

**KANSAS GEOLOGICAL SURVEY  
OPEN-FILE REPORT 91-35**

**ECOLOGY AND HYDROGEOLOGY OF THE KANSAS ECOLOGICAL  
RESERVES AND THE BAKER UNIVERSITY WETLANDS**

Edited by

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# KANSAS ACADEMY OF SCIENCE MULTIDISCIPLINARY GUIDEBOOK 4

## Ecology and Hydrogeology of the Kansas Ecological Reserves and the Baker University Wetlands

Fall Field Trip in Douglas, southeastern Jefferson,  
and southwestern Leavenworth counties, Kansas

October 5, 1991

Kansas Geological Survey Open-File Report 91-35

KANSAS ACADEMY OF SCIENCE  
MULTIDISCIPLINARY GUIDEBOOK 4

Ecology and Hydrogeology  
of the  
Kansas Ecological Reserves  
and the  
Baker University Wetlands

Hosted by

EXPERIMENTAL AND APPLIED ECOLOGY PROGRAM,  
UNIVERSITY OF KANSAS

KANSAS GEOLOGICAL SURVEY

KANSAS BIOLOGICAL SURVEY

and

DEPARTMENT OF BIOLOGY, BAKER UNIVERSITY

Edited by W. Dean Kettle and Donald O. Whittemore

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## ITINERARY

The fourth annual fall field trip of the Kansas Academy of Science will begin from the Kansas Geological Survey and proceed to the Baldwin Woods portion of the Kansas Ecological Reserves (KER) in south-central Douglas County, followed by a visit to the Baker Wetlands on the southern edge of Lawrence (see Figure A). Participants can then eat their sack lunches in the area of the Geological and Biological surveys on West Campus. After lunch, the next stop is the Geohydrological and Experimental Monitoring Site at the Robinson Tract northeast of Lawrence. Afterwards, most of the afternoon involves visits to various educational and research locations in the 3 research natural areas of the KER tri-county tracts. The field trip is being held in conjunction with the Annual Field Day of the Experimental and Applied Ecology Program of The University of Kansas. There will be an informal outdoor supper held by the Program which the KAS participants are welcome to attend with a small donation to defray the cost of the extra food.

The following is the itinerary for the field trip:

### Morning

9:00 Leave from Kansas Geological Survey south parking lot (by core building)  
9:30-10:30 Baldwin Woods  
10:50-11:50 Baker Wetlands

### Lunchtime

12:00-12:50 Lunch around pond northwest of KGS (or inside KGS if raining)

### Afternoon

1:15-1:45 Geohydrologic Experimental Monitoring Site (GEMS), Robinson Tract  
2:00-3:00 Fitch Natural History Reservation  
3:00-4:00 Rockefeller Experimental Tract  
4:00-5:50 Nelson Environmental Study Area  
6:00 Optional, informal outdoor supper with the KU Division of Systematics and Ecology

## INTRODUCTION

The fourth annual fall field trip of the Kansas Academy of Science is being held in conjunction with the Annual Field Day of the Experimental and Applied Ecology Program at The University of Kansas (KU). The trip includes visits to the research natural areas of the Kansas Ecological Reserves of KU and the Baker University Wetlands (Figure A). The field trip is a coordinated effort of several groups in different disciplines at KU and the Biology Department of Baker University.

Habitats seen on the trip will include wetland, native tallgrass prairie, eastern deciduous forest, and land in various stages of ecological succession. Additionally, numerous ecological and environmental research projects on these natural areas will be discussed.

Production of the field guide and organization of the trip has brought together people from the Experimental and Applied Ecology Program, the Kansas Geological Survey, the Kansas Biological Survey, Baker University, and different departments at KU that are involved in research and education at the natural areas. The efforts have spawned a renewed recognition of the relationships of the biological communities to the interactions of climate, soils, geology, and hydrology.

Authors of chapters on the biota of the natural areas were provided with simple guidelines for developing their sections. Identifications of organisms in the checklists were often made to species. However, in other instances subspecies or variety could be determined but in other instances identifications were only made to genus or family. For these reasons the term "taxon" is frequently used to refer to the organism listed. Authors were asked to either provide author(ity) for each named species or to refer to a reference. Where possible common names were provided to make the lists more usable for a wider audience. Species are presented in the order most appropriate for the particular group. "Alphabetical", "phylogenetic", or "customary" were used to describe this arrangement. Authors were encouraged to provide general ecological information where appropriate. Occurrence data for species was taken to as precise a location (tract) as possible. Ecological and biological data included general information on habitat and abundance. Authors were also asked to identify any organisms (or assemblages) that were rare in the region and then to characterize the biota in relation to regional or continental distributions.

Chapters describing the biota of the natural areas provide a valuable baseline biotic inventory. It is hoped that, where appropriate, chapters of the guidebook will be refined and expanded in the future to provide data sets of even greater significance. Future plans include development of additional inventories and a synthesis of these studies with other ecological and environmental studies of the natural areas.

The editors wish to thank all contributors to the Guidebook for sharing their time and expertise. Special thanks go to Anna Kraxner, Kansas Geological Survey, for word processing, and to Vicky C. Varner and Galen L. Pittman, KU Experimental and Applied Ecology Program, for proof reading and miscellaneous tasks associated with the production of this document.

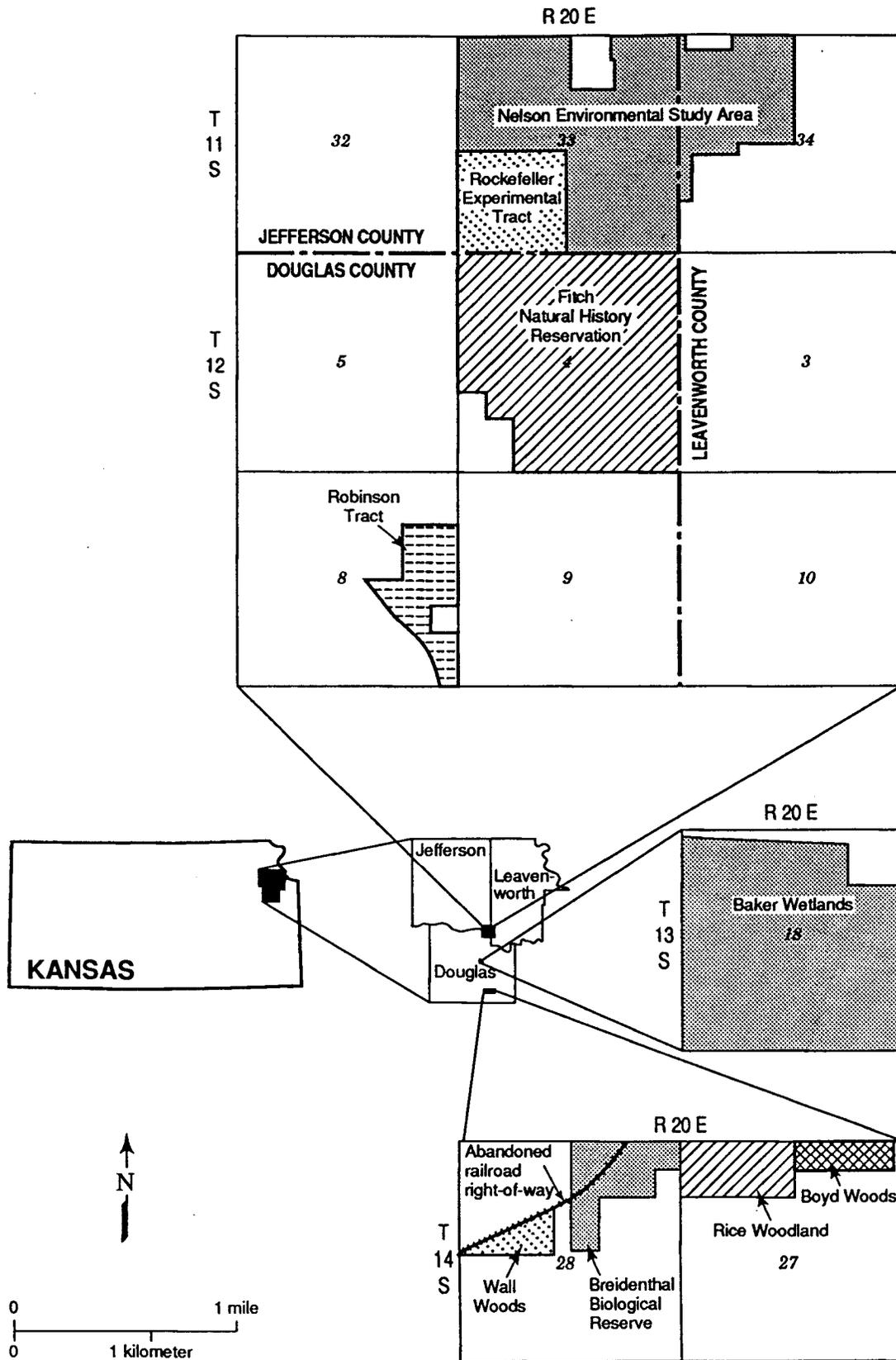


Figure A. Location of research natural areas in Douglas, Jefferson, and Leavenworth counties.

## PART I. ATMOSPHERIC AND GEOLOGIC ENVIRONMENT

Donald O. Whittemore

Kansas Geological Survey, 1930 Constant Ave., Lawrence, KS 66047

### Climate of the Douglas County Area

The climate of Douglas County and, therefore, of the natural areas, is humid continental. Both the temperature and precipitation maxima occur during the summer and the minima during the winter. The mean annual precipitation at Lawrence is 36.62 inches and the mean annual temperature 55.2° F based on the records from 1857 to 1990 (Atmospheric Science Library 1990). The mean monthly temperatures range from 28.9° F in January to 79.0° F in July, while the mean monthly precipitation range is 1.14 inches in January to 5.09 inches in June (Table 1).

The climatic extremes are wide with minimum temperatures as low as less than -20° F and maximum temperatures as high as above 110° F. The lowest mean monthly temperature was 5.0 for January, 1940, while the highest mean monthly value was 103.4° F for July, 1934. The average difference between the daily maximum and minimum temperatures is about 18-20° F during the winter and 21-23° F during the rest of the year. Months with no measurable precipitation have occurred a few times during the winter and the summer. The highest mean monthly precipitation was 16.62 inches in June, 1965. The wettest year was 1973 with 59.25 inches of precipitation, while the driest year was 1953 with 20.99 inches.

The changes in temperature and precipitation during the year are important to the growing season and fluctuations in plant growth and water supplies. The average date on which the last killing frost in the spring occurs at Lawrence is April 10 and the average date of the first killing frost in the fall is October 23, giving a mean annual growing season of about 196 days (Cardwell and Flora 1942). Killing frosts have occurred at appreciably later and earlier times to substantially decrease or increase the length of the growing season to about 170 days to above 220 days, respectively. Lake evaporation and potential evapotranspiration range widely from lows during the cold winter months to a high in July. The mean annual lake evaporation for the Douglas County area is about 45 inches (Todd 1970). The average annual potential evapotranspiration is approximately 32 inches (The Geographical Review 1948), which is less than the mean annual precipitation. The typical soil-moisture budget for Douglas County ranges from a surplus during the late winter through spring when the precipitation exceeds the potential evapotranspiration and the soil is at field capacity, to a deficiency during July and August when potential evapotranspiration exceeds the actual evaporation or soil-moisture utilization (as estimated for Lawrence based on relationships at Manhattan, Kansas described in Strahler and Strahler, 1973).

One of the greatest stresses on plant growth and water supplies is the occurrence of droughts. Although long periods of low precipitation generally reflect droughts well, the inclusion of evapotranspiration data, which is related largely to temperature, improves the indicator of the relative severity of droughts. The Palmer Drought Index (PDI) is a widely used measure of wet and dry conditions (Palmer 1965). It reflects antecedent soil moisture and is based on the difference between actual and potential evapotranspiration. The severest extended droughts in Douglas County as indicated by PDI values for the period 1867-1989 occurred during 1934-1939 and 1953-1956 (Atmospheric Science Library 1990). All of the mean monthly highs for temperature for June through September were set during the 1930's drought. The most extreme droughts other than those of the 1930's and 1950's were of shorter duration, from mid-1963 to mid-1964, mid-1976 to mid-1977, and mid-1988 through 1989. Droughts for the period from 1867-1930 were not as extreme or long as these since

1930. Wet periods were generally longer and more severe than droughts from 1867 to 1930, while droughts were longer and more severe than wet periods from 1930 to 1957. In spite of severe droughts in the 1960's to 1980's, the severity and length of wet spells were approximately the same as the droughts. The severest wet spells since the 1950's drought occurred in 1961, 1973, the last half of 1977, and mid-1985 to mid-1987. A more moderate but extended wet spell was mid-1967 through much of 1969.

Table I-1. Mean monthly temperatures and precipitation for Lawrence  
(Atmospheric Science Library 1990)

	Temp. (°F)	Precip. (in)		Temp. (°F)	Precip. (in)
Jan	28.9	1.14	Jul	79.0	4.14
Feb	33.3	1.30	Aug	77.2	4.12
Mar	43.7	2.40	Sep	69.2	4.01
Apr	55.9	3.30	Oct	57.8	2.90
May	65.3	4.42	Nov	43.6	1.98
Jun	74.2	5.09	Dec	32.8	1.46

### Physiography of the Natural Areas

The Baldwin Woods tracts are in an upland, predominantly hilly area within the Osage cuestas physiographic province (Figure I-1). The cuestas are formed by stream dissection and differential erosion of uplands underlain by limestone, sandstone, and shale (O'Connor 1960). The steepest slopes are limestone and sandstone escarpments near the headwater areas of small stream drainages. The Baldwin Woods lie along the southern limit of the valley of the Wakarusa and Kansas rivers. The woodlands in the area are on the northward facing slopes extending from the drainage divide between the Wakarusa and Kansas rivers to the north and the Marais des Cygnes River to the south. Elevations range from slightly greater than 1150 ft at the corner of one tract very near the top of the ridge forming the drainage divide, to less than 950 ft along the northern boundary of one of the tracts (based on the U.S. Geological Survey 7.5 minute topographic quadrangle for Baldwin City).

The Tri-County area is also generally hilly and, although lying in the glaciated region of Kansas, is essentially characterized as Osage cuestas affected by glaciation and glacial deposits of loess and till (Figure I-1). The floodplain of the Kansas River lies on the southwestern and southern strip of the Robinson Tract. Part of the tracts form the northern valley wall rising from the Kansas River floodplain. The tracts north of the Kansas River extend over a larger area than the Baldwin Woods and comprise primarily both hillslopes and more gentle topography of the remaining upland prairie along ridge tops. The elevations range from less than 840 ft in the Robinson Tract along the northern edge of the Kansas River floodplain to greater than 1090 ft on the hilltops of the Nelson Environmental Study Area (USGS Midland topographic quadrangle). The steepest slopes are generally wooded.

The Baker University Wetlands is a wetland prairie/marsh lying in the floodplain of the Wakarusa River. The physiographic location is along the southern border of the glaciated region (Figure I-1). The Wakarusa River channel meanders along the southern part of the wetlands. Most of the wetland area is nearly flat and generally lies within the elevation range of 821-814 ft (estimated from the USGS Lawrence East topographic quadrangle. The channel wall of the Wakarusa River is steep in comparison, dropping from about 820 ft to about 800 ft (the approximate elevation of the river water at low stage) within 100 ft of areal distance.

## Generalized physiographic map of Kansas

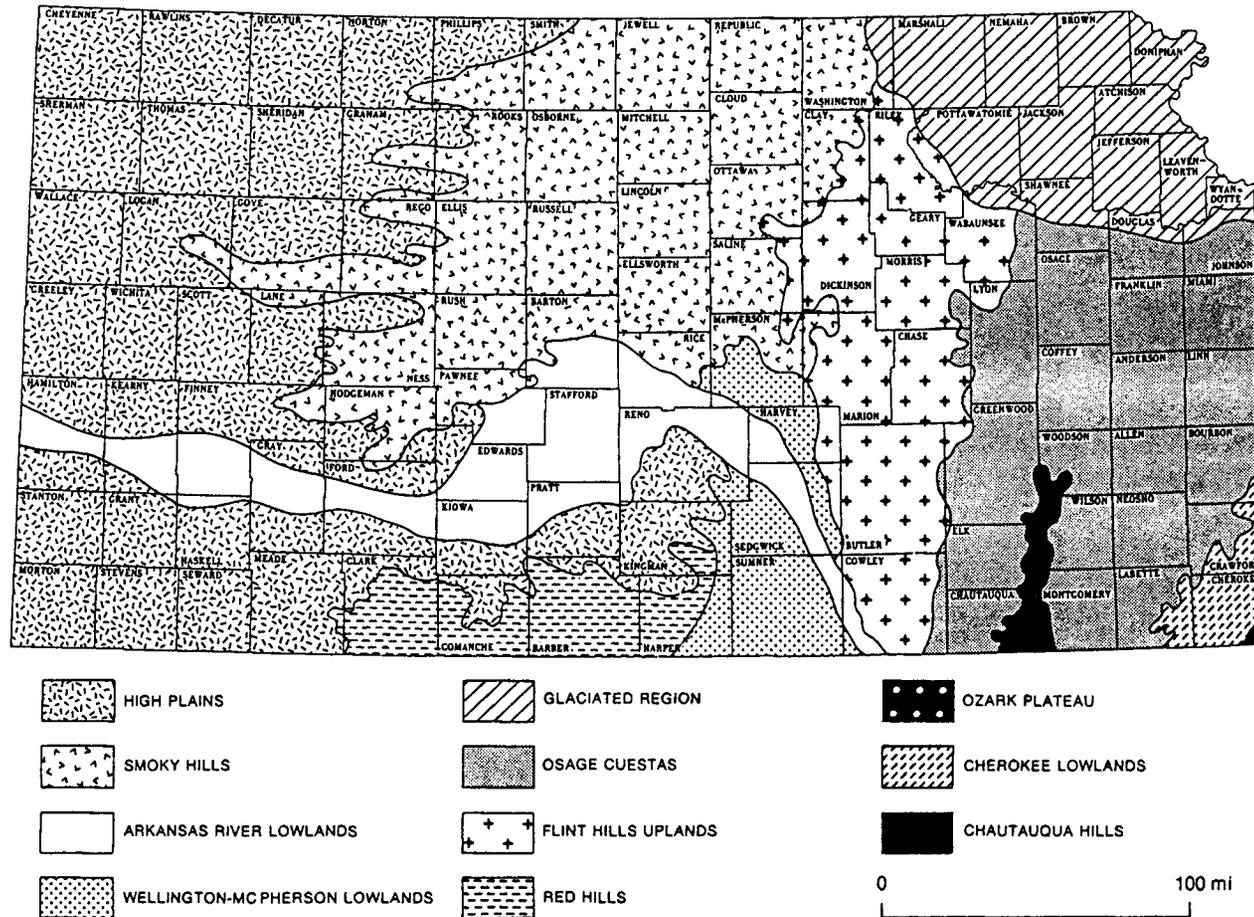


Figure I-1. Generalized physiographic map of Kansas. Compare to Figure A and note that the southern boundary of the glaciated region passes approximately through the location of the Baker University Wetlands in Douglas County, such that the northern tracts of the Kansas Ecological Reserves lie within and the Baldwin Woods lie to the south of the glaciated region.

