

# A Natural Areas Inventory of Anderson and Linn Counties in Kansas



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Cover photo: Native Prairie Hay Meadow, 2008. Photo by Kelly Kindscher

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## Abstract

In 2007, the Kansas Biological Survey initiated a 2-year inventory to identify and survey the remaining high-quality natural areas in Anderson and Linn counties and to identify habitat that might harbor rare species.

The primary natural areas in these counties are prairie and forest plant communities. We found a total of 236 high-quality prairies larger than 5 acres each. We also found 24 high-quality forest sites, most of which were larger than 10 acres each.

High-quality prairie communities include Unglaciaded Tallgrass Prairie, Low (Wet) Prairie and Claypan Prairie. High-quality forest communities include Oak-Hickory Forest and Maple-Basswood Forest.

Each high-quality plant community found is capable of sustaining known or possible rare species of interest. Specifically, we found regal fritillary butterflies at half the sites where butterflies were surveyed, a total of 28 sites.

In addition, we found 88 previously unknown populations of Mead's milkweed, a federally protected species listed as threatened. We also verified the continued existence of 31 previously known populations. These findings result in a total of 119 populations of Mead's milkweed for Anderson and Linn counties, a density unknown anywhere else throughout its global range.

We calculated the percentages of remaining high-quality native prairie in each county and compared them to the estimates of native prairie present in the 1850s from the Public Land Surveys of that time. We found that by 2009, remaining high-quality native prairie was only 1.11% of Anderson County, compared to 94% in the 1850s, and 0.01% of Linn County, compared to 81% in the 1850s.

Overall, these prairie gems are important sites for biological diversity. We have provided county maps showing the locations of remaining high-quality prairies and forests in the two-county area. We suggest several management recommendations for landowners and opportunities for both landowners and planning commissions to conserve some of their biologically rich tracts of land.

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## **Chapter 1: Introduction**

### **1.1. Project Purpose**

In 2007, the Kansas Biological Survey was funded by a State Wildlife Grant from the Kansas Department of Wildlife & Parks to begin a project to identify the remaining, high-quality prairies, forests, and other natural areas in Anderson and Linn counties in northeast Kansas. The primary objective of this study was to provide information so policy makers can balance the need for development of natural resources with the need to preserve remaining natural areas in a changing landscape. Although some natural areas in Anderson County had been documented and mapped in the early 1990s, no recent systematic effort had been made previously to document all natural areas remaining in these counties.

High-quality natural areas are places on the landscape that support plant communities that closely approximate the native vegetation (e.g., tallgrass prairie or oak-hickory forest) that existed prior to Euro-American settlement. They provide many beneficial services to humans by buffering the effects of pollution, protecting water quality, preventing soil erosion, improving land values, and providing opportunities for outdoor recreation. They are reservoirs of biological diversity and sanctuaries for sensitive and declining species.

Our goal was to locate, classify, and evaluate the natural communities remaining in the study area and to identify the plants and animals that rely on them. We were especially concerned with identifying natural areas that provide critical habitat for rare and threatened species.

### **1.2. Objectives**

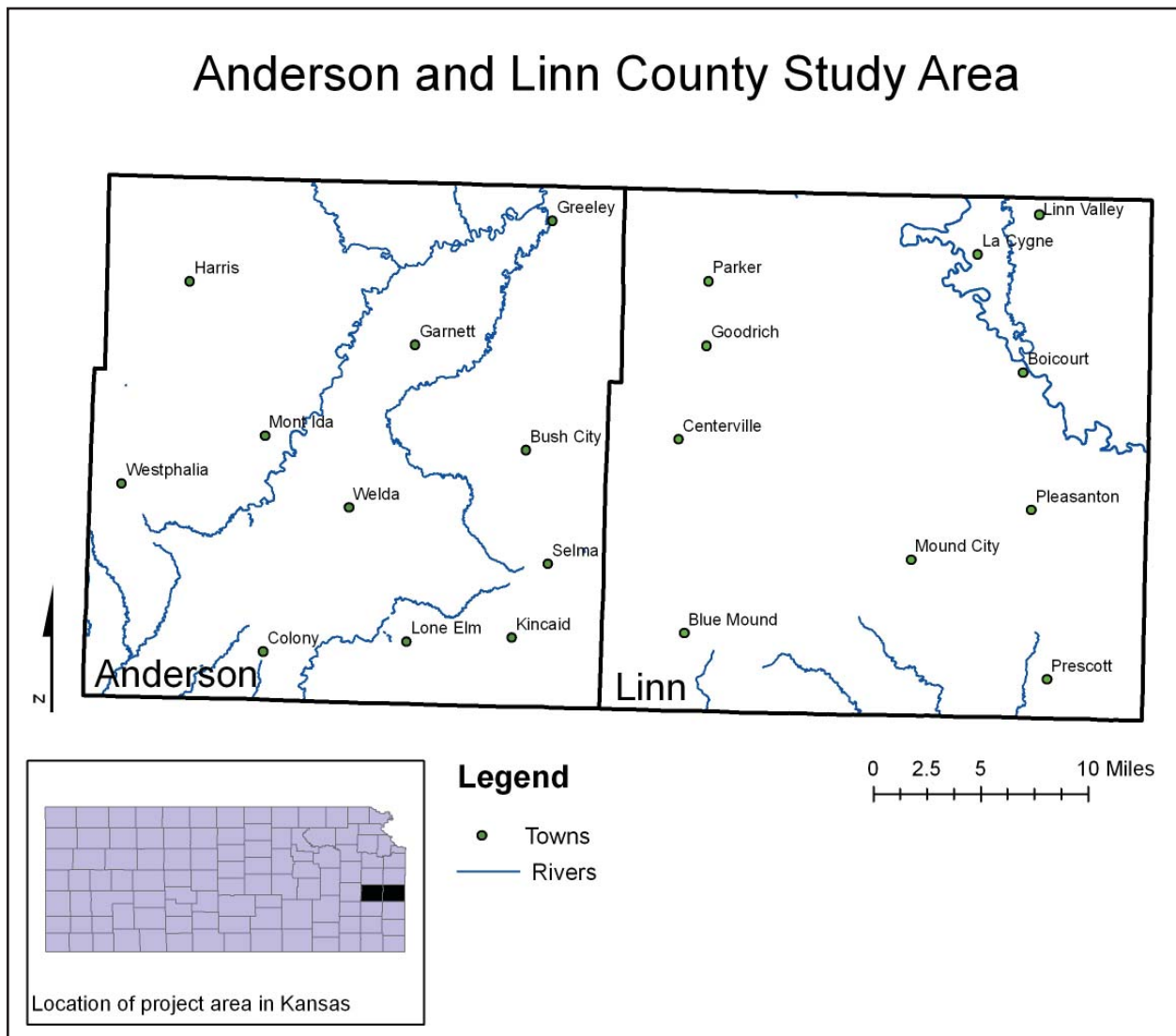
The objectives of this study were

- a) to find, identify, and assess through field surveys the remaining high-quality natural areas in the two-county area;
- b) to document the locations of protected and rare animal and plant species in these areas and to record them in the Kansas Natural Heritage Inventory database;
- c) to document the number of new and previously known sites supporting high-quality prairies, forests, and rare species;
- d) to provide management recommendations to landowners interested in preserving and restoring natural areas on their property; and
- e) to identify sensitive environments, potential parklands, and scenic recreational areas. This information will be valuable for planning purposes and will provide an opportunity for Anderson and Linn counties to lead in the integration of conservation planning with development planning.

## Chapter 2: General Description of Anderson and Linn Counties

### 2.1. Survey Area and Landscape Features

The survey area includes Anderson and Linn counties (see Figure 2.1). This area is bounded on the east by Missouri and is traversed by the Marais des Cygnes River and several tributaries. The two-county area lies within the Osage Cuestas, which is south of the area in Kansas that was covered by glaciers in the Pleistocene. Major geology substrates are limestone, sandstone, and shale. The area is primarily in agricultural production of crops including corn, soybeans, wheat, grain sorghum, and alfalfa, as well as native pasture and cool-season pasture planted to brome and fescue. High-quality native prairies are scattered throughout both counties.



**Figure 2.1.** County Inventory study area of Linn and Anderson Counties in Kansas.



## 2.2. Land-Use History and Trends

### 2.2.a. Past Land-Use Patterns

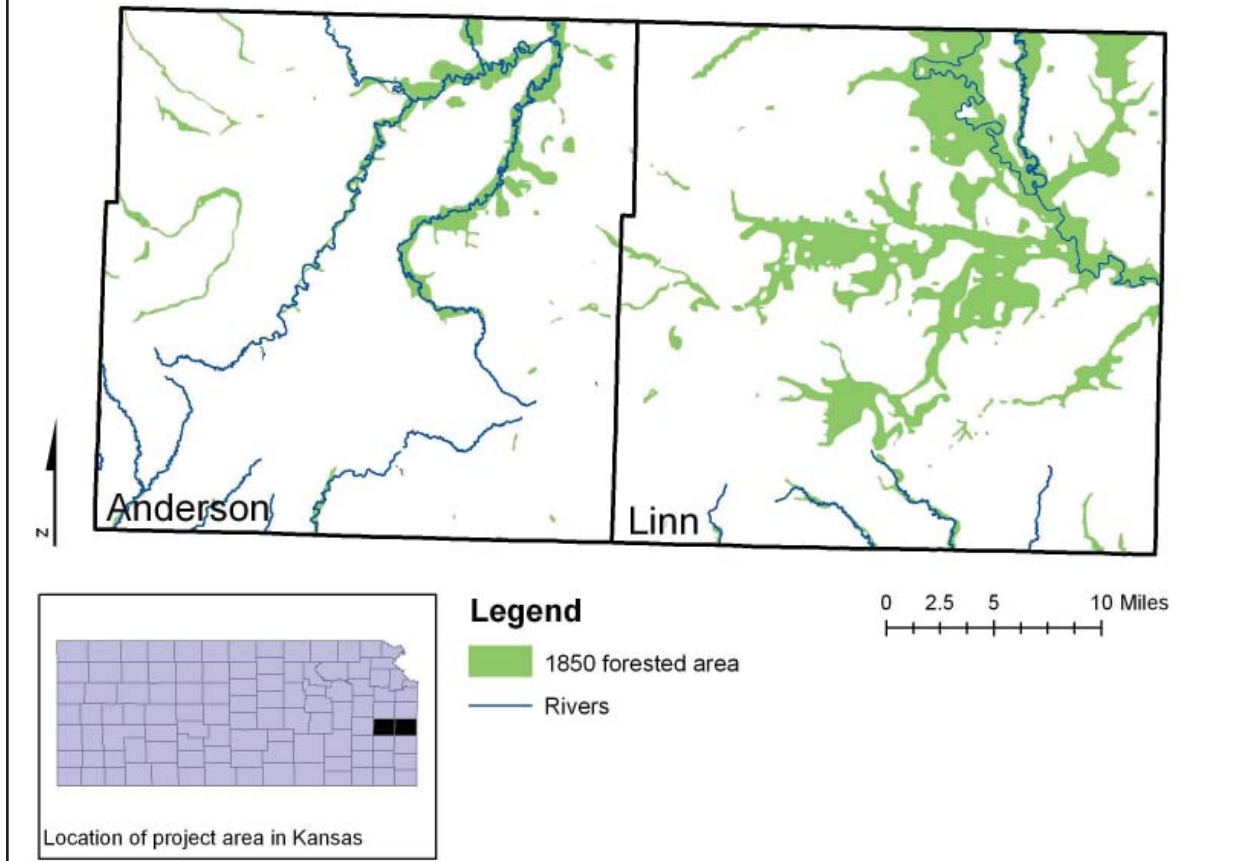
Prior to Euro-American settlement, the area was inhabited by the Kansa, Osage, and other Native American tribes. Most of the land was then prairie, which was maintained by fire set by Native Americans or started by lightning. When Euro-American settlement began in the 1850s, federal land surveyors estimated prairie to cover 94% of Anderson County and 81% of Linn County (see Table 2.1). The remaining land was primarily covered with forest (see Figure 2.2). Europeans at first settled near rivers for access to timber, transportation, and commerce but then expanded to upland prairies, which they tilled for crops and used for pasture. Over time, livestock grazing and suppression of fire led to woody growth replacing grassland; in some areas, conversion of grassland to farmland further reduced prairie acreage. In addition, most wetlands were drained and many riparian forests were cut for timber use, farmland development, and river channel control.

**Table 2.1.** Acreage and Percentage of Land in Native High-Quality Prairie in Anderson and Linn counties, 1850s–2009.

<b>County</b>	<b>1850s Prairie Acreage</b>	<b>1850s Estimated Percent of High-Quality Prairie</b>	<b>2009 Prairie Acreage</b>	<b>2009 Percent of High-Quality Prairie Remaining</b>
<b>Anderson</b>	346,368	93.7%	3,766	1.11%
<b>Linn</b>	310,649	80.9%	2,654	0.01%

Note. Data for the 1850s are from the Kansas State Board of Agriculture (1877). The data for 2009 are for parcels greater than 5 acres that the Kansas Natural Heritage Inventory has identified (see Chapter 4).

## 1850 Public Land Survey of Anderson and Linn Counties



**Figure 2.2.** Map showing forested areas in the 1850 Public Land Survey of Anderson and Linn counties.

### 2.2.b. Current Land Use Trends

At present, land in the United States is being converted to cropland, housing, offices, shopping centers, and industrial uses at an accelerating rate. Some estimates indicate that the amount of land being claimed for urban and suburban uses has increased by nearly 300% since 1955, while the U.S. population has increased by 75%. Conversion of natural areas to human uses reduces habitat for wildlife and limits ecosystem benefits and has become one of the most serious threats to native plant and animal species (Ewing et al. 2005). Although the area in this county inventory is outside of the greater Kansas City area, development is still a major part of the land-use trend. Most conversion of native prairie to agricultural land has already occurred, but when crop prices are high, some land still gets converted.

### 2.3. Potential Natural Communities and Species in Anderson and Linn Counties

Several prairie and forest community types were present in Anderson and Linn counties before Euro-American settlement (Table 2.2). The most common prairie community type was the Unglaciated Tallgrass Prairie, found in the Osage Cuestas Region of east-central and southeast Kansas (see Figures 2.3 and 2.4). Low (Wet) Prairie was found along creeks and streams.

Numerous forest community types were found in the two-county area before European settlement, each characterized by proximity to rivers or moist habitats and the kind of trees dominant in the forest makeup. The most common community type was Oak-Hickory Forest (see Figures 2.5 and 2.6). Other community types included Ash-Elm-Hackberry Floodplain Forest, Cottonwood-Sycamore Floodplain Forest, Pecan-Hackberry Floodplain Forest, and Maple-Basswood Forest.

**Table 2.2.** Major Terrestrial and Wetland Plant Communities in Anderson and Linn Counties Before Euro-American Settlement (Adapted From Lauver et al. 1999).

Ash-Elm-Hackberry Floodplain Forest	Mixed Oak Floodplain Forest
Bur Oak Floodplain Woodland	Mixed Oak Ravine Woodland
Buttonbush Swamp	Neutral Seep
Cottonwood-Black Willow Floodplain Forest	Oak-Hickory Forest
Cottonwood-Sycamore Floodplain Forest	Ozark Limestone Glade
Eastern Cattail Marsh	Pecan-Hackberry Floodplain Forest
Freshwater Marsh	Pondweed Aquatic Wetland
Loess Hills Tallgrass Prairie	Unglaciated Tallgrass Prairie
Maple-Basswood Forest	Wet Prairie



**Figure 2.3.** Unglaciated Tallgrass Prairie in Anderson County, 2009.



**Figure 2.4.** Spiderwort, *Tradescantia ohioensis*, in native prairie in Linn County, 2008.



**Figure 2.5** Oak-Hickory Forest in Linn County, 2009



**Figure 2.6.** An oak leaf on a fallen tree in Oak-Hickory Forest.

## **Chapter 3: Inventory Methods**

### **3.1. Data Sources**

Data sources used to develop the inventory included previously mapped sites in the Heritage database, digital satellite imagery, topographic maps, aerial photographs, and field surveys.

### **3.2. Site Selection**

Work on the project began on November 1, 2007, and ended August 31, 2009. Fieldwork concentrated on the April–July field season each year. Our initial efforts focused on identification of potential natural areas using digital satellite imagery, recent and historical aerial photography (U.S. Department of Agriculture 2003), and previously mapped sites recorded in the Heritage database. Locations were mapped onto USGS 1:24,000 topographic maps and verified in the field.

Forested areas could be observed readily on aerial photographs, and potential high-quality sites were digitized using GIS software. These polygons were overlain on aerial photographs and topographic maps and the area mapped as forest in the 1850 Public Land Survey to create reference maps for use in the field.

Using satellite imagery to locate potential prairies was not as successful as using aerial photographs and topographic maps. We had anticipated using digital satellite data and aerial photography to differentiate between prairie and human-influenced grasslands like fescue pastures and crops. We discovered early in the first season that aerial photographs were helpful up to a point, but Landsat satellite imagery lacked the resolution needed to allow identification of small prairies in a highly fragmented landscape. It became clear that it would be easier to drive all roads looking for sites than to investigate all sites identified as possible natural areas by remote sensing, and we changed our study procedure. To make sure we found appropriate potential natural area sites in the two-county area, field crews drove along all county roads in Anderson and Linn counties. Sites identified in this manner were compared to historical maps (Public Land Surveys of Kansas 1850s) and previously mapped sites in the Heritage database.

Potential prairie sites of 5 acres or more, forest sites of 10 acres or more, and sites that were smaller but potentially supported rare species or were buffered by important plant communities were mapped onto field maps that were used in field surveys during April–July 2008 and March–July 2009. Natural communities that met the quality criteria used by the Kansas Natural Heritage Inventory were identified and assessed by three crews, each of at least two field biologists, botanists, or ecologists, who mapped community boundaries, assessed site condition following standard Heritage methodology, and identified species of plants present. Considering the importance of property rights and our respect for them, we obtained landowner permission before we visited potential sites. We contacted landowners by asking who owned the tract of land at the nearest house, by using county land ownership maps, and by obtaining information through the county courthouses. In exchange for permission to inventory their land, we offered to send prop-

erty owners the plant species lists we compiled while surveying their property.

### 3.3. Ranking Criteria

The objective of a natural areas inventory is to locate tracts of relatively undisturbed natural land that contain one or more natural communities existing in undisturbed or minimally disturbed conditions. Based on what we know about presettlement vegetation and communities (Table 2.2), and the rarity of certain plants and animals in the area (Appendix E), we can employ ranking criteria to determine the overall quality of our potential natural areas.

#### 3.3.a. Natural Heritage Procedures

We used standard Natural Heritage procedures (NatureServe 2005c) to assign a grade to each community and species occurrence to summarize its quality and condition. Four grades ranging from A to D were used, while X was used to indicate a site that had been extirpated (e.g., developed for housing or converted to cropland or other uses). For plant communities, an A-grade indicated a pristine or relatively undisturbed occurrence, while a D-grade site was severely degraded.

The Heritage program gathers detailed information only for A- and B-grade community occurrences, limited information for most C-grade occurrences, and only the information needed to assign a grade for D-grade sites. Information about lower-quality sites, however, may be useful (e.g., for determining whether those sites can serve as buffers for high-quality core areas, links between high-quality sites, restoration projects, or parklands and recreational areas), and where appropriate, we gathered that information, too. These areas may be identified and characterized if the information is deemed potentially useful, but normally they are not added to the Natural Heritage databases.

