox	<i>Cerastium nutans</i> var. <i>brachypodium</i>	Chickweed, short-pedicelled
<i>Carex stricta</i>	Sedge, common tussock	<i>Cerastium vulgatum</i> *	Chickweed, common mouse-ear*
<i>Carex suberecta</i>	Sedge, wedge-fruited oval (Swan's)	<i>Ceratophyllum demersum</i> - OC	Coontail
<i>Carex substricta</i>	Sedge, long-bracted tussock	<i>Ceratophyllum muricatum</i> - OC	Coontail, spiny
<i>Carex swanii</i>	Sedge, downy green	<i>Chaenorrhinum minus</i> *	Snapdragon, dwarf*
<i>Carex tenera</i>	Sedge, remote	<i>Chaerophyllum procumbens</i>	Chervil, streamside
<i>Carex tetanica</i>	Sedge, common stiff	<i>Chamaesyce glyptosperma</i>	Spurge, smooth creeping
<i>Carex tribuloides</i>	Sedge, awl-fruited oval	<i>Chamaesyce humistrata</i>	Spurge, spreading
<i>Carex trichocarpa</i>	Sedge, hairy-fruited lake	<i>Chamaesyce maculata</i>	Spurge, nodding
<i>Carex umbellata</i>	Sedge, early oak	<i>Chamaesyce supina</i>	Spurge, spotted creeping
<i>Carex vescaria</i>	Sedge, tufted lake	<i>Cheilanthes lanosa</i>	Fern, hairy lip
<i>Carex vulpinoidea</i>	Sedge, brown fox	<i>Chelidonium majus</i>	Celandine
<i>Carex woodii</i> - ST	Sedge, pretty - ST	<i>Chelone glabra</i>	Turtlehead, white
<i>Carpinus caroliniana</i>	Beech, blue	<i>Chenopodium album</i> *	Lamb's quarters*
<i>Carya cordiformis</i>	Hickory, bitternut	<i>Chenopodium</i> <i>gigantospermum</i> - OC	Goosefoot, maple-leaved
<i>Carya glabra</i> - OC	Hickory, pignut	<i>Chenopodium glaucum</i> (C. <i>salinum</i>)	Goosefoot, oak leaved
<i>Carya ovata</i>	Hickory, shagbark	<i>Chenopodium leptophyllum</i> (C. <i>pallescens</i>)	Goosefoot, narrow-leaved
<i>Cassia fasciculata</i>	Partridge pea	<i>Chenopodium missouriense</i>	Goosefoot, Missouri
<i>Cassia hebecarpa</i>	Senna, wild	<i>Chenopodium standleyanum</i>	Goosefoot, woodland
<i>Cassia marilandica</i>	Senna, Maryland	<i>Chimaphila umbellata</i> - SE	Pipsissewa - SE
<i>Castilleja coccinea</i> - OC	Indian paintbrush	<i>Chionanthus virginicus</i> *	Tree, fringe
<i>Castilleja sessiliflora</i> - SE	Downy yellow painted cup - SE	<i>Chloris verticillata</i>	Grass, windmill
<i>Catalpa bignonioides</i> *	Catalpa, southern*	<i>Cichorium intybus</i> *	Chickory*
<i>Catalpa speciosa</i> *	Catalpa, northern*	<i>Cicuta bulbifera</i>	Water hemlock, bulbet-bearing
<i>Caulophyllum thalictroides</i>	Cohosh, blue	<i>Cicuta maculata</i>	Water hemlock
<i>Ceanothus americanus</i>	New Jersey tea	<i>Cimicifuga racemosa</i> *- OC	Black cohosh*
<i>Ceanothus ovatus</i> (C. <i>herbaceus</i>)- SE	Redroot - SE		
<i>Celastrus orbiculatus</i> *- OC	Bittersweet, oriental*		
<i>Celastrus scandens</i>	Bittersweet		
<i>Celtis occidentalis</i>	Hackberry		
<i>Cenchrus longispinus</i>	Sandbur, mat		
<i>Centaurea cyanus</i> *	Bachelor's button*		
(C. & N.W. RR near URRAA border)			
<i>Centaurea jacea</i> *	Knapweed, brown*		
<i>Centaurea maculosa</i> *	Knapweed, spotted*		

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Cinna arundinacea</i>	Grass, stout wood reed	<i>Corydalis sempervirens</i>	Corydalis, pink - SE
<i>Circaea lutetiana</i> var. <i>canadensis</i>	Nightshade, enchanter's	- SE	
<i>Cirsium altissimum</i>	Thistle, tall	<i>Corylus americana</i>	American hazelnut
<i>Cirsium arvense</i> *	Thistle, field*	<i>Crataegus coccinea</i> - NG	Hawthorn, scarlet
<i>Cirsium discolor</i>	Thistle, pasture	<i>Crataegus crus-galli</i>	Hawthorn, cock-spur
<i>Cirsium hillii</i> – ST	Thistle, Hill's – ST	<i>Crataegus mollis</i>	Hawthorn, downy
<i>Cirsium muticum</i>	Thistle, swamp	<i>Crataegus pruinosa</i>	Hawthorn, frosted
<i>Cirsium vulgare</i> *	Thistle, bull*	<i>Crataegus punctata</i> - NG	Hawthorn, dotted
<i>Claytonia virginica</i>	Spring beauty	<i>Crataegus succulenta</i>	Hawthorn, fleshy
<i>Clematis virginiana</i> - NG	Virgin's bower	<i>Croton glandulosus</i>	Croton, sand
<i>Coeloglossum viride</i> (<i>Habernaria viridis</i> var. <i>bracteata</i>)	Orchid, bracted green	<i>Cryptogramma stelleri</i>	Fern, slender cliff-brake
<i>Collinsia verna</i>	Blue-eyed Mary	<i>Cryptotaenia</i> <i>canadensis</i>	Honewort
<i>Comandra umbellata</i>	Bastard toad-flax	<i>Cuscuta campestris</i> - NG	Dodder, field
<i>Commelina communis</i> *	Day flower, common*	<i>Cuscuta cephalanthi</i> - OC	Dodder, buttonbush
<i>Comptonia peregrina</i> - SE	Fern, sweet - SE	<i>Cuscuta coryli</i>	Dodder, hazel
<i>Convallaria majalis</i> *	Lily-of -the-Valley*	<i>Cuscuta cuspidata</i> - OC	Dodder, stalked
<i>Convolvulus arvensis</i> *	Bindweed, field*	<i>Cuscuta glomerata</i> - OC	Dodder, rope
<i>Convolvulus sepium</i>	Bindweed, American	<i>Cuscuta gronovii</i>	Dodder, common
<i>Conyza canadensis</i>	Horseweed	<i>Cuscuta pentagona</i> (C. <i>arvensis</i>)	Dodder, prairie
<i>Conyza ramosissima</i> - OC	Dwarf fleabane	<i>Cycloloma</i> <i>atriplicifolium</i>	Pigweed, winged
<i>Corallorhiza maculata</i> - ST	Orchid, spotted coral- root - ST	<i>Cynanchum laeve</i>	Blue vine
<i>Corallorhiza</i> <i>odontorhiza</i>	Orchid, fall coral root	<i>Cynoglossum officinale</i>	Hound's tongue
<i>Coreopsis lanceolata</i>	Coreopsis, sand	<i>Cyperus aristatus</i>	Sedge, awned flat
<i>Coreopsis palmata</i>	Coreopsis, prairie	<i>Cyperus esculentus</i>	Sedge, field nut
<i>Coreopsis tinctoria</i> *- OC	Coreopsis, golden*	<i>Cyperus ferruginescens</i>	Sedge, rusty nut
<i>Coreopsis tripteris</i>	Coreopsis, tall	<i>Cyperus filiculmis</i>	Sedge, slender sand
<i>Cornus alternifolia</i>	Dogwood, alternate- leaved	<i>Cyperus odoratus</i>	Sedge, false rusty nut
<i>Cornus canadensis</i> - SE	Bunchberry - SE	<i>Cyperus rivularis</i> - OC	Sedge, brook flat
<i>Cornus drummondii</i>	Dogwood, rough-leaved	<i>Cyperus schweinitzii</i>	Sedge, rough sand
<i>Cornus obliqua</i>	Dogwood, pale	<i>Cyperus strigosus</i>	Sedge, long-scaled nut
<i>Cornus racemosa</i>	Dogwood, gray	<i>Cypripedium acaule</i> - SE	Orchid, pink lady's slipper, Moccasin flower - SE
<i>Cornus rugosa</i>	Dogwood, round-leaved	<i>Cypripedium candidum</i> - ST	Orchid, white lady's- slipper - ST
<i>Cornus stolonifera</i>	Dogwood, red-osier	<i>Cypripedium pubescens</i>	Orchid, yellow lady's slipper
<i>Coronilla varia</i> *	Vetch, crown*	<i>Cystopteris bulbifera</i>	Fern, berry bladder
<i>Corydalis flavula</i>	Corydalis, pale		
<i>Corydalis micrantha</i>	Corydalis, slender		