## Geology and Soils of the Natural Area Region

### Bedrock

The exposed and near surface bedrock in the areas of the Kansas Ecological Reserves (KER) is in the Upper Pennsylvanian Series. It consists of primarily limestones and shales in the Shawnee Group and predominantly shales and sandstones in the Douglas Group in the lower half of the Virgilian Stage, and chiefly limestones and shales in the Lansing Group in the top of the Missourian Stage. The sediments were deposited in cyclic sequences as a result of transgressions and regressions of shallow seas. The cycles comprise marine shales and limestones alternating with nonmarine beds including the sandstones. The rocks dip westward to northwestward about 20 ft per mile (O'Connor, 1960). Faulting during Pennsylvanian time, especially in southern Douglas County, resulted in erosion of some units and greater deposition of others thereby locally altering the thickness of selected rock units. Submarine slides and differential compaction also affected the thicknesses. Parts of two erosional valleys in the Upper Pennsylvanian rocks in Douglas County are filled with sandstones that vary greatly in thickness and character depending on proximity to the center of the channels. The stratigraphic section shown in Figure I-2 includes only the uppermost bedrock outcropping in the KER area and the lowermost units exposed in Douglas County and not the upper part of the Shawnee Group. The following descriptions are based largely on O'Connor (1960) with modifications for revised stratigraphic nomenclature in Zeller (1968). More emphasis is placed on those units that are of interest in the natural areas.

The thickness of the Oread Limestone averages about 60 ft in Douglas County. It consists of two massive limestone members, the Plattsmouth and Toronto limestones, and two thinner limestones, the Kereford and Leavenworth members. Natural exposures of the Kereford are uncommon because it is relatively thin (2.5-9 ft thick) and contains calcareous shale beds. The Toronto Limestone and especially the Plattsmouth Limestone form outcrop scarps and average 10 and 18 ft in thickness, respectively. The Plattsmouth is the thickest and most extensively quarried of the limestones in Douglas County. It is light-gray to nearly white, wavy bedded, and includes scattered chert nodules near the middle of the unit. The Toronto Limestone is light gray and massive when fresh, but becomes light to deep yellow brown and slabby upon weathering. Chert nodules are scattered in the upper part of the Toronto. The usual thickness range for the Leavenworth Limestone Member is 0.8-2 ft. Fossils in the limestone units include fusulinids, crinoids, bryozoans, corals, brachiopods, mollusks, and algae. The Heumader Shale, Heebner Shale, and Snyderville Shale members commonly have thicknesses of 2-4, 5-8, and 10-15 ft, respectively, although they may be locally substantially thinner or thicker. Some of the beds within the shales are unfossiliferous while others may contain brachiopod, mollusk, and conodont fossils.

The Lawrence Formation is commonly 140–180 ft thick. It is predominantly shale to silty and sandy shale in most of Douglas County, but includes the Ireland Sandstone Member in the southern part of the county. The upper part of the formation is usually shaley and contains two thin coal beds, the Upper and Lower Williamsburg coals. The lower of the coals was mined during the past. A discontinuous limestone, the Amazonia Limestone Member may be present below the upper shale. The nonmarine Ireland Sandstone ranges up to 150 ft thick and fills a west-southwest-trending erosional valley cut into the underlying Stranger Formation. The northern border of the valley was located just north of the Baldwin Woods. The Sandstone consists of very fine to medium sized quartz grains with a small amount of mica, pyrite, and clay minerals. The Robbins Shale Member is in the lower Lawrence Formation and is eroded and overlapped by the Ireland Sandstone. The thin Haskell Limestone Member is at the base of the Lawrence Formation. The Kansas Geological Survey buildings

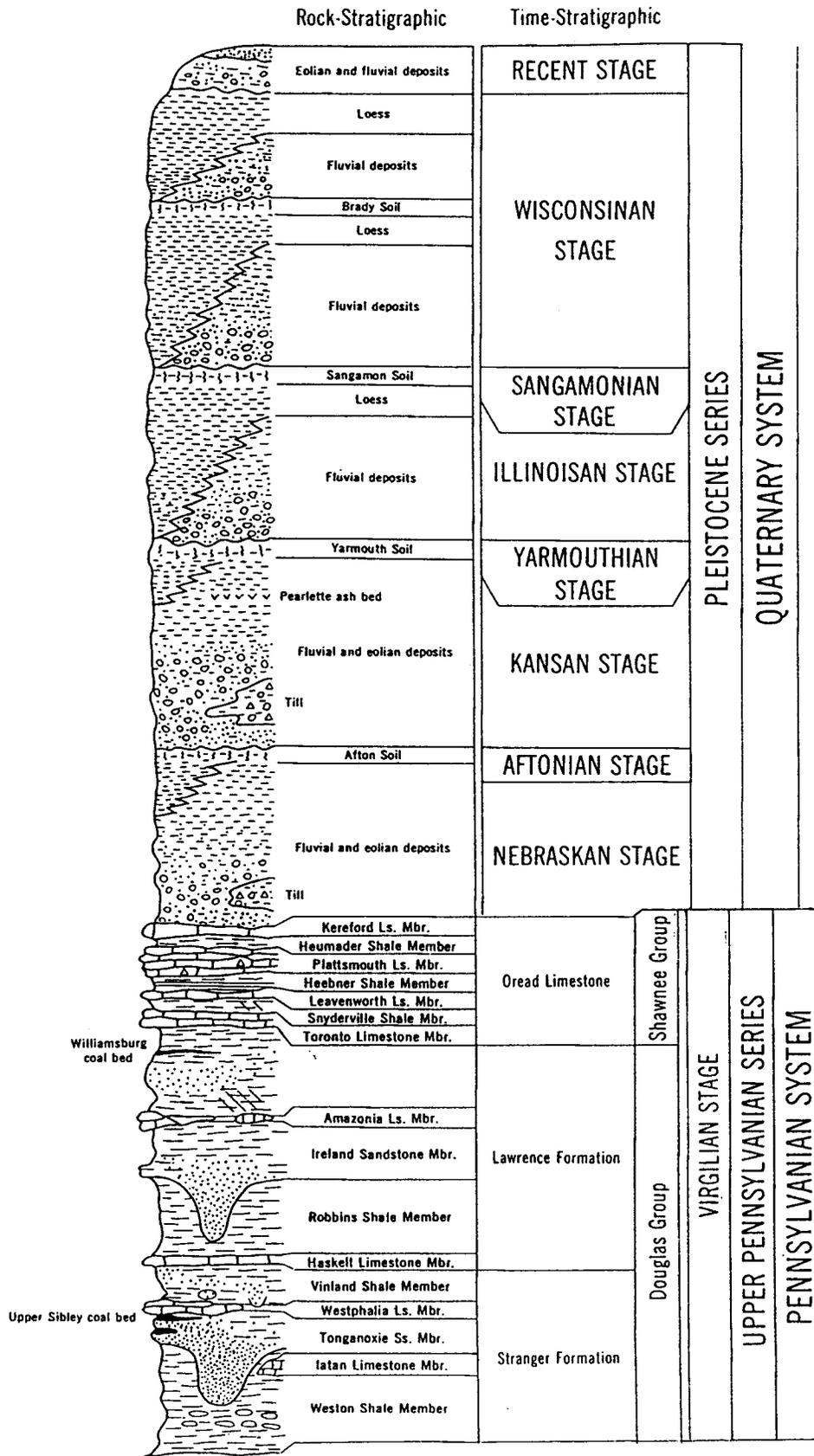


Figure I-2. Stratigraphic section for geologic materials underlying the natural areas (modified from Zeller 1968).

are on the Lawrence Formation. Plant fossils found in the shale are on display in the entrance of Moore Hall.

The Stranger Formation comprises 4 members in Douglas County, the Vinland Shale, Westphalia Limestone, Tonganoxie Sandstone, and Weston Shale. The Vinland Shale consists of about 6 to 25 ft of chiefly marine clayey to sandy shale and calcite-cemented sandstone. It contains a persistent fossil zone of pelecypods. The Westphalia Limestone is only about 1.5 ft thick, is carbonaceous, and contains ostracod and tiny gastropod fossils and carbonized plant fragments. The nonmarine Tonganoxie Sandstone occupies an erosional valley cut into the Weston Shale Member and underlying Stanton Limestone. The ancient valley is 14 to 20 miles wide and trends in a northeasterly direction across Douglas County into southwestern Leavenworth County. The KER tracts north of the Kansas River lie on the northern edge of the valley, Lawrence approximately overlies the center of the valley, and the Baldwin Woods is south of the valley. The Tonganoxie Sandstone Member is chiefly composed of fine to very fine quartz grains slightly cemented with calcite and ranges up to 120 ft thick. Silty and shaley beds in the sandstone contain much mica. Thin coal beds are found in some parts of the Tonganoxie; the Blue Mound coal was mined in the past. The Weston Shale Member is a gray-blue and gray marine shale that weathers to mottled olive and gray or tan. It is slightly more than 100 ft thick where post-erosional channels have not cut into the shale. The Weston contains ironstone concretions that weather to a yellowish brown to reddish brown color. The concretions become larger and more numerous with depth.

The Lansing Group does not outcrop in the natural areas but exists in the subsurface. It consists of two limestone formations, the Stanton and Plattsburg limestones, separated by a shale formation, the Vilas Shale. The Stanton Limestone is about 44 ft thick and includes 3 limestone members. The South Bend Limestone Member has a thickness of 1-4 ft, the Stoner Limestone Member a thickness of 15-17 ft, and the Captain Creek Limestone Member a thickness of 6-7 ft. The two shale members separating the limestone members are the Rock Lake Shale and the Eudora Shale which commonly have thicknesses of about 10-15 ft and 7 ft, respectively. The Rock Lake Shale consists of both shale and marine sandstone. The Vilas Shale ranges from less than 10 ft up to 26 ft in thickness. The upper part is mainly silty shale and the middle and lower parts are chiefly sandy micaceous shale or silty sandstone. The underlying Plattsburg Limestone is about 13-32 ft in the subsurface and consists of 3 members: Spring Hill Limestone, Hickory Creek Shale, and Merriam Limestone. The Spring Hill Limestone Member comprises most of the unit, with a thickness of up to 22 ft.

### Pleistocene deposits

Deposits of fluvial, lacustrine, eolian, and glacial sediments cover the bedrock in many areas of Douglas southeastern Jefferson, and southwestern Leavenworth counties. The fluvial deposits range widely in age, from glacial stages to the Recent Stage, and fill erosional valleys including the Kansas River and Wakarusa River floodplain and terrace areas. Glacial till and loess cover bedrock in some upland areas. The following descriptions of the deposits are from O'Connor (1960) and Zeller (1968).

Fluvial sediments in the floodplain areas of the Kansas and Wakarusa rivers and their tributaries range from clays to silts to sands and gravels. Recent alluvium covers somewhat more than half of the Kansas River floodplain, but only minor parts of the floodplains of the Wakarusa River and tributary streams. The alluvium is chiefly silt and sand with some clay similar to that presently carried by the rivers and occupies the lowest level of the floodplain in an irregularly shaped area on each side of the present river channel. Older terrace deposits comprise higher levels of the Kansas River floodplain and most of the floodplain areas of the Wakarusa River and tributaries. The sediments range from gravels deposited in the deep

bedrock channels of the Kansas and Wakarusa rivers and generally grade upward to valley fill consisting of finer-grained sediments similar to the Recent alluvium. The valley fill ranges from river channel sands to silts and clays in overbank deposits and meander cutoff fill. The terraces in the floodplain areas were deposited during the retreat of the glaciers at the end of the Wisconsinan and Illinoian glacial stages. Nearly all of Baker Wetlands is underlain by fluvial sediments of the Wisconsinan Stage. The elevation above the present river or stream surface and the erosional dissection of the terraces increases with increasing age of the stage. Remnants of fluvial sediments deposited as glacial outwash and valley fill during the Kansan Stage are also present along the edges of the Kansas River floodplain and on lower slopes of the valley walls of the Kansas and Wakarusa river valleys.

Deposits of glacial till cover portions of uplands in the Tri-County area of the KER, representing the southern advance of glacial ice during the Kansan Stage. The till is unstratified and unsorted and constitutes varying mixtures of clay, silt, sand, and gravel. Small deposits of stratified sand and gravel occur locally in some of the high upland tills. Chert gravels containing sparse erratics are present at several locations east and south of Lawrence and in the Eudora area. The leached and oxidized condition of the gravels and their stratigraphic position relative to Kansan deposits indicate that they are pre-Kansan. Thin layers of eolian silt (loess) were deposited over uplands and terraces during Pleistocene time. Much of the loess in Douglas County is probably of Wisconsinan age. The thickest loess deposits are located along bluffs of the Kansas River valley and range up to 5-10 ft thick at some locations.

## Soils

Most of the following summary of the soils was extracted from information in the Soil Survey of Douglas County (Dickey et al. 1977a), one of the county soil series produced by the Soil Conservation Service. The reports for soils in Jefferson County (Dickey et al. 1977b) and Leavenworth County (Zavesky and Boatright 1977) indicate that the soils in the portions of the Tri-County Area of the KER in these two counties are similar to those in Douglas County. The general soil map for Douglas County in Dickey et al. (1977) includes 5 different soil associations. Each soil association correlates well with the major bedrock groups, glacial-fluvial deposits, Recent alluvium, and glacial till mapped in O'Connor (1960).

The Martin-Sogn-Vinland association comprises "deep, moderately well drained, gently sloping to strongly sloping soils and shallow, sloping to moderately steep, somewhat excessively drained soils on uplands" according to Dickey et al. (1977a). The pattern of soils in this association is shown in Figure I-3. All of the tracts of the Tri-County area, and small areas in the southern portions of the Wall Woods and Breidenthal Biological Reserve are typified by this association. The soils formed mainly from the weathering products of interbedded limestones and shales of the Shawnee Group. The Martin soils are the deepest major soils of the association and occur mainly on the lower parts of the slopes and in the small drainages dissecting the hills. Sogn soils form on the limestones and thus, tend to be shallow and occur on moderate to steep slopes. The Vinland soils also are generally shallow, but are derived from the weathering of shales. The minor Oska soils are moderately deep, well drained, and occur on the limestones and shales generally along the more moderate slopes near the tops of hills. The minor Woodson soils are deep, somewhat poorly drained, and form on broad ridgetops where loess may be present.

The Sibleyville-Martin-Woodson association occurs mainly in the areas of exposed Douglas Group shales and sandstones. The association consists of "moderately deep, well drained, sloping to strongly sloping soils and deep, moderately well drained and somewhat poorly drained, nearly level to strongly sloping soils on uplands" (Dickey et al. 1977a). Most

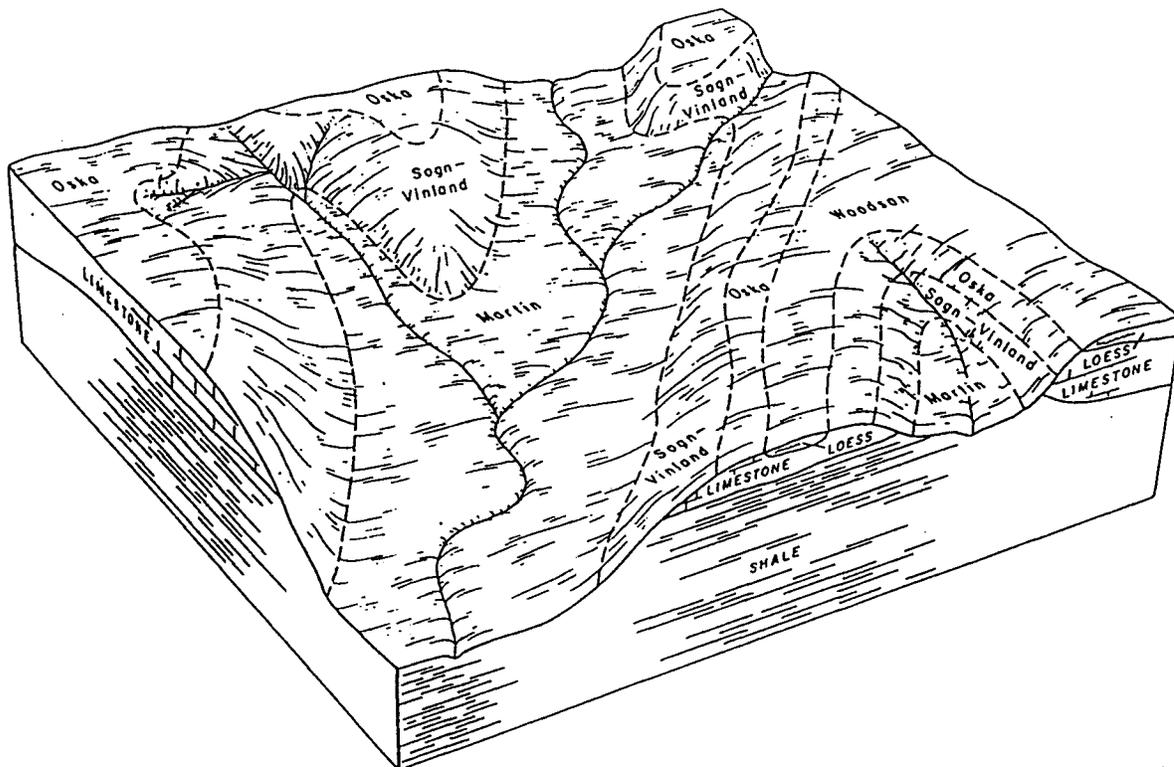


Figure I-3. Patterns of soils in Martin-Sogn-Vinland association (Dickey et al. 1977a).