Sites are ranked by using three key factors: landscape context, size, and condition. Landscape context is the extent to which an area is imbedded in a landscape of intact natural communities. Normally, landscape context and size are weighted more heavily than condition. The rationale is that landscape context and size cannot increase, or can do so only slightly with time, whereas condition is a more variable attribute and can be increased fairly quickly with appropriate management. Also, the assessed condition of a prairie remnant may vary with season, observer, management, or environmental conditions.

*Landscape Context* — Landscape context refers to the general condition of the landscape in which a site occurs, considering such issues as disturbance regimes, fragmentation, topography, and biological diversity. Landscape context is ranked A–D. Generally speaking, A-grade landscapes have not been converted to human land uses (like cropland or housing) and are dominated by natural communities. Natural processes, species interactions, and species migrations can occur across all natural communities and experience no complete barriers. Surrounding vegetation is greater than 80% natural. B-grade landscapes have experienced some land conversion, but natural communities remain well-connected. Natural processes and species interactions and migrations can occur across many natural communities and experience few barriers. Surround-

ing vegetation is 50–80% natural. C-grade landscapes are fragmented by cultural land, including cropland or developed areas. Barriers severely affect many natural processes, species interactions, and migrations, and many species are unable to maintain viable populations. Surrounding vegetation is 20–50% natural. D-grade landscapes are surrounded almost entirely by cultural land. Natural processes and species migrations are severely compromised and cannot occur at natural scales. Only a subset of the historic biological diversity is viable within natural communities.

*Size* — Determining the size of a natural community may appear straightforward, but several issues complicate this process: patch size and minimum distance separating two occurrences.

Patch size denotes the size and landscape position of a natural community (Lauver et al. 1999). Four patch types usually are recognized: matrix, large-patch, small-patch, and linear. Matrix communities occur on the dominant landforms in an ecoregion and form extensive and often contiguous cover, usually greater than 1,000 acres. Large-patch communities generally occur on subdominant landform features and form large but interrupted cover, usually 20–1,000 acres. Small-patch communities occur on specialized landforms and microhabitats, and generally are less than 20 acres. Linear communities are long, narrow communities usually associated with riverine features.

Size standards have been established for many natural communities to distinguish viable from nonviable occurrences and, for viable occurrences, to rank them (A–D, with A being the best and D being the worst). Each community occurrence must meet the minimum size set for its type to be considered viable. For example, for Unglaciated Tallgrass Prairie, a matrix community type, occurrences less than 10,000 acres usually are not considered viable (able to support ecosystem functions necessary to maintain high levels of native biodiversity for more than 100 years).

A second factor complicating the size issue is how far apart two occurrences of the same community type can be before they are considered distinct occurrences. Several evaluation guidelines are available to assist in determining the minimum distance of separation for terrestrial natural communities. Basically, two tracts are treated as distinct if they are separated by:

- 1) a substantial barrier to natural processes and/or to native species, such as a busy highway, developed area, or large body of water;
- 2) cultural vegetation that limits connection of patches;
- 3) a different community type coverage greater than 0.5 mile wide if the communities frequently do not occur in a mosaic, or 1–2 miles wide if frequently in a mosaic;
- 4) a tract subjected to management that is significantly different from that employed on the separated tracts; or
- 5) a major break or change in ecological land unit.



*Condition* — Condition refers to the impact that human disturbance has had on a site. Condition can be estimated by any of several available methods. Most Natural Heritage programs use subjective field assessments, which are based on estimates of native species richness, abundance of exotic species, and ecological processes. As with landscape context, condition may be ranked from A–D, with A being the best (least affected by human disturbance) and D being the worst (severely affected by human disturbance).

The determination of condition at a site was a primary purpose of our fieldwork. For each site we visited, we took note of the ecological and physical characteristics present, working in teams of two or more to put together an accurate plant species list for each site. Plant species that could not be identified in the field were brought back to the Kansas Biological Survey and the R. L. McGregor Herbarium for more exact identification.

### 3.3.b. Floristic Quality Assessment

Floristic Quality Assessment (FQA) is a standardized tool used to estimate the floristic quality of a natural area based on the vascular plants growing there (Taft et al. 1997; Freeman and Morse 2002). By extension, it can be used to assess the overall ecological quality of a site. Ecologists, botanists, environmental professionals, and land managers use FQA to establish baseline assessments, to conduct long-term monitoring, and to assess restoration progress in a variety of ecological settings (Herman et al. 1997; Taft et al. 1997). Developed in the 1970s (Wilhelm 1977; Swink and Wilhelm 1979), the method has been refined from its original form (Wilhelm and Ladd 1988; Taft et al. 1997; Rooney and Rogers 2002) and now is in use or development in numerous states and provinces in the United States and Canada (Taft et al. 1997).

The method was developed to avoid subjective measures of natural community quality, such as “high” or “low”. Some elements of FQA still are subjective, but the method has clear advantages over other evaluation tools, including repeatability and ease of application. Ideally, FQA should be used with other content-based and context-based measures (*sensu* Rooney and Rogers 2002) to estimate the integrity of native plant communities (Taft et al. 1997).

The FQA method is based on calculating an average coefficient of conservatism (C) and a floristic quality index (FQI) for a site. It may be used to compare several sites supporting the same community type (e.g., several Unglaciated Tallgrass Prairies) but should not be used to compare different community types (Rooney and Rogers 2002). A coefficient of conservatism is an integer from 0–10 that is assigned to each native plant species in a given geographic region—often a state or province. Naturally occurring hybrids and infraspe-



**Figure 3.1.** Topeka coneflower, *Echinacea atorubens*, has a coefficient of conservatism of 8.

cific taxa usually are not assigned coefficients.

Coefficients of conservatism express two basic ecological tenets: plants differ in their tolerance of the type, frequency, and amplitude of anthropogenic disturbance, and plants vary in their fidelity to remnant natural plant communities (Taft et al. 1997). As employed in FQA, these two principles exhibit an inverse relationship: the lower a species' tolerance of human-mediated disturbance, the higher its likelihood of occurring only in a natural plant community. Low coefficient values (0–3) denote taxa often found in highly disturbed habitats and without a strong affinity for natural communities. High coefficient values (7–10) denote species that tolerate only limited disturbance and usually are found in natural communities (see Figures 3.1 and 3.2). With these principles as a guide, the C value applied to each species represents a relative rank based on observed behavior and patterns of occurrence in Kansas natural communities. Non-native species are not assigned coefficients because they were not part of the presettlement landscape. They do have an effect on FQA, however, and they may be incorporated in the assessment process.

The FQA process begins with a thorough inventory of vascular plants at a site of interest. The checklist then is used to calculate a floristic quality index (FQI) for the site. A mean C value (mean C) is calculated. The mean C value for a site is the arithmetic mean of the coefficients of all native vascular plants occurring on the entire site ( $\text{mean } C = \Sigma C/N$ ), without regard to dominance or frequency. Non-native taxa are excluded from the calculation of mean C. The FQI is the mean C multiplied by the square root of the total number of taxa ( $\sqrt{N}$ ) inventoried on the site ( $\text{FQI} = \text{mean } C \times \sqrt{N}$ ). Separate calculations may be made using  $N = \text{all taxa}$  (native and non-native) and  $N = \text{native taxa only}$  (see analysis and discussion in Taft et al. 1997). The basic formula for FQI combines the conservatism of the taxa with a measure of the taxon richness of the site. By multiplying by  $\sqrt{N}$  instead of  $N$ , the formula reduces the effect of the size of the site (larger sites tend to have a larger total number of species). If the sampling method involves transects or quadrats, a mean C and FQI can be calculated for each sample (Wilhelm 1977; Taft et al. 1997).

### 3.3.c. Rare Species

Natural Heritage programs across the United States determine state ranks for rare species (NatureServe 2005b). Factors considered in assessing conservation status include total number and condition of populations; population size; range extent and area of occupancy; short- and long-term trends in the above factors; scope, severity, and immediacy of threats to the species; number of protected and managed populations; intrinsic vulnerability, and environmen-



**Figure 3.2.** Culver's root, *Veronicastrum virginicum*, has a coefficient of conservatism of 8.

tal restrictions.

State conservation status ranks of species are based on a 1–5 scale, ranging from critically imperiled (S1) to demonstrably secure (S5). The two state rankings of interest in the County Inventory are the S1 (critically imperiled) and S2 (imperiled) species. We noted the presence of each S1 and S2 plant and animal species found in our survey.

### **3.4. Site Description Format**

Once permission to survey a site was received from the landowner, each site was visited by a two- or three-person crew. They filled out data sheets with the following information:

- 1) latitude and longitude by GPS and a general description of the area;
- 2) landscape description of the site and the surrounding area;
- 3) description of the vegetative community and ranking (according to standard Heritage methodology; NatureServe 2005c);
- 4) the names of all plant species found on the site (the taxonomy used was from the USDA Plants Database 2010);
- 5) any occurrences of rare, threatened, or endangered species; and
- 6) the outline of the site on an aerial photograph of the area.

Data were entered into the Kansas Natural Heritage Inventory database and into plant species databases. Polygons representing natural area occurrences were digitized using ArcView 3.3 software using current aerial photographs as base maps. Tabular data were exported from the Heritage database and attached to each polygon as attributes.

The focus of this study was on the identification of remaining high-quality natural terrestrial communities, which are considered important habitats for many rare species. Resources did not permit systematic assessments of target animals with the exception of one easily surveyed species, the Regal fritillary butterfly (see Section 5.3.a below). Inventory methods for individual target animals were limited to recording evidence of any target animals encountered in the course of other field work. A rare species report form was used to record such species.

## Chapter 4: Plant Community Survey Results and Discussion

### 4.1. Natural Areas Found during the County Inventory and Their Significance

#### 4.1.a. Plant Communities and Their Distribution

*Prairie Communities* — During the 2008–2009 project season, we visited a total of 235 prairie sites in the two-county area. The prairies fell into three community types: Unglaciaded Tallgrass Prairie (232 sites), Low (Wet) Prairie (3 sites), and Claypan Prairie (3 sites) (see Table 4.1).

**Table 4.1.** Prairie Sites Visited, by Community Type, 2008–2009.

Community	Anderson	Linn
Unglaciaded Tallgrass Prairie	104	125
Low (Wet) Prairie	1	2
Claypan	0	3

For this inventory work, we concentrated our efforts on finding sites that were previously unknown and undocumented (new sites) in the Kansas Natural Heritage Inventory database. During the second season we continued to look for new sites, but we also quickly looked at sites that had been previously documented in the Heritage database (revisits) to verify whether those sites still exist as native habitat and to reevaluate their overall rank (= grade). Many of these previously documented sites had not been revisited for over 15 years, and several were known to have been converted to other land uses—primarily agriculture or development.

Of the 235 sites we visited and ranked during 2008–2009, 226 sites are new and 9 are sites previously tracked in the Heritage database (see Table 4.2).

**Table 4.2.** Prairie Sites Visited, by County, 2008-2009.

	Anderson	Linn
New	99	127
Revisits	8	1

To be considered A-grade according to Heritage methods, a prairie would be surrounded by a large-acreage, high-quality prairie landscape. Such landscape no longer exists in the County Inventory area, so no prairie we visited during 2008–2009 had an overall rank of A.

Of the 235 sites visited, 229 sites were C-grade or better. Five prairie sites were D-grade (severely degraded), 2 were X-grade (extirpated), and 14 sites were E (previously ranked and still occur but were not visited due to not having access (see Tables 4.3 and 4.4). The severely degraded and extirpated sites are considered to be areas of high-quality tallgrass prairie that have been lost during the last 15 years.

**Table 4.3.** Number of Remaining Prairie Sites and Acreages in the 2009 Kansas Natural Heritage Inventory Database, by Rank (No. of Sites = 229).

County	A Sites	B Sites	C Sites	D Sites <sup>1</sup>	X Sites <sup>2</sup>	E Sites <sup>3</sup>
<b>Anderson</b>						
<b>No. of Sites</b>	0	24	83	5	2	13
<b>Acre</b>	0	1177	2855	2547	587	2469
<b>Linn</b>						
<b>No. of Sites</b>	0	53	76	0	0	1
<b>Acre</b>	0	1324	1416	0	0	100
<b>Total</b>						
<b>No. of Sites</b>	0	77	159	5	2	14
<b>Acre</b>	0	2501	4271	2547	587	2569

Note. All sites meet the five-acre minimum requirement. D-ranked sites are revisits that were previously recorded in the Natural Heritage Inventory Database.

X = extirpated sites (previously documented sites that have been converted to housing or cropland).

E = previously tracked sites determined to be extant; viability not assessed.

<sup>1</sup> Sites previously ranked as A, B, or C that have been significantly degraded.

<sup>2</sup> Sites previously ranked as A, B, or C that are no longer prairie.

<sup>3</sup> Sites previously ranked as A, B, or C that were determined to be still prairie according to a drive-by, but which were not visited.

*Mapping of Plant Communities.*—The distribution of all prairie sites can be seen in the county maps in Appendices A and B. We are confident that we have successfully inventoried almost all of the remaining high-quality tallgrass prairie remnants in these counties. Since we drove the roads, we may have missed a small number of sites that are not visible from county roads.

The mapping of these sites is very useful for planning purposes and to see where our native prairies remain. Overall, more native prairie remains in 2009 in Anderson County than in Linn County (Appendices A and B), but in both cases it is a very small portion of the remaining natural landscape. Areas with numerous rock outcrops seem to harbor the most remaining high-quality prairie.

*Forest Communities.*—We found 24 high-quality forest sites (grades B and C) in the two-county area (see Appendices A, B, D, and F). They included five different community types, including Ash-Elm-Hackberry Forest, Cottonwood-Sycamore Floodplain Forest, two Cross Timbers–Post Oak Woodlands, three Maple-Basswood Forests, and 15 Oak-Hickory Forests. The addition of these sites brings the total number of forest sites in the two-county area that are documented in the Heritage database to 45 (see Table 4.4). The floodplain forests were most common along the Marais des Cygnes River and its tributaries, while the other forest community types were found most typically on north-facing slopes along bluffs and steep hills associated with streams.

While there were no A-grade forest sites found, owing to their small size and occurrence in fragmented landscapes, there were 6 B-grade and 18 C-grade sites, mostly in Linn County (see Table 4.4).

**Table 4.4.** Forest Sites in the Kansas Natural Heritage Inventory Database, by Rank, 2008-2009.

<b>County</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>Total</b>
<b>Anderson</b>				
<b>No. of Sites</b>	0	2	5	7
<b>Acreage</b>	0	102.07	212.93	315.00
<b>Linn</b>				
<b>No. of Sites</b>	6	16	16	38
<b>Acreage</b>	503.49	983.70	936.28	2423.47
<b>Both Counties</b>				
<b>No. of Sites</b>	6	18	21	45
<b>Acreage</b>	503.49	1085.77	1149.20	2738.46

Overall, we documented slightly more native forest acreage in the two counties than prairie acreage even though more than 80% of the area was originally covered with native prairie. Almost 90% of the forest acres ranked in the County Inventory were in Linn County, but each county had some forest sites of B- or C-grade. The large area of forest in Linn County is due to the Marais des Cygnes drainage. There are still some sites that remain undocumented. Forest sites were considerably more difficult to inventory because of their large size, often linear shape along bluffs and rivers, and because they usually had multiple ownership. In addition, we wanted to find as many spring ephemeral woodland species—which are often indicators of forest quality—as possible when we inventoried, and those could be readily observed only in April and May, which limited our survey time.

There are also many sites in both counties that have become forested over the last several decades, as landscape fires have been eliminated and brush and trees have spread where landscape management, suburban growth, availability of seeds, and other factors have inadvertently encouraged them. These areas provide significant habitat for wildlife species, but they are not

high-quality plant communities, so they have not been inventoried or mapped in the survey work. Typically, these areas do not serve as habitat for many of our rare species.

#### 4.1.b. Floristic Quality Assessment Results

The Floristic Quality Index provides additional support that the communities identified during the 2008-2009 inventory are high-quality tracts (see Appendix G). Areas with the highest-ranked condition grades (independent of overall rank) were more likely to have high Floristic Quality Index scores than other sites.

#### 4.2. Significant Plant Species

##### 4.2.a. Mead's Milkweed (*Asclepias meadii*)

*Description and Location.*—Mead's milkweed, which is federally protected and listed as threatened, occurs in the Midwest and eastern Great Plains (U.S. Fish & Wildlife Service 2003). It is a smooth, rhizomatous, perennial herb with a distinctive single nodding head of greenish-cream-colored, fragrant flowers produced at the end of each flowering stem (see Figure 4.1). Flowers are produced from mid-May to early June. Slender, hairy, erect pods mature from mid-June to late September. Slender, vegetative plants often arise from the rhizomes in the vicinity of flowering or fruiting stems.

Mead's milkweed was the only federally-protected species found in our survey work in Anderson and Linn counties. It has declined due to habitat destruction and alteration by humans. Because of its rhizomes, plants can survive annual mowing, a common practice on native prairies in eastern Kansas. Unfortunately, haying removes fruits before they can mature and release seeds, which prevents new plants from growing in most populations. Consequently, populations on most prairies with a long history of haying show less genetic variability than do populations on sites managed by fire (Freeman and Hall 1991).



**Figure 4.1.** Mead's milkweed, *Asclepias meadii*.

A majority of the remaining concentrations of the species occurs in Kansas, where more than 100 populations have been documented in the eastern two tiers of counties in the Osage Cuestas and in the southern Glaciated Region (Freeman and Hall 1991). Large populations may include several thousand stems, but most populations in Kansas have fewer than 50. Most populations occur on

dry-mesic to mesic tallgrass prairies that are hayed annually, but a few sites are known to be grazed lightly. Plants grow most frequently on the middle and upper slopes of ridges and hills that have shallow, well-drained, limestone or (infrequently) sandstone soils.

*County Inventory Results.*—We found 88 new sites and verified six previously known sites in the County Inventory that had Mead’s milkweed on them. Sites were fairly equally divided between the two counties, but Anderson County had sites with larger acreages and larger populations, including two populations with several thousand stems. All of the Mead’s milkweed locations in Anderson and Linn counties are on B- and C-grade sites (see Table 4.7).

**Table 4.5.** New and Previously Known Populations of Mead’s Milkweed in the Kansas Natural Heritage Database.

	<b>Total Number of Mead’s Milkweed Populations</b>	<b>New Populations Found in 2008-2009</b>	<b>Populations Known Previous to 2008</b>
<b>Anderson</b>	59	37	22
<b>Linn</b>	60	51	9
<b>Total</b>	119	88	31

#### 4.2.c. Indicator Species and Conservative Species

To determine if sites are high-quality native prairies or high-quality native forests, we look for species that are indicators of quality (see Tables 4.6 and 4.7). These are typically referred to as conservative species, which are species that have high fidelity to certain community types, which is reflected by a high coefficient of conservatism. Many of these species—for example, the high-quality prairie indicators inland New Jersey tea (*Ceanothus herbaceous*) and azure aster (*Symphotrichum oolentangiense*)—occur almost exclusively on our highest-quality sites. Finding one of these species often means that other important species might be present, and they often indicate that some of our rarest species might also be present, such as Mead’s milkweed (*Asclepias meadii*).

Most of our efforts to find new prairies were based on looking for indicator species while driving the roads. When we had personal leads about locating additional native prairie sites from land-owners and other knowledgeable people, and when we identified sites through aerial photography, we quickly determined whether we would be interested in inventorying promising sites by looking for these indicator species, which are typically showy or large conservative species.