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Cystopteris fragilis</i> var. <i>protrusa</i>	Fern, fragile	<i>Dyssodia papposa</i> *-OC	Marigold, fetid*
<i>Cystopteris X tenuis</i>	Fern, hybrid fragile	<i>Echinacea pallida</i>	Coneflower, pale
<i>Dactylis glomerata</i> *	Grass, orchard*	<i>Echinochloa crus-galli</i> *	Grass, barnyard*
<i>Dalea leporina</i> -OC	Dalea, foxtail	<i>Echinochloa muricata</i>	Grass, spiny barnyard
<i>Danthonia spicata</i>	Grass, poverty oat	<i>Echinocystis lobata</i>	Cucumber, wild
<i>Dasistoma macrophylla</i>	Foxglove, mullein	<i>Eclipta prostrata</i>	Yerba de tajo
<i>Datura stramonium</i> *	Jimsonweed*	<i>Elaeagnus umbellata</i> *	Olive, autumn*
<i>Daucus carota</i> *	Queen Anne's lace*	<i>Eleocharis acicularis</i>	Rush, needle spike
<i>Decodon verticillatus</i>	Loosestrife	<i>Eleocharis compressa</i> -OC	Rush, flat-stemmed spike
<i>Dentaria laciniata</i>	Toothwort	<i>Eleocharis elliptica</i>	Rush, golden-seeded spike
<i>Descurainia pinnata</i> *	Mustard, tansy*	<i>Eleocharis erythropoda</i>	Rush, red-rooted spike
<i>Desmanthus illinoioensis</i>	Bundle flower, Illinois	<i>Eleocharis intermedia</i> -OC, WC	Rush, matted spike
<i>Desmodium canadense</i>	Tick Trefoil, showy	<i>Eleocharis obtusa</i>	Rush, blunt spike
<i>Desmodium canescens</i>	Tick Trefoil, hoary	<i>Eleocharis palustris</i>	Rush, great spike
<i>Desmodium cuspidatum</i>	Tick Trefoil, bracted	<i>Eleocharis verrucosa</i> -NG	Rush, slender spike
<i>Desmodium glutinosum</i>	Tick Trefoil, pointed	<i>Ellisia nyctelea</i>	Aunt Lucy
<i>Desmodium illinoense</i>	Tick Trefoil, Illinois	<i>Elodea canadensis</i>	Waterweed, common
<i>Desmodium nudiflorum</i>	Tick Trefoil, bare-stemmed	<i>Elodea nuttallii</i>	Waterweed
<i>Desmodium obtusum</i>	Tick Trefoil, stiff	<i>Elymus canadensis</i>	Grass, Canada wild rye
<i>Desmodium sessilifolium</i>	Tick trefoil, sessile leaved	<i>Elymus hystrix</i>	Grass, bottlebrush
<i>Dianthus armeria</i> *	Deptford pink*	<i>Elymus riparius</i>	Grass, riverbank wild rye
<i>Diarrhena americana</i>	Grass, beak	<i>Elymus trachycaulum</i> -SE (Agropyron <i>subsecundum</i> , A. <i>unilaterale</i> , A. <i>trachycaulum</i>)	Grass, bearded wheat - SE
<i>Dicentra canadensis</i>	Squirrel corn	<i>Elymus villosus</i>	Grass, silky wild rye
<i>Dicentra cucullaria</i>	Dutchman's breeches	<i>Elymus virginicus</i>	Grass, Virginia wild rye
<i>Dicentra eximia</i> *-OC	Bleeding heart, wild*	<i>Epilobium angustifolium</i>	Fireweed
<i>Diervilla lonicera</i>	Honeysuckle, dwarf	<i>Epilobium ciliatum</i> (E. <i>adenocaulon</i>)	Willow herb, northern
<i>Digitaria ischaemum</i> *	Grass, smooth crab*	<i>Epilobium coloratum</i>	Willow herb, cinnamon
<i>Digitaria sanguinalis</i> *	Grass, hairy crab*	<i>Epilobium leptophyllum</i>	Willow herb, fen
<i>Dioscorea villosa</i>	Yam, wild	<i>Equisetum arvense</i>	Horsetail, common
<i>Dipsacus lacinatus</i> *-WC	Teasel, Cut leaved*	<i>Equisetum fluviatile</i>	Pipes
<i>Dipsacus sylvestris</i> *	Teasel, common*	<i>Equisetum hyemale</i>	Scouring rush, tall
<i>Dirca palustris</i>	Leatherwood	<i>Equisetum laevigatum</i>	Scouring rush, smooth
<i>Dodecatheon meadia</i>	Shooting star	<i>Equisetum pratense</i> -ST	Horsetail, meadow - ST
<i>Draba reptans</i>	Whitlow grass, common		
<i>Dryopteris carthusiana</i>	Fern, spinulose wood		
<i>Dryopteris cristata</i>	Fern, crested shield		
<i>Dryopteris marginalis</i>	Fern, marginal shield		
<i>Dryopteris intermedia</i>	Fern, common wood, intermediate		
<i>Dulichium arundinacea</i>	Sedge, three-way		

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Equisetum sylvaticum</i> SE	Horsetail - SE	<i>Festuca obtusa</i>	Fescue, nodding
<i>Eragrostis capillaris</i>	Grass, love	<i>Festuca ovina</i> - WC	Fescue, sheep
<i>Eragrostis cilianensis</i> *	Grass, stink*	<i>Floerkea</i>	Mermaid, false
<i>Eragrostis frankii</i>	Grass, sandbar love	<i>proserpinacoides</i> - NG	
<i>Eragrostis hypnoides</i>	Grass, creeping love	<i>Fragaria americana</i>	Strawberry, hillside
<i>Eragrostis pectinacea</i>	Grass, small love	<i>Fragaria virginiana</i>	Strawberry, wild
<i>Eragrostis spectabilis</i>	Grass, purple love	<i>Fraxinus americana</i>	Ash, American
<i>Eragrostis trichodes</i>	Grass, ice cream	<i>Fraxinus nigra</i>	Ash, black
<i>Erechtites hieracifolia</i>	Fireweed	<i>Fraxinus pennsylvanica</i>	Ash, green
<i>Erigeron annuus</i>	Fleabane, annual	<i>Fraxinus</i>	Ash, blue
<i>Erigeron philadelphicus</i>	Fleabane, marsh	<i>quadrangulata</i>	
<i>Erigeron pulchellus</i>	Plantain, robin's	<i>Froelichia gracilis</i> *	Cottonweed, small*
<i>Erigeron strigosus</i>	Fleabane, daisy	<i>Galearis spectabilis</i> (<i>Orchis spectabilis</i>)	Orchid, showy
<i>Eriochloa villosa</i> *	Grass, cup*	<i>Galinsoga</i>	Daisy, Peruvian*
<i>Eriophorum</i> <i>angustifolium</i> - NG	Cotton grass, narrow leaved	<i>quadriradiata</i> *	
<i>Eryngium yuccifolium</i>	Rattlesnake master	<i>Galium aparine</i>	Bedstraw, annual
<i>Erysimum capitatum</i> *	Wallflower, western*	<i>Galium asprellum</i> - OC	Bedstraw, rough
<i>Erysimum</i> <i>cheiranthoides</i> *	Mustard, wormseed*	<i>Galium boreale</i>	Bedstraw, northern
<i>Erythronium albidum</i>	Lily, white trout	<i>Galium circaeans</i>	Licorice, wild
<i>Erythronium</i> <i>americanum</i> - OC	Violet, yellow dog- tooth	<i>Galium concinnum</i>	Bedstraw, shining
<i>Euonymus obovatus</i>	Strawberry, running	<i>Galium obtusum</i>	Madder, wild
<i>Euonymus alata</i> *	Euonymus, winged	<i>Galium tinctorium</i>	Bedstraw, stiff
<i>Euonymus atropurpurea</i>	Wahoo	<i>Galium triflorum</i>	Bedstraw, sweet- scented
<i>Euonymus europaeus</i> *	Tree, european spindle*	<i>Gaura biennis</i>	Gaura, biennial
<i>Eupatorium altissimum</i>	Boneset, tall	<i>Gaura longiflora</i>	Gaura, common
<i>Eupatorium maculatum</i>	Joe Pye weed, spotted	<i>Gaylussacia baccata</i>	Huckleberry, black
<i>Eupatorium perfoliatum</i>	Boneset, common	<i>Gentiana alba</i> - NG	Gentian, pale
<i>Eupatorium purpureum</i>	Joe Pye weed, purple	<i>Gentiana andrewsii</i>	Gentian, closed
<i>Eupatorium rugosum</i>	Snakeroot, white	<i>Gentiana puberulenta</i>	Gentian, downy
<i>Eupatorium serotinum</i>	Boneset, late	<i>Gentiana saponaria</i> - NG	Gentian, soapwort
<i>Euphorbia commutata</i> - OC	Spurge, tinted	<i>Gentianella</i> <i>quinquefolia</i>	Gentian, stiff
<i>Euphorbia corollata</i>	Spurge, flowering	<i>Gentianopsis crinita</i>	Gentian, fringed
<i>Euphorbia</i> <i>cyparissias</i> *- OC	Spurge, cypress*	<i>Geranium maculatum</i>	Geranium, wild
<i>Euphorbia esula</i> *	Spurge, leafy*	<i>Geranium sibiricum</i> *	Cranesbill, siberian*
<i>Euthamia graminifolia</i>	Goldenrod, hairy grass- leaved	<i>Geum aleppicum</i>	Avens, yellow
<i>Euthamia</i> <i>gymnospermoides</i>	Goldenrod, viscid grass-leaved	<i>Geum canadense</i>	Avens, white
<i>Festuca elatior</i> * (F. <i>arundinacea</i>)	Fescue, tall*	<i>Geum laciniatum</i>	Avens, rough
		<i>Geum triflorum</i>	Prairie smoke
		<i>Geum vernum</i>	Avens, spring
		<i>Glechoma hederacea</i> *	Creeping Charlie*
		<i>Gleditsia triacanthos</i>	Locust, honey