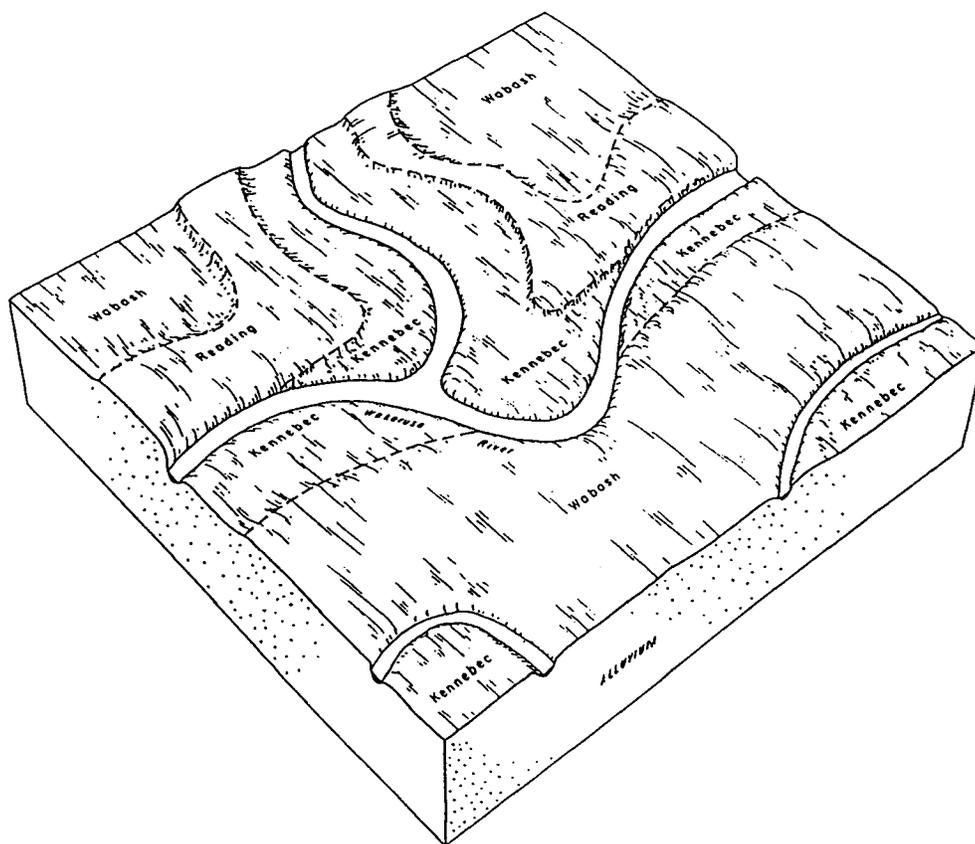


Figure I-4. Patterns of soils in Wabash-Kennebec-Reading association (Dickey et al. 1977a).

of the Baldwin Woods area includes this association. Sibleyville soils are moderately deep, well drained, and generally occur on side slopes of hills. Their counterpart in Figure I-3 would be the Sogn-Vinland soils. In the Baldwin Woods area, Basehor soils also occur on slopes in this position. The Basehor soils are shallow, well drained soils that formed from fine-grained sandstone. The Martin and Woodson soils are described above and occur in the same relative positions as in Figure I-3. Minor Pawnee soils are present in somewhat the same relative position as the Oska soil in Figure I-3 as well as on ridgetops.

The Wabash-Kennebec-Reading association formed chiefly over fluvial sediments deposited during the Wisconsin Stage of glaciation, but also includes areas of fluvial deposits of Illinoian age. This association comprises "deep, nearly level, well drained to very poorly drained soils on bottom lands" of flood plains and terraces of the rivers and larger streams (Dickey et al. 1977a). Essentially all of the soils in the Baker University Wetlands and the southwestern and southern parts of the Robinson Tract are included in this association. Figure I-4 shows the pattern of the major soils in the association. The Wabash soils occur in backwater areas on high bottoms and low terraces adjacent to the bottom of the valley walls of the floodplain. The silty clay nature of the soils reflects the overbank type of fluvial deposits and results in poor to very poor drainage. The soil in the northern two-thirds of the Baker University Wetlands is Wabash silty clay. The Kennebec soils are on the first bottoms adjacent to streams and are subject to common flooding. The silt loam and silty clay loam that constitutes these soils reflects the coarser-grained character of the sediments deposited on the floodplain near the streams in comparison with those on the higher bottoms and low terraces where the Wabash soils occur. Kennebec silt loam is present in strips adjacent to the Wakarusa River channel. Thus, the Kennebec soils are well to moderately well drained. Both Kennebec and Wabash soils cover the strip of the Robinson Tract in the Kansas River floodplain. The Reading soils formed on high bottoms and terraces. The soils are well drained and consist of silt loam and silty clay loam. Reading silt loam occurs in the southern part of the Wetlands as a wide band just north of and paralleling the Wakarusa River and to the south of the Wakarusa River within the area between the meander that encroaches farthest into the Wetlands.

Soils of the Eudora-Kimo association are on the Recent alluvial sediments of the lower levels of the Kansas River floodplain. The association includes "deep, nearly level to gently undulating, well drained and somewhat poorly drained soils on bottom lands" (Dickey et al. 1977a). Eudora soils occur in the higher areas of the gently undulating flood plain of the Kansas River but below the higher Wisconsin terrace deposits. They are well drained silt loam. Kimo soils are nearly level and are located in low areas of the Kansas River floodplain where finer surface sediments have accumulated. Thus, the surface layer of the Kimo soils consists of silty clay loam to silty clay and the soils are somewhat poorly drained.

The Pawnee-Woodson-Morrill association formed on the thicker deposits of glacial till deposited during the Kansas Stage of glaciation, and also are present on some glaciofluvial and old alluvial clayey sediment. The association is in locations with broad and moderately wide ridgetops and long, sloping side slopes such as occur in parts of the Lawrence area and from Eudora to the south for about 7 miles. "Deep, nearly level to strongly sloping, well drained to somewhat poorly drained soils on uplands" comprise the association (Dickey et al., 1977). Pawnee soils are well drained and occur on hill sides that have gentle to moderate slopes, but can also be on ridgetops where Woodson soils are not locally present. Woodson soils form on broad ridgetops where loess may be present and are deep and somewhat poorly drained. Morrill soils occur on moderately to strongly sloping sides of hills below Pawnee and Woodson soils and are well drained. The Thurman complex that covers most of the sloping area of the Robinson Tract is a group of minor soils in the Pawnee-Woodson-Morrill association. Thurman soils range from loamy fine sand to sandy loam to clay loam, reflecting the composition of the glaciofluvial sediments on which they formed.

## Hydrogeology of the Natural Areas

### Baldwin Woods

Most of the Baldwin Woods is underlain by shales and sandstones of the Douglas Group (Figures I-2 and I-5). The Toronto Limestone Member of the Oread Limestone overlies the top of the Lawrence Formation in the southwest and northwest corners of the Breidenthal Biological Reserve and the extreme southeast corner of the Wall Woods. The base of the Toronto is estimated at an elevation of 1100 ft based on the geologic map of O'Connor (1960) and the U.S. Geological Survey topographic map for the area. The quarries just to the south of the Breidenthal Biological Reserve and to the north of the Wall Woods removed blocks of the Toronto Limestone. The water present in the quarry pits occurs because the underlying shale of the top of the Lawrence Formation is relatively impermeable. There is a possibility that moist soils could exist at the base of the Toronto Limestone as a result of small amounts subsurface flow through fractures in the limestone above the underlying shale.

The Ireland Sandstone Member of the Lawrence Formation is an important aquifer in southern Douglas county (O'Connor, 1960). The aquifer yields small to moderate quantities of water to wells (usually 5-50 gpm, but up to 100 gpm possible in some areas). Baldwin City obtains municipal water supplies from the Ireland Sandstone. The ground-water is unconfined (water-table conditions) in the outcrop areas of the Ireland Sandstone such as at the Baldwin Woods. At the Baldwin City well field, the base of the Ireland Sandstone rests on the Weston Shale Member in the lower part of the Stranger Formation. However, the Ireland Sandstone is thinner and finer grained at the Baldwin Woods than at the location of the Baldwin City wells because the Woods lie farther from the center of the ancient Ireland valley. The geologic map (Figure I-5) drawn using the 7.5 minute topographic quadrangle for Baldwin City and the geologic map in O'Connor (1960) indicates that the Ireland overlies the upper part of the Stranger Formation in the Baldwin Woods area.

Springs and seeps could be expected to occur at the base of the Ireland where it overlies shale such as the Robbins Shale Member of the Lawrence Formation or shales of the underlying Stranger Formation. The springs and seeps would be expected to vary appreciably in flow dependent on the amount of antecedent recharge. During and just after wet periods flows would be appreciably greater than during droughts. Springs or seeps at the base of the Ireland could be a major contributor to maintenance of water during dry periods to the very small pond in the eastern portion of the Breidenthal Biological Reserve. A band of moist soils along the outcrop base of the Ireland Sandstone could exist which might affect the distribution of floral and faunal species in the Baldwin Woods. The elevation of the base of the Ireland based on the geologic and topographic maps is estimated as 970 ft. The quality of water in the sandstone is probably similar to that for a well located about 0.2 mile to the west of the western corner of the Wall Woods (Table I-2). The water is very hard as a result of the solution of carbonate minerals, but otherwise would be considered good for domestic use.

The Stranger Formation found farther down the hillslopes in the Breidenthal Biological Reserve, Rice Woodland, and Boyd Woods is predominantly sandy shale to shale. Very small amounts of ground water could be possibly obtained from thin sandstone beds in the Vinland Shale Member, but no thick sandstones of the Tonganoxie Sandstone Member should be present because the ancient Tonganoxie valley lay appreciably to the north and northwest of the Baldwin Woods. Thus, the lower part of the Stranger Formation at the Woods is the Weston Shale Member. Weston Shale outcrops in the extreme northeast corner of the Breidenthal Biological Reserve, the north-central portion of the Rice Woodland, and the northwest part of the Boyd Woods. The elevation of the top of the Weston Shale is estimated as 950 ft. If the Vinland Shale is sandy in the area, there is a possibility that another moist band of soils could

BALDWIN WOODS RESEARCH AREA - UNIVERSITY OF KANSAS AND BAKER UNIVERSITY

1: Wall Woods (KU) 2: Breidenthal Biological Reserve (KU) 3: Rice Woodland (KU) 4: Boyd Woods (BU)

11

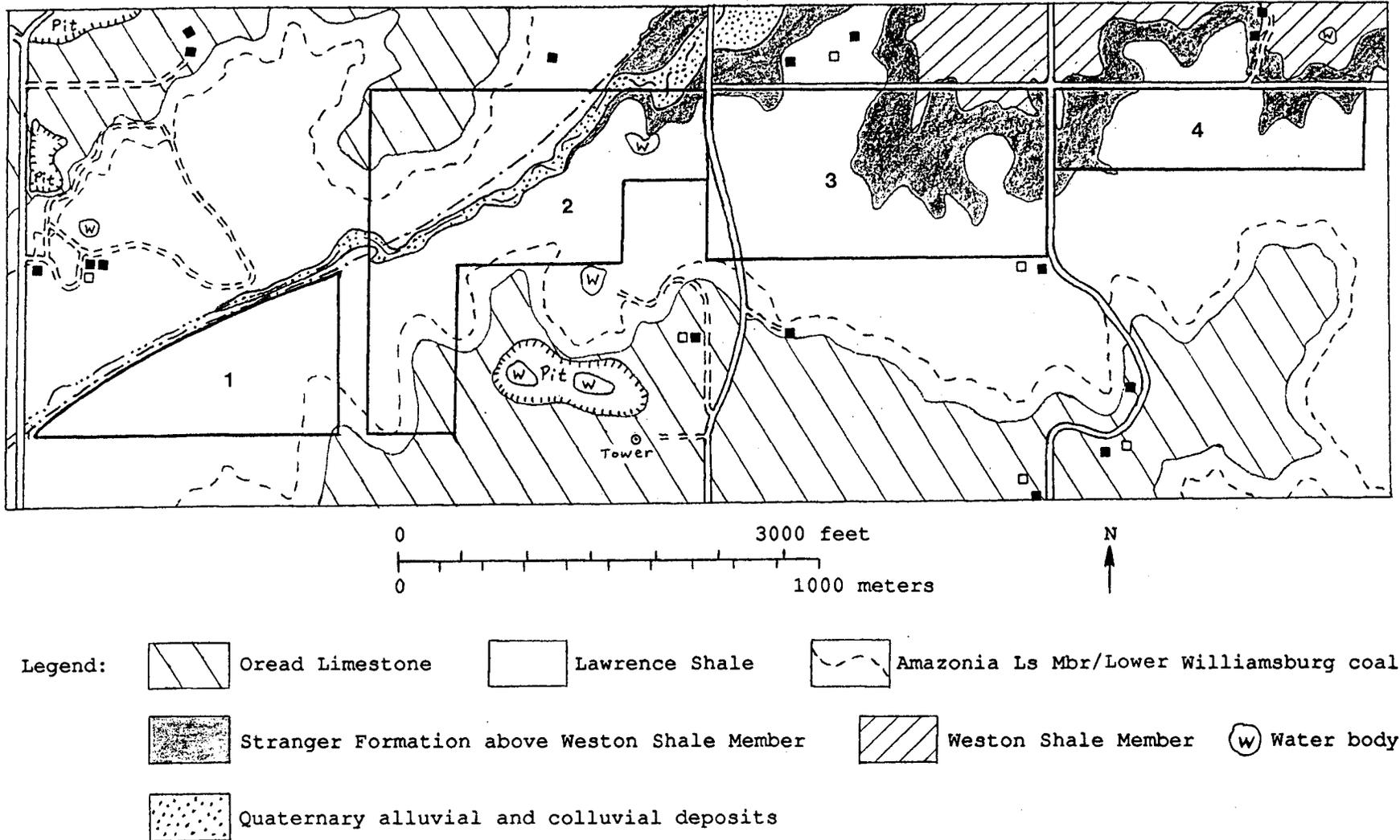


Figure I-5. Preliminary geologic map for the Baldwin Woods area. The map was produced using the U.S. Geological 7.5 minute topographic quadrangle for Baldwin City and estimates of elevations for stratigraphic boundaries in O'Connor (1960).

occur along the slopes just below this elevation. Recent colluvium and alluvium and Wisconsinan fluvial deposits are present in a narrow band along the tributary to Coal Creek in the Breidenthal Biological Reserve. Ground-water flow could continue to occur in these deposits during periods of no stream flow to help maintain subsurface soil moisture along the tributary channel.

### Baker Wetlands

The Baker University Wetlands is on Wisconsinan fluvial sediments underlying the Wakarusa River floodplain. Some Illinoisan fluvial deposits could also form part of the alluvium under the Wetlands. Based on logs of test holes and wells in the Wakarusa River valley south of Lawrence (O'Connor 1960), the maximum depth of the alluvial sediments below the Wetlands and above the bedrock is probably 65-70 ft. The expected character of the sediments would be clay to silty clay to sandy clay in the upper 30 ft, to sandy clay and silt from 30 to 50 ft depth, to silty sand from 50-55 ft, with the last 5-10 ft silty sand or silty sand and gravel. The sediments differ markedly from those underlying the Kansas River floodplain, where much greater thicknesses of sands and gravels are present. A cross section (Figure I-6) from O'Connor (1960) that crosses the Wakarusa valley two miles west of the Baker Wetlands shows the shape and character of the bedrock valley in comparison with that of the Kansas River valley to the north.

Moderate amounts of ground water could be obtained from wells screened in the basal sands and gravels underlying the Wetlands. However, the presence of silt and very fine sand and the thin zone of the basal sands and gravels (1-7 ft) mean that wells drilled into the aquifer are difficult to screen and develop. The quality of water in the sediments underlying the area would probably be similar to that for well water listed in Table I-2 for the Wakarusa River floodplain. The nitrate concentration for the well water in the table is relatively high indicating local contamination. Nitrate concentrations in the basal sands and gravels underlying the Wetlands would be expected to be substantially lower, but the chloride content could be higher as a result of the intrusion of saline water from the underlying Stranger Formation. The clayey nature of most of the sediments under the Wetlands indicates that there would be only slow hydraulic communication between the surface and the basal unit. The clayey sediments under the soils would also help to perch surface water to maintain the wetland character of the area.