**Table 4.6.** The Most Conservative Prairie Plants Found During the County Inventory for 235 Sites.

Species Name	Common Name	No. of Sites Where Found
COEFFICIENT OF CONSERVATISM = 10:		
<i>Asclepias meadii</i>	Mead's milkweed	91
<i>Trifolium reflexum</i>	buffalo clover	27
COEFFICIENT OF CONSERVATISM = 9:		
<i>Buchnera americana</i>	blue hearts	35
<i>Ceanothus americanus</i>	New Jersey tea	92
COEFFICIENT OF CONSERVATISM = 8:		
<i>Camassia angusta</i>	prairie camas	56
<i>Camassia scilloides</i>	wild hyacinth	18
<i>Carex bicknellii</i>	Bicknell's sedge	38
<i>Carex microdonta</i>	littletooth sedge	36
<i>Ceanothus herbaceus</i>	inland New Jersey tea	51
<i>Coreopsis grandiflora</i>	bigflower coreopsis	91
<i>Dodecatheon meadia</i>	shooting star	4
<i>Echinacea atrorubens</i>	Topeka purple coneflower	4
<i>Eleocharis tenuis</i> var. <i>verrucosa</i>	slender spikerush	14
<i>Fimbristylis puberula</i>	hairy fimbristylis	133
<i>Gentiana puberulenta</i>	downy gentian	132
<i>Hesperostipa spartea</i>	porcupinegrass	21
<i>Lilium michiganense</i>	Michigan lily	3
<i>Minuartia patula</i>	pitcher's stitchwort	6
<i>Pediomelum argophyllum</i>	silverleaf Indian breadroot	1
<i>Perideridia americana</i>	eastern yampah	6
<i>Polygala incarnata</i>	slender milkwort	43
<i>Polygala sanguinea</i>	blood milkwort	43
<i>Prenanthes aspera</i>	rough rattlesnakeroot	74
<i>Scleria triglomerata</i>	whip razorsedge	120
<i>Spiranthes vernalis</i>	spring ladies'-tresses	1
<i>Sporobolus heterolepis</i>	prairie dropseed	25
<i>Symphyotrichum oolentangiense</i>	skyblue aster	105
<i>Symphyotrichum sericeum</i>	western silver aster	2

**Table 4.7.** The Most Conservative Forest Plants Found During the County Inventory for 27 Sites.

Species Name	Common Name	No. of Sites Where Found
COEFFICIENT OF CONSERVATISM = 8:		
<i>Aplectrum hyemale</i>	Adam and Eve	1
<i>Camassia scilloides</i>	Atlantic camas	4
<i>Carex bicknellii</i>	Bicknell's sedge	1
<i>Collinsia verna</i>	spring blue eyed Mary	1
<i>Hybanthus concolor</i>	eastern greenviolet	4
<i>Lilium michiganense</i>	Michigan lily	14
<i>Maianthemum stellatum</i>	starry false lily of the valley	4
<i>Thalictrum thalictroides</i>	rue anemone	4

\*No species with Coefficient of Conservation equal to 9 or 10 were found.

#### **4.2.d. Protected and Rare Species Occurrences**

The rare plant species found during our survey work (Kansas state-ranked critically imperiled and imperiled species) are listed in Tables 4.8 and 4.9. These data will help determine their status and rank. Finding them at numerous sites indicates that the sites surveyed, especially the prairie sites, contain many species of statewide importance.

#### **4.2.e. Non-Native and Invasive Plant Species**

Invasive species are non-native (exotic) species that rapidly establish themselves in new habitats, especially habitats that have experienced localized or generalized disturbance. The species listed in Tables 4.10 and 4.11 are those that have most often invaded our prairies and forests.

**Table 4.8.** Kansas State-Ranked S1 (Critically Imperiled) and S2 (Imperiled) Plant Species At 235 High-Quality Prairie Sites, 2008-2009.

Species Name	Common Name	No. of Sites Where Found
STATE RANK = S1		
<i>Carex arkansana</i>	Arkansas sedge	3
<i>Coreopsis grandiflora</i>	bigflower coreopsis	91
<i>Eleocharis wolfii</i>	Wolf's spikerush	1
<i>Perideridia americana</i>	eastern yampah	6
<i>Physostegia angustifolia</i>	narrowleaf false dragonhead	64
<i>Rosa blanda</i>	smooth rose	4
<i>Rubus argutus</i>	sawtooth blackberry	28
STATE RANK = S2		
<i>Asclepias meadii</i>	Mead's milkweed	91
<i>Camassia angusta</i>	prairie camas	56
<i>Carex caroliniana</i>	Carolina sedge	1
<i>Carex hisutella</i>	hairy-leaf hirsute sedge	1
<i>Cyperus pseudovegetus</i>	marsh flatsedge	2
<i>Desmodium ciliare</i>	hairy small-leaf ticktrefoil	1
<i>Dichanthelium linearifolium</i>	slimleaf panicgrass	5
<i>Dichanthelium scoparium</i>	velvet panicum	22
<i>Eleocharis montevidensis</i>	sand spikerush	1
<i>Eleocharis tenuis</i>	slender spikerush	14
<i>Helenium flexuosum</i>	purple-head sneezeweed	11
<i>Phalaris caroliniana</i>	Carolina canarygrass	2
<i>Sporobolus heterolepis</i>	prairie dropseed	25
<i>Trifolium reflexum</i>	buffalo clover	27
<i>Verbesina helianthoides</i>	gravelweed	1

**Table 4.9.** Kansas State-Ranked S1 (Critically Imperiled) and S2 (Imperiled) Plant Species Found At 27 High-Quality Forest Sites, 2008-2009.

Species Name	Common Name	No. of Sites Where Found
STATE RANK = S1		
<i>Collinsia verna</i>	spring blue eyed Mary	1
<i>Polymnia canadensis</i>	whiteflower leafcup	2
<i>Smilax ecirrhata</i>	upright carrionflower	2
STATE RANK = S2		
<i>Aplectrum hyemale</i>	Adam and Eve	1
<i>Carex radiata</i>	eastern star sedge	1
<i>Carex rosea</i>	rosy sedge	1
<i>Carya laciniosa</i>	shellbark hickory	10
<i>Dichanthelium latifolium</i>	wide leaf panicgrass	2
<i>Hybanthus concolor</i>	eastern greenviolet	4
<i>Hydrophyllum appendiculatum</i>	great waterleaf	3
<i>Maianthemum stellatum</i>	starry false lily of the valley	4
<i>Packera glabella</i>	butterweed	2
<i>Ranunculus hispidus</i>	bristly buttercup	2
<i>Taenidia integerrima</i>	yellow pimpernel	5
<i>Thalictrum thalictroides</i>	rue anemone	4
<i>Trillium sessile</i>	toadshade	5
<i>Viburnum prunifolium</i>	blackhaw	1

**Table 4.10.** The Most Frequently Encountered Invasive Plant Species Found in High-Quality Prairies During the County Inventory at 235 Sites, 2008-2009.

<b>Species Name</b>	<b>Common Name</b>	<b>No. of Sites Where Found</b>
<i>Dianthus armeria</i>	Deptford pink	177
<i>Potentilla recta</i>	sulphur cinquefoil	172
<i>Schedonorus phoenix</i>	tall fescue	165
<i>Bromus arvensis</i>	field brome	158
<i>Leucanthemum vulgare</i>	oxeye daisy	153
<i>Trifolium pratense</i>	red clover	153
<i>Trifolium campestre</i>	low hop clover	119
<i>Hypericum perforatum</i>	common St. Johnswort	118
<i>Tragopogon dubius</i>	goat's beard	94
<i>Poa pratensis</i>	Kentucky bluegrass	90
<i>Daucus carota</i>	wild carrot	87
<i>Melilotus officinalis</i>	yellow sweet clover	84
<i>Rumex crispus</i>	curly dock	68
<i>Prunella vulgaris</i>	self-heal	65
<i>Lespedeza cuneata</i>	sericea lespedeza	57
<i>Barbarea vulgaris</i>	garden yellowrocket	49
<i>Phleum pratense</i>	timothy	38
<i>Medicago lupulina</i>	black medick	33
<i>Bromus inermis</i>	smooth brome	28
<i>Stellaria media</i>	common chickweed	25
<i>Cruciata pedemontana</i>	piedmont bedstraw	20
<i>Trifolium repens</i>	white clover	16
<i>Kummerowia striata</i>	Japanese clover	14
<i>Agrostis stolonifera</i>	redtop	12
<i>Cirsium vulgare</i>	bull thistle	12
<i>Dactylis glomerata</i>	orchardgrass	10
<i>Rosa multiflora</i>	multiflora rose	10
<i>Torilis arvensis</i>	hedge parsley	9
<i>Lepidium campestre</i>	field peppergrass	8
<i>Trifolium hybridum</i>	alsike clover	8
<i>Allium vineale</i>	field garlic	6
<i>Morus alba</i>	white mulberry	6
<i>Plantago lanceolata</i>	English plantain	6

**Table 4.11.** The Most Frequently Encountered Invasive Plant Species Found in High-Quality Forests During the County Inventory at 27 Sites, 2008-2009.

Species Name	Common Name	No. of Sites Where Found
<i>Maclura pomifera</i>	osage orange	8
<i>Lamium purpureum</i>	purple deadnettle	7
<i>Taraxacum officinale</i>	common dandelion	7
<i>Alliaria petiolata</i>	garlic mustard	6
<i>Lysimachia nummularia</i>	moneywort	4
<i>Allium vineale</i>	field garlic	3
<i>Lactuca serriola</i>	prickly lettuce	3
<i>Morus alba</i>	white mulberry	3
<i>Rosa multiflora</i>	multiflora rose	2
<i>Stellaria media</i>	common chickweed	2
<i>Ailanthus altissima</i>	tree of heaven	1
<i>Brassica nigra</i>	black mustard	1
<i>Bromus inermis</i>	smooth brome	1
<i>Campsis radicans</i>	trumpet creeper	1
<i>Cirsium vulgare</i>	bull thistle	1
<i>Elaeagnus angustifolia</i>	Russian olive	1
<i>Euonymus fortunei</i>	winter creeper	1
<i>Lamium amplexicaule</i>	henbit deadnettle	1
<i>Leonurus cardiaca</i>	common motherwort	1
<i>Securigera varia</i>	crownvetch	1
<i>Verbascum thapsus</i>	woolly mullein	1
<i>Veronica arvensis</i>	corn speedwell	1
<i>Veronica hederifolia</i>	ivy leaf speedwell	1
<i>Vinca minor</i>	common periwinkle	1

#### 4.3. Direct Benefits of High-Quality Natural Areas to People

Native prairies and forests provide many benefits to the public including habitat for rare species, flood control, water- or air-quality control, recreational opportunities, and aesthetic enjoyment of the outdoors. The remaining natural areas also provide habitat for some of the state's sensitive and declining species and help to maintain biological diversity. In addition, many of the residents in the region appreciate the pastoral, native landscapes of Kansas and want to see them remain as part of the identifiable Kansas landscape.

#### **4.4. Management Recommendations**

The County Inventory revealed that high-quality prairies and forests still exist in northeast Kansas, but as Table 2.1 shows, less than 0.5% of original high-quality prairie still exists. Our data also indicate that during the last 10 years a significant number of these remaining prairies have decreased and are still decreasing in both size and number. Although we know that a smaller amount of high-quality native forest still exists, we do not have enough survey information to calculate its acreage or quality. Other high-quality plant communities do exist in this area, but their acreage is so small that we did not find them in our detailed study. The majority of remaining areas of high-quality native prairie and forest are owned by private landowners, and it is thanks to them that these native communities still exist.

##### **4.4.a. Landowners and Managers**

With the majority of remaining high-quality prairies and forests being held as private property, encouragement of continued good management is essential. In addition, various means need to be found to encourage good management for biological diversity, including funding through U.S. Department of Agriculture programs, state programs, and local monies, for both direct management and conservation of these high-quality native tracts.

A substantial number (perhaps 10%) of tracts of native prairie and forest are owned by public and nonprofit entities, including the U.S. Army Corps of Engineers, Kansas Department of Wildlife & Parks, the University of Kansas, county and city governmental entities, and nonprofit organizations. These public and nonprofit landowners also need to be encouraged to manage these tracts appropriately because they may have other management interests, may not have significant staff or funding, or may not fully recognize the ecological values of the lands they manage.

##### **4.4.b. Conservation Easements**

One way to maintain the natural areas that remain in Anderson and Linn counties is for property owners to preserve the high-quality property that they have. Conservation easements are a tool that provides landowners with tax benefits when they agree to limit the kind of development that can occur on their property. Planning commissions and nonprofit organizations can educate landowners about conservation easements and encourage their use. Conservation easements held by the Kansas Land Trust, The Nature Conservancy, and the Kansas Department of Wildlife & Parks have already been put into place to protect the ecological values of forests and prairies in the two-county area. Funds for programs to purchase conservation easements on additional high-quality parcels of forest and prairie would significantly help conserve these tracts.

#### **4.4.c. Restoration and Other Uses of Low-Quality Sites**

Programs can be developed by state and local government to provide funding to landowners to restore lower-quality areas adjacent to high-quality property. When high-quality areas are surrounded with buffers of restored land, corridors can be created that give native plants and animals the opportunity to expand and find appropriate habitat in which to live. Where clusters of prairies and forests occur, lands that connect them could be appropriate places to encourage and fund restoration in voluntary programs. In addition, there are larger acreages of rangeland habitat in southern Anderson County that serve as important habitat for grassland birds and other species. These areas also need restoration and other conservation practices.

#### **4.4.d. Other Management Recommendations**

The information obtained by this survey work can be helpful to landowners as we have provided plant species lists to all landowners who gave us permission to visit their land. This study can also be useful to several organizations in northeast Kansas that are involved with planning and land-use management. We will encourage them to create new programs to encourage the conservation of these lands by working with private property owners. We will be sharing this information with the following entities:

- Kansas Department of Wildlife & Parks;
- U.S. Fish & Wildlife Service;
- planning commissions in Anderson and Linn counties;
- the Kansas Land Trust; and
- The Nature Conservancy.

We intend to update and supplement this information on our County Inventory web page. We encourage others to look at it, or to obtain an additional copy of this report at:

[http://www.kbs.ku.edu/people/staff\\_www/kindscher/County\\_Inventory/html/Co\\_Inv\\_Website\\_No\\_Frames\\_051705.htm](http://www.kbs.ku.edu/people/staff_www/kindscher/County_Inventory/html/Co_Inv_Website_No_Frames_051705.htm).



## Chapter 5: Animal Surveys

### 5.1. Project Purpose

In addition to systematic surveys of high-quality prairies and forests in Anderson and Linn counties, surveys of selected animal species also were conducted. Two main questions were addressed: First, what threatened and endangered species and Species of Greatest Conservation Need (SGCN) (KDWP 2005) have the potential to occur in these plant communities? Second, do plant communities in the study area provide important habitat for selected species of conservation-priority wildlife? Question 1 is addressed in Table 5.2 (SGCN that may occur in forest habitats in Anderson and Linn counties), Table 5.1 (SGCN that may occur in tallgrass prairie habitats in Anderson and Linn counties), and Appendix E, (potentially occurring threatened and endangered animal species in the two-county area). Question 2 is more challenging to address as it requires field surveys for individual species or taxa. Targeted surveys were employed for a small number of animal species and species groups, including two insect species (prairie mole cricket, *Gryllotalpa major*, and regal fritillary butterfly, *Speyeria idalia*), one forest bird (whip-poor-will, *Caprimulgus vociferus*), grassland nesting birds, and grassland butterflies. These species and species groups were selected for inventory based on likelihood of occurrence in the plant communities identified during the study and the feasibility of conducting inventories in a time and budget-efficient manner. The primary purpose of this project was to identify remaining high-quality plant communities. A thorough assessment of all conservation priority animals that inhabit and benefit from these plant communities was beyond the scope of this project.

**Table 5.1.** Tallgrass Prairie Species of Greatest Conservation Need known or likely to occur in high quality prairies in Anderson and Linn counties. Source: Comprehensive Wildlife Conservation Plan (KDWP 2005). Species are listed in decreasing order of total points in the Comprehensive Wildlife Conservation Plan. Presence codes: A = verified in this study, B = verified in past 10 years in Anderson County, C = potentially occurs (sources: Kansas Natural Heritage Inventory database).

Group	Common Name	Scientific Name	Tier	Presence	Seasonal Status
Bird	Henslow's Sparrow	<i>Ammodramus henslowii</i>	I	A	Breeder
Insect	Prairie Mole Cricket	<i>Gryllotalpa major</i>	I	A	Resident
Bird	Loggerhead Shrike	<i>Lanius ludovicianus</i>	I	B	Breeder
Bird	Greater Prairie-Chicken	<i>Tympanuchus cupido</i>	I	A	Resident
Amphibian	Crawfish Frog	<i>Rana areolata</i>	I	B	Resident
Bird	American Golden-Plover	<i>Pluvialis dominica</i>	I	B	Migrant
Bird	Short-eared Owl	<i>Asio flammeus</i>	I	B	Migrant
Bird	Bell's Vireo	<i>Vireo bellii</i>	I	A	Breeder
Bird	Smith's Longspur	<i>Calcarius pictus</i>	I	B	Migrant
Reptile	Massasauga	<i>Sistrurus catenatus</i>	II	B	Resident

Insect	Regal Fritillary	<i>Speyeria idalia</i>	II	A	Resident
Insect	Ottoo Skipper	<i>Hesperia ottoe</i>	II	C	Resident
Insect	Byssus Skipper	<i>Probema byssus</i>	II	C	Resident
Insect	Arogos Skipper	<i>Atrytone arogos</i>	II	A	Resident
Bird	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	II	A	Breeder
Bird	Scissor-tailed Flycatcher	<i>Tyrannus forficatus</i>	II	A	Breeder
Bird	Eastern Meadowlark	<i>Sturnella magna</i>	II	A	Resident
Bird	Dickcissel	<i>Spiza americana</i>	II	A	Breeder
Bird	Northern Bobwhite	<i>Colinus virginianus</i>	III	A	Resident

**Table 5.2.** Deciduous Forest Species of Greatest Conservation Need (SGCN) known or likely to occur in upland or riparian forest in Anderson and Linn counties. Source: Comprehensive Wildlife Conservation Plan (KDWP 2005). Species are listed in decreasing order of total points in the Comprehensive Wildlife Conservation Plan. Presence codes: A = verified in this study, B = verified in past 10 years in Anderson County, C = potentially occurs (source: Kansas Natural Heritage Inventory database).