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Glyceria grandis</i>	Grass, manna	<i>Heteranthera dubia</i>	Grass, water star
<i>Glyceria septentrionalis</i>	Grass, floating manna	<i>Heterotheca camporum</i> -	Aster, golden
<i>Glyceria striata</i>	Grass, fowl manna	OC	
<i>Glycine max</i> *	Soy bean*	<i>Heuchera americana</i>	Alumroot, tall
<i>Gnaphalium</i>	Old-field balsam	<i>Heuchera richardsonii</i>	Alumroot, prairie
<i>obtusifolium</i>		<i>Hibiscus trionum</i> *	Flower-of-an-hour*
<i>Gnaphalium purpureum</i>	Early cudweed	<i>Hieraceum</i>	Paint brush, devil's
<i>Goodyera pubescens</i>	Plantain, rattlesnake	<i>aurantiacum</i> *	
<i>Gratiola neglecta</i>	Clammy hedge hyssop	<i>Hieraceum</i>	Hawkweed, field*
<i>Grindelia squarrosa</i> -	Gum plant	<i>caespitosum</i> *- NG	
NG		<i>Hieracium canadense</i>	Hawkweed, Canada
<i>Gymnocarpium</i>	Fern, Oak- SE	<i>Hieracium gronovii</i>	Hawkweed, hairy
<i>dryopteris</i> - SE		<i>Hieracium longipilum</i>	Hawkweed, long-bearded
<i>Gymnocladus dioica</i> s	Kentucky coffee tree	<i>Hieracium scabrum</i>	Hawkweed, rough
<i>Hackelia virginiana</i>	Stickseed	<i>Hierochloa odorata</i>	Grass, sweet
<i>Hamamelis virginiana</i>	Witch hazel	<i>Hordeum jubatum</i> *	Grass, squirrel-tail*
<i>Hedeoma hispida</i>	Pennyroyal, rough	<i>Humulus japonicus</i> *	Hops, Japanese*
<i>Hedeoma pulegioides</i> -	Pennyroyal, American	<i>Humulus lupulus</i>	Hops, common
OC		<i>Hydrastis canadensis</i>	Golden seal
<i>Hedera helix</i> *	Ivy, english*	<i>Hydrophyllum</i>	Waterleaf, great
<i>Hedyotis crassifolia</i> -	Bluets, tiny	<i>appendiculatum</i>	
OC		<i>Hydrophyllum</i>	Waterleaf, Virginia
<i>Hedyotis longifolia</i>	Bluets, long-leaved	<i>virginianum</i>	
<i>Helenium autumnale</i>	Sneezeweed	<i>Hypericum canadense</i>	St. John's wort, Canadian
<i>Helianthemum</i>	Rockrose	<i>Hypericum</i>	Pineweed
<i>bicknellii</i>		<i>gentianoides</i>	
<i>Helianthemum</i>	Rockrose, common	<i>Hypericum majus</i>	St. John's-wort, sand
<i>canadense</i>		<i>Hypericum mutilum</i>	St. John's wort, dwarf
<i>Helianthus annuus</i> *	Sunflower, common*	<i>Hypericum perforatum</i> *	St. John's wort, common*
<i>Helianthus decapetalus</i>	Sunflower, pale	<i>Hypericum</i>	St. John's-wort
<i>Helianthus divaricatus</i>	Sunflower, woodland	<i>pseudomaculatum</i>	
<i>Helianthus</i>	Sunflower, sawtooth	<i>Hypericum punctatum</i>	St. John's wort, spotted
<i>grosseserratus</i>		<i>Hypericum</i>	St. John's wort, great
<i>Helianthus hirsutus</i>	Sunflower, bristly	<i>pyramidatum</i> - NG	
<i>Helianthus mollis</i>	Sunflower, downy	<i>Hypericum</i>	St. John's wort, round-fruited
<i>Helianthus occidentalis</i>	Sunflower, western	<i>sphaerocarpum</i>	
<i>Helianthus petiolaris</i> *	Sunflower, petioled*	<i>Hypoxis hirsuta</i>	Grass, yellow star
<i>Helianthus rigidus</i>	Sunflower, prairie	<i>Ilex verticillata</i>	Winterberry
<i>Helianthus strumosus</i>	Sunflower, pale-leaved	<i>Impatiens capensis</i>	Touch-me-not, spotted
<i>Helianthus tuberosus</i>	Jerusalem artichoke	<i>Impatiens pallida</i>	Touch-me-not, pale
<i>Heliopsis helianthoides</i>	Sunflower, false	<i>Ipomoea hederacea</i> *- NG	Morning glory, ivy-leaved*
<i>Hemerocallis fulva</i> *	Lily, orange day*		
<i>Hepatica nobilis</i> var.	Liverleaf, sharp-leaved		
<i>acutiloba</i>			
<i>Heracleum lanatum</i>	Parsnip, cow		
<i>Hesperis matronalis</i> *	Dame's rocket*		