### Robinson Tract

The Robinson Tract extends from the northern part of the Kansas River floodplain to partway up the valley wall. The valley wall in the vicinity has relatively moderate slopes in comparison with other portions of the Kansas River valley. Based on a test hole in the square portion of non-reserve land on the east side of the Robinson tract, the slopes in the tract above the floodplain are underlain by Kansas glaciofluvial deposits (O'Connor 1960). The test hole was near the junction of the road to the home and the north-south county road in the NE 1/4 of the SE 1/4 of Sec. 8, based on its location on Plate 1 in O'Connor (1960) and land surface elevation of 894 ft. Clay to sandy clay extends from the surface to 23 ft, clay and very fine sand from 23 to 52 ft, coarse sand and fine gravel at 52-58 ft, and fine to medium gravel at 58-62.5 ft, which rest on a limestone that could be the Haskell Limestone Member at the base of the Lawrence Formation. The base of the fluvial deposits is at an elevation of about 832 ft at this location, about the same elevation as the break in slope at the edge of the floodplain. A well screened in the 10 ft of basal sands and gravels at the location of the test hole could be expected to yield moderate amounts of water if the water level in the sediments were at least several feet above the top of the sands and gravels. Such a water level might occur there but probably would fluctuate appreciably from severe wet to severe dry periods.

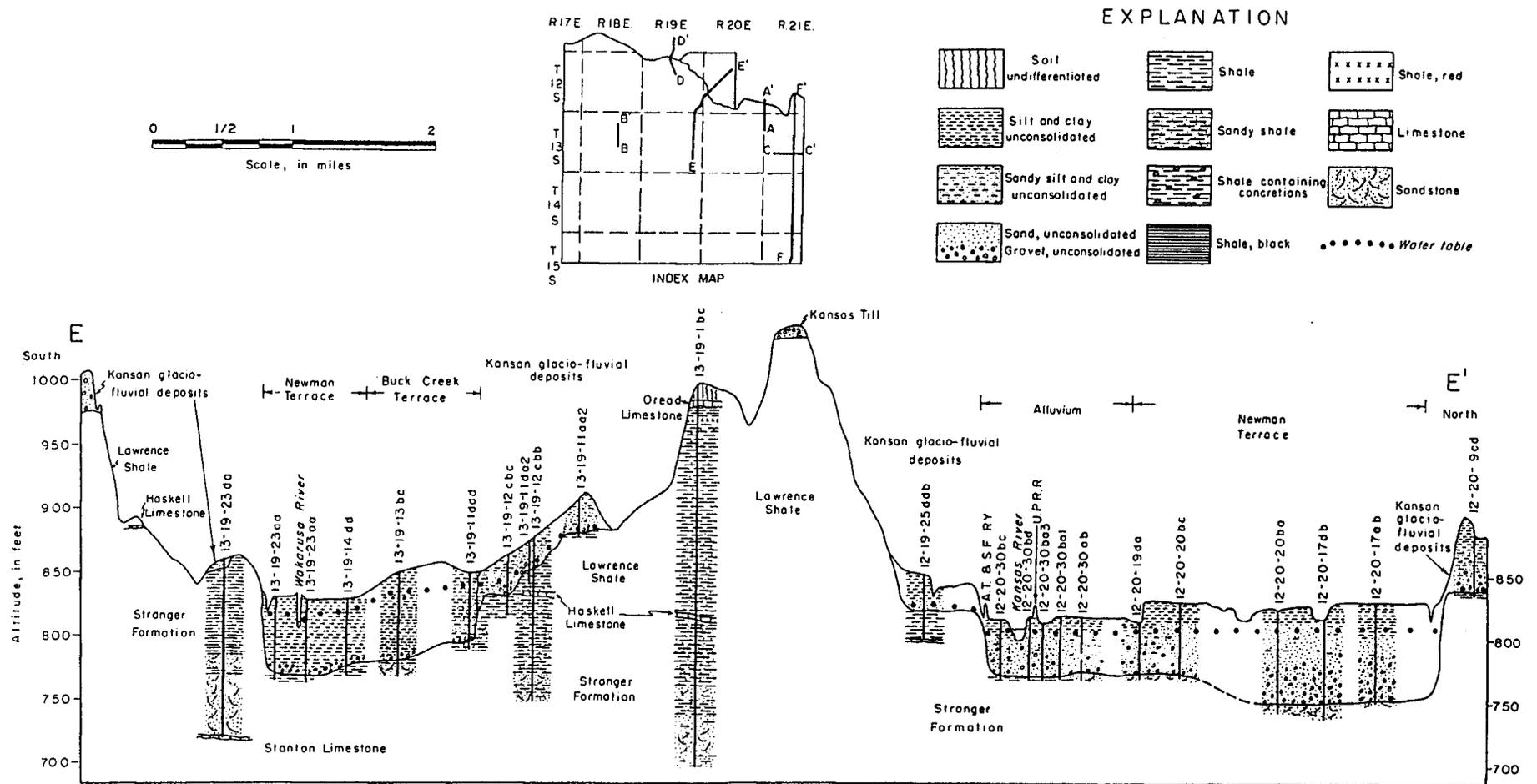


Figure I-6. Geologic cross section for the Wakarusa River and Kansas River floodplains (from O'Connor 1960). Note the coarser sediments filling the bedrock cut under the floodplain and terrace areas in the Kansas River valley on the right (north) side of the figure in comparison with the Wakarusa River valley on the left (south).

Table I-2. Chemical composition of ground waters from different geologic strata representative of units underlying the natural areas.

Concentration units are in mg/L. Nitrate concentrations greater than 10 mg/L probably represent contamination from the surface. Concentrations for dissolved Sr, PO<sub>4</sub>, Fe, and Mn in the water sample from the Robinson Tract well 12-20-8ddd were 0.44, 0.25, 0.018, and 0.028 mg/L, respectively, the field pH was 6.7 units and the specific conductance 721 uS (umho/cm). Values for the fluvial deposits underlying the Kansas River floodplain (the KER water-supply well in the Robinson Tract) are from D. Whittemore (unpublished), the others are from O'Connor (1960). Location is given as township S, range E, section, large to small quarters.

Location	14-19-15db	14-20-29da	13-19-12aad	12-20-8ddd	13-19-18dd
Geologic source	Oread Limestone	Ireland Sandstone Member	Tonganoxie Sandstone Member	Wisconsinan fluvial deposits	Wisconsinan fluvial deposits
Type area	upland	upland	Wakarusa R. valley	Kansas R. floodplain	Wakarusa R. floodplain
Well type	dug	drilled	drilled	drilled	dug, drilled
Depth, ft	28.7	92	78-127	71	37
T.D.S <sup>a</sup>	515	560	2,980	442	318
Total hardness <sup>b</sup>	305	332	384	348	218
SiO <sub>2</sub>	2.6	13	9.6	25	5.2
Ca	63	95	103	124	71
Mg	36	23	31	9.4	10
Na + K	80	86	1,020	16.8 <sup>c</sup>	27
K				1.0	
HCO <sub>3</sub>	417	495	434	379	205
SO <sub>4</sub>	32	83	58	49.5	67
Cl	43	17	1,540	11.0	13
F	0.2	0.3	0.3	0.19	0.2
NO <sub>3</sub>	53	1.1	4.9	18	35

a. Total dissolved solids; b. Total hardness as mg/l CaCO<sub>3</sub>; c. Na concentration

The south and southwest portions of the Robinson Tract lie on upper terraces of the floodplain of the Kansas River. A test hole was drilled by the KGS and USGS in 1971 at the extreme southeast corner of the Robinson Tract (100 ft west and 50 ft north of the center of the intersection) where the land surface elevation is 828 ft. A total of 73 ft of Wisconsinan fluvial deposits were drilled before encountering gray shale of the Stranger Formation. Clayey

sediments extend from the soil to a depth of 24 ft, fine to medium-grained sand at 24-28 ft, clay at 28-38 ft (with sand streaks 34-38 ft), sand and fine to medium gravel at 38-58 ft, fine to medium gravel at 58-64 ft, and fine to coarse gravel in the bottom 9 ft. The zone containing gravel from a depth of 38-73 ft is the main portion of the aquifer. Other wells drilled more recently in the area have encountered bedrock at a depth of about 70-71 ft. The deepest part of the bedrock channel underlying the Kansas River floodplain in the Lawrence area is just to the southwest of the southern part of the Robinson Tract based on the cross section shown in Figure I-6. The bottom of the bedrock channel is only several feet deeper than at the southeastern corner of the Tract, indicating that the deep ancient channel of the river was against the northern part of the valley. Figure I-6 shows the broader extent and coarser nature of fluvial sediments in the Kansas River valley in comparison with the Wakarusa River valley.

The bedrock underlying the alluvium is a silty sandstone in the upper portion of the Tonganoxie Sandstone Member of the Stranger Formation. Field measurements of specific conductance during a pumping test using the KER supply well in the southeastern corner of the Robinson Tract showed very little increase, indicating that significant amounts of saline water that could be present in the deeper parts of the Tonganoxie Sandstone at this location are not being drawn up. Ground-water flow from the uplands may be slower through the shales and limestones than through the top of the Tonganoxie laterally to the wall of the subsurface bedrock valley resulting in the flushing of saline water from the top of the Tonganoxie Sandstone.

The sands and gravels of the alluvial aquifer of the Kansas River in the Lawrence area provide large quantities of water for municipal, industrial, and irrigation use. Yields of large capacity wells are generally in the 500-1,000 gpm range. The KER water-supply well drilled in 1976 pumps water at a rate of about 100 gpm to the experimental pond facility at the Nelson Environmental Study Area. The chemical composition of the well water on October 23, 1990 is listed in Table I-2. The water is very hard, but would be considered very good for domestic and agricultural purposes. The nitrate concentration is high enough that some local contamination of the aquifer is suspected such as from human or animal waste, fertilizer, or oxidation of soil organic matter from farm disturbance of soils. Monitoring wells of the Geohydrologic Experimental and Monitoring Site (GEMS) of the Kansas Geological Survey are located in the vicinity of the supply well. Additional information on the GEMS studies are in Part II of this field guide.

### Tri-County Area

The subsurface material of the Fitch Natural History Reservation (FNHR), Rockefeller Experimental Tract, and the Nelson Environmental Study Area (NESA) consists of glacial till and loess on the broad to narrow ridgetops, shales and limestones of the Oread Limestone along the upper hillslopes, primarily shales of the Lawrence Formation along the lower parts of the slopes, and glaciofluvial deposits at the base of the slopes along the stream drainages. None of these materials within the Tri-County area is capable of yielding more than a few gpm to a conventional shallow well.

The most probable source of water for a well drilled on the ridgetops within the natural areas would be from within fractures, joints, and bedding planes of the Plattsmouth Limestone Member of the Oread Limestone. The log of a test hole drilled April 26, 1971 (Table I-3) in the northwest part of the NESA indicates that the Plattsmouth Limestone is 17 ft thick and somewhat weathered. The depth to water in the test hole on May 13, 1971 was 13.4 ft below the surface, a level just above the top of the Plattsmouth. The water level for this location could be expected to decline markedly during dry spells because ground-water flow to seeps and springs along the hillslopes and slow flow to underlying units would drain the limestone

without substantial recharge. The Palmer Drought Index for Lawrence in April-May, 1971 was approximately -1 (Atmospheric Science Laboratory 1990), a value near the average climatic conditions. Thus, the depth to water at the test hole location could be expected to be greater during appreciably wetter periods and lower during droughts. The test hole was drilled on a relatively narrow ridgetop in the natural areas. If a well were drilled in the broader and somewhat higher portions of the ridgetops in the central portion of the NESAs, the water level would probably not drop as much into the limestone during droughts, but still could drop enough to appreciably decrease the amount of water available. The quality of the water from the Oread Limestone would be very hard from the dissolution of carbonate minerals in the limestones and shales, but should be good for drinking if not contaminated in the past by leaching of nitrate from human or animal wastes, fertilizer, or the oxidation of soil organic matter during agricultural disturbance. The water analysis in Table I-2 is probably representative of water for the Oread, except for the high nitrate content which is above the 45 mg/L standard for drinking use. Uncontaminated ground waters in the upland areas of the northern tracts would have a lower nitrate content, and a somewhat lower sodium and chloride concentration because these latter two constituents are associated with animal and human waste thought to be the main source of the nitrate in the analysis in Table I-2.

Drainage of water through the Plattsmouth, Leavenworth, and Toronto limestones to the slopes of the natural areas would produce springs and seeps along the base of the limestones at the top of the underlying shales. The locations of the springs and seeps would probably be more irregular than bands of wet soils in the Baldwin Woods because the groundwater flow would be more through joints and fractures of varying sizes in different areas, in contrast with both fracture and matrix permeability in the sandstone in the Baldwin Woods. Upper Pennsylvanian rocks dip about 20 ft per mile to the west-northwest in north-central Douglas County (O'Connor 1960). The test hole described in Table I-3 drilled in the northwestern part of the NESAs includes the Lower Williamsburg coal at a subsurface elevation of 959-960 ft. Barnett, Stuart, and Associates (1988) encountered a thin coal seam at an elevation of 985.2-985.4 ft in boring D-1 and at 982.3-982.9 ft in boring D-5 in the SW 1/4 of the SW 1/4 of Sec. 34, the portion of the NESAs in Leavenworth County. If the coal is the Lower Williamsburg seam, then the dip of the Lawrence Shale is about 20-25 ft per mile. However, an unpublished geologic map by T. McClain for the NESAs indicates that the dip is only about 15 ft per mile. McClain's map shows that the elevation of the base of the Plattsmouth Limestone ranges from about 1040 ft in the NW 1/4 of Sec. 33 to 1052 ft in the SE 1/4 of the same section in the Jefferson County portion of the NESAs. The base of the Toronto Limestone ranges from an elevation of about 1008 ft to 1020 ft in the same respective quarter-sections on his map. Borings (Barnett, Stuart, and Associates 1988) in the SE 1/4 of Sec. 33 in the vicinity of the experimental pond facility passed through clays before encountering the top of some limestone at a subsurface elevation of about 1060-1061 ft. This should be somewhere in the middle of the Plattsmouth Limestone Member, based on the dip of the rocks. The borings at higher locations to a maximum depth of 20 ft found only clays and no shale or limestone. The top of the rock column is at an elevation of 1062 at the location of the test hole described in Table I-3. This suggests that the Kansas glacier stripped the bedrock to an elevation of approximately 1060-1062 ft in the NESAs, followed by deposition of till, and later, loess, that now comprise the unconsolidated mantle.

Glaciofluvial deposits and colluvium are present in the two more gently sloped valleys in the west-central and south-central portions of the FNHR. These deposits can supply water to shallow wells. A well was dug in the fluvial deposits near the residence in the valley in the northwest part of the FNHR in November 1955. The well has a casing of concrete and brick, diameter of from 72 to 36 inches, and a depth of 27 ft. The measured water level on November 6, 1975, was 20.7 ft below land surface. The level dropped to a depth of 22.7 ft on November 7, 1955, after pumping at 3-4 gpm for 6 hours (V. Fitch, personal communication). The water level on November 11, 1955 was 20.5 ft below land surface

Table I-3. Log of a test hole in the northwest portion of the Nelson Environmental Study Area, T. 11 S., R. 20E-, Sec. 33bc, drilled April 26, 1971.

The elevation of the land surface was 1070 ft. (McClain, unpublished).

Geologic description	Thickness/ft	Depth/ft	Elevation of base/ft
Soil, brownish black	1	1	1069
Quaternary - Pleistocene Series			
Clay, brownish gray	7	8	1062
Pennsylvanian - Upper Pennsylvanian Series			
Virgilian Stage			
Shawnee Group			
Oread Limestone			
Heumader Shale Member			
Shale, clayey, gray, weathered to tan	6	14	1056
Plattsmouth Limestone Member			
Limestone, cherty, weathered tan to brown; contains 2" gray shale layers at 15, 16, and 17 ft	5	19	1051
Limestone, gray, white and tannish brown; contains gray shale layer from 21 to 21.5 ft	12	31	1039
Heebner Shale Member			
Shale, clayey, dark gray to black	2	33	1037
Shale, laminated, black	3	36	1034
Leavenworth Limestone Member			
Limestone, gray, hard	2	38	1032
Snyderville Shale Member			
Shale, clayey, gray; harder streaks of tan sandy or limy shale in upper 5 ft; lower 6 ft are sparsely sandy	11	49	1021
Toronto Limestone Member			
Limestone, gray, hard; layers of gray shale from 54 to 54.2 ft, 56.2 to 56.5 ft, and 56.8 to 57.1 ft	13	62	1008
Douglas Group			
Lawrence Shale			
Shale, clayey, light greenish gray	11	73	997
Upper Williamsburg coal			
Coal, black, soft	1.5	74.5	995.5
Shale, clayey, light greenish gray; contains laminated dark gray layers	5.5	80	990
Amazonia Limestone Member			
Limestone, gray; thin shale partings from 81 to 83 ft	2.5	82.5	987.5
Shale, clayey, light gray	27.5	110	960
Lower Williamsburg coal			
Coal, black, soft	1	111	959
Shale, platy, light gray	24	135	935
Shale, very fine sandy, gray	30	165	905

according to O'Connor (1960). The period of level measurements was during the severe drought period of the 1950's, thus the usual water level is expected to be higher. Although the dug well is about 600 ft west-southwest of the residence, it became contaminated from near surface seepage. Use of the water for household purposes was discontinued at the end of 1983 and the well was capped. The residence was connected to the rural water system in the fall 1984. The quality of water in the fluvial deposits is probably similar to that for the ground water from the Oread Limestone in Table I-2 because drainage through the limestones and calcareous shales of the Oread and the Lawrence Formation would comprise an appreciable portion of the water at the FNHR location. Whether the nitrate was as high as that in the table would depend on the location of the septic field and any past activities in the area that could have introduced nitrate to the subsurface.