Group	Common Name	Scientific Name	Tier	Presence	Seasonal Status
Bird	Rusty Blackbird	<i>Euphagus carolinus</i>	I	B	Winter Resident
Bird	Cerulean Warbler	<i>Dendroica cerulea</i>	I	B	Summer Resident
Mammal	Spotted Skunk (T)	<i>Spilogale putorius</i>	I	C	Resident
Reptile	Timber Rattlesnake	<i>Crotalus horridus</i>	I	C	Resident
Insect	Linda's Roadside Skipper	<i>Amblyscirtes Linda</i>	I	C	Resident
Mammal	Little Brown Myotis	<i>Myotis lucifugus</i>	I	C	Summer Resident
Bird	Whip-poor-will	<i>Caprimulgus vociferus</i>	I	A	Summer Resident
Bird	Yellow-throated Warbler	<i>Dendroica dominica</i>	I	B	Summer Resident
Bird	Kentucky Warbler	<i>Oporornis formosus</i>	I	B	Summer Resident
Bird	Painted Bunting	<i>Passerina ciris</i>	I	C	Summer Resident
Mammal	Southern Flying Squirrel	<i>Glaucomys volans</i>	I	C	Resident
Reptile	Redbelly Snake (T)	<i>Storeria occipitomaculata</i>	I	C	Resident
Reptile	Smooth Earth Snake (T)	<i>Virginia valeriae</i>	II	C	Resident
Insect	Bell's Roadside Skipper	<i>Amblyscirtes belli</i>	II	C	Summer Resident
Amphibian	Northern Cricket Frog	<i>Acris crepitans</i>	II	B	Resident

Mammal	Texas Mouse	<i>Peromyscus attwateri</i>	II	C	Resident
Mammal	Fulvous Harvest Mouse	<i>Reithrodontomys fulvescens</i>	II	C	Resident
Amphibian	Eastern Newt (T)	<i>Notophthalmus viridescens</i>	II	B	Resident
Bird	Brown Thrasher	<i>Toxostoma rufum</i>	II	A	Summer Resident
Bird	Chuck-will's-widow	<i>Caprimulgus carolinensis</i>	II	B	Summer Resident
Reptile	Broadhead Skink (T)	<i>Eumeces laticeps</i>	II	B	Resident
Reptile	Coal Skink	<i>Eumeces anthracinus</i>	II	C	Resident
Reptile	Rough Earth Snake	<i>Virginia striatula</i>	II	C	Resident
Bird	Eastern Wood-Pewee	<i>Contopus virens</i>	II	B	Summer Resident
Bird	Orchard Oriole	<i>Icterus spurius</i>	II	B	Summer Resident
Bird	Baltimore Oriole	<i>Icterus galbula</i>	II	B	Summer Resident
Bird	Pileated Woodpecker	<i>Dryocopus pileatus</i>	II	B	Summer Resident
Amphibian	Spring Peeper (T)	<i>Pseudacris crucifer</i>	III	B	Resident
Bird	Harris' Sparrow	<i>Zonotrichia querula</i>	III	B	Winter Resident
Bird	Northern Bobwhite	<i>Colinus virginianus</i>	III	A	Resident
Bird	Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	III	B	Resident
Reptile	Milk Snake	<i>Lampropeltis triangulum</i>	III	B	Resident
Mammal	Common Gray Fox	<i>Urocyon cinereoargenteus</i>	III	C	Resident

## 5.2. Species Accounts

### 5.2a. Prairie Mole Cricket (*Gryllotalpa major*)

*Introduction.* — This large, burrowing cricket is endemic to the southern tallgrass prairie region in Kansas, Missouri, Arkansas, and Oklahoma. Believed to be extinct in the early 1980s, surveys have since shown that the species persists in prairies with appropriate soil structure and vegetation. In Kansas, the prairie mole cricket inhabits high quality prairie hay meadows east of the Flint Hills and rangeland in the Flint Hills and Chautauqua Hills.



Figure 5.1. Prairie Mole Cricket, *Gryllotalpa major*. Photo Courtesy of Thomas J. Walker, University of Florida.

*Methods.* — Prairie mole crickets are most readily detected by listening for calling males during the spring (April-May) breeding season. Males construct acoustical chambers at the soil surface on prairie slopes and hilltops and often cluster together with other males. Calling occurs on calm, rainless evenings with an air temperature > 16.7°C. Calling commences at sunset and usually lasts for approximately one hour.

Surveys were conducted by listening at selected prairies under suitable calling conditions. Calling is generally continuous during the calling period, so if no calling was heard after 5 minutes, the surveyor would then drive to the next site, and so on. If calling was heard, the approximate location and number of calling males was recorded. Surveys in this study were conducted in May 2009 in Anderson and Linn counties.

*Results and Discussion.* — Surveys for calling male crickets were conducted on 26 May 2009 in Anderson County and on 28 May 2009 in Linn County (Table 5.3). In Linn County, nine prairies were surveyed and no prairie mole crickets were heard. In Anderson County, many males were detected at one site, Sunset Prairie, where the species had been confirmed in previous years. Overall, no new sites for prairie mole cricket were located during this study. However, survey effort was minimal. Based on records of prairie mole cricket in nearby counties in Kansas and Missouri (Kansas Natural Heritage Inventory 2009, Dennis Figg, pers. comm.) it is likely that additional populations remain to be discovered in high-quality prairie hay meadows in Linn and Anderson counties.

**Table 5.3.** Results Of Surveys For Prairie Mole Cricket in Anderson and Linn counties at Tall-grass Prairie Hay Meadows in 2009.

County	Site Name	Lat	Long	Date	Crickets Heard?	Est. # Males	Notes
LN	Trail Through Woods Prairie	38.09392	-94.78716	5/28/2009	No	0	8:40 p.m.; good conditions
LN	Caddy-Corner Prairie	38.09555	-94.77599	5/28/2009	No	0	good conditions
LN	Prickly Pear Prairie	38.10068	-94.76875	5/28/2009	No	0	good conditions
LN	Two Fence Prairie	38.10402	-94.7688	5/28/2009	No	0	good conditions
LN	Centenarian Prairie	38.10861	-94.76874	5/28/2009	No	0	good conditions
LN	Butterfly Hill Prairie	38.12384	-94.76895	5/28/2009	No	0	good conditions
LN	Windsock Prairie	38.12628	-94.75053	5/28/2009	No	0	good conditions
LN	Three Arm Prairie	38.16053	-94.7518	5/28/2009	No	0	good conditions
LN	Secret Garden Prairie	38.1705	-94.76893	5/28/2009	No	0	9:35 p.m.; good conditions
AN	Sunset Prairie	38.18123	-95.32536	5/26/2009	Yes	>20	good conditions

### 5.2.b. Regal Fritillary (*Speyeria idalia*)

*Introduction.* — This large orange butterfly (see Figure 5.2) is a grassland specialist that feeds on violets in the larval stage. Regal fritillary populations have declined range-wide, and the species has disappeared from much of its eastern range. Remaining populations are found in the prairie regions of the central U.S.; the species largely is restricted to prairie habitats. It is adversely affected by fire (which kills eggs and young) but will readily colonize post-burn habitat. Conservation management for this species consists of managing for forb and wildflower diversity, particularly violets (*Viola* sp.) and nectar plants such as milkweeds (*Asclepias* sp.), thistles (*Cirsium* and *Carduus* sp.), *Liatris* sp., *Echinacea* sp., and ironweed (*Vernonia* sp.), and avoiding frequent use of fire.



**Figure 5.2.** Regal fritillary butterfly, *Speyeria idalia*.

*Methods.* — During plant community surveys, field personnel recorded the presence and numbers of regal fritillary butterflies encountered. Regal fritillary counts were incidental to other activities and not always conducted during a site visit. In addition, many plant community surveys were conducted at times unsuitable for regal fritillary activity (before mid-June, during cold or wet weather, etc.).

*Results and Discussion.* — Regal fritillary butterflies were observed on 28 prairies in Anderson and Linn counties during plant community surveys. In 2008, the species was documented at 17 sites, with 1 to 20 butterflies reported per prairie. In 2009, regal fritillaries were observed at 11 prairies, with 1 to 7 butterflies recorded per prairie. Regal fritillary populations, like those of many insects, fluctuate greatly from year to year. During this study, 2008 appeared to be a year of low abundance in Kansas (Moranz pers. obs.). Population levels in 2009 were somewhat better but still below normal. The fact that regal fritillary was documented in so many tallgrass prairie hay meadows in each county, despite the modest effort devoted, indicates that this species is a frequent resident of high-quality prairies in this region. This finding is consistent with results of studies in other counties in eastern Kansas (Powell et al. 2007; Busby pers. obs.) that report that remnant hay meadows often support high densities of regal fritillary despite the small size and isolated nature of such sites. Possible factors in their high abundance in prairie hay meadows are high plant species diversity, including native violets and wildflowers that produce nectar utilized for food by the regal fritillary, and infrequent burning.

### 5.2.c. Whip-poor-will (*Caprimulgus vociferous*)

*Introduction.* — The whip-poor-will, named for the sound of its nocturnal call, is a medium-sized night bird that feeds on flying insects captured in the air. A migratory species, it nests on the ground during May through July, and occurs on wooded slopes in eastern Kansas, primarily east of the Flint Hills. Due to its ground-nesting habit, the whip-poor-will is vulnerable to a wide variety of terrestrial predators. Populations have been declining, possibly due to habitat loss and

fragmentation, and disturbance during the nesting season. However, the whip-poor-will remains common in suitable habitat in eastern Kansas (Busby and Zimmerman 2001). It calls mostly at dawn and dusk, but during the early breeding season (May) birds may call off-and-on all night. Calling activity is dependent on the moon cycle and other variables.

*Methods.* — Surveys for the whip-poor-will are most easily accomplished by listening for calling birds during the early part of the nesting season (May to about mid-June). Whip-poor-wills continue to call throughout the nesting season but less frequently. Listening surveys were conducted by following a driving route in suitable habitat with stops at regular intervals (about 0.5 miles). At each 2-minute listening stop, the presence or absence of calling whip-poor-wills was recorded. Distance to the nearest suitable habitat, defined as a 20-acre or larger patch of upland woodland, from each listening stop was calculated in ArcView software using 2008 USDA aerial photography.

*Results and Discussion.* — A whip-poor-will survey was conducted in Linn County on 28 May 2009 (Table 5.4). Birds were recorded at six of eight stops. Birds were heard at all stops where suitable habitat was present within 500 m of the listening point. Results from one survey cannot be generalized, but these results are consistent with casual observations during other field work in Linn and Anderson counties that indicate that the whip-poor-will is common and widespread in upland forests and can reliably be heard during favorable calling conditions. The high-volume call can carry a considerable distance (1 km or more), and the presence of several calling birds combined with the repetitive nature of calling in late spring can, however, create the mistaken impression of great abundance.

The whip-poor-will survey in this study was not conducted in high-quality forest sites identified during this project. Consequently, the role of forest quality (from a plant community perspective) on whip-poor-will occurrence was not addressed. Given the apparent abundance in the two-county area and the rarity of high-quality forest, it seems unlikely that the whip-poor-will is dependent on high quality forests as habitat.

**Table 5.4.** Results of a whip-poor-will (WPWI) survey conducted in south-central Linn County, Kansas from 8:54 to 9:40 pm on 28 May 2009.

County	County Road	Lat	Long	Distance to Upland Forest (m)	WPWI heard?
LN	500 Rd	38.09555	-94.77599	400	Yes
LN	Quail Rd	38.10068	-94.76875	440	Yes
LN	Quail Rd	38.10402	-94.76888	400	Yes
LN	Quail Rd	38.10861	-94.76874	70	Yes
LN	Quail Rd & 700th Rd	38.12384	-94.76895	560	No
LN	Read Rd & 700th Rd	38.12628	-94.75053	975	No
LN	Read Rd & 950th Rd	38.16053	-94.7518	760	Yes
LN	Quail Rd	38.1705	-94.76893	0	Yes

### 5.3. Surveys of Species Groups

#### 5.3.a. Butterflies

*Introduction.* — In 2005, the State of Kansas selected 10 butterfly species as Species of Greatest Conservation Need (SGCN) and indicated the need for more field data on these species (KDWP 2005). This study addressed this need by conducting surveys of all butterfly species present and their relative abundance on high-quality tallgrass prairie plant communities identified in the study. The surveys were conducted in Anderson County in summer, 2009, by Ray Moranz. The primary purpose of this work was to provide the Kansas Biological Survey with results from butterfly monitoring that was performed in Anderson County during the summer of 2009. Additionally, results were interpreted and management practices were recommended for maintenance and/or enhancement of populations of butterfly Species of Greatest Conservation Need (SGCN).

*Methods.* — Butterfly surveys used two sampling methods, line transects and non-random walks, to estimate the abundance of the entire butterfly fauna. The primary sampling method used in this study was the non-random walk survey. These surveys consisted of recording butterfly observations while walking in a non-random fashion, without recording the precise waypoints of the walk. Though clearly less repeatable and more biased than line-transect surveys, they were a means to maximize the likelihood of seeing butterflies of interest. During non-random walk surveys, the biologist walked at a pace of approximately 2 km/hour. The amount of time spent on each transect was also recorded. In addition some line transects were also surveyed. Line-transect routes were straight, and were placed randomly within each unit, except all portions of each transect route were at least 50 m from unit boundaries (to avoid edge effects) and 50 m from the nearest transect route (to minimize repeat sightings). Transects ranged in length from 100 m to 300 m.

Most sampling was performed during weather conditions appropriate for butterfly flight (temperature > 20°C, cloud cover < 70%, wind < 20 km/hr), but some sampling was performed under heavy cloud cover as long as temperatures surpassed 20°C and there was no precipitation. During line-transect sampling, the biologist walked each transect at a speed of 1.2 km/hr and recorded data on butterflies seen within the 180° field of view spanning from the observer's left to the observer's right. Data were collected in 100 m transect segments, allowing for future calculation of the species richness of each segment.

Each butterfly was identified to the species level if possible and its behavior when first detected was recorded. If a butterfly was nectaring, the plant species upon which it nectared was recorded. This allows for the determination of which nectar sources were used most frequently during each sampling session.

*Results and Discussion.* — During the summer of 2009, 35 butterfly species were observed during surveys at 20 prairies in Anderson County (Table 5.5). Of these, two species, arogos skipper and regal fritillary, are SGCN butterflies. Arogos skippers were observed at three sites; they were almost always nectaring on pale purple coneflower, *Echinacea pallida*, when observed. Regal fritillaries were observed at 10 locations, or one-half of the prairies surveyed. Many hay meadows that were not burned in 2009 had SGCN butterfly species (regal fritillaries and/or arogos

skippers). Almost all hay meadows that were burned in 2009 lacked SGCN butterfly species.

The arogos skipper records are the first for Anderson County. While this species is widely distributed in Kansas (Ely et al. 1986) and the Great Plains, populations are declining, and its current status is poorly known (NatureServe 2009, Xerces Society 2009). Loss of prairie habitat and frequent use of fire are considered threats to this butterfly.

The high proportion of prairie sites where regal fritillaries were found is significant but not unexpected. Regal fritillary populations are often associated with high-quality prairie hay meadows in northeastern and east-central Kansas (Powell et al. 2007; Kansas Natural Heritage Inventory 2009). At such sites, the species appears to benefit from good populations of its host plant (native violets, *Viola*) and the infrequent use of fire.

In summary, high-quality prairie hay meadows appear to be an important habitat for conservative prairie butterflies, even where such sites are small in size (< 200 acres) and found in fragmented landscapes.

**Table 5.5.** Results Of Butterfly Surveys At 20 High-Quality Prairie Hay Meadows in Anderson County in 2009.

Common Name	Scientific Name	Occurrence # sites	Occurrence %
American Lady	<i>Vanessa virginiensis</i>	4	20
Arogos skipper	<i>Atrytone arogos</i>	3	15
Black swallowtail	<i>Papilio polyxenes</i>	12	60
Cabbage white	<i>Pieris rapae</i>	1	5
Checkered skipper	<i>Pyrgus communis</i>	1	5
Clouded sulfur	<i>Colias philodice</i>	8	40
Common buckeye	<i>Junonia coenia</i>	2	10
Crossline skipper	<i>Polites origenes</i>	5	25
Delaware skipper	<i>Anatrytone logan</i>	8	40
Dun skipper	<i>Euphyes vestries</i>	4	20
Eastern tailed-blue	<i>Everes comyntas</i>	10	50
Eastern tiger swallowtail	<i>Papilio glaucus</i>	1	5
Giant swallowtail	<i>Papilio cressphontes</i>	1	5
Gray copper	<i>Lycaena dione</i>	5	25
Gray hairstreak	<i>Strymon melinus</i>	1	5
Great spangled fritillary	<i>Speyeria cybele</i>	9	45
Hackberry emperor	<i>Asterocampa celtis</i>	1	5
Monarch	<i>Danaus plexippus</i>	12	60
Northern broken dash	<i>Wallengrenia egeremet</i>	1	5
Orange sulfur	<i>Colias eurytheme</i>	18	90
Painted lady	<i>Vanessa cardui</i>	1	5
Pearl crescent	<i>Phyciodes tharos</i>	8	40



Red admiral	<i>Vanessa atalanta</i>	1	5
Regal fritillary	<i>Speyeria idalia</i>	10	50
Silvery checkerspot	<i>Chlosyne nycteis</i>	1	5
Tawny-edged skipper	<i>Polites themistocles</i>	12	60
Unknown duskywing	<i>Eyrnnis sp.</i>	1	5
Unknown fritillary	<i>Speyeria sp.</i>	1	5
Unknown grass skipper		3	15
Unknown lady	<i>Vanessa sp.</i>	2	10
Unknown spreadwing		1	5
Zebra swallowtail	<i>Eurytides marcellus</i>	1	5

### 5.3.b. Grassland Birds

*Introduction.* — Several species of grassland birds that occur in eastern Kansas are highly ranked in the Kansas Wildlife Conservation Plan (KDWP 2005), including grasshopper sparrow, Henslow’s sparrow, dickcissel, eastern meadowlark, greater prairie-chicken, and upland sandpiper (Table 5.1). To determine grassland breeding bird use of high quality prairies, surveys of grassland birds were conducted. The goal was to determine the species and their relative abundance on tallgrass prairies, most of which are privately-owned and managed for hay production.

*Methods.* — To determine the relative abundance of bird species on prairies, line transect counts were conducted in 2009. Linear transects were set up in previously identified high-quality prairies. Transect length and width were fit to prairie size but generally were at least 200-400 m in length and 150 m in width. Coordinates of start and ending points were recorded with a handheld GPS unit. Transect location was random with respect to grassland habitat but avoided trees and other woody habitat. In some cases, two transects were established in a prairie. Transect lines within a prairie were at least 250 m apart. Transects were run between dawn and 1100 h during dry weather with winds <15 mph. Each transect was sampled once in June 2009. All birds seen or heard within the surveyed area were recorded except for birds flying over the transect area. Bird abundance was calculated as birds per 10 ha.

*Results and Discussion.* — Descriptive statistics for five grassland-obligate species found in high-quality prairies in 2009 are shown in Table 5.6. Three species were regularly encountered at prairie sites: dickcissel, eastern meadowlark, and grasshopper sparrow. Two additional species, Henslow’s sparrow and upland sandpiper, were found at relatively few sites. These results are consistent with other data for eastern Kansas (Zimmerman 1993). Clearly, high-quality hay meadow prairies are attractive to dickcissels, eastern meadowlarks, and grasshopper sparrows. Upland sandpipers were encountered infrequently and then only where the site was surrounded by larger areas of grassland. All upland sandpipers observed on grassland transects were in Anderson County, which has substantially larger areas of tallgrass prairie. Henslow’s sparrow was observed in both Linn and Anderson counties, but only where the prairie had not been hayed the previous year or burned in the year of the survey. Other studies suggest Henslow’s sparrow requires dense grass cover (Herkert 2003). Thus, hay meadow management is not compatible with

Henslow's sparrow, at least if hay is harvested every year.