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Ipomoea pandurata</i> - NG	Potato, wild sweet	<i>Leonorus</i> <i>marrubiastrum</i> *	Lion's tail
<i>Ipomoea purpurea</i> *	Morning glory, common*	<i>Leonurus cardiaca</i> *	Motherwort*
<i>Iris pseudoacorus</i> *- OC	Iris, tall yellow*	<i>Lepidium campestre</i> *	Cress, field*
<i>Iris virginica</i> var. <i>shrevei</i>	Blue flag	<i>Lepidium densiflorum</i> *	Peppergrass, small*
<i>Isopyrum biternatum</i> - OC	Rue anemone, false	<i>Lepidium virginicum</i>	Peppergrass, common
<i>Jeffersonia diphylla</i>	Twinleaf	<i>Leptochloa fascicularis</i> - WC	Grass, salt meadow
<i>Juglans cinerea</i>	Butternut	<i>Leptoloma cognatum</i>	Grass, fall witch
<i>Juglans nigra</i>	Walnut, black	<i>Lespedeza capitata</i>	Clover, round-headed bush
<i>Juncus acuminatus</i>	Rush, sharp-fruited	<i>Lespedeza leptostachya</i> – FT, SE	Clover, prairie bush – FT, SE
<i>Juncus bufonius</i>	Rush, toad	<i>Lespedeza stipulacea</i> *- OC	Clover, Korean bush*
<i>Juncus canadensis</i>	Rush, Canadian	<i>Lespedeza virginica</i> - OC	Clover, slender bush
<i>Juncus dudleyi</i>	Rush, Dudley's	<i>Lespeza hirta</i>	Clover, hairy bush
<i>Juncus effusus</i>	Rush, common	<i>Leucanthemum</i> <i>vulgare</i> *	Ox-eye daisy*
<i>Juncus greenii</i>	Rush, Greene's	<i>Liatris aspera</i>	Blazing star, rough
<i>Juncus interior</i>	Rush, inland	<i>Liatris cylindracea</i>	Blazing star, cylindrical
<i>Juncus marginatus</i> - NG	Rush, grass-leaved	<i>Liatris pycnostachya</i>	Blazing star, prairie
<i>Juncus nodosus</i>	Rush, joint	<i>Ligustrum amurense</i> *- WC	Privet, amur
<i>Juncus tenuis</i>	Rush, path	<i>Lilium michiganense</i>	Lily, Michigan
<i>Juniperus virginiana</i>	Cedar, eastern red	<i>Lilium philadelphicum</i> var. <i>andinum</i>	Lily, prairie
<i>Kochia scoparia</i> *	Cypress, summer*	<i>Linaria canadensis</i>	Toadflax, blue
<i>Koeleria cristata</i>	Grass, June	<i>Linaria vulgaris</i> *	Butter-and-eggs*
<i>Krigia biflora</i>	Dandelion, false	<i>Lindernia dubia</i>	Pimpernel, false
<i>Krigia virginica</i>	Dandelion, dwarf	<i>Linum sulcatum</i>	Flax, grooved yellow
<i>Lactuca biennis</i>	Lettuce, tall blue	<i>Liparis liliifolia</i>	Orchid, large twayblade
<i>Lactuca canadensis</i>	Lettuce, wild	<i>Liparis loeselii</i>	Orchid, lesser twayblade
<i>Lactuca floridana</i>	Lettuce, woodland blue	<i>Liriodendron</i> <i>tulipifera</i> *	Tree, tulip poplar*
<i>Lactuca serriola</i> *	Lettuce, prickly*	<i>Lithospermum</i> <i>canescens</i>	Puccoon, hoary
<i>Laportea canadensis</i>	Nettle, Canada wood	<i>Lithospermum</i> <i>carolinense</i>	Puccoon, hairy
<i>Lappulae echinata</i> *- OC	Beggar's lice*	<i>Lithospermum incisum</i>	Puccoon, fringed
<i>Lathyrus chroleucus</i> - ST	Vetchling, pale - ST	<i>Lithospermum</i> <i>lafifolium</i> - OC	Gromwell, American
<i>Lathyrus palustris</i>	Vetchling, marsh	<i>Lithospermum</i> <i>officinale</i> *- OC	Gromwell, common*
<i>Lechea minor</i> - OC	Pinweed, small		
<i>Lechea pulchella</i>	Pinweed, pretty		
<i>Lechea stricta</i>	Pinweed, bushy		
<i>Lechea tenuifolia</i>	Pinweed, narrow-leaved		
<i>Lechea villosa</i>	Pinweed, hairy		
<i>Leersia lenticularis</i>	Grass, catchfly		
<i>Leersia oryzoides</i>	Grass, rice cut		
<i>Leersia virginica</i>	Grass, white		
<i>Lemna minor</i>	Duckweed, small		

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Lobelia cardinalis</i> - NG	Cardinal flower	<i>Lycopodium</i>	Clubmoss, cliff
<i>Lobelia inflata</i>	Indian tobacco	<i>porophilum</i> - OC	
<i>Lobelia siphilitica</i>	Lobelia, great blue	<i>Lycopus americanus</i>	Water horehound, common
<i>Lobelia spicata</i>	Lobelia, pale spiked	<i>Lycopus rubellus</i>	Water horehound, stalked
<i>Lolium multiflorum</i> *	Grass, Italian rye*	<i>Lycopus uniflorus</i>	Bugle weed, northern
<i>Lolium perenne</i> *	Grass, perennial rye*	<i>Lycopus virginicus</i>	Bugle weed
<i>Lonicera canadensis</i> (<i>Xylosteon</i> <i>canadense</i>)	Honeysuckle, fly	<i>Lysimachia ciliata</i>	Loosestrife, fringed
<i>Lonicera dioica</i>	Honeysuckle, red	<i>Lysimachia hybrida</i>	Loosestrife, river
<i>Lonicera maackii</i> *	Honeysuckle, Amur bush*	<i>Lysimachia lanceolata</i>	Loosestrife, lance- leaved
<i>Lonicera morrowii</i> *	Honeysuckle, Morrow's bush*	<i>Lysimachia</i> <i>mummularia</i> *	Moneywort*
<i>Lonicera prolifera</i>	Honeysuckle, yellow	<i>Lysimachia quadriflora</i>	Loosestrife, narrow- leaved
<i>Lonicera</i> <i>sempervirens</i> *- OC	Honeysuckle, trumpet*	<i>Lysimachia terrestris</i> - OC	Swamp candles
<i>Lonicera tatarica</i> *	Honeysuckle, Tartarian*	<i>Lysimachia thyrsiflora</i> - OC	Loosestrife, tufted
<i>Lonicera x bella</i> *	Honeysuckle, bush*	<i>Lysimachia vulgaris</i> *	Loosestrife, garden
<i>Lonicera xylosteum</i> *	Honeysuckle, european fly*	<i>Lythrum alatum</i>	Loosestrife, winged
<i>Lotus corniculatus</i> *	Trefoil, birdsfoot*	<i>Lythrum salicaria</i> *- OC	Loosestrife, purple*
<i>Ludwigia alternifolia</i>	Seedbox	<i>Maclura pomifera</i> *	Osage orange*
<i>Ludwigia polycarpa</i>	Loosestrife, false	<i>Maianthemum</i> <i>canadense</i>	Mayflower, Canada
<i>Lupinus perennis</i>	Lupine, wild	<i>Malus coronaria</i> - OC	Crab-apple, wild sweet
<i>Luzula acuminata</i> - SE	Rush, hairy wood - SE	<i>Malus ioensis</i>	Crab-apple, Iowa
<i>Luzula multiflora</i>	Rush, common wood	<i>Malus pumila</i> *	Apple*
<i>Lychnis alba</i> * (<i>Silene</i> <i>latifolia</i>)	Campion, white*	<i>Malva neglecta</i> *	Cheeses*
<i>Lycopersicum</i> <i>esculentum</i> *	Tomato*	<i>Matricaria</i> <i>matricarioides</i> *	Pineapple weed*
<i>Lycopodium clavatum</i> - SE	Clubmoss, running pine - SE	<i>Matteuccia</i> <i>struthiopteris</i>	Fern, ostrich
<i>Lycopodium</i> <i>dendroideum</i> - SE (<i>L. obscurum</i> var. <i>dendroideum</i>)	Clubmoss, ground pine - SE	<i>Medicago lupulina</i> *	Black medic*
<i>Lycopodium digitatum</i> *	Clubmoss, ground pine*	<i>Medicago sativa</i> *	Alfalfa*
(<i>Diphasiastrum</i> <i>digitatum</i>)		<i>Melica nitens</i>	Grass, tall melic
<i>Lycopodium inundatum</i> - SE (last seen 1962 in URRAA)	Clubmoss, bog - SE	<i>Melilotus alba</i> *	Clover, white sweet*
<i>Lycopodium lucidulum</i>	Clubmoss, shining	<i>Melilotus officinalis</i> *	Clover, yellow sweet*
		<i>Menispermum</i> <i>canadense</i>	Moonseed
		<i>Mentha arvensis</i> var. <i>villosa</i>	Mint, foxtail
		<i>Mentha spicata</i> *	Mint, spear*
		<i>Mertensia virginica</i>	Virginia bluebells