If a deep well were drilled near the FNHR residence, it would encounter the coarser sediments of the Tonganoxie Sandstone Member of the Stranger Formation at a depth of 200-250 ft. The well would probably yield small to moderate amounts of water to a well. However, the water may be saline and not suitable for domestic use because the sandstone aquifer is confined underlying this location. An analysis of the water from a well in the Tonganoxie Sandstone that was located in south Lawrence (Table I-2) suggests what the water quality might be like in the lower part of the sandstone underlying the FNHR residence. A test hole next to Foley Hall (the former Geohydrology Center of the KGS and location of the present offices of the KBS) was drilled an additional 24 ft past the Tonganoxie Sandstone down to the Stoner Limestone Member of the Stanton Limestone. The chloride content of the borehole water was 2,160 mg/L. The geologic environment of the south Lawrence well (Table I-2) and the Foley borehole is somewhat equivalent to that of the FNHR residence home based on the presence of the overlying Lawrence Formation and the position relative to the Kansas River valley and to the north-northeast strike of the rocks. The water quality in the Tonganoxie Sandstone is relatively good where the sandstone is unconfined in Douglas and Leavenworth Counties and also good in some confined areas such as southwestern Douglas County. The water in the sandstone generally improves updip, thus, the best quality for the northern tracts area would be expected in the southeast corner of the FNHR. As indicated in the geohydrologic description for the Robinson Tract, the water in the upper part of the Tonganoxie Sandstone is probably of better quality due to the flushing effect of water moving laterally to the subsurface wall of the bedrock valley of the Kansas River. Thus, a well drilled to a depth of about 170 ft at the FNHR residence might yield small quantities of water of usable quality in the upper part of the Tonganoxie. Prior to the shallow well dug in the fluvial sediments near the residence, a well was drilled about 200 ft deep into the Tonganoxie Sandstone (H. O'Connor, personal communication) in 1948 or 1949, about 50 ft east-northeast of the residence. The drilled well provided water of acceptable quality for a few years until it was abandoned and filled due to a combination of low yield (H. O'Connor) and contamination from surface material (V. Fitch).

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## KANSAS ECOLOGICAL RESERVES—AN OVERVIEW

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The Kansas Ecological Reserves (KER) is the collective name for seven tracts of land, 690 ha (1700 acres) in total, used for environmental research and education by The University of Kansas. Fitch (1965) and Fitch and Kettle (1988) should be consulted for additional information on specific KER sites.

### Habitats and Use

There are a variety of habitats represented on KER due, in part, to their location in the transition zone (ecotone) between the eastern deciduous forest and tallgrass prairie biomes. Remnant tracts of native (unplowed) prairie and relatively undisturbed forested stands are represented on KER. Most of the habitat on KER, however, has been disturbed through human activity (beginning largely with the agricultural practices of the early settlers of European origin in the 1850s). Therefore, in addition to the native prairie and forested habitats, there is land in various stages of ecological succession following disturbance (e.g., woodland, shrubland, and old field), as well as land maintained through active management (e.g., burning or mowing). Aquatic habitats are represented by constructed impoundments, springs, and intermittent streams.

All KER tracts are assigned to one of two broad categories for research use; nature reserves or experimental areas. Nature reserves are protected from direct human disturbance and manipulation. Research or other use on these tracts must be of minimal impact. By contrast, on portions of experimental areas where no rare communities or populations are present, experimental manipulation of the environment is permitted. It is also on these areas where research and support facilities are developed.

### Location

The KER tracts are located in two geographic areas, those south of the Kansas River approximately 16 km (10 miles) south of Lawrence, Kansas and those north of the Kansas River roughly 6-10 km (4-6 miles) north-northeast of Lawrence (Figure A, Introduction). Three KER tracts (Breedenthal Biological Reserve, Rice Woodland, and Roy and Eleanor Wall Woods) in the southern grouping are referred to collectively as Baldwin Woods. Of the four tracts in the northern area, the Robinson Tract is partially within the Kansas River floodplain. The remaining three KER tracts (Fitch Natural History Reservation, John H. Nelson Environmental Study Area, and Rockefeller Experimental Tract) are in a contiguous grouping. These three tracts occupy portions of Leavenworth, Douglas, and Jefferson counties and are referred to as the Tri-County area.

### Synopsis of Tracts

About one-half of the KER land is set aside in the nature reserve (non-manipulation) category. The largest tract in this category is the 240 ha (590 acre) Fitch Natural History Reservation (FNHR). The FNHR, established in 1948, was a former farm of the first governor of Kansas, Charles Robinson. Ecological succession has been allowed to proceed without disturbance since 1948, and many of the formerly open fields and pastures are now wooded. These successional changes in plant and animal populations have been studied since 1948. Other KER tracts treated exclusively as nature reserves are those in the Baldwin Woods area; these forested tracts were acquired between 1965-1974.

Acquisition of KER land that could be experimentally manipulated, and where facilities could be constructed, greatly expanded the range of research possibilities. The Rockefeller Experimental Tract was acquired in 1956 to determine the impact of different management practices (burning, mowing, grazing, or no treatment) on prairie vegetation (Fitch and Hall 1978). These treatments have been underway since 1962, and research on management effects on soils and vegetation has involved use of advanced remote sensing technologies. The John H. Nelson Experimental Study Area (NESA), established in 1970, permitted development of new experimental facilities for ecological research. Major research facilities located on NESA include those for aquatic research with experimental ponds and a 4 ha (10 acre) reservoir, fenced enclosures for small mammal research, a biotic succession facility, irrigated garden areas, tree plantation, and a meteorological station. Additionally, vegetation at some research sites on NESA can be manipulated to address specific ecological questions. It is also on NESA where many support facilities are located including laboratories, caretaker residence, maintenance shop, and equipment.

## Research and Education

There are currently about 25 faculty and staff from the University of Kansas and several other universities who conduct research at KER. Those from KU come from several areas including the departments of Systematics and Ecology, Botany, Civil Engineering, Entomology, Geography, Geology, as well as from the Environmental Studies Program, Museum of Natural History, Kansas Applied Remote Sensing Program, Kansas Biological Survey, and Kansas Geological Survey. In addition, there are about 20 students conducting research for graduate degrees, and several undergraduates are also conducting research. Several university classes visit KER each semester as do various other groups (e.g., elementary schools and civic groups).

Since 1948 there have been more than 400 publications and 100 theses and dissertations describing research conducted entirely, or in part, on KER tracts. Ongoing research at KER is varied, with many of the studies interdisciplinary in nature. Current initiatives include aquatic ecology, especially the interactions of agriculture and aquatic ecosystems; small mammal population biology and ecology; reptile ecology; insect ecology; plant ecology, population biology, and ecophysiology; and community ecology. Other research has involved use of remote sensing and geographic information systems to measure ecosystem attributes, examination of atmospheric and soils conditions and characteristics using sensitive monitoring equipment; and long-term monitoring and experimental studies on aquifers. Financial support for this research comes from a variety of sources including the University of Kansas, the National Science Foundation, Environmental Protection Agency, Kansas Water Resources Research Institute, and the United States Department of Agriculture.

## Administration

All research, teaching, and management of KER is coordinated through the Experimental and Applied Ecology Program at KU. The Program also maintains databases and materials that augment research use of KER. Data sets include land use history, reference literature, meteorological data, and various biotic inventories. Small synoptic collections of plants and animals are available, as are aerial photographs (from as early as 1937), maps, and other archived materials.

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## VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES

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The Kansas Ecological Reserves (KER) support a diverse vascular flora of more than 700 species, including 19 species that are rare in Kansas. The Reserves are located along the eastern deciduous forest-tallgrass prairie ecotone in northeastern Kansas (Settergen 1974; Fitch and Kettle 1988). Plant communities on KER have been minimally disturbed to severely disturbed by human activities. Principal habitats include deciduous forest, tallgrass prairie, cool-season grassland, aquatic and wetland sites, and land in various stages of ecological succession (old fields and woodlands). The Reserves consist of three major units: Baldwin Woods, the Robinson Tract, and the Tri-County area. These areas support distinct floras, a fact substantially related to their recent history of use by humans and to edaphic factors.

Baldwin Woods is a unique remnant stand of relatively undisturbed deciduous forest at the western edge of its range (Settergen 1974; Fitch and Kettle 1988). Reserves tracts contained within the Baldwin Woods ecosystem are Breidenthal Biological Reserve, Rice Woodland, and Wall Woods (Fitch and Kettle 1988). Two other managed areas also largely within Baldwin Woods, but not discussed in this report, are the Ivan L. Boyd Woods (managed by Baker University) and the Douglas County State Lake (managed by the Kansas Dept. of Wildlife and Parks). Baldwin Woods was designated a National Natural Landmark in 1980 by the National Park Service in recognition of its exemplary condition (Fitch and Kettle 1988).

The vegetation of Baldwin Woods is largely oak-hickory forest. Small areas of floodplain forest parallel creeks, and isolated patches of xeric tallgrass prairie occur along dry sandstone ridges, especially on the Breidenthal Biological Reserve. Soils are mostly well drained and formed in material weathered from sandstone or loamy shale (Dickey et al. 1977). Historical data from Government Land Surveys in the 1850s record Baldwin Woods as a 3,000–4,000 acre grove of timber; the size and contiguous nature of this grove has been altered greatly in the intervening 140 years.

By contrast, those KER units north of the Kansas River (Tri-County area and Robinson Tract) have long histories of intensive use, especially for agricultural production. They generally support natural communities that are moderately to severely disturbed, some of which are in secondary succession. Small forest and prairie remnants contribute significantly to the total species richness of the northern units. Soils range from somewhat poorly drained to well drained in material weathered from limestone and shale bedrock, alluvium, glacial till, and loess (Dickey et al. 1977).

The Tri-County area consists primarily of level to hilly uplands above of the Kansas River floodplain. It comprises three adjacent KER tracts: Fitch Natural History Reservation, Rockefeller Experimental Tract, and Nelson Environmental Study Area. Government Land Surveys from the 1850s indicate the area was primarily tallgrass prairie with some timber along draws. Much of the Tri-County area was farmed previously, and cool-season grasslands, old

fields, and successional woodlands predominate. A few small, scattered remnants of the pre-settlement vegetation are extant. Most conservative prairie species recorded from the Tri-County area are restricted to the Rockefeller Native Prairie, a 4-ha mesic, native tallgrass prairie in the southwest corner of the Rockefeller Experimental Tract (Fitch and Kettle 1988; Kindscher in prep.).

The southern and southwestern portions of the Robinson Tract lie on upper terraces of the Kansas River floodplain. The northern portion extends up a southwest-facing section of the valley wall. Many areas of the tract once were cultivated or grazed. Small areas of relict tallgrass prairie and floodplain forest remain (Fitch and Kettle 1988).

## Vegetation

Five major habitat types are distinguished on KER: forest, prairie, cool-season grassland, aquatic and wetland sites, and successional areas and other disturbed sites. These types and significant subtypes are discussed below.

## Forests

Forests are natural communities with a tree cover of 50% or greater and three distinct canopy layers (Lauver 1989). Two subtypes are recognized: oak-hickory forest and floodplain forest.

Oak-hickory forests occupy gentle to moderately steep slopes on uplands and steep valley sides. The best examples are on Baldwin Woods, a ravine in the Nelson Environmental Study Area, and East Woods on the Fitch Natural History Reservation. Dominant species include *Quercus* (*Quercus borealis* var. *maxima*, *Quercus macrocarpa*, *Quercus muehlenbergii*, and *Quercus velutina*) and *Carya* (*Carya cordiformis* and *Carya ovata*). Other common forest trees are *Celtis occidentalis*, *Fraxinus americana*, *Juglans nigra*, *Morus rubra*, *Ulmus americana*, and *Ulmus rubra*. *Quercus alba* also is common in Baldwin Woods. Characteristic understory shrubs and vines are *Aesculus glabra* var. *arguta*, *Asimina triloba*, *Cercis canadensis*, *Cornus drummondii*, *Ostrya virginiana*, *Parthenocissus quinquefolia*, *Smilax hispida*, *Staphylea trifolia*, and *Symphoricarpos orbiculatus*. Common herbs and graminoids are *Anemone thalictroides*, *Botrychium virginianum*, *Bromus pubescens*, *Carex blanda*, *Carex davisii*, *Carex jamesii*, *Circaea lutetiana* subsp. *canadensis*, *Cryptotaenia canadensis*, *Cystopteris protrusa*, *Desmodium glutinosum*, *Dicentra cucullaria*, *Festuca obtusa*, *Galium aparine*, *Isopyrum biternatum*, *Lactuca florida*, *Phlox divaricata* subsp. *laphamii*, *Podophyllum peltatum*, *Sanicula canadensis*, *Sanicula gregaria*, *Solidago ulmifolia* var. *ulmifolia*, *Viola pratincola*, and *Viola pubescens*.

Floodplain forest occupies level to undulating floodplains along rivers and major creeks. This forest type is restricted to floodplains along tributaries of Coal Creek in Baldwin Woods and the Kansas River along the southwestern edge of the Robinson Tract. Dominant species include *Celtis occidentalis*, *Populus deltoides* subsp. *monilifera*, *Platanus occidentalis*, *Fraxinus americana*, *Ulmus americana*, and *Ulmus rubra*. *Acer saccharinum* also is a dominant on the Robinson Tract. Characteristic understory shrubs are *Aesculus glabra* var. *arguta*, *Asimina triloba*, *Staphylea trifolia*, and *Symphoricarpos orbiculatus*. Common herbs and graminoids are *Campanula americana*, *Cinna arundinacea*, *Circaea lutetiana* subsp. *canadensis*, *Dichanthelium latifolium*, *Erythronium americanum*, *Hydrophyllum virginianum*, *Hystrix patula*, *Isopyrum biternatum*, *Laportea canadensis*, *Pilea pumila*, *Verbesina alternifolia*, and *Viola sororia*. *Chasmanthium latifolium* and *Diarrhena americana* var. *obovata* also are characteristic in floodplain forests on Baldwin Woods.

## Prairies

Prairies are grassland communities dominated by graminoid and herbaceous species, often with scattered low shrubs (Lauver 1989). Several tallgrass prairie subtypes occur on KER, but they are combined here for purposes of clarity. The largest and most diverse prairie on KER is the Rockefeller Native Prairie. Smaller remnants also occur on other tracts north of the Kansas River, but most have been moderately to severely degraded. *Andropogon gerardii* and *Andropogon scoparius* are dominant species on the Rockefeller Native Prairie. Common shrubs are *Amorpha canescens*, *Ceanothus herbaceus*, and *Rhus glabra*. Characteristic herbs and graminoids are *Ambrosia artemisiifolia*, *Apocynum cannabinum*, *Aster praealtus*, *Baptisia bracteata* var. *glabrescens*, *Eryngium yuccifolium*, *Euphorbia corollata*, *Helianthus rigidus*, *Lespedeza violacea*, *Panicum virgatum*, *Silphium laciniatum*, *Solidago canadensis*, *Solidago missouriensis*, *Solidago rigida*, *Sorghastrum nutans*, *Sporobolus heterolepis*, and *Tripsacum dactyloides* (Kindscher unpubl. data).

Several small, xeric prairie remnants are situated along the western edge of the Breidenthal Biological Reserve in Baldwin Woods. These occur on well drained, sandy loam soils on south-facing slopes as openings in oak-hickory forest. *Andropogon scoparius* and *Andropogon gerardii* are dominant. Other characteristic species include *Agalinis tenuifolia*, *Lechea tenuifolia* var. *occidentalis*, *Dalea purpurea* var. *purpurea*, *Desmanthus illinoensis*, *Lespedeza virginica*, *Liatris aspera*, *Liatris hirsuta*, and *Viola pedata*. Historically, a small, mesic prairie was present along the railroad right-of-way near the western edge of the Breidenthal Biological Reserve, but this now is overgrown with woody vegetation (McGregor personal communication). Several mesic prairie species reported for Baldwin Woods by McGregor (1966) apparently came from this area.

## Cool-season Grasslands

These areas are dominated by introduced grasses, but they often contain remnant or colonizing prairie species. Several units in the Tri-County area are maintained in this state for experimental studies by periodic mowing. Common species include *Bromus inermis*, *Festuca arundinacea*, *Festuca pratensis*, *Poa compressa*, *Poa pratensis*, *Sporobolus asper*, and *Tridens flavus*. Common remnant or colonizing prairie species are *Asclepias viridis*, *Asclepias verticillata*, *Desmanthus illinoensis*, *Desmodium illinoense*, *Ruellia humilis*, and *Silphium laciniatum*.

## Aquatic and Wetland

Intermittent streams and ponds account for most of the aquatic and wetland habitats on KER. Stream beds and temporary pools in drainages are home to a variety of aquatic and wetland species. Common species in a wet-mesic ravine in the northern part of the Robinson Tract are *Carex annectens*, *Carex brevior*, *Bidens aristosa* var. *retrorsa*, *Lobelia siphilitica*, *Phalaris arundinacea*, *Polygonum lapathifolium*, *Polygonum hydropiperoides*, *Rudbeckia laciniata*, *Spartina pectinata*, *Tripsacum dactyloides*, and *Veronicastrum virginicum*. In Baldwin Woods along tributaries to Coal Creek, common species are *Commelina communis*, *Impatiens capensis*, *Impatiens pallida*, *Lobelia siphilitica*, *Pilea pumila*, and *Polygonum punctatum*.

An array of ponds form the experimental pond facility on the Nelson Environmental Study Area. In addition, there are nine farm ponds on tracts in the Tri-County area. A small, shallow limestone quarry in the northeast corner of the Breidenthal Biological Reserve contains water, but aquatic species there are limited. *Potamogeton* spp. and *Najas guadalupensis* are

common submerged aquatics in ponds. Emergent species include *Typha angustifolia*, *Typha latifolia*, *Carex* spp., *Eleocharis* spp., and *Scirpus* spp.