This study was limited primarily to small prairies managed for hay production. It does not address several important questions related to the conservation value of such sites for grassland birds. First, it does not compare the relative attractiveness of hay meadows to prairie managed for grazing or other purposes. Grazed prairies may be more or less attractive to different species of grassland birds than hayed sites (Zimmerman 1993, With et al. 2008). Hayed prairies tend to support relatively large numbers of grasshopper sparrow and dickcissel, but are less attractive to species that prefer greater structural complexity, such as Henslow's sparrow or greater prairie-chicken. Second, this study did not measure the reproductive success of grassland birds at the study sites. The abundance of species in a habitat type may not be closely related to the productivity of birds at the site. For example, dickcissels were relatively abundant in the habitat studied, but birds may produce few offspring if sites are hayed before eggs are hatched or young are mobile. These and other questions need to be addressed before the conservation value of prairie hay meadows for grassland birds can be determined more precisely.

**Table 5.6.** Descriptive Statistics For Five Species of Grassland Birds Found in Surveys of High-Quality Prairies in Anderson and Linn Counties in 2009. Units are Number of Birds Per 10 Ha.

Species	No. of sites	Mean	Standard Deviation	Minimum	Median	Maximum
Upland sandpiper	56	0.300	1.007	0.000	0.000	5.000
Grasshopper sparrow	56	2.323	3.289	0.000	0.000	14.245
Henslow's sparrow	56	0.139	0.594	0.000	0.000	4.000
Dickcissel	56	7.536	7.037	0.000	6.508	50.000
Eastern meadowlark	56	2.239	3.537	0.000	1.250	21.429

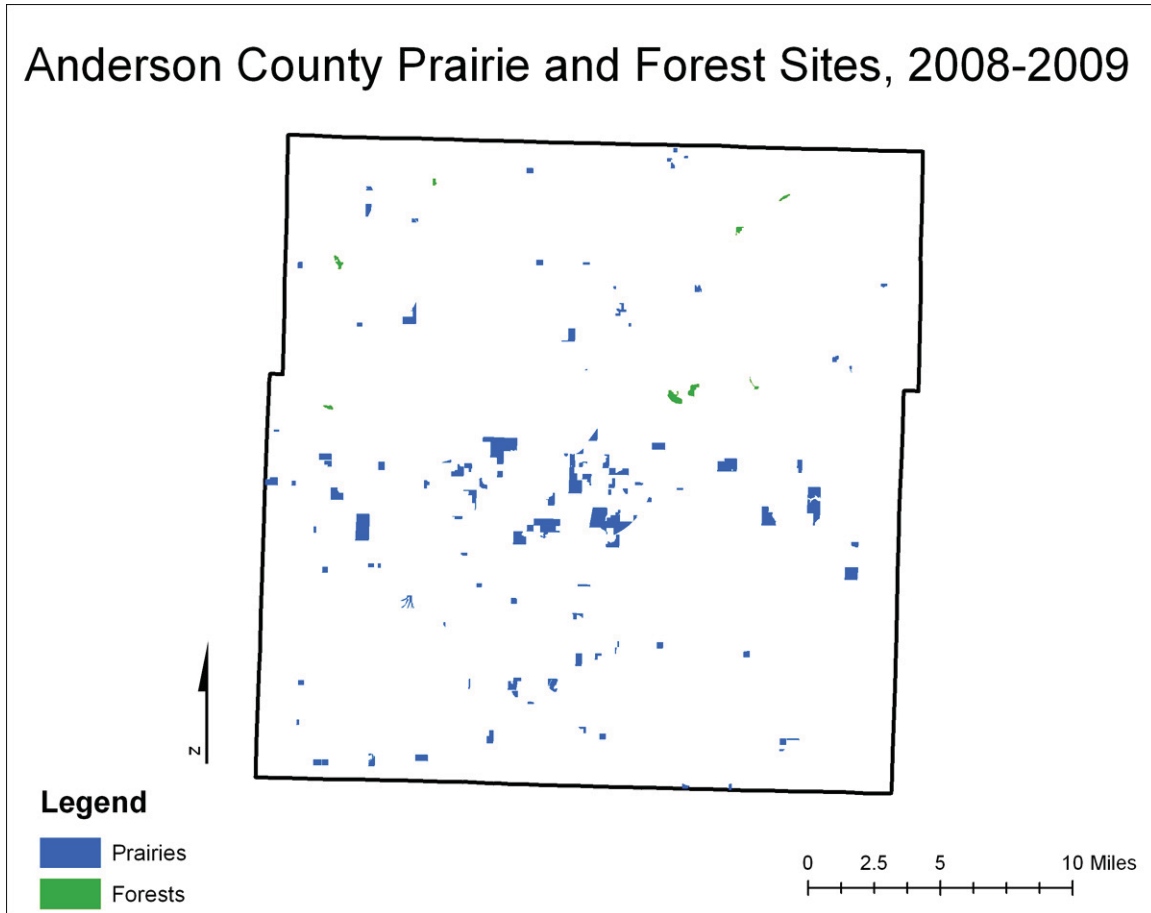
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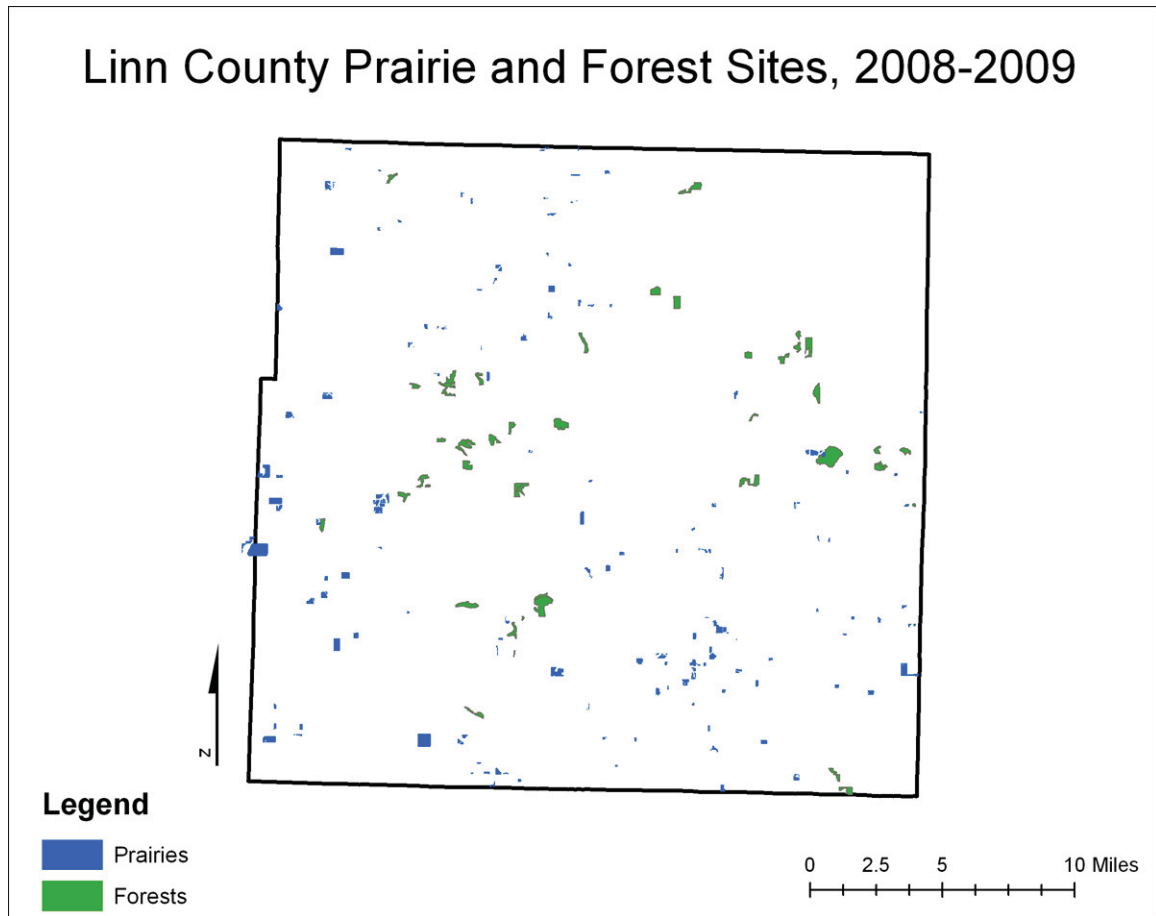
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# Appendix A

## Anderson County Prairie and Forest Sites, 2008-2009



## Appendix B



**Appendix C**  
**Prairie Plant Species Found During the County Inventory**  
**2008-2009**  
(No. of Prairie Sites = 235)

Species Name	Common Name	No. of Sites Where Found
<i>Acalypha virginica</i>	Virginia copperleaf	36
<i>Acer negundo</i>	boxelder	3
<i>Achillea millefolium</i>	yarrow	214
<i>Ageratina altissima</i>	white snakeroot	1
<i>Agrimonia parviflora</i>	harvestlice	4
<i>Agrostis gigantea</i>	redtop	1
<i>Agrostis hyemalis</i>	winter bentgrass	158
<i>Agrostis stolonifera</i>	redtop	12
<i>Allium canadense</i>	meadow garlic	160
<i>Allium vineale</i>	field garlic	6
<i>Amaranthus sp.</i>	pigweed	2
<i>Ambrosia artemisiifolia</i>	common ragweed	27
<i>Ambrosia bidentata</i>	lanceleaf ragweed	1
<i>Ambrosia psilostachya</i>	western ragweed	96
<i>Ambrosia trifida</i>	giant ragweed	15
<i>Ammannia coccinea</i>	purple toothcup	2
<i>Amorpha canescens</i>	leadplant	217
<i>Amorpha fruticosa</i>	false indigo	60
<i>Amphicarpaea bracteata</i>	American hogpeanut	2
<i>Andropogon gerardii</i>	big bluestem	225
<i>Andropogon ternarius</i>	splitbeard bluestem	1
<i>Andropogon virginicus</i>	broomsedge bluestem	72
<i>Antennaria neglecta</i>	field pussytoes	168
<i>Apocynum cannabinum</i>	Indianhemp	210
<i>Arenaria serpyllifolia</i>	thyme-leaved sandwort	1
<i>Aristida oligantha</i>	prairie threeawn	1
<i>Arnoglossum atriplicifolium</i>	pale Indian plantain	1
<i>Arnoglossum plantagineum</i>	groovestem Indian plantain	174
<i>Artemisia ludoviciana</i>	white sage	2
<i>Asclepias hirtella</i>	prairie milkweed	72
<i>Asclepias incarnata</i>	swamp milkweed	2
<i>Asclepias meadii</i>	Mead's milkweed	91

Species Name	Common Name	No. of Sites Where Found
<i>Asclepias purpurascens</i>	purple milkweed	2
<i>Asclepias stenophylla</i>	narrowleaf milkweed	26
<i>Asclepias sullivantii</i>	Sullivant's milkweed	86
<i>Asclepias syriaca</i>	common milkweed	30
<i>Asclepias tuberosa</i>	butterfly milkweed	124
<i>Asclepias verticillata</i>	whorled milkweed	87
<i>Asclepias viridiflora</i>	green-flowered milkweed	112
<i>Asclepias viridis</i>	green Antelopehorn milkweed	224
<i>Asparagus officinalis</i>	asparagus	3
<i>Astragalus canadensis</i>	Canadian milk-vetch	5
<i>Astragalus crassicaarpus</i>	common ground plum	20
<i>Astragalus distortus</i>	Ozark milk-vetch	31
<i>Baptisia alba</i>	white wild indigo	72
<i>Baptisia australis</i>	blue false indigo	150
<i>Baptisia bracteata</i>	plains wild indigo	215
<i>Barbarea vulgaris</i>	garden yellowrocket	49
<i>Bidens frondosa</i>	devil's beggartick	2
<i>Boltonia asteroides</i>	white false aster	2
<i>Bouteloua curtipendula</i>	side-oats grama	38
<i>Bouteloua gracilis</i>	blue grama	3
<i>Bouteloua hirsuta</i>	hairy grama	11
<i>Brassica nigra</i>	black mustard	2
<i>Brickellia eupatorioides</i>	false boneset	97
<i>Bromus arvensis</i>	field brome	158
<i>Bromus inermis</i>	smooth brome	28
<i>Buchnera americana</i>	blue hearts	35
<i>Callirhoe alcaeoides</i>	pale poppy mallow	180
<i>Calystegia sepium</i>	hedge bindweed	20
<i>Camassia angusta</i>	prairie camas	56
<i>Camassia scilloides</i>	Atlantic camas	18
<i>Campsis radicans</i>	trumpet creeper	1
<i>Capsella bursa-pastoris</i>	shepherd's purse	1
<i>Carduus nutans</i>	musk thistle	4
<i>Carex aggregata</i>	glomerate sedge	2
<i>Carex annectens</i>	yellowfruit sedge	42
<i>Carex arkansana</i>	Arkansas sedge	3
<i>Carex bicknellii</i>	Bicknell's sedge	38



Species Name	Common Name	No. of Sites Where Found
<i>Carex blanda</i>	eastern woodland sedge	1
<i>Carex brevior</i>	straw sedge	78
<i>Carex bushii</i>	Bush's sedge	204
<i>Carex caroliniana</i>	Carolina sedge	1
<i>Carex conjuncta</i>	soft fox sedge	2
<i>Carex frankii</i>	Frank's sedge	12
<i>Carex granularis</i>	meadow sedge	6
<i>Carex gravida</i>	heavy sedge	33
<i>Carex grayi</i>	Gray's sedge	1
<i>Carex hisutella</i>	hairy-leaf hirsute sedge	1
<i>Carex lupulina</i>	hop sedge	1
<i>Carex meadii</i>	Mead's sedge	76
<i>Carex mesochorea</i>	midland sedge	1
<i>Carex microdonta</i>	littletooth sedge	36
<i>Carex muhlenbergii</i>	southern sedge	1
<i>Carex pellita</i>	woolly sedge	8
<i>Carex shortiana</i>	Short's sedge	2
<i>Carex sp.</i>	sedge	3
<i>Carex vulpinoidea</i>	fox sedge	17
<i>Carex x subimpressa</i>	sedge	1
<i>Carya illinoensis</i>	pecan	1
<i>Castilleja coccinea</i>	Indian paintbrush	24
<i>Ceanothus americanus</i>	New Jersey tea	92
<i>Ceanothus herbaceus</i>	inland New Jersey tea	51
<i>Ceanothus sp.</i>	New Jersey tea	1
<i>Celastrus scandens</i>	American bittersweet	1
<i>Celtis occidentalis</i>	common hackberry	1
<i>Cephalanthus occidentalis</i>	common buttonbush	4
<i>Cerastium fontanum</i>	mouse-ear chickweed	1
<i>Cercis canadensis</i>	eastern redbud	2
<i>Chaerophyllum tainturieri</i>	wild chervil	42
<i>Chamaecrista fasciculata</i>	partridge pea	8
<i>Chamaesyce maculata</i>	spotted sandmat	1
<i>Chamaesyce nutans</i>	eyebane	3
<i>Chamaesyce prostrata</i>	prostrate sandmat	1
<i>Chamaesyce sp.</i>	sandmat	1
<i>Chasmanthium latifolium</i>	Indian woodoats	2

Species Name	Common Name	No. of Sites Where Found
<i>Cicuta maculata</i>	water hemlock	5
<i>Cirsium altissimum</i>	tall thistle	71
<i>Cirsium undulatum</i>	wavyleaf thistle	43
<i>Cirsium vulgare</i>	bull thistle	12
<i>Claytonia virginica</i>	Virginia springbeauty	7
<i>Clematis pitcheri</i>	bluebill	1
<i>Comandra umbellata</i>	bastard toadflax	28
<i>Convolvulus arvensis</i>	field bindweed	4
<i>Conyza canadensis</i>	Canada horseweed	10
<i>Coreopsis grandiflora</i>	bigflower coreopsis	91
<i>Coreopsis palmata</i>	finger coreopsis	81
<i>Cornus drummondii</i>	roughleaf dogwood	34
<i>Crataegus sp.</i>	hawthorn	3
<i>Croton capitatus</i>	woolly croton	2
<i>Croton monanthogynus</i>	one-seeded croton	12
<i>Cruciata pedemontana</i>	piedmont bedstraw	20
<i>Cuscuta sp.</i>	dodder	3
<i>Cyperus echinatus</i>	globe flatsedge	43
<i>Cyperus esculentus</i>	yellow nut-sedge	1
<i>Cyperus lupulinus</i>	Great Plains flatsedge	16
<i>Cyperus pseudovegetus</i>	marsh flatsedge	2
<i>Cyperus setigerus</i>	lean flatsedge	2
<i>Cyperus sp.</i>	flatsedge	3
<i>Cyperus squarrosus</i>	bearded flatsedge	1
<i>Cyperus strigosus</i>	strawcolored flatsedge	1
<i>Dactylis glomerata</i>	orchardgrass	10
<i>Dalea candida</i>	white prairie clover	208
<i>Dalea multiflora</i>	roundhead prairie clover	2
<i>Dalea purpurea</i>	purple prairie clover	185
<i>Daucus carota</i>	wild carrot	87
<i>Delphinium carolinianum</i>	Carolina larkspur	130
<i>Desmanthus illinoensis</i>	Illinois bundleflower	115
<i>Desmodium ciliare</i>	hairy small-leaf ticktrefoil	1
<i>Desmodium glutinosum</i>	pointedleaf ticktrefoil	1
<i>Desmodium illinoense</i>	Illinois tickclover	123
<i>Desmodium paniculatum</i>	panickedleaf ticktrefoil	44
<i>Desmodium sessilifolium</i>	sessile-leaf tickclover	140

Species Name	Common Name	No. of Sites Where Found
<i>Dianthus armeria</i>	Deptford pink	177
<i>Dichanthelium acuminatum</i>	pointed dichanthelium	161
<i>Dichanthelium linearifolium</i>	slimleaf panicgrass	5
<i>Dichanthelium oligosanthes</i>	Scribner's panicum	183
<i>Dichanthelium scoparium</i>	velvet panicum	22
<i>Dichanthelium sphaerocarpon</i>	roundseed dichanthelium	73
<i>Diodia teres</i>	rough buttonweed	2
<i>Diospyros virginiana</i>	common persimmon	9
<i>Dipsacus fullonum</i>	teasel	1
<i>Dodecatheon meadia</i>	shooting star	4
<i>Draba cuneifolia</i>	wedge leaf-draba	3
<i>Echinacea atrorubens</i>	Topeka purple coneflower	4
<i>Echinacea pallida</i>	pale purple coneflower	180
<i>Eleocharis compressa</i>	flatstem spikesedge	13
<i>Eleocharis erythropoda</i>	bald spikerush	1
<i>Eleocharis montevidensis</i>	sand spikerush	1
<i>Eleocharis palustris</i>	common spikerush	3
<i>Eleocharis sp.</i>	spikerush	118
<i>Eleocharis tenuis</i>	slender spikerush	14
<i>Eleocharis wolfii</i>	Wolf's spikerush	1
<i>Elymus canadensis</i>	Canada wildrye	53
<i>Elymus hystrix</i>	eastern bottlebrush grass	1
<i>Elymus virginicus</i>	Virginia wildrye	94
<i>Equisetum hyemale</i>	common scouring rush	1
<i>Erigeron annuus</i>	eastern daisy fleabane	53
<i>Erigeron philadelphicus</i>	Philadelphia fleabane	29
<i>Erigeron strigosus</i>	prairie fleabane	217
<i>Eryngium leavenworthii</i>	Leavenworth's eryngo	1
<i>Eryngium yuccifolium</i>	button snakeroot	129
<i>Erythronium albidum</i>	white fawnlily	2
<i>Erythronium mesochoreum</i>	midland fawnlily	4
<i>Eupatorium altissimum</i>	tall thoroughwort	13
<i>Eupatorium perfoliatum</i>	clasping-leaf joe-pye-weed	1
<i>Eupatorium serotinum</i>	lateflowering thoroughwort	1
<i>Euphorbia corollata</i>	flowering spurge	190
<i>Euphorbia dentata</i>	toothed spurge	1
<i>Euphorbia spathulata</i>	spurge	5