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Microseris cuspidata</i> – SE	Dandelion, prairie – SE	<i>Ophioglossum vulgatum</i> var. <i>pseudopodium</i>	Adder's tongue, northern
<i>Mimulus glabratus</i> – SE- NG	Monkey flower, yellow – SE	<i>Opuntia humifusa</i>	Prickly-pear, eastern
<i>Mimulus ringens</i>	Monkey flower	<i>Ornithogallum</i> <i>umbellatum</i> * – NG	Star-of-Bethlehem*
<i>Minuartia stricta</i>	Sandwort, stiff	<i>Orobanche uniflora</i>	Cancerroot, one- flowered
<i>Mirabilis nyctaginea</i> *	Wild four o'clock*	<i>Oryzopsis racemosa</i>	Grass, rice
<i>Mitchella repens</i>	Partridgeberry	<i>Osmorhiza claytonii</i>	Sweet cicely, hairy
<i>Mitella diphylla</i>	Bishop's cap	<i>Osmorhiza longistylis</i>	Anise root
<i>Moehringia lateriflora</i>	Sandwort, blunt-leaf	<i>Osmunda cinnamomea</i>	Fern, cinnamon
<i>Mollugo verticillata</i>	Carpet weed	<i>Osmunda claytoniana</i>	Fern, interrupted
<i>Monarda fistulosa</i>	Bergamot, wild	<i>Osmunda regalis</i>	Fern, royal
<i>Monarda punctata</i> – NG	Mint, horse	<i>Ostrya virginiana</i>	Hop hornbeam
<i>Monotropa uniflora</i>	Indian pipe	<i>Oxalis corniculata</i> *	Wood sorrel, creeping
<i>Morus alba</i> *	Mulberry, white*	<i>Oxalis dillenii</i>	Wood sorrel, common
<i>Morus rubra</i>	Mulberry, red	<i>Oxalis stricta</i>	Wood sorrel, tall
<i>Muhlenbergia frondosa</i>	Grass, common satin	<i>Oxalis violacea</i>	Wood sorrel, purple
<i>Muhlenbergia</i> <i>glomerata</i>	Grass, marsh timothy	<i>Oxypolis rigidior</i>	Cowbane
<i>Muhlenbergia mexicana</i>	Grass, leafy satin	<i>Panax quinquefolius</i>	Ginseng
<i>Muhlenbergia</i> <i>racemosa</i> – OC	Grass, upland wild timothy	<i>Panicum boreale</i> – SE	Grass, northern panic – SE
<i>Muhlenbergia schreberi</i>	Nimblewill	<i>Panicum capillare</i>	Grass, old witch
<i>Muhlenbergia sylvatica</i> – OC	Grass, woodland satin	<i>Panicum depauperatum</i>	Grass, starved panic
<i>Myosotis scorpiodes</i> *	Forger-me-not, common*	<i>Panicum</i> <i>dichotomiflorum</i>	Grass, fall panicum
<i>Myosotis verna</i>	Forget-me-not, white	<i>Panicum implicatum</i>	Grass, old field panic
<i>Myosoton aquaticum</i>	Chickweed, giant	<i>Panicum latifolium</i>	Grass, broad-leaved panic
<i>Napaea dioica</i>	Mallow, glade	<i>Panicum leibergii</i>	Grass, prairie panic
<i>Nasturtium officinale</i> *	Cress, water*	<i>Panicum lindheimeri</i>	Grass, smooth woolly panic
<i>Nepeta cataria</i> *	Catnip*	<i>Panicum oligosanthos</i> var. <i>scribnerianum</i>	Grass, Scribner's panic
<i>Nuphar lutea</i>	Shatterdock	<i>Panicum perlongum</i>	Grass, long-stalked panic
<i>Oenothera biennis</i>	Evening primrose, common	<i>Panicum villosissimum</i>	Grass, white-haired panic
<i>Oenothera laciniata</i>	Primrose, ragged evening	<i>Panicum virgatum</i>	Grass, prairie switch
<i>Oenothera parviflora</i>	Primrose, evening	<i>Panicum wilcoxianum</i>	Grass, Wilcox's panic
<i>Oenothera</i> <i>rhubipetala</i>	Primrose, sand	<i>Parietaria pensylvanica</i>	Pennsylvania pellitory
<i>Onoclea sensibilis</i>	Fern, sensitive	<i>Parnassia glauca</i>	Grass-of-Parnassus
<i>Onosmodium</i> <i>hispidissimum</i>	Marbleseed	<i>Paronychia canadensis</i>	Chickweed, tall forked
<i>Onosmodium molle</i> – OC	Marbleseed, downy	<i>Parthenium</i> <i>integrifolium</i>	American feverfew
		<i>Parthenocissus inserta</i>	Creeper, thicket

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Parthenocissus quinquefolia</i>	Creeper, Virginia	<i>Pinus strobus</i>	Pine, white
<i>Paspalum ciliatifolium</i>	Grass, bead	<i>Plantago aristata</i>	Poor Joe
<i>Pastinaca sativa</i> *	Parsnip, wild*	<i>Plantago lanceolata</i> *	Plantain, English*
<i>Pedicularis canadensis</i>	Lousewort	<i>Plantago major</i> *	Plantain, common*
<i>Pedicularis lanceolata</i>	Wood betony, swamp	<i>Plantago patagonica</i>	Plantain, woolly
<i>Pellaea atropurpurea</i>	Fern, purple cliff brake	<i>Plantago rugelii</i>	Plantain, red-stalked
<i>Pellaea glabella</i>	Fern, purple cliff brake	<i>Plantago virginica</i>	Plantain, dwarf
<i>Penstemon calycosus</i>	Beard tongue, smooth	<i>Platanthera hyperborea</i> var. <i>huronensis</i> -NG	Orchid, northern bog
<i>Penstemon digitalis</i>	Beard tongue, foxglove	<i>Platanthera lacera</i>	Orchid, green fringed
<i>Penstemon hirsutus</i>	Beard tongue, hairy	<i>Platanus occidentalis</i>	Buttonwood
<i>Penstemon pallidus</i>	Beard tongue, pale	<i>Poa annua</i> *	Grass, annual blue*
<i>Penthorum sedoides</i>	Stonecrop, ditch	<i>Poa arachnifera</i> *	Grass, Texas blue*
<i>Perideridia americana</i> - OC	Parsley, thicket	<i>Poa bulbosa</i> *	Grass, bulbous blue*
<i>Petalostemum candidum</i>	Clover, white prairie	<i>Poa compressa</i> *	Grass, Canadian blue*
<i>Petalostemum purpureum</i>	Clover, purple prairie	<i>Poa nemoralis</i> *	Grass, woodland blue*
<i>Phalaris arundinacea</i> *	Grass, reed canary*	<i>Poa palustris</i>	Grass, fowl blue
<i>Phegopteris connectilis</i> - SE	Fern, long beech - SE	<i>Poa pratensis</i> *	Grass, Kentucky blue*
<i>Phegopteris hexagonoptera</i>	Fern, broad beech	<i>Poa sylvestris</i>	Grass, woodland blue
<i>Phleum pratense</i> *	Grass, timothy*	<i>Podophyllum peltatum</i>	May apple
<i>Phlox bifida</i> - OC	Phlox, cleft	<i>Poinsettia cyathophora</i>	Fire-on-the-Mountain
<i>Phlox divaricata</i>	Phlox, blue	<i>Poinsettia dentata</i>	Spurge, toothed
<i>Phlox glaberrima</i>	Phlox, smooth	<i>Polanisia dodecandra</i>	Clammy weed
<i>Phlox maculata</i> - NG	Wild sweet William	<i>Polemonium reptans</i>	Jacob's ladder
<i>Phlox pilosa</i>	Phlox, prairie	<i>Polygala cruciata</i> var. <i>aquilonia</i> - OC	Milkwort, cross
<i>Phragmites australis</i>	Grass, common reed	<i>Polygala polygama</i> var. <i>obtusata</i>	Milkwort, purple
<i>Phryma leptostachya</i>	Lopseed	<i>Polygala sanguinea</i>	Milkwort, field
<i>Phyla lanceolata</i>	Fog fruit	<i>Polygala senega</i>	Snakeroot, seneca
<i>Physalis heterophylla</i>	Ground cherry, clammy	<i>Polygala verticillata</i> var. <i>isocycla</i>	Milkwort, whorled
<i>Physalis longifolia</i>	Ground cherry, tall	<i>Polygonatum</i> <i>commutatum</i>	Solomon's seal
<i>Physalis pubescens</i>	Ground cherry, hairy	<i>Polygonatum pubescens</i>	Solomon's seal, downy
<i>Physalis subglabrata</i>	Ground cherry, smooth	<i>Polygonella articulata</i>	Jointweed
<i>Physalis virginiana</i>	Ground cherry, lance- leaved	<i>Polygonum achoreum</i>	Knotweed, beak-seeded
<i>Physocarpus opulifolius</i>	Ninebark	<i>Polygonum amphibium</i>	Smartweed, water
<i>Physostegia virginiana</i>	Obedient plant	<i>Polygonum</i> <i>arenastrum</i> *- NG	Knotweed, sidewalk*
<i>Phytolacca americana</i>	Pokeweed	<i>Polygonum aviculare</i> *	Knotweed, common*
<i>Pilea fontana</i> - NG	Clearweed, bog	<i>Polygonum buxiforme</i> - NG	Knotweed, boxwood
<i>Pilea pumila</i>	Clearweed, Canada	<i>Polygonum</i> <i>convolvulus</i> *	Birdweed, black*
<i>Pinus banksiana</i> *- SE	Pine, jack* - SE	<i>Polygonum erectum</i>	Knotweed, erect
<i>Pinus resinosa</i> *	Pine, red*		