### Successional Areas and Other Disturbed Sites

These habitats, which include old fields (abandoned farmland), roadsides, ditches, and forest clearings, are similar in that they have been altered by major ecosystem disturbances. If permitted to undergo succession, these areas pass through a predictable series of vegetative stages. Disturbed areas initially are dominated by weedy herbaceous annuals for several years. Eventually, herbaceous biennial and perennial plants replace the annuals. Ultimately, in the absence of further human disturbance or manipulation, woody species dominate and the site is transformed into a woodland. This phenomenon, called secondary succession, is studied at the Biotic Succession Facility on the Nelson Environmental Study Area. Common species of disturbed sites include *Ambrosia artemisiifolia*, *Ambrosia trifida*, *Asclepias syriaca*, *Bromus inermis*, *Bromus japonicus*, *Coryza canadensis*, *Digitaria sanguinalis*, *Digitaria ischaemum*, *Eragrostis cilianensis*, *Eragrostis pectinacea*, *Gaura parviflora*, *Lespedeza stipulacea*, *Melilotus alba*, *Melilotus officinalis*, *Poa pratensis*, *Setaria faberi*, *Taraxacum officinale*, *Verbascum thapsus*, and *Xanthium strumarium*.

### Rare Plants

One indication of the high quality of certain natural community remnants is found in the numerous protected and rare species that occur on KER. Nineteen rare plant species currently are known from the Reserves, including two that are federally protected, one that is a federal candidate, and 16 that are rare in Kansas.

Mead's milkweed (*Asclepias meadii*) and Western prairie fringed orchid (*Platanthera praeclara*) are listed as threatened species under provisions of the federal Endangered Species Act. These two tallgrass prairie forbs have declined rangewide because of habitat loss and degradation. Both occur on the Rockefeller Native Prairie. Earleaf foxglove (*Tomanthera auriculata*) is being studied by the U.S. Fish and Wildlife Service for possible listing as an endangered or threatened species. A population was discovered recently on a disturbed prairie in the northwest portion of the Tri-County area.

Sixteen species considered rare in the state of Kansas and tracked by the Kansas Natural Heritage Inventory (KSNHI) of the Kansas Biological Survey occur on KER. Most occur in Baldwin Woods. They are American spikenard (*Aralia racemosa*), Hirsute sedge (*Carex hirsutella*), Reflexed-fruit sedge (*Carex retroflexa*), Bur-reed sedge (*Carex sparganioides*), Buttonbush dodder (*Cuscuta cephalanthi*), White gentian (*Gentiana flavida*), Michigan lily (*Lilium canadense* subsp. *michiganense*), American gromwell (*Lithospermum latifolium*), Indian tobacco (*Lobelia inflata*), Virginia bunchflower (*Melanthium virginicum*), Pinesap (*Monotropa hypopithys*), Green adder's mouth (*Malaxis unifolia*), Oval ladies'-tresses (*Spiranthes ovalis*), Nodding pogonia (*Triphora trianthophora*), Hooked buttercup (*Ranunculus recurvatus*), and Woodland agrimony (*Agrimonia rostellata*). Ongoing field studies by the KSNHI will provide detailed data about the quality, condition, and status of populations of these species.

### Floristic Studies

Floristic studies of the Kansas Ecological Reserves date back to the early 1940s when the first specimens unequivocally referable to Baldwin Woods were collected. Wells and Morley (1964) characterized the woody vegetation of the Rice Woodland, listing 31 trees and 21 shrubs and vines in their study area. Fitch (1965) compiled a list of nearly 340 species

from what is now the Fitch Natural History Reservation and the Rockefeller Experimental Tract. His study was begun in 1948 and provides important baseline data for the Tri-County area. McGregor (1966) provided the first inclusive list of vascular plants for the Breidenthal Biological Reserve, enumerating 404 species. Recently, field work has been conducted to update earlier lists, to verify species reports (particularly those based on unvouchered reports), and to characterize plant communities. Systematic surveys of all management units on the Tri-County area and Robinson Tract were begun in 1987 (Kettle and Kindscher unpubl. data) and on the Baldwin Woods in 1990 (Freeman unpubl. data).

## Annotated List of Vascular Plants

In the list that follows, plants are arranged alphabetically by family, genus, species, and infraspecific taxon, respectively. Scientific names follow the Great Plains Flora Association (1986) or, for groups with recent nomenclatural changes, Brooks and Freeman (in prep.). Colloquial names follow Brooks and Freeman (in prep.). The origin of each taxon is designated either as native (n) or introduced (i). The typical habitat of each taxon on KER is designated by one or more letter: A = aquatic and wetland sites; F = forest; G = cool-season grasslands; O = successional areas and other disturbed sites; and P = native tallgrass prairie. Occurrence data are presented for each taxon on the three major units of KER: Baldwin Woods (BW), Robinson Tract (RT), and Tri-County area (TC). Taxa are included on the basis of a voucher specimen (V) or a reliable report (R). Records based on misidentifications from earlier studies are excluded. Voucher specimens are deposited in the Ronald L. McGregor Herbarium of the University of Kansas (KANU) and duplicate specimens are in the KER reference collection in Foley Hall at the University of Kansas. Data for plant surveys and reference collections are maintained in a relational database on an IBM-compatible computer.

A total of 718 species and infraspecific taxa in 371 genera and 103 families of vascular plants are listed. These numbers represent 33% of the species and infraspecific taxa, 51% of the genera, and 71% of the families in Kansas (Brooks 1986). Eighteen percent (126 taxa) of the vascular plants on KER are considered introduced, slightly lower than the 20% figure for the entire state's flora. The ten largest families and the number of taxa in each are Poaceae (98), Asteraceae (91), Cyperaceae (44), Fabaceae (35), Rosaceae (31), Brassicaceae (24), Lamiaceae (18), Euphorbiaceae (17), Scrophulariaceae (17), and Polygonaceae (15).

A summary of taxon occurrences by habitats reveals 140 in aquatic and wetland habitats (125 native, 15 introduced), 253 in forests (241 native, 12 introduced), 109 in cool-season grasslands (88 native, 21 introduced), 209 in prairie (202 native, 7 introduced), and 266 in successional areas and other disturbed sites (150 native, 116 introduced). The sum of values for the five habitat types exceeds the total number of taxa on KER because many taxa occur in more than one habitat. Of the 718 species and infraspecific taxa reported from KER, 127 are unique to Baldwin Woods, 22 are unique to the Robinson Tract, and 137 are unique to the Tri-County area. One hundred eighty-five taxa occur on all three units.

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**VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES**

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
<b>Acanthaceae</b>						
<i>Ruellia humilis</i>	Fringeleaf ruellia	n	G,P		R	V
<i>Ruellia strepens</i>	Woodland ruellia	n	F	V	R	V
<b>Aceraceae</b>						
<i>Acer negundo</i>	Box elder	n	F	V	R	V
<i>Acer saccharinum</i>	Silver maple	n	F		R	V
<i>Acer saccharum</i>	Sugar maple	n	F	R		
<b>Alismataceae</b>						
<i>Sagittaria cuneata</i>	Duckpotato arrowhead	n	A			V
<i>Sagittaria latifolia</i>	Common arrowhead	n	A			V
<b>Amaranthaceae</b>						
<i>Amaranthus hybridus</i>	Slender pigweed	i	O	R		R
<i>Amaranthus palmeri</i>	Palmer's pigweed	n	O			R
<i>Amaranthus rudis</i>	Water hemp	n	A,O,P	V	R	V
<i>Froelichia floridana</i> var. <i>campestris</i>	Field snakecotton	n	O	R		
<b>Anacardiaceae</b>						
<i>Rhus aromatica</i>	Fragrant sumac	n	F		R	V
<i>Rhus copallina</i>	Dwarf sumac	n	F,P	V	R	V
<i>Rhus glabra</i>	Smooth sumac	n	F,P	V	R	V
<i>Toxicodendron radicans</i>	Poison ivy	n	F,G,O	R	R	R
<b>Annonaceae</b>						
<i>Asimina triloba</i>	Pawpaw	n	F	V		V
<b>Apiaceae</b>						
<i>Chaerophyllum procumbens</i>	Spreading chervil	n	F	V	V	
<i>Chaerophyllum tainturieri</i>	Erect chervil	n	P	R		V
<i>Conium maculatum</i>	Poison hemlock	i	O	V		
<i>Cryptotaenia canadensis</i>	Honewort	n	F	V		V
<i>Eryngium yuccifolium</i>	Button snakeroot	n	P		R	V
<i>Lomatium foeniculaceum</i>	Carrotleaf lomatium	n	P			R
<i>Osmorhiza longistylis</i>	Anise root	n	F	V	R	V
<i>Polytaenia nuttallii</i>	Prairie parsley	n	P			V
<i>Sanicula canadensis</i>	Canada sanicle	n	F	V		V
<i>Sanicula gregaria</i>	Cluster sanicle	n	F	V	R	V
<i>Spermolepis inermis</i>	Spreading spermolepis	n	O			V
<i>Torilis arvensis</i>	Hedge parsley	i	O	V	V	V
<i>Zizia aurea</i>	Golden alexanders	n	F,O,P			V
<b>Apocynaceae</b>						
<i>Apocynum cannabinum</i>	Hemp dogbane	n	A,O,P	V	R	V
<i>Vinca minor</i>	Common periwinkle	i	O	V		
<b>Araceae</b>						
<i>Arisaema dracontium</i>	Green dragon	n	F	V		R
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	n	F	V		V
<b>Araliaceae</b>						
<i>Aralia racemosa</i>	American spikenard	n	F	V		
<b>Asclepiadaceae</b>						
<i>Asclepias incarnata</i>	Swamp milkweed	n	A		V	
<i>Asclepias meadii</i>	Mead's milkweed	n	P			V
<i>Asclepias purpurascens</i>	Purple milkweed	n	F	V		R
<i>Asclepias stenophylla</i>	Narrowleaf milkweed	n	P			V
<i>Asclepias sullivantii</i>	Smooth milkweed	n	P		V	V
<i>Asclepias syriaca</i>	Common milkweed	n	O,P	V	R	V
<i>Asclepias tuberosa</i>	Butterfly milkweed	n	G,P	R	R	V

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Asclepiadaceae, cont.						
<i>Asclepias verticillata</i>	Whorled milkweed	n	G,O,P	V	R	V
<i>Asclepias viridiflora</i>	Green milkweed	n	P			V
<i>Asclepias viridis</i>	Spider milkweed	n	G,O	V		V
<i>Cynanchum laeve</i>	Climbing milkweed	n	F	V		R
Asteraceae						
<i>Achillea millefolium</i> ssp. <i>lanulosa</i>	Yarrow	n	G,O,P	R	R	V
<i>Ambrosia artemisiifolia</i>	Common ragweed	n	A,O	V	R	V
<i>Ambrosia psilostachya</i>	Western ragweed	n	P		R	V
<i>Ambrosia trifida</i>	Giant ragweed	n	A,O	V	R	V
<i>Amphichyris dracunculoides</i>	Annual broomweed	n	O			R
<i>Antennaria neglecta</i>	Field pussytoes	n	G,O,P	V		V
<i>Antennaria parlinii</i>	Plantainleaf pussytoes	n	F	V		V
<i>Arctium minus</i>	Common burdock	i	O		V	R
<i>Artemisia ludoviciana</i>	Louisiana sage	n	O			V
<i>Aster drummondii</i>	Drummond's aster	n	F	V		V
<i>Aster ericoides</i>	Heath aster	n	P		R	V
<i>Aster lanceolatus</i> ssp. <i>simplex</i>	Panicled aster	n	O			R
<i>Aster novae-angliae</i>	New England aster	n	P		R	V
<i>Aster oolentangiensis</i>	Azure aster	n	P			V
<i>Aster pilosus</i>	White aster	n	G,O,P	V	R	V
<i>Aster praealtus</i>	Willowleaf aster	n	F,P		R	V
<i>Bidens aristosa</i> var. <i>retrorsa</i>	Coreopsis beggartick	n	A,O,P		R	V
<i>Bidens bipinnata</i>	Spanish needles	n	O	V		R
<i>Bidens frondosa</i>	Devil's beggartick	n	A	V		V
<i>Bidens vulgata</i>	Tall beggartick	n	A	R		
<i>Cacalia atriplicifolia</i>	Pale Indian plantain	n	F	V	V	V
<i>Cacalia plantaginea</i>	Tuberous Indian plantain	n	P	R		V
<i>Carduus nutans</i>	Musk thistle	i	G,O	V	V	R
<i>Chrysanthemum leucanthemum</i>	Ox-eye daisy	i	G			V
<i>Cirsium altissimum</i>	Tall thistle	n	A,G,O,P	V	R	V
<i>Cirsium undulatum</i>	Wavyleaf thistle	n	P		V	
<i>Cirsium vulgare</i>	Bull thistle	i	O		R	
<i>Conyza canadensis</i>	Horseweed	n	A,O	V	R	V
<i>Coreopsis palmata</i>	Finger coreopsis	n	P	R		V
<i>Echinacea pallida</i>	Pale purple coneflower	n	P	R		V
<i>Eclipta prostrata</i>	Yerba de tajo	n	O			V
<i>Erechtites hieracifolia</i>	American burnweed	n	A	V	V	
<i>Erigeron annuus</i>	Annual fleabane	n	O	V		V
<i>Erigeron philadelphicus</i>	Philadelphia fleabane	n	F	V		V
<i>Erigeron strigosus</i>	Daisy fleabane	n	G,O,P	V	R	V
<i>Eupatorium altissimum</i>	Tall eupatorium	n	G,O,P	V	R	V
<i>Eupatorium perfoliatum</i>	Common boneset	n	A		V	
<i>Eupatorium purpureum</i>	Sweet joe-pye weed	n	F	V		V
<i>Eupatorium rugosum</i>	White snakeroot	n	F	V	R	V
<i>Eupatorium serotinum</i>	Late eupatorium	n	F			R
<i>Euthamia graminifolia</i>	Grassleaf euthamia	n	G		R	V
<i>Euthamia gymnospermoides</i>	Viscid euthamia	n	G,P			V
<i>Gnaphalium obtusifolium</i>	Fragrant cudweed	n	O,P	V	R	V
<i>Gnaphalium purpureum</i>	Purple cudweed	n	P	R		
<i>Grindelia squarrosa</i>	Curlycup gumweed	n	O	R		
<i>Helenium autumnale</i>	Common sneezeweed	n	A		V	R
<i>Helianthus annuus</i>	Common sunflower	n	G,O,P	R	R	V

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Asteraceae, cont.						
<i>Helianthus grosseserratus</i>	Sawtooth sunflower	n	G,P			V
<i>Helianthus hirsutus</i>	Hairy sunflower	n	F	V		V
<i>Helianthus mollis</i>	Ashy sunflower	n	G,P			V
<i>Helianthus rigidus</i>	Stiff sunflower	n	G,P			V
<i>Helianthus tuberosus</i>	Jerusalem artichoke	n	F	R	R	
<i>Heliopsis helianthoides</i> var. <i>scabra</i>	False sunflower	n	F,G	R		V
<i>Hieracium longipilum</i>	Longbeard hawkweed	n	O,P	V		R
<i>Iva annua</i>	Annual sumpweed	n	A	V	R	V
<i>Krigia caespitosa</i>	Dwarf dandelion	n	P			V
<i>Kuhnia eupatorioides</i>	False boneset	n	G,P		R	V
<i>Lactuca canadensis</i>	Canada lettuce	n	O,P	V	R	V
<i>Lactuca floridana</i>	Florida lettuce	n	F	V		R
<i>Lactuca ludoviciana</i>	Louisiana lettuce	n	G,P		R	V
<i>Lactuca saligna</i>	Willowleaf lettuce	i	O	V		V
<i>Lactuca serriola</i>	Prickly lettuce	i	O	V	R	V
<i>Liatris aspera</i>	Rough gayfeather	n	P	R		V
<i>Liatris hirsuta</i>	Hairy gayfeather	n	P	V		V
<i>Liatris punctata</i>	Dotted gayfeather	n	P		V	
<i>Liatris pycnostachya</i>	Thickspike gayfeather	n	G,P			V
<i>Prenanthes aspera</i>	Rough whitelettuce	n	P			V
<i>Pyrrhopappus carolinianus</i>	Carolina false dandelion	n	O	V	R	V
<i>Ratibida columnifera</i>	Yellow prairie coneflower	n	P			R
<i>Ratibida pinnata</i>	Grayhead prairie coneflower	n	G,P	V		V
<i>Rudbeckia hirta</i> var. <i>pulcherrima</i>	Black-eyed susan	n	G,O,P	V	R	V
<i>Rudbeckia laciniata</i>	Golden glow	n	A		V	
<i>Silphium integrifolium</i>	Wholeleaf rosinweed	n	P	V		R
<i>Silphium laciniatum</i>	Compass plant	n	G,P	V		V
<i>Silphium perfoliatum</i>	Cupleaf rosinweed	n	A	V	V	
<i>Solidago canadensis</i> var. <i>hargerii</i>	Harger's Canada goldenrod	n	O,P	V		
<i>Solidago canadensis</i> var. <i>scabra</i>	Rough Canada goldenrod	n	O,P	R	R	V
<i>Solidago gigantea</i>	Giant goldenrod	n	P	V	V	V
<i>Solidago missouriensis</i>	Prairie goldenrod	n	G,P		R	V
<i>Solidago nemoralis</i>	Gray goldenrod	n	O,P	V		V
<i>Solidago petiolaris</i> var. <i>angusta</i>	Downy goldenrod	n	G			R
<i>Solidago rigida</i>	Stiff goldenrod	n	G,P			V
<i>Solidago ulmifolia</i> var. <i>ulmifolia</i>	Elmleaf goldenrod	n	F	V		V
<i>Sonchus asper</i>	Prickly sowthistle	i	A,O	V		
<i>Taraxacum erythrospermum</i>	Redseed dandelion	i	O			R
<i>Taraxacum officinale</i>	Common dandelion	i	O	V	R	V
<i>Tragopogon dubius</i>	Goat's beard	i	O	V	R	V
<i>Tragopogon pratensis</i>	Meadow salsify	i	O			R
<i>Verbesina alternifolia</i>	Wingstem crownbeard	n	A,F	V	V	R
<i>Vernonia baldwinii</i> ssp. <i>interior</i>	Inland ironweed	n	F,G,O,P	V	R	V
<i>Xanthium strumarium</i>	Cocklebur	n	A,O	V		R
Balsaminaceae						
<i>Impatiens capensis</i>	Spotted touch-me-not	n	A	V	V	
<i>Impatiens pallida</i>	Pale touch-me-not	n	A	V		
Berberidaceae						
<i>Podophyllum peltatum</i>	Mayapple	n	F	V		V
Betulaceae						
<i>Corylus americana</i>	American hazelnut	n	F	V		V
<i>Ostrya virginiana</i>	Ironwood	n	F	V		R