Species Name	Common Name	No. of Sites Where Found
<i>Euthamia graminifolia</i>	grassleaf euthamia	1
<i>Euthamia gymnospermoides</i>	viscid euthamia	98
<i>Fimbristylis puberula</i>	hairy fimbristylis	133
<i>Fragaria virginiana</i>	Virginia strawberry	127
<i>Fraxinus pennsylvanica</i>	green ash	1
<i>Galium aparine</i>	cleavers	10
<i>Galium concinnum</i>	shining bedstraw	2
<i>Galium obtusum</i>	bluntleaf bedstraw	40
<i>Galium sp.</i>	bedstraw	1
<i>Galium virgatum</i>	southwestern bedstraw	1
<i>Gaura mollis</i>	velvetweed	32
<i>Gentiana puberulenta</i>	downy gentian	132
<i>Geranium carolinianum</i>	Carolina cranesbill	34
<i>Glandularia canadensis</i>	rose mock vervain	32
<i>Gleditsia triacanthos</i>	honeylocust	8
<i>Hedeoma hispidum</i>	rough false pennyroyal	19
<i>Helenium autumnale</i>	common sneezeweed	5
<i>Helenium flexuosum</i>	purple-head sneezeweed	11
<i>Helianthus annuus</i>	common sunflower	6
<i>Helianthus grosseserratus</i>	sawtooth sunflower	87
<i>Helianthus maximiliani</i>	Maximilian's sunflower	27
<i>Helianthus mollis</i>	ashy sunflower	185
<i>Helianthus pauciflorus</i>	stiff sunflower	110
<i>Helianthus salicifolius</i>	willowleaf sunflower	47
<i>Helianthus tuberosus</i>	Jerusalem artichoke	1
<i>Heliopsis helianthoides</i>	rough ox-eye	3
<i>Heliotropium tenellum</i>	pasture heliotrope	2
<i>Hemerocallis fulva</i>	orange daylily	1
<i>Hesperostipa spartea</i>	porcupinegrass	21
<i>Hibiscus laevis</i>	halberdleaf rosemallow	1
<i>Hieracium longipilum</i>	longbeard hawkweed	186
<i>Hordeum jubatum</i>	foxtail barley	5
<i>Hordeum pusillum</i>	little barley	10
<i>Houstonia pusilla</i>	tiny bluet	1
<i>Hymenopappus scabiosaesus</i>	Carolina woollywhite	1
<i>Hypericum perforatum</i>	common St. Johnswort	118
<i>Hypericum punctatum</i>	spotted St. Johnswort	14

Species Name	Common Name	No. of Sites Where Found
<i>Hypericum sphaerocarpum</i>	roundseed St. Johnswort	12
<i>Hypoxis hirsuta</i>	yellow star grass	58
<i>Iva annua</i>	marsh elder	1
<i>Juncus acuminatus</i>	taper-leaf rush	1
<i>Juncus dudleyi</i>	Dudley's rush	7
<i>Juncus interior</i>	inland rush	52
<i>Juncus marginatus</i>	shore rush	7
<i>Juncus nodosus</i>	knotted rush	2
<i>Juncus sp.</i>	rush	6
<i>Juncus tenuis</i>	path rush	15
<i>Juncus torreyi</i>	Torrey's rush	9
<i>Juniperus virginiana</i>	eastern red cedar	36
<i>Koeleria macrantha</i>	Junegrass	168
<i>Krigia cespitosa</i>	weedy dwarf-dandelion	16
<i>Kummerowia striata</i>	Japanese clover	14
<i>Lactuca canadensis</i>	Canada lettuce	3
<i>Lactuca ludoviciana</i>	Louisiana lettuce	1
<i>Lactuca serriola</i>	prickly lettuce	2
<i>Leersia oryzoides</i>	rice cutgrass	2
<i>Lepidium campestre</i>	field peppergrass	8
<i>Lepidium densiflorum</i>	peppergrass	68
<i>Lepidium virginicum</i>	Virginia peppergrass	1
<i>Lespedeza capitata</i>	roundhead lespedeza	160
<i>Lespedeza cuneata</i>	sericea lespedeza	57
<i>Lespedeza sp.</i>	lespedeza	1
<i>Lespedeza stuevei</i>	tall lespedeza	2
<i>Lespedeza violacea</i>	violet lespedeza	133
<i>Lespedeza virginica</i>	slender bush lespedeza	118
<i>Leucanthemum vulgare</i>	oxeye daisy	153
<i>Liatris aspera</i>	tall blazing star	98
<i>Liatris mucronata</i>	eastern dotted gayfeather	1
<i>Liatris punctata</i>	dotted gayfeather	52
<i>Liatris pycnostachya</i>	thickspike gayfeather	148
<i>Lilium michiganense</i>	Michigan lily	3
<i>Lindernia dubia</i>	yellow false pimpernel	2
<i>Linum sulcatum</i>	grooved flax	66
<i>Lithospermum canescens</i>	hoary gromwell	45

<b>Species Name</b>	<b>Common Name</b>	<b>No. of Sites Where Found</b>
<i>Lithospermum incisum</i>	narrowleaf gromwell	11
<i>Lobelia spicata</i>	palespike lobelia	200
<i>Lomatium foeniculaceum</i>	wild pasley	10
<i>Ludwigia alternifolia</i>	bush seedbox	5
<i>Ludwigia palustris</i>	water purslane	1
<i>Lycopus americanus</i>	American bugleweed	8
<i>Lysimachia ciliata</i>	fringed loosestrife	9
<i>Lysimachia nummularia</i>	moneywort	1
<i>Lythrum alatum</i>	winged loosestrife	24
<i>Medicago lupulina</i>	black medick	33
<i>Medicago sativa</i>	alfalfa	1
<i>Melilotus officinalis</i>	yellow sweet clover	84
<i>Mimosa quadrivalvis</i>	cat-claw sensitive briar	151
<i>Minuartia patula</i>	pitcher's stitchwort	6
<i>Mirabilis albida</i>	white four-o'clock	9
<i>Mirabilis nyctaginea</i>	wild four-o'clock	3
<i>Monarda citriodora</i>	lemon beebalm	7
<i>Monarda fistulosa</i>	wild bergamot	18
<i>Morus alba</i>	white mulberry	6
<i>Morus rubra</i>	red mulberry	1
<i>Muhlenbergia frondosa</i>	wirestem muhly	1
<i>Muhlenbergia sp.</i>	muhly	1
<i>Myosotis verna</i>	Virginia forget-me-not	73
<i>Nothoscordum bivalve</i>	crowpoison	27
<i>Oenothera macrocarpa</i>	Missouri evening primrose	10
<i>Oenothera speciosa</i>	white evening primrose	40
<i>Oligoneuron rigidum</i>	stiff goldenrod	152
<i>Ophioglossum engelmannii</i>	limestone adderstongue	4
<i>Opuntia macrorhiza</i>	bigroot prickly pear	29
<i>Oxalis dillenii</i>	green wood sorrel	104
<i>Oxalis violacea</i>	violet wood sorrel	60
<i>Packera plattensis</i>	prairie groundsel	41
<i>Packera pseudoaurea</i>	falsegold groundsel	2
<i>Panicum capillare</i>	common witchgrass	1
<i>Panicum obtusum</i>	vine mesquite	6
<i>Panicum virgatum</i>	switchgrass	184
<i>Parthenocissus quinquefolia</i>	Virginia creeper	1

<b>Species Name</b>	<b>Common Name</b>	<b>No. of Sites Where Found</b>
<i>Pascopyrum smithii</i>	western wheatgrass	1
<i>Paspalum setaceum</i>	sand paspalum	5
<i>Pedicularis canadensis</i>	wood betony	56
<i>Pediomelum argophyllum</i>	silverleaf Indian breadroot	1
<i>Pediomelum esculentum</i>	large Indian breadroot	111
<i>Penstemon cobaea</i>	cobaea beardtongue	9
<i>Penstemon digitalis</i>	talus slope penstemon	19
<i>Penstemon tubiflorus</i>	tube beardtongue	219
<i>Perideridia americana</i>	eastern yampah	6
<i>Phalaris arundinacea</i>	reed canarygrass	5
<i>Phalaris caroliniana</i>	Carolina canarygrass	2
<i>Phleum pratense</i>	timothy	38
<i>Phlox pilosa</i>	prairie phlox	45
<i>Phyla lanceolata</i>	lanceleaf fogfruit	3
<i>Physalis heterophylla</i>	clammy groundcherry	24
<i>Physalis longifolia</i>	common groundcherry	7
<i>Physalis pumila</i>	dwarf ground cherry	87
<i>Physalis sp.</i>	groundcherry	1
<i>Physalis virginiana</i>	Virginia groundcherry	42
<i>Physostegia angustifolia</i>	narrowleaf false dragonhead	64
<i>Physostegia virginiana</i>	Virginia lion-heart	50
<i>Phytolacca americana</i>	American pokeweed	1
<i>Pilea pumila</i>	Canadian clearweed	1
<i>Plantago aristata</i>	bottlebrush plantain	8
<i>Plantago lanceolata</i>	English plantain	6
<i>Plantago patagonica</i>	woolly plantain	13
<i>Plantago rugelii</i>	Rugel's plantain	3
<i>Plantago sp.</i>	plantain	4
<i>Plantago virginica</i>	pale-seeded plantain	80
<i>Pluchea odorata</i>	sweetscent	1
<i>Poa pratensis</i>	Kentucky bluegrass	90
<i>Polygala incarnata</i>	slender milkwort	43
<i>Polygala sanguinea</i>	blood milkwort	43
<i>Polygala verticillata</i>	whorled milkwort	32
<i>Polygonum amphibium</i>	water smartweed	5
<i>Polygonum punctatum</i>	dotted smartweed	1
<i>Polytaenia nuttallii</i>	prairie parsley	213

Species Name	Common Name	No. of Sites Where Found
<i>Populus deltoides</i>	cottonwood	1
<i>Portulaca oleracea</i>	little hogweed	1
<i>Potentilla arguta</i>	tall cinquefoil	1
<i>Potentilla recta</i>	sulphur cinquefoil	172
<i>Potentilla simplex</i>	old-field cinquefoil	113
<i>Prenanthes aspera</i>	rough rattlesnakeroot	74
<i>Prunella vulgaris</i>	self-heal	65
<i>Prunus americana</i>	wild plum	1
<i>Prunus serotina</i>	black cherry	4
<i>Prunus sp.</i>	plum	4
<i>Pseudognaphalium obtusifolium</i>	sweet everlasting	16
<i>Psoralidium tenuiflorum</i>	slimflower scurfpea	202
<i>Ptilimnium nuttallii</i>	Nuttall's mock bishop-weed	31
<i>Pycnanthemum tenuifolium</i>	slender mountain mint	198
<i>Pyrrhopappus carolinianus</i>	Carolina false dandelion	1
<i>Quercus muehlenbergii</i>	chinkapin oak	1
<i>Quercus palustris</i>	pin oak	1
<i>Quercus rubra</i>	northern red oak	1
<i>Ranunculus sp.</i>	buttercup	1
<i>Ratibida columnifera</i>	yellow prairie coneflower	4
<i>Ratibida pinnata</i>	pinnate prairie coneflower	96
<i>Rhus aromatica</i>	fragrant sumac	8
<i>Rhus copallinum</i>	dwarf sumac	16
<i>Rhus glabra</i>	smooth sumac	38
<i>Rhynchospora harveyi</i>	Harvey's beaksedge	1
<i>Robinia pseudoacacia</i>	black locust	2
<i>Rosa arkansana</i>	prairie rose	116
<i>Rosa blanda</i>	smooth rose	4
<i>Rosa carolina</i>	pasture rose	51
<i>Rosa multiflora</i>	multiflora rose	10
<i>Rosa setigera</i>	climbing rose	14
<i>Rosa sp.</i>	rose	6
<i>Rubus argutus</i>	sawtooth blackberry	28
<i>Rubus flagellaris</i>	northern dewberry	25
<i>Rubus occidentalis</i>	black raspberry	3
<i>Rubus sp.</i>	blackberry	17
<i>Rudbeckia hirta</i>	black-eyed Susan	227



Species Name	Common Name	No. of Sites Where Found
<i>Rudbeckia subtomentosa</i>	sweet coneflower	10
<i>Ruellia humilis</i>	fringeleaf ruellia	204
<i>Rumex acetosella</i>	sheep sorrel	1
<i>Rumex altissimus</i>	pale dock	47
<i>Rumex crispus</i>	curly dock	68
<i>Salix nigra</i>	black willow	2
<i>Salvia azurea</i>	blue sage	192
<i>Sambucus nigra</i>	black elderberry	3
<i>Saponaria officinalis</i>	bouncingbet	1
<i>Schedonorus phoenix</i>	tall fescue	165
<i>Schizachyrium scoparium</i>	little bluestem	217
<i>Schoenoplectus acutus</i>	hardstem bulrush	1
<i>Scirpus atrovirens</i>	green bulrush	16
<i>Scirpus georgianus</i>	Georgia bulrush	5
<i>Scirpus pendulus</i>	rusty bulrush	121
<i>Scleria triglomerata</i>	whip razorsedge	120
<i>Scutellaria parvula</i>	small skullcap	98
<i>Securigera varia</i>	crownvetch	1
<i>Sedum pulchellum</i>	widowscross	15
<i>Setaria parviflora</i>	knotroot bristlegrass	63
<i>Setaria pumila</i>	yellow bristlegrass	1
<i>Setaria verticillata</i>	hooked bristlegrass	1
<i>Silene antirrhina</i>	sleepy catchfly	14
<i>Silene stellata</i>	widowsfrill	4
<i>Silphium integrifolium</i>	rosinweed	72
<i>Silphium laciniatum</i>	compass plant	126
<i>Sisyrinchium angustifolium</i>	narrowleaf blue-eyed grass	2
<i>Sisyrinchium campestre</i>	prairie blue-eyed grass	114
<i>Smilax tamnoides</i>	bristly greenbrier	1
<i>Solanum carolinense</i>	Carolina horse nettle	118
<i>Solidago canadensis</i>	Canada goldenrod	154
<i>Solidago gigantea</i>	giant goldenrod	8
<i>Solidago missouriensis</i>	Missouri goldenrod	186
<i>Solidago nemoralis</i>	gray goldenrod	52
<i>Solidago speciosa</i>	noble goldenrod	16
<i>Sorghastrum nutans</i>	Indiangrass	169
<i>Spartina pectinata</i>	prairie cordgrass	86

<b>Species Name</b>	<b>Common Name</b>	<b>No. of Sites Where Found</b>
<i>Sphenopholis obtusata</i>	prairie wedgescale	67
<i>Spiranthes vernalis</i>	spring ladies'-tresses	1
<i>Sporobolus compositus</i>	rough dropseed	135
<i>Sporobolus heterolepis</i>	prairie dropseed	25
<i>Stellaria media</i>	common chickweed	25
<i>Stenosiphon linifolius</i>	false gaura	1
<i>Strophostyles leiosperma</i>	slick-seed bean	8
<i>Symphoricarpos orbiculatus</i>	coralberry	24
<i>Symphyotrichum ericoides</i>	white heath aster	172
<i>Symphyotrichum laeve</i>	smooth blue aster	2
<i>Symphyotrichum lanceolatum</i>	white panicle aster	15
<i>Symphyotrichum oblongifolium</i>	aromatic aster	15
<i>Symphyotrichum oolentangiense</i>	skyblue aster	105
<i>Symphyotrichum pilosum</i>	hairy white oldfield aster	110
<i>Symphyotrichum praealtum</i>	willowleaf aster	112
<i>Symphyotrichum sericeum</i>	western silver aster	2
<i>Symphyotrichum sp.</i>	aster	1
<i>Taraxacum officinale</i>	common dandelion	3
<i>Tephrosia virginiana</i>	goat's rue	10
<i>Teucrium canadense</i>	Canada germander	16
<i>Thalictrum dasycarpum</i>	purple meadow-rue	4
<i>Thlaspi arvense</i>	pennycress	4
<i>Torilis arvensis</i>	hedge parsley	9
<i>Toxicodendron radicans</i>	poison ivy	24
<i>Tradescantia bracteata</i>	bracted spiderwort	13
<i>Tradescantia ohiensis</i>	Ohio spiderwort	223
<i>Tragia betonicifolia</i>	nettleleaf noseburn	38
<i>Tragopogon dubius</i>	goat's beard	94
<i>Tragopogon porrifolius</i>	salsify	1
<i>Tridens flavus</i>	purpletop tridens	8
<i>Trifolium campestre</i>	low hop clover	119
<i>Trifolium hybridum</i>	alsike clover	8
<i>Trifolium pratense</i>	red clover	153
<i>Trifolium reflexum</i>	buffalo clover	27
<i>Trifolium repens</i>	white clover	16
<i>Triodanis biflora</i>	small Venus' looking-glass	1
<i>Triodanis leptocarpa</i>	slimpod Venus' looking glass	16

<b>Species Name</b>	<b>Common Name</b>	<b>No. of Sites Where Found</b>
<i>Triodanis perfoliata</i>	Venus' looking glass	33
<i>Triosteum perfoliatum</i>	horse gentian	1
<i>Tripsacum dactyloides</i>	eastern gammagrass	180
<i>Triticum aestivum</i>	wheat	1
<i>Typha latifolia</i>	broadleaf cattail	3
<i>Ulmus americana</i>	American elm	3
<i>Ulmus pumila</i>	Siberian elm	2
<i>Ulmus rubra</i>	red elm	33
<i>Valerianella radiata</i>	beaked cornsalad	111
<i>Veratrum virginicum</i>	Virginia bunchflower	1
<i>Verbascum blattaria</i>	moth mullein	1
<i>Verbascum thapsus</i>	woolly mullein	4
<i>Verbena bracteata</i>	bigbract verbena	2
<i>Verbena hastata</i>	blue verbena	13
<i>Verbena simplex</i>	narrowleaf verbena	25
<i>Verbena stricta</i>	woolly verbena	14
<i>Verbena urticifolia</i>	white verbena	2
<i>Verbesina alternifolia</i>	wingstem crownbeard	2
<i>Verbesina helianthoides</i>	gravelweed	1
<i>Vernonia baldwinii</i>	Baldwin's ironweed	187
<i>Vernonia fasciculata</i>	western ironweed	11
<i>Veronica peregrina</i>	purslane speedwell	7
<i>Vicia americana</i>	American vetch	1
<i>Viola nephrophylla</i>	northern bog violet	26
<i>Viola pedatifida</i>	prairie violet	149
<i>Viola sagittata</i>	arrowleaf violet	2
<i>Vitis riparia</i>	riverbank grape	5
<i>Vulpia octoflora</i>	sixweeks fescue	45
<i>Xanthium strumarium</i>	common cocklebur	1
<i>Yucca filamentosa</i>	Adam's needle	1
<i>Zizia aurea</i>	golden zizia	53