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Polygonum hydropiper</i> *	Water pepper*	<i>Prenanthes aspera</i>	Lettuce, rough white
<i>Polygonum hydropiperoides</i>	Water pepper, mild	<i>Prenanthes crepidinea</i> -NG	Lettuce, great white
<i>Polygonum lapathifolium</i>	Smartweed, pale	<i>Prenanthes racemosa</i>	Lettuce, glaucous white
<i>Polygonum pensylvanicum</i>	Pinkweed	<i>Prunella vulgaris</i> var. <i>elongata</i>	Self-heal
<i>Polygonum persicaria</i> *	Lady's thumb*	<i>Prunus americana</i>	Plum, American
<i>Polygonum punctatum</i>	Smartweed	<i>Prunus pennsylvanicus</i>	Cherry, pin
<i>Polygonum ramosissimum</i>	Knotweed, bushy	<i>Prunus serotina</i>	Cherry, black
<i>Polygonum sagittatum</i>	Tearthumb, arrow-leaved	<i>Prunus virginiana</i>	Cherry, Choke
<i>Polygonum scandens</i>	False buckwheat, climbing	<i>Psoralea tenuiflora</i> *	Pea, scurf*
<i>Polygonum tenue</i>	Knotweed, slender	<i>Ptelea trifoliata</i>	Ash, wafer
<i>Polygonum virginianum</i>	Knotweed, Virginia	<i>Pteridium aquilinum</i> var. <i>latiusculum</i>	Fern, bracken
<i>Polymnia canadensis</i>	Leafcup, pale	<i>Puccinellia distans</i> -WC	Grass, alkali
<i>Polypodium virginianum</i>	Fern, polypody	<i>Pycnanthemum tenuifolium</i>	Mountain mint, slender
<i>Polystichum acrostichoides</i>	Fern, Christmas	<i>Pycnanthemum virginianum</i>	Mountain mint, common
<i>Polytaenia nuttallii</i> -OC	Prairie parsley	<i>Pyrola americana</i> -SE (extirpated)	Shinleaf, round-leaved, Lilly-of-the-Valley -SE
<i>Populus alba</i> *	Poplar, white*	<i>Pyrola elliptica</i>	Shinleaf, large-leaved
<i>Populus deltoides</i>	Cottonwood, eastern	<i>Quercus alba</i>	Oak, white
<i>Populus grandidentata</i>	Aspen, big-tooth	<i>Quercus bicolor</i>	Oak, swamp white
<i>Populus tremuloides</i>	Aspen, quaking	<i>Quercus ellipsoidalis</i> (<i>Q. coccinea</i>)	Oak, Hill's
<i>Portulaca oleracea</i> *	Purslane*	<i>Quercus imbricaria</i>	Oak, shingle
<i>Potamogeton crispus</i> *	Pondweed, beginner's*	<i>Quercus macrocarpa</i>	Oak, bur
<i>Potamogeton diversifolius</i> -WC	Pondweed, water-thread	<i>Quercus muhlenbergii</i>	Oak, chinquapin
<i>Potamogeton foliosus</i>	Pondweed, leafy	<i>Quercus palustris</i> -OC	Oak, pin
<i>Potamogeton illinoensis</i>	Pondweed	<i>Quercus rubra</i>	Oak, northern red
<i>Potamogeton natans</i> -WC	Pondweed	<i>Quercus velutina</i>	Oak, black
<i>Potamogeton nodosus</i>	Pondweed, American	<i>Ranunculus abortivus</i>	Buttercup, little-leaf
<i>Potamogeton pectinatus</i>	Pondweed, comb	<i>Ranunculus acris</i> *-OC	Buttercup, tall*
<i>Potamogeton pusillus</i>	Pondweed	<i>Ranunculus fascicularis</i>	Buttercup, early
<i>Potamogeton zosteriformis</i>	Pondweed	<i>Ranunculus flabellaris</i> -OC	Buttercup, yellow water
<i>Potentilla argentea</i> *	Cinquefoil, silvery*	<i>Ranunculus hispidus</i> var. <i>nitidus</i>	Buttercup, rough
<i>Potentilla arguta</i>	Cinquefoil, prairie	<i>Ranunculus longirostris</i> -OC	Crowroot, white water
<i>Potentilla norvegica</i>	Cinquefoil, rough	<i>Ranunculus recurvatus</i>	Buttercup, hooked
<i>Potentilla recta</i> *	Cinquefoil, sulfur*	<i>Ranunculus repens</i> *-OC	Buttercup, creeping*
<i>Potentilla simplex</i>	Cinquefoil, common		
<i>Prenanthes alba</i>	Lion's foot		

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Ranunculus</i>	Buttercup, prairie - ST	<i>Rudbeckia</i>	Black-eyed Susan,
<i>rhomboideus</i> - ST		<i>subtomentosa</i>	sweet
<i>Ranunculus sceleratus</i>	Crowfoot, cursed	<i>Rudbeckia triloba</i>	Brown-eyed Susan
<i>Ranunculus</i>	Buttercup, swamp	<i>Ruellia humilis</i>	Petunia, wild
<i>septentrionalis</i>		<i>Rumex acetosella</i> *	Sorrel, field*
<i>Ranunculus</i>	Crowfoot, white water	<i>Rumex altissimus</i>	Dock, pale
<i>trichophyllus</i> - OC		<i>Rumex crispus</i> *	Dock, curly*
<i>Ratibida pinnata</i>	Coneflower, gray-headed	<i>Rumex obtusifolius</i> *	Dock, bitter*
<i>Rhamnus cathartica</i> *	Buckthorn, common*	<i>Rumex orbiculatus</i>	Dock, great water
<i>Rhamnus frangula</i> *	Buckthorn, glossy*	<i>Rumex patientia</i> *	Dock, patience*
<i>Rhus aromatica</i>	Sumac, fragrant	<i>Rumex verticillatus</i>	Dock, swamp
<i>Rhus copalina</i>	Sumac, dwarf	<i>Sagittaria brevirostra</i>	Arrowleaf, short-beaked
<i>Rhus glabra</i>	Sumac, smooth	<i>Sagittaria cuneata</i>	Arrowhead, arum leaved
<i>Rhus typhina</i>	Sumac, staghorn	<i>Sagittaria latifolia</i>	Arrowhead, common
<i>Ribes americana</i>	Currant, American black	<i>Salix alba</i> *	Willow, white*
<i>Ribes cynosbati</i>	Gooseberry, prickly wild	<i>Salix amygdaloides</i>	Willow, peach-leaved
<i>Ribes missouriense</i>	Gooseberry, Missouri	<i>Salix bebbiana</i> - OC	Willow, beaked
<i>Ribes odoratum</i> *- OC	Currant, buffalo*	<i>Salix discolor</i>	Willow, pussy
<i>Robinia pseudoacacia</i> *	Locust, black*	<i>Salix eriocephala</i>	Willow, heart leaved
<i>Rorippa islandica</i> var.	Cress, marsh yellow	<i>(S.rigida)</i>	
<i>fernaldiana</i>		<i>Salix exigua</i>	Willow, sandbar
<i>Rorippa sessiliflora</i> - OC	Cress, sessile-flowered	<i>Salix fragilis</i> *	Willow*
<i>Rorippa sinuata</i>	Cress, spreading yellow	<i>Salix glaucophylloides</i>	Willow, blue leaved
<i>Rorippa sylvestris</i> *	Cress, creeping yellow*	<i>Salix humilis</i>	Willow, prairie
<i>Rosa blanda</i>	Rose, early wild	<i>Salix lucida</i> - OC	Willow, shining
<i>Rosa carolina</i>	Rose, pasture	<i>Salix nigra</i>	Willow, black
<i>Rosa eglanteria</i>	Rose, Sweetbrier	<i>Salix petiolaris</i> - NG	Willow, meadow
<i>Rosa multiflora</i> *	Rose, multiflora*	<i>Salix x rubens</i> - NG	Willow, hybrid crack
<i>Rosa palustris</i>	Rose, swamp	<i>Sambucus canadensis</i>	Elderberry
<i>Rosa setigera</i>	Rose, prairie	<i>Sambucus pubens</i> - SE	Elder, red-berried - SE
<i>Rosa suffulta</i>	Rose, sunshine	<i>Sanguinaria canadensis</i>	Bloodroot
<i>Rubus allegheniensis</i>	Blackberry, common	<i>Sanicula canadensis</i>	Black snakeroot, Canadian
<i>Rubus argutus</i> - OC	Blackberry, highbush	<i>Sanicula gregaria</i>	Black snakeroot, clustered
<i>Rubus flagellaris</i>	Dwberry, common	<i>Sanicula marilandica</i>	Black snakeroot
<i>Rubus hispidus</i>	Dewberry, swampy	<i>Saponaria officinalis</i> *	Bouncing bet*
<i>Rubus idaeus</i> *	Raspberry, cultivated*	<i>Saxifraga pensylvanica</i>	Saxifrage, swamp
<i>Rubus occidentalis</i>	Raspberry, black	<i>Schizachyrium</i>	Grass, little bluestem
<i>Rubus pensylvanicus</i> - NG	Blackberry, Yankee	<i>scoparium</i>	
<i>Rubus strigosus</i>	Raspberry, red	<i>Schrankia uncinata</i> (S.	Cat-claw, sensitive briar
<i>Rudbeckia hirta</i>	Black-eyed Susan	<i>nuttallii</i>)(>1 mile from	
<i>Rudbeckia laciniata</i>	Wild golden glow	URRAA boundary)	