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
<b>Bignoniaceae</b>						
<i>Campsis radicans</i>	Trumpet creeper	i	F,O	V		R
<b>Boraginaceae</b>						
<i>Cynoglossum officinale</i>	Common houndstongue	i	A,F	V		R
<i>Hackelia virginiana</i>	Virginia stickseed	n	F	V	V	V
<i>Lappula squarrosa</i>	European stickseed	n	O			R
<i>Lithospermum arvense</i>	Corn gromwell	i	O	V		R
<i>Lithospermum canescens</i>	Hoary gromwell	n	P	V		V
<i>Lithospermum incisum</i>	Narrowleaf gromwell	n	G,P	R	R	V
<i>Lithospermum latifolium</i>	American gromwell	n	F	V		
<i>Myosotis verna</i>	Forget-me-not	n	P			V
<i>Onosmodium molle</i>	Rough marbleseed	n	G,P			V
<b>Brassicaceae</b>						
<i>Alliaria petiolata</i>	Garlic mustard	i	F	V	V	R
<i>Arabis canadensis</i>	Canada rockcress	n	F	V		V
<i>Arabis shortii</i>	Short's rockcress	n	F		V	
<i>Barbarea vulgaris</i>	Winter cress	i	A,O	V	R	V
<i>Brassica hirta</i>	White mustard	i	O			V
<i>Brassica nigra</i>	Black mustard	i	O	R		
<i>Camelina microcarpa</i>	Smallfruit false flax	i	O,P	V		V
<i>Capsella bursa-pastoris</i>	Shepherd's purse	i	O	R		V
<i>Cardamine concatenata</i>	Toothwort	n	F	V		V
<i>Cardamine parviflora</i> var. <i>arenicola</i>	Smallflower bittercress	n	F	V	V	
<i>Descurainia pinnata</i> var. <i>osmiarum</i>	Tansy mustard	n	F	V	V	V
<i>Descurainia sophia</i>	Flixweed	i	O	R		R
<i>Draba brachycarpa</i>	Shortpod draba	n	P			V
<i>Draba cuneifolia</i>	Wedgeleaf draba	n	P	R		
<i>Erysimum repandum</i>	Bushy wallflower	i	O	R		V
<i>Hesperis matronalis</i>	Dame's rocket	i	O			R
<i>Iodanthus pinnatifidus</i>	Purple rocket	n	F		V	
<i>Lepidium densiflorum</i>	Manyflower peppergrass	i	P	R		R
<i>Lepidium virginicum</i>	Virginia peppergrass	n	G,O,P			V
<i>Nasturtium officinale</i>	Watercress	i	A		V	
<i>Rorippa sessiliflora</i>	Stalkless yellowcress	n	A	V		
<i>Sisymbrium altissimum</i>	Tumbling mustard	i	O	R		
<i>Thlaspi arvense</i>	Field pennycress	i	O	V	R	V
<i>Thlaspi perfoliatum</i>	Perfoliate pennycress	i	O		V	
<b>Cactaceae</b>						
<i>Opuntia humifusa</i>	Eastern pricklypear	n	O			R
<b>Caesalpiiniaceae</b>						
<i>Cercis canadensis</i>	Redbud	n	F	V	V	V
<i>Chamaecrista fasciculata</i>	Showy partridge pea	n	A,O,P	V	R	V
<i>Gleditsia triacanthos</i>	Honey locust	n	F	V	V	R
<i>Gymnocladus dioica</i>	Kentucky coffeetree	n	F	V	V	R
<i>Senna marilandica</i>	Maryland senna	n	G,O	R	V	V
<b>Campanulaceae</b>						
<i>Campanula americana</i>	American bellflower	n	A,F	V		V
<i>Lobelia inflata</i>	Indian tobacco	n	A,F	V		
<i>Lobelia siphilitica</i>	Blue lobelia	n	A	V	R	R
<i>Lobelia spicata</i>	Palespike lobelia	n	P			R

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Campanulaceae, cont.						
<i>Triodanis leptocarpa</i>	Slimpod Venus' looking-glass	n	P	R		V
<i>Triodanis perfoliata</i>	Clasping-leaf Venus' looking-glass	n	A,P	V		V
Cannabaceae						
<i>Cannabis sativa</i> var. <i>sativa</i>	Hemp	i	O	R	V	R
<i>Humulus lupulus</i> var. <i>pubescens</i>	Hairy hops	n	A,F	V	V	V
Capparaceae						
<i>Polanisia dodecandra</i> var. <i>trachysperma</i>	Clammyweed	n	P			R
Caprifoliaceae						
<i>Lonicera dioica</i>	Limber honeysuckle	n	F	V		
<i>Lonicera japonica</i>	Japanese honeysuckle	i	O	V		V
<i>Sambucus canadensis</i>	Common elderberry	n	A,F	R	R	V
<i>Symphoricarpos orbiculatus</i>	Buckbrush	n	F,G,P	V	R	V
<i>Triosteum perfoliatum</i> var. <i>aurantiacum</i>	Orange horsegentian	n	F			R
<i>Triosteum perfoliatum</i> var. <i>perfoliatum</i>	Common horsegentian	n	F	V	R	V
<i>Viburnum prunifolium</i>	Blackhaw	n	F			V
Caryophyllaceae						
<i>Arenaria serpyllifolia</i>	Thymeleaf sandwort	i	A,O	V		
<i>Cerastium fontanum</i> ssp. <i>triviale</i>	Common chickweed	n	O	V		V
<i>Dianthus armeria</i>	Deptford pink	i	G,O,P		V	R
<i>Paronychia canadensis</i>	Canada nailwort	n	F	V		
<i>Paronychia fastigiata</i>	Forked nailwort	n	F	V		
<i>Saponaria officinalis</i>	Soapwort	i	O			V
<i>Silene antirrhina</i>	Sleepy catchfly	n	G,O,P	V	R	V
<i>Silene stellata</i>	Starry campion	n	F	V		V
<i>Stellaria media</i>	Common chickweed	i	A,O	V	V	R
Celastraceae						
<i>Celastrus scandens</i>	American bittersweet	n	F	V	R	V
<i>Euonymus atropurpureus</i>	Wahoo	n	F	V	V	R
Chenopodiaceae						
<i>Chenopodium album</i>	Lamb's-quarters	i	O	R		R
<i>Chenopodium ambrosioides</i>	Mexican tea	i	O	V		
<i>Chenopodium berlandieri</i> var. <i>zschackei</i>	Pitseed goosefoot	n	O,P		R	V
<i>Chenopodium simplex</i>	Mapleleaf goosefoot	n	F	V	R	R
<i>Chenopodium standleyanum</i>	Standley's goosefoot	n	F	V		R
<i>Cycloloma atriplicifolium</i>	Winged pigweed	n	O			R
Cistaceae						
<i>Lechea tenuifolia</i> var. <i>occidentalis</i>	Narrowleaf pinweed	n	P	V		
Clusiaceae						
<i>Hypericum mutilum</i>	Dwarf St. John's-wort	n	F	V		
<i>Hypericum perforatum</i>	Common St. John's-wort	i	G,O,P	V		V
<i>Hypericum punctatum</i>	Spotted St. John's-wort	n	G,O,P	V	R	V
Commelinaceae						
<i>Commelina communis</i>	Common dayflower	i	A,O	V	V	V
<i>Commelina virginica</i>	Virginia dayflower	n	F	R		
<i>Tradescantia bracteata</i>	Bracted spiderwort	n	P	R		R
<i>Tradescantia ohioensis</i>	Ohio spiderwort	n	P	V	R	V
Convolvulaceae						
<i>Calystegia sepium</i>	Hedge bindweed	n	O	R		
<i>Convolvulus arvensis</i>	Field bindweed	i	O		R	V
<i>Ipomoea hederacea</i>	Ivyleaf morning-glory	i	O	V	R	

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Convolvulaceae, cont.						
<i>Ipomoea lacunosa</i>	White morning-glory	n	O	V		V
<i>Ipomoea pandurata</i>	Bigroot morning-glory	n	P			V
<i>Ipomoea purpurea</i>	Common morning-glory	i	O	R		
Cornaceae						
<i>Cornus amomum</i> ssp. <i>obliqua</i>	Pale dogwood	n	F	V		R
Cornaceae						
<i>Cornus drummondii</i>	Roughleaf dogwood	n	F,G,O,P	V	R	V
Crassulaceae						
<i>Penthorum sedoides</i>	Ditch stonecrop	n	A	V		V
Cucurbitaceae						
<i>Sicyos angulatus</i>	Bur cucumber	n	A,F		R	V
Cupressaceae						
<i>Juniperus virginiana</i>	Red cedar	n	F,G,O	V	R	V
Cuscutaceae						
<i>Cuscuta cephalanthi</i>	Buttonbush dodder	n	F	V		
<i>Cuscuta glomerata</i>	Cluster dodder	n	G,P			V
<i>Cuscuta polygonorum</i>	Smartweed dodder	n	O			V
Cyperaceae						
<i>Bulbostylis capillaris</i>	Hairsedge bulbstyle	n	A	R		
<i>Carex albicans</i> var. <i>albicans</i>	White-tinged sedge	n	F	V		
<i>Carex amphibola</i> var. <i>turgida</i>	Narrowleaf sedge	n	F	V	R	V
<i>Carex annectens</i>	Yellowfruit sedge	n	A,P		V	R
<i>Carex bicknellii</i>	Bicknell's sedge	n	F			R
<i>Carex blanda</i>	Woodland sedge	n	F	V		R
<i>Carex brevior</i>	Straw sedge	n	A,G,P	R	V	V
<i>Carex bushii</i>	Bush's sedge	n	P	V		V
<i>Carex cephalophora</i>	Woodbank sedge	n	F	V		
<i>Carex conjuncta</i>	Soft fox sedge	n	A,F			V
<i>Carex davisii</i>	Davis' sedge	n	F	V	R	V
<i>Carex emoryi</i>	Emory's sedge	n	A			R
<i>Carex frankii</i>	Frank's sedge	n	A	V		V
<i>Carex granularis</i> var. <i>granularis</i>	Meadow sedge	n	A	V		
<i>Carex gravida</i> var. <i>lunelliana</i>	Lunell's heavy sedge	n	A,F,G,P	V	V	V
<i>Carex hirsutella</i>	Hirsute sedge	n	F	V		
<i>Carex hyalinolepis</i>	Thinscale sedge	n	A			R
<i>Carex jamesii</i>	James' sedge	n	F	V		
<i>Carex lanuginosa</i>	Woolly sedge	n	A		V	
<i>Carex leavenworthii</i>	Leavenworth's sedge	n	F	R		
<i>Carex meadii</i>	Mead's sedge	n	P		R	V
<i>Carex molestia</i>	Disturbed sedge	n	A	R		
<i>Carex muhlenbergii</i> var. <i>australis</i>	Southern Muhlenberg's sedge	n	A	V		
<i>Carex muhlenbergii</i> var. <i>enervis</i>	Nerveless Muhlenberg's sedge	n	A	V		
<i>Carex oligocarpa</i>	Few-fruit sedge	n	F	V		
<i>Carex retroflexa</i>	Reflexed-fruit sedge	n	F	V		
<i>Carex rosea</i>	Rosy sedge	n	F	V		
<i>Carex sparganioides</i>	Bur-reed sedge	n	F	V		
<i>Carex umbellata</i>	Umbellate sedge	n	P	V		
<i>Carex vulpinoidea</i>	Fox sedge	n	A			R
<i>Cyperus acuminatus</i>	Tapeleaf flatsedge	n	A,O	R		V
<i>Cyperus erythrorhizos</i>	Redroot flatsedge	n	A			V
<i>Cyperus esculentus</i>	Yellow nutsedge	n	O	R		
<i>Cyperus lupulinus</i>	Slenderstem flatsedge	n	G,O,P		R	V

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Cyperaceae, cont.						
<i>Cyperus odoratus</i>	Slender flatsedge	n	A			V
<i>Cyperus strigosus</i>	False nutsedge	n	A		V	V
<i>Eleocharis macrostachya</i>	Longstem spikesedge	n	A		R	V
<i>Eleocharis obtusa</i>	Blunt spikesedge	n	A	R		V
<i>Eleocharis xyridiformis</i>	Irisleaf spikesedge	n	A			V
<i>Fimbristylis puberula</i>	Marsh fimbry	n	P			V
Cyperaceae						
<i>Scirpus atrovirens</i>	Green bulrush	n	A	V	V	V
<i>Scirpus pendulus</i>	Drooping bulrush	n	A,P	V		V
<i>Scirpus validus</i>	Softstem bulrush	n	A			V
<i>Scleria triglomerata</i>	Whip razorsedge	n	G,P			V
Ebenaceae						
<i>Diospyros virginiana</i>	Persimmon	n	F	R		R
Equisetaceae						
<i>Equisetum hyemale</i>	Common scouring rush	n	A,F	V		
<i>Equisetum x ferrissii</i>	Intermediate scouring rush	n	A		V	
Euphorbiaceae						
<i>Acalypha gracilens</i> ssp. <i>monococca</i>	Slender copperleaf	n	A	V		
<i>Acalypha ostryaefolia</i>	Hophornbeam copperleaf	n	O		V	
<i>Acalypha rhomboidea</i>	Rhombic copperleaf	n	O	V	V	V
<i>Acalypha virginica</i>	Virginia copperleaf	n	G,O,P	V	R	V
<i>Croton capitatus</i>	Woolly croton	n	G,O,P	V	R	V
<i>Croton glandulosus</i>	Tropic croton	n	O		R	
<i>Croton monanthogynus</i>	Oneseed croton	n	O,P	V	R	V
<i>Euphorbia corollata</i>	Flowering spurge	n	G,P	R	R	V
<i>Euphorbia cyathophora</i>	Painted spurge	n	O	V	R	V
<i>Euphorbia dentata</i>	Toothed spurge	n	G,O	V	R	V
<i>Euphorbia maculata</i>	Spotted spurge	n	O,P	V	R	V
<i>Euphorbia marginata</i>	Snow-on-the-mountain	n	O,P	R	R	V
<i>Euphorbia missurica</i>	Missouri spurge	n	O		R	
<i>Euphorbia nutans</i>	Nodding spurge	n	G,O	V	R	V
<i>Euphorbia prostrata</i>	Prostrate spurge	i	O	V		
<i>Euphorbia serpens</i>	Roundleaf spurge	n	O	V		R
<i>Tragia betonicifolia</i>	Nettleleaf noseburn	n	P		R	V
Fabaceae						
<i>Amorpha canescens</i>	Leadplant	n	P	R	R	V
<i>Amorpha fruticosa</i>	False indigo	n	A		R	
<i>Amphicarpaea bracteata</i>	Southern hogpeanut	n	F	V		V
<i>Apios americana</i>	American potatobean	n	A,F	R		V
<i>Astragalus canadensis</i>	Canada milkvetch	n	F	R		
<i>Astragalus crassicaarpus</i>	Groundplum milkvetch	n	P		V	
<i>Baptisia bracteata</i> var. <i>glabrescens</i>	Plains wildindigo	n	P	R	R	V
<i>Baptisia lactea</i>	White wildindigo	n	G,P		R	V
<i>Crotalaria sagittalis</i>	Rattlebox	n	P	R		V
<i>Dalea candida</i>	White prairieclover	n	P			V
<i>Dalea purpurea</i> var. <i>purpurea</i>	Purple prairieclover	n	P	V		V
<i>Desmodium cuspidatum</i>	Longleaf tickclover	n	F	V		
<i>Desmodium glutinosum</i>	Largeflower tickclover	n	F	V		V
<i>Desmodium illinoense</i>	Illinois tickclover	n	G,P		R	V
<i>Desmodium paniculatum</i>						
var. <i>paniculatum</i>	Panicled tickclover	n	F,O	V	R	V
<i>Desmodium sessilifolium</i>	Sessileleaf tickclover	n	P	R	R	V