**Appendix D**  
**Forest Plant Species Found During the County Inventory 2008-2009**  
(No. of Forest Sites = 27)

Species Name	Common Name	No. of Sites Where Found
<i>Acer negundo</i>	boxelder	10
<i>Acer saccharinum</i>	silver maple	7
<i>Acer saccharum</i>	sugar maple	16
<i>Aesculus glabra</i>	Ohio buckeye	12
<i>Agastache nepetoides</i>	yellow giant hyssop	1
<i>Ageratina altissima</i>	white snakeroot	9
<i>Agrimonia parviflora</i>	harvestlice	11
<i>Agrimonia sp.</i>	agrimony	4
<i>Ailanthus altissima</i>	tree of heaven	1
<i>Alliaria petiolata</i>	garlic mustard	6
<i>Allium canadense</i>	meadow garlic	9
<i>Allium sp.</i>	onion	1
<i>Allium vineale</i>	field garlic	3
<i>Ambrosia trifida</i>	great ragweed	4
<i>Amorpha canescens</i>	leadplant	1
<i>Amphicarpaea bracteata</i>	American hogpeanut	5
<i>Aplectrum hyemale</i>	Adam and Eve	1
<i>Apocynum cannabinum</i>	Indianhemp	6
<i>Aquilegia canadensis</i>	red columbine	6
<i>Arabis canadensis</i>	sicklepod	6
<i>Arisaema dracontium</i>	green dragon	11
<i>Arisaema triphyllum</i>	Jack in the pulpit	12
<i>Arnoglossum atriplicifolium</i>	pale Indian plantain	10
<i>Asclepias purpurascens</i>	purple milkweed	2
<i>Asclepias tuberosa</i>	butterfly milkweed	1
<i>Asimina triloba</i>	pawpaw	15
<i>Asplenium platyneuron</i>	ebony spleenwort	1
<i>Astragalus crassicaarpus</i>	common ground plum	1
<i>Botrychium virginianum</i>	rattlesnake fern	21
<i>Brassica nigra</i>	black mustard	1
<i>Bromus inermis</i>	smooth brome	1
<i>Bromus pubescens</i>	hairy woodland brome	10
<i>Bromus sp.</i>	brome	3

Species Name	Common Name	No. of Sites Where Found
<i>Calystegia sp.</i>	false bindweed	1
<i>Camassia scilloides</i>	Atlantic camas	4
<i>Campanulastrum americanum</i>	American bellflower	4
<i>Campsis radicans</i>	trumpet creeper	1
<i>Cardamine concatenata</i>	cutleaf toothwort	15
<i>Cardamine pensylvanica</i>	Pennsylvania bittercress	1
<i>Carex aggregata</i>	glomerate sedge	3
<i>Carex albicans</i>	whitetinge sedge	6
<i>Carex bicknellii</i>	Bicknell's sedge	1
<i>Carex blanda</i>	eastern woodland sedge	19
<i>Carex cephalophora</i>	oval-leaf sedge	1
<i>Carex conjuncta</i>	soft fox sedge	2
<i>Carex davisii</i>	Davis' sedge	2
<i>Carex gravida</i>	heavy sedge	1
<i>Carex grayi</i>	Gray's sedge	3
<i>Carex grisea</i>	inflated narrow-leaf sedge	5
<i>Carex hyalinolepis</i>	shoreline sedge	1
<i>Carex jamesii</i>	James' sedge	7
<i>Carex meadii</i>	Mead's sedge	1
<i>Carex oligocarpa</i>	richwoods sedge	2
<i>Carex radiata</i>	eastern star sedge	1
<i>Carex rosea</i>	rosy sedge	1
<i>Carex sp.</i>	sedge	4
<i>Carex sparganioides</i>	bur-reed sedge	1
<i>Carya cordiformis</i>	bitternut hickory	15
<i>Carya illinoensis</i>	pecan	6
<i>Carya laciniosa</i>	shellbark hickory	10
<i>Carya ovata</i>	shagbark hickory	24
<i>Carya sp.</i>	hickory	1
<i>Celastrus scandens</i>	American bittersweet	2
<i>Celtis occidentalis</i>	common hackberry	25
<i>Cercis canadensis</i>	eastern redbud	23
<i>Chaerophyllum procumbens</i>	spreading chervil	17
<i>Chaerophyllum tainturieri</i>	wild chervil	2
<i>Chasmanthium latifolium</i>	Indian woodoats	9
<i>Chenopodium sp.</i>	goosefoot	1
<i>Cirsium altissimum</i>	tall thistle	5

Species Name	Common Name	No. of Sites Where Found
<i>Cirsium sp.</i>	thistle	1
<i>Cirsium vulgare</i>	bull thistle	1
<i>Claytonia virginica</i>	Virginia springbeauty	12
<i>Clematis pitcheri</i>	bluebill	2
<i>Clematis sp.</i>	leather flower	2
<i>Collinsia sp.</i>	blue eyed Mary	1
<i>Collinsia verna</i>	spring blue eyed Mary	1
<i>Collinsia violacea</i>	violet blue eyed Mary	1
<i>Corallorhiza sp.</i>	coralroot	2
<i>Corallorhiza wisteriana</i>	spring coralroot	4
<i>Cornus drummondii</i>	roughleaf dogwood	16
<i>Corydalis flavula</i>	yellow fumewort	8
<i>Corylus americana</i>	American hazelnut	1
<i>Crataegus sp.</i>	hawthorn	1
<i>Cystopteris tennesseensis</i>	Tennessee bladderfern	11
<i>Dasistoma macrophylla</i>	mullein foxglove	2
<i>Delphinium tricornis</i>	dwarf larkspur	3
<i>Descurainia pinnata</i>	western tansymustard	1
<i>Desmodium glutinosum</i>	pointedleaf ticktrefoil	11
<i>Desmodium paniculatum</i>	panicledleaf ticktrefoil	3
<i>Desmodium perplexum</i>	perplexed ticktrefoil	1
<i>Desmodium sp.</i>	ticktrefoil	5
<i>Dicentra cucullaria</i>	dutchman's breeches	12
<i>Dichantherium clandestinum</i>	deertongue	1
<i>Dichantherium latifolium</i>	wide leaf panicgrass	2
<i>Dichantherium sp.</i>	rosette grass	1
<i>Dioscorea sp.</i>	yam	2
<i>Diospyros virginiana</i>	common persimmon	4
<i>Draba cuneifolia</i>	wedge leaf-draba	2
<i>Elaeagnus angustifolia</i>	Russian olive	1
<i>Ellisia nyctelea</i>	Aunt Lucy	17
<i>Elymus canadensis</i>	Canada wildrye	4
<i>Elymus virginicus</i>	Virginia wildrye	14
<i>Enemion biternatum</i>	eastern false rue anemone	16
<i>Eragrostis sp.</i>	lovegrass	1
<i>Erigeron annuus</i>	eastern daisy fleabane	1
<i>Erigeron strigosus</i>	prairie fleabane	1

Species Name	Common Name	No. of Sites Where Found
<i>Erythronium albidum</i>	white fawnlily	18
<i>Erythronium mesochoreum</i>	midland fawnlily	4
<i>Euonymus atropurpureus</i>	burningbush	4
<i>Euonymus fortunei</i>	winter creeper	1
<i>Eupatorium altissimum</i>	tall thoroughwort	2
<i>Eupatorium purpureum</i>	sweetscented joe pye weed	8
<i>Eupatorium serotinum</i>	lateflowering thoroughwort	1
<i>Euphorbia corollata</i>	flowering spurge	1
<i>Festuca subverticillata</i>	nodding fescue	12
<i>Fragaria virginiana</i>	Virginia strawberry	1
<i>Fraxinus americana</i>	white ash	14
<i>Fraxinus pennsylvanica</i>	green ash	12
<i>Fraxinus sp.</i>	ash	1
<i>Galium aparine</i>	stickywilly	23
<i>Galium circaezans</i>	licorice bedstraw	19
<i>Galium concinnum</i>	shining bedstraw	14
<i>Galium obtusum</i>	bluntleaf bedstraw	1
<i>Geum canadense</i>	white avens	18
<i>Geum vernum</i>	spring avens	3
<i>Glandularia canadensis</i>	rose mock vervain	3
<i>Gleditsia triacanthos</i>	honeylocust	8
<i>Gymnocladus dioicus</i>	Kentucky coffeetree	7
<i>Hackelia virginiana</i>	beggarslice	7
<i>Helianthus hirsutus</i>	hairy sunflower	17
<i>Humulus lupulus</i>	common hop	1
<i>Hybanthus concolor</i>	eastern greenviolet	4
<i>Hydrophyllum appendiculatum</i>	great waterleaf	3
<i>Hydrophyllum virginianum</i>	eastern waterleaf	8
<i>Hypericum sphaerocarpum</i>	roundseed St. Johnswort	6
<i>Impatiens capensis</i>	jewelweed	18
<i>Iodanthus pinnatifidus</i>	purplerocket	3
<i>Juglans nigra</i>	black walnut	21
<i>Juniperus virginiana</i>	eastern red cedar	18
<i>Lactuca floridana</i>	woodland lettuce	6
<i>Lactuca serriola</i>	prickly lettuce	3
<i>Lamium amplexicaule</i>	henbit deadnettle	1
<i>Lamium purpureum</i>	purple deadnettle	7

Species Name	Common Name	No. of Sites Where Found
<i>Laportea canadensis</i>	Canadian woodnettle	17
<i>Leersia virginica</i>	whitegrass	1
<i>Leonurus cardiaca</i>	common motherwort	1
<i>Lespedeza capitata</i>	roundhead lespedeza	1
<i>Lespedeza violacea</i>	violet lespedeza	5
<i>Liatris aspera</i>	tall blazing star	3
<i>Lilium michiganense</i>	Michigan lily	14
<i>Lithospermum canescens</i>	hoary gromwell	1
<i>Lonicera sp.</i>	honeysuckle	1
<i>Lysimachia nummularia</i>	moneywort	4
<i>Maclura pomifera</i>	osage orange	8
<i>Maianthemum racemosum</i>	feathery false lily of the valley	12
<i>Maianthemum sp.</i>	false lily of the valley	2
<i>Maianthemum stellatum</i>	starry false lily of the valley	4
<i>Melilotus sp.</i>	sweetclover	2
<i>Menispermum canadense</i>	common moonseed	17
<i>Mirabilis sp.</i>	four o'clock	1
<i>Monarda fistulosa</i>	wild bergamot	1
<i>Morus alba</i>	white mulberry	3
<i>Morus rubra</i>	red mulberry	6
<i>Muhlenbergia sp.</i>	muhly	5
<i>Myosotis verna</i>	Virginia forget-me-not	1
<i>Nothoscordum bivalve</i>	crowpoison	7
<i>Ophioglossum engelmannii</i>	limestone adderstongue	2
<i>Opuntia humifusa</i>	devil's-tongue	2
<i>Osmorhiza longistylis</i>	longstyle sweetroot	12
<i>Ostrya virginiana</i>	hophornbeam	17
<i>Oxalis dillenii</i>	green wood sorrel	1
<i>Oxalis violacea</i>	violet woodsorrel	10
<i>Packera glabella</i>	butterweed	2
<i>Packera obovata</i>	roundleaf ragwort	18
<i>Parietaria pensylvanica</i>	Pennsylvania pellitory	9
<i>Parthenocissus quinquefolia</i>	Virginia creeper	25
<i>Pellaea atropurpurea</i>	purple cliffbrake	2
<i>Penstemon sp.</i>	beardtongue	1
<i>Phalaris arundinacea</i>	reed canarygrass	1
<i>Phlox divaricata</i>	wild blue phlox	23



Species Name	Common Name	No. of Sites Where Found
<i>Physalis virginiana</i>	Virginia groundcherry	1
<i>Phytolacca americana</i>	American pokeweed	4
<i>Pilea pumila</i>	Canadian clearweed	1
<i>Pilea sp.</i>	clearweed	1
<i>Plantago rugelii</i>	Rugel's plantain	2
<i>Platanus occidentalis</i>	American sycamore	17
<i>Poa sylvestris</i>	woodland bluegrass	11
<i>Podophyllum peltatum</i>	mayapple	22
<i>Polygonatum biflorum</i>	smooth Solomon's seal	9
<i>Polygonum virginianum</i>	jumpseed	17
<i>Polymnia canadensis</i>	whiteflower leafcup	2
<i>Populus deltoides</i>	cottonwood	4
<i>Prunus serotina</i>	black cherry	11
<i>Ptelea trifoliata</i>	common hoptree	1
<i>Quercus alba</i>	white oak	3
<i>Quercus macrocarpa</i>	bur oak	14
<i>Quercus muehlenbergii</i>	chinkapin oak	22
<i>Quercus palustris</i>	pin oak	6
<i>Quercus rubra</i>	northern red oak	21
<i>Quercus shumardii</i>	Shumard's oak	3
<i>Quercus sp.</i>	oak	1
<i>Quercus stellata</i>	post oak	9
<i>Quercus velutina</i>	black oak	16
<i>Ranunculus abortivus</i>	littleleaf buttercup	7
<i>Ranunculus hispidus</i>	bristly buttercup	2
<i>Ratibida pinnata</i>	pinnate prairie coneflower	3
<i>Rhus aromatica</i>	fragrant sumac	7
<i>Rhus glabra</i>	smooth sumac	2
<i>Ribes aureum</i>	golden currant	1
<i>Ribes missouriense</i>	Missouri gooseberry	19
<i>Rosa multiflora</i>	multiflora rose	2
<i>Rosa setigera</i>	climbing rose	4
<i>Rubus occidentalis</i>	black raspberry	6
<i>Rubus sp.</i>	blackberry	7
<i>Rudbeckia laciniata</i>	cutleaf coneflower	4
<i>Rumex sp.</i>	dock	1
<i>Sambucus nigra</i>	black elderberry	13

Species Name	Common Name	No. of Sites Where Found
<i>Sanguinaria canadensis</i>	bloodroot	6
<i>Sanicula canadensis</i>	Canadian blacksnakeroot	17
<i>Sanicula odorata</i>	clustered blacksnakeroot	5
<i>Schizachyrium scoparium</i>	little bluestem	1
<i>Scrophularia marilandica</i>	carpenter's square	7
<i>Securigera varia</i>	crownvetch	1
<i>Setaria sp.</i>	bristlegrass	1
<i>Sicyos angulatus</i>	oneseed bur cucumber	2
<i>Sideroxylon lanuginosum</i>	gum bully	2
<i>Silene stellata</i>	widowsfrill	8
<i>Silphium perfoliatum</i>	cup plant	2
<i>Sisyrinchium campestre</i>	prairie blue-eyed grass	1
<i>Smilax ecirrhata</i>	upright carrionflower	2
<i>Smilax herbacea</i>	smooth carrionflower	7
<i>Smilax tamnoides</i>	bristly greenbrier	24
<i>Solidago gigantea</i>	giant goldenrod	6
<i>Solidago nemoralis</i>	gray goldenrod	1
<i>Solidago ulmifolia</i>	elmleaf goldenrod	9
<i>Staphylea trifolia</i>	American bladdernut	17
<i>Stellaria media</i>	common chickweed	2
<i>Stellaria sp.</i>	starwort	3
<i>Symphoricarpos orbiculatus</i>	coralberry	27
<i>Symphyotrichum drummondii</i>	Drummond's aster	3
<i>Symphyotrichum laeve</i>	smooth blue aster	5
<i>Symphyotrichum lanceolatum</i>	white panicle aster	5
<i>Taenidia integerrima</i>	yellow pimpernel	5
<i>Taraxacum officinale</i>	common dandelion	7
<i>Teucrium canadense</i>	Canada germander	2
<i>Thalictrum thalictroides</i>	rue anemone	4
<i>Tilia americana</i>	American basswood	12
<i>Toxicodendron radicans</i>	poison ivy	20
<i>Trillium sessile</i>	toadshade	5
<i>Triosteum perfoliatum</i>	horse gentian	5
<i>Ulmus americana</i>	American elm	14
<i>Ulmus rubra</i>	red elm	19
<i>Urtica dioica</i>	stinging nettle	8
<i>Valerianella radiata</i>	beaked cornsalad	1

<b>Species Name</b>	<b>Common Name</b>	<b>No. of Sites Where Found</b>
<i>Verbascum thapsus</i>	woolly mullein	1
<i>Verbena urticifolia</i>	white vervain	5
<i>Verbesina alternifolia</i>	wingstem crownbeard	9
<i>Vernonia baldwinii</i>	Baldwin's ironweed	3
<i>Veronica arvensis</i>	corn speedwell	1
<i>Veronica hederifolia</i>	ivy leaf speedwell	1
<i>Viburnum prunifolium</i>	blackhaw	1
<i>Viburnum rufidulum</i>	rusty blackhaw	6
<i>Viburnum sp.</i>	viburnum	1
<i>Vinca minor</i>	common periwinkle	1
<i>Vinca sp.</i>	periwinkle	1
<i>Viola bicolor</i>	field pansy	2
<i>Viola nephrophylla</i>	northern bog violet	25
<i>Viola pubescens</i>	downy yellow violet	22
<i>Vitis riparia</i>	riverbank grape	21
<i>Woodsia obtusa</i>	bluntlobe cliff fern	3
<i>Zanthoxylum americanum</i>	common pricklyash	13
<i>Zizia aurea</i>	golden zizia	18

## Appendix E

### Animal and Plant Species Protected by Federal and/or State Laws with Historic or Current Occurrences in Anderson and/or Linn Counties, Kansas

Common Name	Scientific Name	Status <sup>1</sup>
<b>ANIMALS</b>		
<b>Mammals</b>		
Eastern spotted skunk	<i>Spilogale putorius</i>	T
Franklin's ground squirrel	<i>Spermophilus franklinii</i>	S
Southern bog lemming	<i>Synaptomys cooperi</i>	S
Southern flying squirrel	<i>Glaucomys volans</i>	S
<b>Birds</b>		
Black tern*	<i>Chlidonias niger</i>	S
Cerulean warbler	<i>Dendroica cerulea</i>	S
Ferruginous hawk*	<i>Buteo regalis</i>	S
Golden eagle*	<i>Aquila chrysaetos</i>	S
Henslow's sparrow	<i>Ammodramus henslowii</i>	S
Least tern*	<i>Sterna antillarum</i>	LE, E
Piping plover*	<i>Charadrius melodus</i>	LT, T
Short-eared owl*	<i>Asio flammeus</i>	S
Snowy plover*	<i>Charadrius alexandrinus</i>	T
Whip-poor-will	<i>Caprimulgus vociferus</i>	S
Yellow-throated warbler	<i>Dendroica dominica</i>	S
<b>Reptiles</b>		
Broadhead skink	<i>Eumeces laticeps</i>	T
Common map turtle	<i>Graptemys geographica</i>	T
Redbelly snake	<i>Storeria occipitomaculata</i>	T
Smooth earth snake	<i>Virginia valeriae</i>	T
Timber rattlesnake	<i>Crotalus horridus</i>	S
<b>Amphibians</b>		
Eastern newt	<i>Notophthalmus viridescens</i>	T
Crawfish frog	<i>Rana areolata</i>	S
Spring peeper	<i>Pseudacris triserata</i>	T
<b>Fishes</b>		
Bluntnose darter	<i>Etheostoma chlorosoma</i>	S
Bobolink	<i>Dolichonyx oryzivorus</i>	S
Greenside darter	<i>Etheostoma blenniodes</i>	S
Hornyhead chub	<i>Nocomis biguttatus</i>	T
Tadpole madtom	<i>Noturus gyrinus</i>	S