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Scirpus acutus</i>	Bulrush, hard-stemmed	<i>Sisyrinchium</i>	Grass, blue-eyed
<i>Scirpus americanus</i>	Rush, chairmaker's	<i>angustifolium</i>	
<i>Scirpus atrovirens</i>	Rush, dark green	<i>Sisyrinchium campestre</i>	Grass, prairie blue-eyed
<i>Scirpus cyperinus</i>	Grass, wool	<i>Sisyrinchium</i>	Grass, blue-eyed
<i>Scirpus fluviatilis</i> - NG	Bulrush, river	<i>mucronatum</i> - OC	
<i>Scirpus heterochaetus</i>	Bulrush, slender	<i>Smilacina racemosa</i>	Solomon seal, false
<i>Scirpus maritimus</i> *	Bulrush, alkali*	<i>Smilacina stellata</i>	Solomon seal, starry false
<i>Scirpus</i>	Bulrush, great	<i>Smilax ecirrhata</i>	Carriion flower, upright
<i>tabernaemontanii</i>		<i>Smilax hispida</i>	Green brier, bristly
<i>Scleria triglomerata</i>	Rush, tall nut	<i>Smilax illinoensis</i>	Carriion flower, Illinois
<i>Scrophularia lanceolata</i>	Figwort, early	<i>Smilax lasioneuron</i>	Carriion flower, common
<i>Scrophularia</i>		<i>Solanum carolinense</i>	Horse nettle
<i>marilandica</i>	Figwort, late	<i>Solanum cornutum</i> *	Buffalo Bur*
<i>Scutellaria galericulata</i>	Skullcap, marsh	<i>Solanum dulcamara</i> *	Nightshade, bittersweet*
<i>(S. epilobifolia)</i>		<i>Solanum ptycanthum</i> (S.	Nightshade, black
<i>Scutellaria lateriflora</i>	Skullcap, mad-dog	<i>nigrum)</i>	
<i>Scutellaria leonardii</i>	Skullcap, small	<i>Solidago canadensis</i>	Goldenrod, Canada
<i>Scutellaria ovata</i>	Skullcap, heart-leaved	<i>Solidago flexicaulis</i>	Goldenrod, broad- leaved
<i>Selaginella rupestris</i>	Selaginella, rock	<i>Solidago gigantea</i>	Goldenrod, late
<i>Senecio aureus</i>	Ragwort, golden	<i>Solidago hispida</i>	Goldenrod, hairy
<i>Senecio pauperculus</i>	Ragwort, balsam	<i>Solidago juncea</i>	Goldenrod, early
<i>Senecio plattensis</i>	Ragwort, prairie	<i>Solidago missouriensis</i>	Goldenrod, Missouri
<i>Senecio vulgaris</i> *	Groundsel, common*	<i>Solidago nemoralis</i>	Goldenrod, old field
<i>Setaria faberii</i> *	Foxtail, giant*	<i>Solidago ohioensis</i> - NG	Goldenrod, Ohio
<i>Setaria glauca</i> *	Foxtail, yellow*	<i>Solidago patula</i>	Goldenrod, swamp
<i>Setaria viridis</i> *	Foxtail, green*	<i>Solidago ptarmicoides</i>	Aster, stiff
<i>Sicyos angulatus</i>	Bur cucumber	<i>Solidago riddellii</i>	Goldenrod, Riddell's
<i>Silene antirrhina</i>	Catchfly, sleepy	<i>Solidago rigida</i>	Goldenrod, rigid
<i>Silene armeria</i> *- OC	Catchfly, sweet william*	<i>Solidago speciosa</i>	Goldenrod, showy
<i>Silene cserei</i> *	Campion, glaucous*	<i>Solidago uliginosa</i>	Goldenrod, bog
<i>Silene nivea</i>	Campion, snowy	<i>Solidago ulmifolia</i>	Goldenrod, elm leaved
<i>Silene noctiflora</i> *- OC	Catchfly, night- flowering*	<i>Sonchus arvensis</i> *	Sow thistle, common
<i>Silene stellata</i>	Campion, starry	<i>Sonchus asper</i> * (S.	Sow thistle, prickly*
<i>Silphium integrifolium</i>	Rosin weed	<i>uliginosus)</i>	
<i>Silphium laciniatum</i>	Compass plant	<i>Sonchus oleraceus</i> *	Sow thistle, common
<i>Silphium perfoliatum</i>	Cup plant	<i>Sorbus americana</i> - SE	Ash, american
<i>Silphium</i>	Prairie dock		mountain - SE
<i>terebinthinaceum</i>		<i>Sorghastrum nutans</i>	Grass, Indian
<i>Sisymbrium</i>	Mustard, tumble*	<i>Sorghum bicolor</i> *- OC	Grass, Sorghum*
<i>altissimum</i> *		<i>Sparganium</i>	Bur-reed, branched
<i>Sisymbrium officinale</i> *	Mustard, hedge*	<i>androcladum</i>	
<i>Sisyrinchium albidum</i>	Blue-eyed grass, common		

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Sparganium eurycarpum</i>	Bur-reed, common	<i>Thalictrum revolutum</i>	Rue, waxy meadow
<i>Sparganium americanum</i> - SE	Bur-reed, american- SE	<i>Thalictrum thalictroides</i> (Anemonella thalictroides)	Rue anemone
<i>Spartina pectinata</i>	Grass, prairie cord	<i>Thaspium barbinode</i>	Parsnip, hairy meadow
<i>Sphenopholis intermedia</i> (S. nitida)- NG	Grass, slender wedge	<i>Thaspium trifoliatum</i>	Parsnip, purple meadow
<i>Sphenopholis obtusata</i>	Grass, prairie wedge	<i>Thelypteris palustris</i> var. pubescens	Fern, marsh
<i>Spiraea alba</i>	Meadowsweet	<i>Thlaspi arvense</i> *	Cress, field penny*
<i>Spiranthes cernua</i>	Orchid, nodding ladies' tresses	<i>Thuja occidentalis</i> *	Cedar, northern white*
<i>Spiranthes lacera</i>	Orchid, slender ladies' tresses	<i>Tilia americana</i>	Basswood, American
<i>Spiranthes magnicamporum</i> - OC	Orchid, fragrant ladies' tresses	<i>Tomanthera auriculata</i> - ST	Foxglove, eared false - ST
<i>Spirodela polyrhiza</i>	Duckweed, great	<i>Toxicodendron radicans</i>	Poison ivy
<i>Sporobolus asper</i>	Grass, rough dropseed	<i>Tradescantia ohiensis</i>	Spiderwort, Ohio
<i>Sporobolus cryptandrus</i>	Grass, sand dropseed	<i>Tradescantia virginiana</i>	Spiderwort, vrginia
<i>Sporobolus heterolepis</i>	Grass, prairie dropseed	<i>Tragopogon dubius</i> *	Goat's beard, sand*
<i>Sporobolus neglectus</i>	Grass, small rush	<i>Tragopogon porrifolius</i> *- OC	Oyster salsify*
<i>Sporobolus vaginiflorus</i>	Grass, northern rush	<i>Tragopogon pratensis</i> *	Goat's beard, common*
<i>Stachys palustris</i> var. homotricha	Woundwort	<i>Triadenum fraseri</i>	St. John's-wort, Fraser's
<i>Stachys tenuifolia</i>	Nettle, smooth hedge	<i>Trichostema brachiatum</i>	Pennyroyal, false
<i>Staphylea trifolia</i>	Bladdernut	<i>Trichostema dichotomum</i>	Blue curls
<i>Stellaria media</i> *	Chickweed, common*	<i>Tridens flavus</i>	Grass, purpletop
<i>Stipa spartea</i>	Grass, porcupine	<i>Trientalis borealis</i> - ST	Starflower - ST
<i>Strophostyles helvula</i> - OC	Bean, trailing wild	<i>Trifolium arvense</i> *- OC	Clover, rabbit-foot*
<i>Sullivantia renifolia</i> - ST	Sullivantia - ST	<i>Trifolium campestre</i> *	Clover, low hop*
<i>Symphoricarpos occidentalis</i>	Wolfberry	<i>Trifolium dubium</i> *	Clover, little hop*
<i>Symphoricarpos orbiculatus</i>	Coralberry	<i>Trifolium hybridum</i> *	Clover, alsike*
<i>Symplocarpus foetidus</i>	Skunk cabbage	<i>Trifolium pratense</i> *	Clover, red*
<i>Taenidia integerrima</i>	Pimpernel, yellow	<i>Trifolium repens</i> *	Clover, white*
<i>Talinum rugospermum</i>	Fame flower	<i>Trillium flexipes</i>	Trillium, declined
<i>Tanacetum vulgare</i> *	Tansy, common*	<i>Trillium nivale</i>	Trillium, snow
<i>Taraxacum officinale</i> *	Dandelion, common*	<i>Trillium recurvatum</i>	Trillium, red
<i>Taxus canadensis</i>	Canadian yew	<i>Triodanis perfoliata</i>	Venus's looking glass
<i>Tephrosia virginiana</i>	Rue, goat's	<i>Triosteum aurantiacum</i>	Horse gentian, early
<i>Teucrium canadense</i>	Germander	<i>Triosteum perfoliatum</i>	Horse gentian, late
<i>Thalictrum dasycarpum</i>	Rue, purple meadow	<i>Triphora trianthophora</i> - OC	Pogonia, nodding
<i>Thalictrum diocium</i>	Rue, early meadow	<i>Triticum aestivum</i> *	Grass, wheat*
		<i>Typha angustifolia</i> *	Cattail, narrow-leaved*
		<i>Typha latifolia</i>	Cattail, broad-leaved cattail

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
<i>Ulmus americana</i>	Elm, American	<i>Viburnum trilobum</i>	Cranberry, American high-bush
<i>Ulmus pumila</i> *	Elm, Siberian*	<i>Vicia americana</i>	Vetch, American
<i>Ulmus rubra</i>	Elm, slippery	<i>Vicia caroliniana</i>	Vetch, wood
<i>Ulmus thomasi</i> - SE	Elm, rock - SE	<i>Vicia cracca</i>	Vetch, cow
<i>Urtica dioica</i>	Nettle, tall	<i>Vicia villosa</i> *	Vetch, winter*
<i>Uvularia grandiflora</i>	Bellwort	<i>Viola affinis</i>	Violet, Le Conte's
<i>Vaccaria pyramidata</i>	Cow-herb	<i>Viola fimbriatula</i>	Violet, sand
<i>Vaccinium angustifolium</i>	Blueberry, early low	<i>Viola lanceolata</i>	Violet, lance-leaved
<i>Vaccinium myrtilloides</i>	Blueberry, Canada	<i>Viola macloskeyivar. pallens</i>	Violet, smooth white
<i>Vaccinium pallidum</i>	Blueberry, late low-bush	<i>Viola nephrophylla</i>	Violet, northern bog
<i>Valeriana edulis</i> var. <i>ciliata</i>	Valerian, common	<i>Viola obliqua</i> - OC	Violet, marsh blue violet
<i>Vallisneria americana</i>	Grass, eel	<i>Viola pedata</i>	Violet, bird's foot
<i>Verbascum blattaria</i> *-NG	Mullein, moth*	<i>Viola pedatifida</i>	Violet, prairie
<i>Verbascum thapsus</i> *	Mullein, woolly*	<i>Viola pubescens</i>	Violet, downy yellow
<i>Verbena bracteata</i>	Vervain, creeping	<i>Viola sagittata</i>	Violet, arrow-leaved
<i>Verbena hastata</i>	Vervain, blue	<i>Viola sororia</i>	Violet, common blue
<i>Verbena simplex</i>	Vervain, narrow leaved	<i>Viola striata</i> - OC	Violet, common white
<i>Verbena stricta</i>	Vervain, hoary	<i>Viola triloba</i>	Violet, cleft
<i>Verbena urticifolia</i>	Vervain, white	<i>Viola x bernardii</i>	Violet, hybrid
<i>Verbesina alternifolia</i>	Wingstem	<i>Vitis aestavalis</i>	Grape, summer
<i>Vernonia fasciculata</i>	Ironweed, common	<i>Vitis riparia</i>	Grape, riverbank
<i>Vernonia missurica</i> -OC	Ironweed, Missouri	<i>Vitis vulpina</i>	Grape, frost
<i>Veronica arvensis</i> *	Speedwell, corn*	<i>Vulpia octoflora</i>	Fescue, six weeks
<i>Veronica officinalis</i> *	Speedwell, common*	<i>Wolffia columbiana</i>	Water meal
<i>Veronica peregrina</i>	Speedwell, purslane	<i>Woodsia ilvensis</i> – SE	Fern, rusty woodsia – SE
<i>Veronica serpyllifolia</i>	Speedwell, thyme-leaved	<i>Woodsia obtusa</i>	Fern, cliff
<i>Veronicastrum virginicum</i>	Culver's root	<i>Xanthium strumarium</i>	Cocklebur
<i>Viburnum acerifolium</i>	Viburnum, maple leaved	<i>Xyris torta</i>	Grass, yellow-eyed
<i>Viburnum lentago</i>	Nannyberry	<i>Zannichellia palustris</i>	Pondweed, horned
<i>Viburnum opulus</i> *	Cranberry, European high-bush*	<i>Zanthoxylum americanum</i>	Ash, prickly
<i>Viburnum prunifolium</i>	Black haw	<i>Zizia aptera</i>	Parsnip, heart-leaved meadow
<i>Viburnum rafinesquianum</i>	Arrowwood, downy	<i>Zizia aurea</i>	Golden Alexanders
		<i>Zosterella dubia</i>	Grass, water star

Appendix 2. Continued.

Scientific Name ^{1,2}	Common Name ^{1,2}	Scientific Name ^{1,2}	Common Name ^{1,2}
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Area (from Appendix 1), sorted by scientific name with the corresponding common name. Nomenclature generally follows Mohlenbrock (1986), with modifications from Swink and Wilhelm (1994) and Gleason and Cronquist (1991).

SE = State endangered; ST = state threatened; * = non-native species.

NG= plants confirmed within Nachusa Grasslands, may or may not be within URRRAA

OC= reported in Ogle county but without a specific locality

WC=reported in Winnebago county without a specific locality

Appendix 2. Continued.

<u>Scientific Name^{1,2}</u>	<u>Common Name^{1,2}</u>	<u>Scientific Name^{1,2}</u>	<u>Common Name^{1,2}</u>
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