<b>Invertebrates</b>		
Creeper	<i>Strophitus undulatus</i>	S
Deertoe mussel	<i>Truncilla truncata</i>	S
Elktoe	<i>Alasmidonta marginata</i>	E
Fatmucket	<i>Lampsilis siliquoidea</i>	S
Fawnsfoot	<i>Truncilla donaciformis</i>	S
Flat floater	<i>Anodonta suborbiculata</i>	E
Fluted shell	<i>Lasmigona costata</i>	T
Mucket	<i>Actinonaias ligimentina</i>	E
Prairie mole cricket	<i>Gryllotalpa major</i>	S
Rock pocketbook	<i>Arcidens confragosus</i>	T
Round pigtoe mussel	<i>Pleurobema sintoxia</i>	S
Spike mussel	<i>Elliptio dilatata</i>	S
Wabash pigtoe mussel	<i>Fusconaia flava</i>	S
Wartyback mussel	<i>Quadrula nodulata</i>	S
Washboard	<i>Megalonaias nervosa</i>	S
Yellow Sandshell	<i>Lampsilis teres</i>	S
<b>PLANTS</b>		
Mead's milkweed	<i>Asclepias meadii</i>	LT
Western prairie fringed orchid	<i>Platanthera praeclara</i>	LT

\* Migrant only

1 Status abbreviations (federal, then state) are as follows:

LE = listed as endangered by the U.S. Fish & Wildlife Service

LT = listed as threatened the U.S. Fish & Wildlife Service

S = listed as species in need of conservation by Kansas Dept. of Wildlife & Parks

E = listed as endangered by Kansas Dept. of Wildlife & Parks

T = listed as threatened by Kansas Dept. of Wildlife & Parks

Appendix F  
 State Rank List of Prairie and Forest Plant Species Found in  
 County Inventory 2008-2009

Habitat	Species	Common Name	State Rank	CoC	# of Locations
Prairie	<i>Eleocharis tenuis var. verrucosa</i>	slender spikerush	S2	8	18
Forest	<i>Ranunculus hispidus</i>	bristly buttercup	S2	6	6
Forest	<i>Aplectrum hyemale</i>	Adam and Eve	S2	8	1
Prairie	<i>Asclepias meadii</i>	Mead's milkweed	S2	10	92
Prairie	<i>Camassia angusta</i>	prairie camas	S2	8	61
Prairie	<i>Carex arkansana</i>	Arkansas sedge	S1	7	7
Prairie	<i>Carex caroliniana</i>	Carolina sedge	S2	7	1
Prairie	<i>Carex hisutella</i>	hairy-leaf hirsute sedge	S2	5	2
Forest	<i>Carex hitchcockiana</i>	Hitchcock's sedge	S1	10	1
Forest	<i>Carex radiata</i>	eastern star sedge	S2	6	3
Forest	<i>Carex retroflexa</i>	reflexed sedge	S2	5	1
Forest	<i>Carex rosea</i>	rosy sedge	S2	7	2
Prairie	<i>Carex squarrosa</i>	squarrose sedge	S1	7	1
Forest	<i>Carya laciniosa</i>	shellbark hickory	S2	7	19
Forest	<i>Collinsia verna</i>	spring blue eyed Mary	S1	8	2
Forest	<i>Crataegus viridis</i>	green hawthorn	S2	4	1
Prairie	<i>Cyperus pseudovegetus</i>	marsh flatsedge	S2	7	2
Prairie	<i>Desmodium ciliare</i>	hairy small-leaf ticktrefoil	S2	5	2
Prairie	<i>Dichanthelium latifolium</i>	broadleaf rosette grass	S2	7	0
Forest	<i>Dichanthelium latifolium</i>	broadleaf rosette grass	S2	7	4
Prairie	<i>Dichanthelium linearifolium</i>	slimleaf panicgrass	S2	7	5
Prairie	<i>Dichanthelium scoparium</i>	velvet panicum	S2	7	24
Prairie	<i>Eleocharis montevidensis</i>	sand spikerush	S2	5	1
Prairie	<i>Eleocharis wolfii</i>	Wolf's spikerush	S1	5	1
Prairie	<i>Helenium flexuosum</i>	purple-head sneezeweed	S2	6	11
Forest	<i>Hybanthus concolor</i>	eastern greenviolet	S2	8	5
Forest	<i>Hydrophyllum appendiculatum</i>	great waterleaf	S2	7	5
Forest	<i>Maianthemum stellatum</i>	starry false lily of the valley	S2	8	7
Forest	<i>Packera glabella</i>	butterweed	S2	2	5
Prairie	<i>Perideridia americana</i>	eastern yampah	S1	8	6
Prairie	<i>Phalaris caroliniana</i>	Carolina canarygrass	S2	1	2

Habitat	Species	Common Name	State Rank	CoC	# of Locations
Prairie	<i>Physostegia angustifolia</i>	narrowleaf false dragonhead	S1	5	71
Forest	<i>Polymnia canadensis</i>	whiteflower leafcup	S1	7	2
Forest	<i>Prunus hortulana</i>	hortulan plum	S1	3	1
Prairie	<i>Rosa blanda</i>	smooth rose	S1	6	4
Prairie	<i>Rubus alumnus</i>	nursling highbrush blackberry	S1	4	1
Prairie	<i>Rubus argutus</i>	sawtooth blackberry	S1	4	29
Forest	<i>Rubus argutus</i>	sawtooth blackberry	S1	4	1
Forest	<i>Smilax ecirrhata</i>	upright carrionflower	S1	5	6
Prairie	<i>Sporobolus heterolepis</i>	prairie dropseed	S2	8	28
Forest	<i>Taenidia integerrima</i>	yellow pimpernel	S2	7	6
Forest	<i>Thalictrum thalictroides</i>	rue anemone	S2	8	8
Prairie	<i>Trifolium reflexum</i>	buffalo clover	S2	10	27
Forest	<i>Trillium sessile</i>	toadshade	S2	7	8
Prairie	<i>Verbesina helianthoides</i>	gravelweed	S2	5	1
Forest	<i>Viburnum prunifolium</i>	blackhaw	S2	6	1

Appendix G  
 Floristic Quality Indices for Prairie Sites  
 (No. of Sites = 235)

Site Number	FQI	County	Site Grade	No. of Acres	No. of Species Found
No. 1	50.18	Linn	C	130.07	136
No. 2	47.44	Linn	C	26.19	118
No. 3	46.71	Anderson	C	35.04	119
No. 4	45.85	Linn	B	55.99	97
No. 5	45.52	Linn	C	52.18	76
No. 6	45.38	Anderson	B	12.06	123
No. 7	45.33	Linn	B	88.28	99
No. 8	45.18	Linn	C	13.13	112
No. 9	45.14	Linn	B	32.92	111
No. 10	44.72	Anderson	B	50.71	113
No. 11	44.58	Linn	C	78.85	100
No. 12	44.53	Linn	B	15.12	105
No. 13	44.49	Anderson	B	40.30	105
No. 14	44.38	Linn	C	8.86	103
No. 15	44.32	Linn	B	21.46	108
No. 16	44.13	Linn	B	19.87	103
No. 17	44.04	Anderson	B	41.29	107
No. 18	43.96	Linn	B	12.05	97
No. 19	43.96	Linn	C	84.58	104
No. 20	43.88	Linn	B	89.63	125
No. 21	43.86	Linn	B	42.50	116
No. 22	43.86	Anderson	C	59.73	114
No. 23	43.84	Linn	B	20.27	88
No. 24	43.57	Anderson	B	20.83	103
No. 25	43.50	Linn	B	86.41	109
No. 26	43.44	Anderson	C	142.92	93
No. 27	43.38	Linn	B	14.06	96
No. 28	43.22	Linn	B	11.28	126
No. 29	43.20	Anderson	B	120.44	112
No. 30	43.13	Linn	C	14.06	113
No. 31	43.11	Anderson	C	50.97	106
No. 32	43.06	Linn	C	7.42	114



<b>Site Number</b>	<b>FQI</b>	<b>County</b>	<b>Site Grade</b>	<b>No. of Acres</b>	<b>No. of Species Found</b>
No. 33	43.01	Anderson	B	36.15	88
No. 34	42.88	Linn	B	6.42	103
No. 35	42.85	Linn	C	35.20	101
No. 36	42.81	Anderson	C	22.75	94
No. 37	42.74	Anderson	B	278.71	106
No. 38	42.67	Linn	B	10.16	90
No. 39	42.60	Linn	C	22.15	113
No. 40	42.60	Anderson	C	2.35	88
No. 41	42.56	Anderson	C	22.99	129
No. 42	42.54	Anderson	C	70.94	127
No. 43	42.49	Anderson	C	30.33	88
No. 44	42.29	Linn	C	25.69	112
No. 45	42.07	Anderson	B	89.62	78
No. 46	42.04	Anderson	B	49.60	92
No. 47	42.00	Linn	C	16.63	92
No. 48	41.78	Anderson	B	38.39	106
No. 49	41.70	Linn	C	24.59	92
No. 50	41.67	Anderson	C	26.03	94
No. 51	41.61	Linn	C	28.92	117
No. 52	41.43	Anderson	B	25.81	97
No. 53	41.43	Linn	C	11.02	95
No. 54	41.41	Linn	C	31.88	94
No. 55	41.29	Linn	C	5.64	93
No. 56	41.24	Anderson	B	23.88	72
No. 57	41.17	Anderson	C	128.04	99
No. 58	41.16	Linn	B	88.50	92
No. 59	41.16	Anderson	B	5.15	93
No. 60	41.11	Anderson	B	5.01	84
No. 61	41.11	Linn	B	7.54	91
No. 62	41.11	Anderson	B	36.23	90
No. 63	41.00	Linn	B	17.43	92
No. 64	40.94	Linn	C	29.94	107
No. 65	40.89	Anderson	C	41.15	95
No. 66	40.81	Anderson	C	5.01	77
No. 67	40.78	Anderson	C	15.15	90
No. 68	40.72	Linn	B	5.27	104

<b>Site Number</b>	<b>FQI</b>	<b>County</b>	<b>Site Grade</b>	<b>No. of Acres</b>	<b>No. of Species Found</b>
No. 69	40.65	Anderson	C	29.95	110
No. 70	40.64	Linn	C	15.98	94
No. 71	40.54	Linn	C	12.46	105
No. 72	40.54	Linn	C	44.76	93
No. 73	40.42	Linn	B	36.78	97
No. 74	40.37	Linn	C	5.11	93
No. 75	40.36	Linn	C	5.02	86
No. 76	40.11	Anderson	B	15.69	91
No. 77	40.11	Linn	C	9.40	69
No. 78	39.95	Linn	C	12.12	80
No. 79	39.94	Anderson	C	32.96	93
No. 80	39.94	Linn	C	30.47	105
No. 81	39.92	Linn	B	5.07	79
No. 82	39.92	Linn	C	7.21	86
No. 83	39.84	Anderson	B	14.15	79
No. 84	39.80	Linn	B	7.84	110
No. 85	39.57	Anderson	C	73.34	102
No. 86	39.53	Anderson	C	81.36	97
No. 87	39.52	Anderson	C	7.83	84
No. 88	39.49	Anderson	C	33.17	83
No. 89	39.44	Linn	B	6.66	93
No. 90	39.26	Linn	C	13.23	86
No. 91	39.22	Anderson	C	9.30	79
No. 92	39.17	Linn	C	12.77	98
No. 93	39.09	Linn	B	8.06	113
No. 94	38.94	Linn	B	73.68	90
No. 95	38.88	Anderson	C	81.28	81
No. 96	38.86	Anderson	B	22.65	84
No. 97	38.75	Linn	C	5.12	74
No. 98	38.69	Linn	C	11.69	100
No. 99	38.68	Anderson	C	25.46	97
No. 100	38.67	Linn	B	8.65	62
No. 101	38.59	Anderson	C	19.60	88
No. 102	38.57	Anderson	B	6.43	90
No. 103	38.45	Linn	B	11.70	80
No. 104	38.44	Anderson	C	77.74	93

<b>Site Number</b>	<b>FQI</b>	<b>County</b>	<b>Site Grade</b>	<b>No. of Acres</b>	<b>No. of Species Found</b>
No. 105	38.32	Anderson	C	20.89	96
No. 106	38.25	Linn	C	6.81	82
No. 107	38.25	Anderson	C	31.54	87
No. 108	38.17	Linn	B	5.06	114
No. 109	38.11	Linn	B	8.55	99
No. 110	38.01	Linn	C	5.02	80
No. 111	37.99	Linn	C	33.93	84
No. 112	37.95	Anderson	C	14.35	105
No. 113	37.86	Linn	B	23.82	83
No. 114	37.80	Anderson	C	36.23	81
No. 115	37.59	Anderson	C	52.39	103
No. 116	37.48	Anderson	C	19.63	70
No. 117	37.47	Anderson	B	5.01	68
No. 118	37.44	Linn	B	12.71	82
No. 119	37.38	Linn	B	7.76	76
No. 120	37.36	Anderson	C	29.98	84
No. 121	37.35	Anderson	C	34.68	79
No. 122	37.29	Anderson	B	112.49	71
No. 123	37.26	Linn	B	5.10	70
No. 124	37.16	Linn	B	7.06	61
No. 125	37.14	Linn	B	25.04	107
No. 126	37.08	Linn	C	13.94	70
No. 127	37.02	Linn	B	18.87	82
No. 128	37.01	Linn	B	6.41	76
No. 129	36.93	Anderson	C	27.09	81
No. 130	36.82	Linn	C	11.30	85
No. 131	36.73	Linn	C	5.08	81
No. 132	36.62	Anderson	C	8.61	69
No. 133	36.47	Linn	C	5.04	78
No. 134	36.45	Anderson	C	7.38	84
No. 135	36.43	Anderson	C	34.11	80
No. 136	36.35	Linn	C	8.94	90
No. 137	36.28	Anderson	C	21.93	85
No. 138	36.24	Linn	B	8.34	67
No. 139	36.14	Linn	B	25.04	83
No. 140	36.09	Anderson	C	11.93	76

<b>Site Number</b>	<b>FQI</b>	<b>County</b>	<b>Site Grade</b>	<b>No. of Acres</b>	<b>No. of Species Found</b>
No. 141	36.04	Anderson	C	153.73	79
No. 142	36.04	Linn	B	33.89	71
No. 143	35.96	Linn	C	7.38	78
No. 144	35.85	Linn	B	8.29	62
No. 145	35.80	Anderson	C	13.14	88
No. 146	35.79	Linn	C	36.75	101
No. 147	35.72	Linn	B	5.09	77
No. 148	35.71	Linn	C	12.18	76
No. 149	35.67	Anderson	B	11.86	98
No. 150	35.67	Linn	C	5.00	89
No. 151	35.56	Anderson	C	13.81	71
No. 152	35.48	Anderson	C	16.14	86
No. 153	35.48	Linn	C	48.88	106
No. 154	35.45	Linn	C	7.39	77
No. 155	35.44	Linn	C	17.35	104
No. 156	35.31	Linn	C	24.82	80
No. 157	35.10	Anderson	C	44.40	91
No. 158	34.93	Linn	B	13.31	75
No. 159	34.90	Anderson	C	101.83	85
No. 160	34.76	Linn	C	21.11	115
No. 161	34.66	Linn	B	5.01	68
No. 162	34.65	Anderson	C	36.67	87
No. 163	34.51	Anderson	C	5.12	71
No. 164	34.42	Linn	C	6.70	72
No. 165	34.30	Linn	C	23.67	87
No. 166	34.30	Linn	C	8.22	92
No. 167	34.30	Anderson	B	10.19	83
No. 168	34.23	Anderson	C	15.42	78
No. 169	34.21	Linn	C	7.72	68
No. 170	34.18	Linn	C	3.98	88
No. 171	34.07	Linn	B	5.96	55
No. 172	34.06	Anderson	C	11.45	57
No. 173	33.89	Linn	C	5.56	91
No. 174	33.84	Anderson	C	21.78	84
No. 175	33.84	Linn	B	10.20	75
No. 176	33.78	Anderson	C	39.73	78

<b>Site Number</b>	<b>FQI</b>	<b>County</b>	<b>Site Grade</b>	<b>No. of Acres</b>	<b>No. of Species Found</b>
No. 177	33.71	Linn	C	5.04	67
No. 178	33.70	Linn	B	11.65	85
No. 179	33.59	Linn	B	11.83	62
No. 180	33.51	Linn	C	5.57	74
No. 181	33.38	Linn	C	31.45	69
No. 182	33.28	Anderson	C	26.47	68
No. 183	33.24	Linn	C	11.23	76
No. 184	33.24	Anderson	C	7.32	60
No. 185	33.16	Anderson	C	156.80	76
No. 186	33.05	Anderson	C	5.23	98
No. 187	32.83	Linn	C	31.37	66
No. 188	32.81	Linn	C	5.06	92
No. 189	32.74	Anderson	C	15.75	80
No. 190	32.50	Linn	C	6.01	87
No. 191	32.45	Anderson	C	31.02	66
No. 192	32.39	Anderson	C	9.87	68
No. 193	32.38	Linn	C	12.90	74
No. 194	32.37	Linn	B	23.75	76
No. 195	32.35	Linn	C	19.88	88
No. 196	32.27	Linn	C	5.02	69
No. 197	32.25	Anderson	C	20.47	60
No. 198	32.24	Anderson	C	40.39	54
No. 199	32.13	Anderson	C	15.79	84
No. 200	32.07	linn	B	13.33	62
No. 201	32.04	Anderson	C	29.03	76
No. 202	31.80	Anderson	C	45.99	68
No. 203	31.37	Anderson	C	5.05	76
No. 204	30.87	Linn	C	25.35	71
No. 205	30.86	Anderson	C	19.21	71
No. 206	30.84	Linn	C	7.47	95
No. 207	30.80	Anderson	C	27.15	91
No. 208	30.73	Anderson	C	66.28	71
No. 209	30.69	linn	B	70.31	63
No. 210	30.36	Anderson	C	65.48	59
No. 211	30.23	Anderson	C	60.53	71
No. 212	30.22	Anderson	C	17.41	61

<b>Site Number</b>	<b>FQI</b>	<b>County</b>	<b>Site Grade</b>	<b>No. of Acres</b>	<b>No. of Species Found</b>
No. 213	30.00	Anderson	C	19.32	60
No. 214	29.97	Linn	C	5.07	69
No. 215	29.93	Anderson	C	7.92	68
No. 216	29.89	Linn	C	17.02	106
No. 217	29.73	Anderson	C	16.00	57
No. 218	29.59	Linn	C	7.93	70
No. 219	29.49	Linn	C	5.13	83
No. 220	29.29	Anderson	C	14.40	58
No. 221	29.27	Anderson	C	47.19	57
No. 222	29.25	Linn	C	20.31	86
No. 223	28.77	Linn	C	11.06	68
No. 224	28.43	Anderson	C	39.21	66
No. 225	28.03	Anderson	C	15.94	68
No. 226	27.55	Linn	C	6.97	67
No. 227	26.85	Anderson	C	19.32	46
No. 228	26.53	Anderson	C	33.05	51
No. 229	26.50	Linn	C	5.20	73
No. 230	25.91	Anderson	C	14.19	58
No. 231	25.78	Linn	C	7.22	72
No. 232	24.23	Anderson	C	18.19	52
No. 233	19.27	Linn	B	104.73	58
No. 234	17.34	Linn	B	8.43	56
No. 235	17.27	Anderson	C	54.03	34

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