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Fabaceae, cont.						
<i>Lathyrus pusillus</i>	Singletery vetchling	i	O			V
<i>Lespedeza capitata</i>	Roundhead lespedeza	n	P			V
<i>Lespedeza stipulacea</i>	Korean lespedeza	i	G,O	V	R	V
<i>Lespedeza striata</i>	Japanese lespedeza	i	O			R
<i>Lespedeza violacea</i>	Prairie lespedeza	n	F,P	V	R	V
<i>Lespedeza virginica</i>	Slenderbush lespedeza	n	P	V		
<i>Medicago lupulina</i>	Black medic	i	O	V		R
<i>Medicago sativa</i> ssp. <i>sativa</i>	Alfalfa	i	G,O	V		
<i>Melilotus alba</i>	White sweetclover	i	G,O	V	R	V
<i>Melilotus officinalis</i>	Yellow sweetclover	i	G,O	V		V
<i>Pedimelum esculentum</i>	Tall breadroot scurfpea	n	P		R	V
<i>Psoraleidum tenuiflorum</i>	Manyflower scurfpea	n	P	V		V
<i>Robinia pseudo-acacia</i>	Black locust	i	F,O	V		R
<i>Strophostyles leiosperma</i>	Slickseed bean	n	P		R	R
<i>Trifolium campestre</i>	Low hopclover	i	O			V
<i>Trifolium hybridum</i>	Alsike clover	i	O			V
<i>Trifolium pratense</i>	Red clover	i	G,O	V		V
<i>Trifolium repens</i>	White clover	i	O	V	V	V
<i>Vicia villosa</i>	Hairy vetch	i	O		R	V
Fagaceae						
<i>Quercus alba</i>	White oak	n	F	V		
<i>Quercus borealis</i> var. <i>maxima</i>	Red oak	n	F	V	R	V
<i>Quercus macrocarpa</i>	Bur oak	n	F	V		V
<i>Quercus marilandica</i>	Blackjack oak	n	F	V	V	
<i>Quercus muehlenbergii</i>	Chinquapin oak	n	F	V	R	V
<i>Quercus prinoides</i>	Dwarf chinquapin oak	n	F	V		R
<i>Quercus shumardii</i>	Shumard's oak	n	F	R		
<i>Quercus stellata</i>	Post oak	n	F	V	V	
<i>Quercus velutina</i>	Black oak	n	F	V	R	V
Fumariaceae						
<i>Corydalis flavula</i>	Yellow corydalis	n	F	V		V
<i>Dicentra cucullaria</i>	Dutchman's breeches	n	F	V		V
Gentianaceae						
<i>Gentiana flavida</i>	White gentian	n	P	V		
<i>Gentiana puberulenta</i>	Downy gentian	n	P		R	V
Geraniaceae						
<i>Geranium carolinianum</i>	Carolina cranesbill	n	G,O,P	R	R	V
Grossulariaceae						
<i>Ribes missouriense</i>	Missouri gooseberry	n	F,O	V	R	V
Hippocastanaceae						
<i>Aesculus glabra</i> var. <i>arguta</i>	Western buckeye	n	F	V		R
Hydrophyllaceae						
<i>Ellisia nyctelea</i>	Waterpod	n	A,F	V	V	
<i>Hydrophyllum virginianum</i>	Virginia waterleaf	n	F	V		
Iridaceae						
<i>Iris x germanica</i>	Blue flag iris	i	O			V
<i>Sisyrinchium campestre</i>	White-eyed grass	n	P	V		V
Juglandaceae						
<i>Carya cordiformis</i>	Bitternut hickory	n	F	V	V	
<i>Carya laciniosa</i>	Kingnut hickory	n	F	V		V
<i>Carya ovata</i>	Shagbark hickory	n	F	V	R	V

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Juglandaceae, cont.						
<i>Carya tomentosa</i>	Mockernut hickory	n	F	R		
<i>Juglans nigra</i>	Black walnut	n	F	V	V	V
Juncaceae						
<i>Juncus interior</i>	Inland rush	n	A,G	V		V
<i>Juncus marginatus</i>	Shore rush	n	A	V		
<i>Juncus tenuis</i>	Path rush	n	A,O	V		
<i>Juncus torreyi</i>	Torrey's rush	n	A	V		V
Lamiaceae						
<i>Agastache nepetoides</i>	Catnip gianthyssop	n	F	V	R	V
<i>Hedeoma hispidum</i>	Rough false pennyroyal	n	G,O,P			V
<i>Hedeoma pulegioides</i>	American false pennyroyal	n	P	V		
<i>Lamium amplexicaule</i>	Henbit	i	O	R	R	V
<i>Lamium purpureum</i>	Deadnettle	i	O	V		
<i>Leonurus marrubiastrum</i>	Hoarhound motherwort	i	O	V		
<i>Lycopus americanus</i>	American bugleweed	n	A	R		V
<i>Lycopus virginicus</i>	Virginia bugleweed	n	A		R	
<i>Monarda fistulosa</i> var. <i>fistulosa</i>	Wild beebalm	n	F	V	R	V
<i>Nepeta cataria</i>	Catnip	i	O	R		V
<i>Prunella vulgaris</i> var. <i>lanceolata</i>	Self-heal	n	F	V	V	V
<i>Pycnanthemum tenuifolium</i>	Slender mountainmint	n	P	V	R	V
<i>Salvia azurea</i>	Pitcher's sage	n	P		R	V
<i>Salvia reflexa</i>	Lanceleaf sage	n	P			R
<i>Scutellaria parvula</i> var. <i>australis</i>	Southern small skullcap	n	P	V		
<i>Scutellaria parvula</i> var. <i>leonardii</i>	Leonard's small skullcap	n	P			V
<i>Stachys tenuifolia</i>	Slenderleaf betony	n	A,F	V		
<i>Teucrium canadense</i> var. <i>canadense</i>	Canada germander	n	G,O	V	R	V
Lemnaceae						
<i>Lemna minor</i>	Common duckweed	n	A			V
<i>Spirodela polyrrhiza</i>	Giant duckweed	n	A			V
Liliaceae						
<i>Allium canadense</i> var. <i>canadense</i>	Common Canada onion	n	O,P	V		V
<i>Allium canadense</i> var. <i>lavendulare</i>	Lavender Canada onion	n	P	V	R	R
<i>Allium vineale</i>	Wild garlic	i	G,O	V		V
<i>Asparagus officinalis</i>	Asparagus	i	O	V	R	V
<i>Camassia scilloides</i>	Eastern camass	n	P	R		
<i>Erythronium albidum</i>	White fawnlily	n	F	V		V
<i>Erythronium mesochoreum</i>	Prairie fawnlily	n	F,P	V	V	V
<i>Hemerocallis fulva</i>	Daylily	i	F	V		V
<i>Hypoxis hirsuta</i>	Yellow stargrass	n	P		R	V
<i>Lilium canadense</i> ssp. <i>michiganense</i>	Michigan lily	n	F	R		V
<i>Melanthium virginicum</i>	Virginia bunchflower	n	P	R		
<i>Polygonatum biflorum</i>	Solomon's seal	n	F	V		V
Linaceae						
<i>Linum sulcatum</i>	Grooved flax	n	G,P			V
Loasaceae						
<i>Mentzelia oligosperma</i>	Stickleaf mentzelia	n	O			R
Lythraceae						
<i>Ammannia coccinea</i>	Purple toothcup	n	A			V
<i>Cuphea viscosissima</i>	Blue waxweed	n	A,F	R		V
<i>Lythrum alatum</i>	Winged loosestrife	n	A	R	V	V
<i>Lythrum salicaria</i>	Purple loosestrife	i	A			V

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
<b>Malvaceae</b>						
<i>Abutilon theophrasti</i>	Velvetleaf	i	O	R	V	V
<i>Hibiscus trionum</i>	Flower-of-an-hour	i	O	V	R	V
<i>Malva neglecta</i>	Common mallow	i	O	R		
<i>Malva rotundifolia</i>	Roundleaf mallow	i	O	R		
<i>Sida spinosa</i>	Prickly sida	i	O	V		V
<b>Menispermaceae</b>						
<i>Menispermum canadense</i>	Moonseed	n	F	V	R	V
<b>Mimosaceae</b>						
<i>Desmanthus illinoensis</i>	Illinois bundleflower	n	O,P	V	R	V
<i>Schrankia nuttallii</i>	Catclaw sensitive briar	n	P	R	R	
<b>Molluginaceae</b>						
<i>Mollugo verticillata</i>	Carpetweed	i	O	R	V	V
<b>Monotropaceae</b>						
<i>Monotropa hypopithys</i>	Pinesap	n	F	V		
<i>Monotropa uniflora</i>	Indian pipe	n	F	V		
<b>Moraceae</b>						
<i>Maclura pomifera</i>	Osage orange	i	F,O	V	V	R
<i>Morus alba</i>	White mulberry	i	F,O	V	R	V
<i>Morus rubra</i>	Red mulberry	n	F	V	R	R
<b>Najadaceae</b>						
<i>Najas guadalupensis</i>	Southern naiad	n	A			V
<b>Nyctaginaceae</b>						
<i>Mirabilis albida</i>	White four-o'clock	n	P		R	V
<i>Mirabilis nyctaginea</i>	Wild four-o'clock	n	G,O	R		V
<b>Oleaceae</b>						
<i>Forsythia suspensa</i>	Forsythia	i	O			R
<i>Fraxinus americana</i>	White ash	n	F	V	R	V
<i>Fraxinus pennsylvanica</i>	Green ash	n	F	R	V	V
<i>Ligustrum sinense</i>	Chinese privet	i	O	V		
<i>Syringa vulgaris</i>	Lilac	i	O			R
<b>Onagraceae</b>						
<i>Circaea lutetiana</i> ssp. <i>canadensis</i>	Enchanter's nightshade	n	F	V		V
<i>Epilobium coloratum</i>	Narrowleaf willowherb	n	A		V	
<i>Gaura longiflora</i>	Largeflower gaura	n	G,O,P	R		V
<i>Gaura parviflora</i>	Velvety gaura	n	O	V		R
<i>Ludwigia palustris</i>	Marsh seedbox	n	A			R
<i>Oenothera biennis</i>	Common eveningprimrose	n	O	V		R
<i>Oenothera speciosa</i>	Showy white eveningprimrose	n	O	R		V
<i>Oenothera villosa</i>	Hairy eveningprimrose	n	P			V
<i>Stenosiphon linifolius</i>	Stenosiphon	n	P			R
<b>Ophioglossaceae</b>						
<i>Botrychium dissectum</i>	Cutleaf grapefern	n	F	V		V
<i>Botrychium virginianum</i>	Rattlesnake fern	n	F	V	R	V
<i>Ophioglossum engelmannii</i>	Limestone adder's-tongue	n	P			V
<b>Orchidaceae</b>						
<i>Corallorhiza odontorhiza</i>	Late coralroot	n	F	V		
<i>Corallorhiza wisteriana</i>	Wister's coralroot	n	F	V		
<i>Cypripedium calceolus</i> var. <i>pubescens</i>	Yellow lady slipper	n	F	V		V
<i>Galearis spectabilis</i>	Showy orchis	n	F	V		
<i>Malaxis unifolia</i>	Green adder's mouth	n	F	V		
<i>Platanthera praeclara</i>	Western prairie fringed orchid	n	P			V
<i>Spiranthes cernua</i>	Nodding ladies'-tresses	n	G,O,P			R

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Orchidaceae, cont.						
<i>Spiranthes ovalis</i>	Oval ladies'-tresses	n	F	V		
<i>Spiranthes tuberosa</i>	Little ladies'-tresses	n	F	V		
<i>Triphora trianthophora</i>	Nodding pogonia	n	F	V		
Oxalidaceae						
<i>Oxalis dillenii</i>	Green wood sorrel	n	G,O,P	V	R	V
<i>Oxalis stricta</i>	Common wood sorrel	n	O	V	R	V
<i>Oxalis violacea</i>	Violet wood sorrel	n	F,P	V	R	V
Phytolaccaceae						
<i>Phytolacca americana</i>	Pokeweed	n	O	V	V	V
Pinaceae						
<i>Pinus sylvestris</i>	Scotch pine	i	O			R
Plantaginaceae						
<i>Plantago aristata</i>	Bottlebrush plantain	n	O,P	V		V
<i>Plantago lanceolata</i>	Buckhorn plantain	i	O	V		R
<i>Plantago major</i>	Common plantain	i	O			R
<i>Plantago patagonica</i>	Patagonian plantain	n	O,P	R		V
<i>Plantago rhodosperma</i>	Redseed plantain	n	P	R		
<i>Plantago rugelii</i>	Rugel's plantain	n	F,O	V		V
<i>Plantago virginica</i>	Paleseed plantain	n	O,P	V		V
Platanaceae						
<i>Platanus occidentalis</i>	Sycamore	n	F	V	V	R
Poaceae						
<i>Aegilops cylindrica</i>	Jointed goatgrass	i	O	R		
<i>Agrostis hyemalis</i>	Ticklegrass	n	P	V		V
<i>Agrostis perennans</i>	Autumn bentgrass	n	F,O	R		
<i>Agrostis stolonifera</i>	Redtop	i	A,O	V	V	V
<i>Alopecurus carolinianus</i>	Carolina foxtail	n	O			V
<i>Andropogon gerardii</i>	Big bluestem	n	G,P	R	R	V
<i>Andropogon scoparius</i>	Little bluestem	n	G,P	R	R	V
<i>Andropogon ternarius</i>	Splitbeard bluestem	n	O			R
<i>Andropogon virginicus</i>	Broomsedge bluestem	n	G,O			R
<i>Aristida basiramea</i>	Forktip threeawn	n	P			V
<i>Aristida oligantha</i>	Prairie threeawn	n	O,P	R		V
<i>Bouteloua curtipendula</i>	Sideoats grama	n	P	R	R	V
<i>Bouteloua hirsuta</i>	Hairy grama	n	P		R	
<i>Bromus inermis</i> ssp. <i>inermis</i>	Smooth brome	i	G,O	V	R	V
<i>Bromus japonicus</i>	Japanese brome	i	G,O	V	R	V
<i>Bromus latiglumis</i>	Earleaf brome	n	O			
<i>Bromus pubescens</i>	Canada brome	n	F	V		R
<i>Bromus tectorum</i>	Downy brome	i	O	R		
<i>Cenchrus longispinus</i>	Longspine sandbur	n	O	V		
<i>Chasmanthium latifolium</i>	Wild oats	n	F	V		
<i>Chloris verticillata</i>	Windmillgrass	n	O	R		
<i>Cinna arundinacea</i>	Stout woodreed	n	F	V		V
<i>Dactylis glomerata</i>	Orchardgrass	i	F,G,O	V	R	V
<i>Danthonia spicata</i>	Poverty oatgrass	n	F	V		
<i>Diarrhena americana</i> var. <i>obovata</i>	American beakgrass	n	F	V		V
<i>Dichanthelium acuminatum</i> var. <i>implicatum</i>	Pointed dichanthelium	n	F,G,P	V	R	V
<i>Dichanthelium clandestinum</i>	Deertongue dichanthelium	n	G,P		V	R
<i>Dichanthelium latifolium</i>	Wideleaf dichanthelium	n	F	V		R
<i>Dichanthelium linearifolium</i>	Slimleaf dichanthelium	n	P	V		

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Poaceae, cont.						
<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	Scribner's dichanthelium	n	G,P	R	R	V
<i>Dichanthelium sphaerocarpon</i>	Roundseed dichanthelium	n	A,P	R		
<i>Digitaria filiformis</i>	Slender crabgrass	n	O	R		
<i>Digitaria ischaemum</i>	Smooth crabgrass	i	O	V		R
<i>Digitaria sanguinalis</i>	Hairy crabgrass	i	O	V		V
<i>Echinochloa colonum</i>	Jungle-rice	i	O			V
<i>Echinochloa crusgalli</i>	Common barnyardgrass	i	A,O	V		R
<i>Echinochloa muricata</i>	Prickly barnyardgrass	n	A,O		V	V
<i>Eleusine indica</i>	Goosegrass	i	O	V		
<i>Elymus canadensis</i>	Canada wildrye	n	F,G,P	R		V
<i>Elymus villosus</i>	Hairy wildrye	n	F	V		
<i>Elymus virginicus</i> var. <i>virginicus</i>	Virginia wildrye	n	F,P	V		V
<i>Eragrostis capillaris</i>	Lacegrass	n	O	R		R
<i>Eragrostis cilianensis</i>	Stinkgrass	i	O	R		V
<i>Eragrostis pectinacea</i>	Carolina lovegrass	n	O	V		
<i>Eragrostis spectabilis</i>	Purple lovegrass	n	O,P	R	V	V
<i>Eriochloa contracta</i>	Prairie cupgrass	n	O	V		V
<i>Festuca arundinacea</i>	Tall fescue	i	G			V
<i>Festuca obtusa</i>	Nodding fescue	n	F	V	R	V
<i>Festuca octoflora</i>	Sixweeks fescue	n	O,P	V		
<i>Festuca ovina</i>	Sheep's fescue	i	O	R		
<i>Festuca paradoxa</i>	Cluster fescue	n	F	V		
<i>Festuca pratensis</i>	Meadow fescue	i	O	V		
<i>Glyceria striata</i>	Fowl mannagrass	n	A	V	V	
<i>Hordeum jubatum</i>	Foxtail barley	n	A,O	R		V
<i>Hordeum pusillum</i>	Little barley	n	O	R		V
<i>Hystrix patula</i>	Bottlebrushgrass	n	F	V		R
<i>Koeleria pyramidata</i>	Junegrass	n	P			V
<i>Leersia oryzoides</i>	Rice cutgrass	n	A			R
<i>Leersia virginica</i>	Whitegrass	n	A	V		V
<i>Leptochloa fascicularis</i>	Bearded sprangletop	n	A			V
<i>Leptochloa filiformis</i>	Red sprangletop	n	O	V		
<i>Leptoloma cognatum</i>	Fall witchgrass	n	G			R
<i>Lolium perenne</i>	Ryegrass	i	O	R		
<i>Melica nitens</i>	Threeflower melic	n	F	V		
<i>Muhlenbergia frondosa</i>	Wirestem muhly	n	F,P	V	R	V
<i>Muhlenbergia racemosa</i>	Marsh muhly	n	A,G,P	R		V
<i>Muhlenbergia schreberi</i>	Schreber's muhly	n	F	R	V	R
<i>Muhlenbergia sobolifera</i>	Rock muhly	n	F	V	R	V
<i>Muhlenbergia sylvatica</i>	Forest muhly	n	F	V		R
<i>Panicum capillare</i>	Common witchgrass	n	G,O	R	R	V
<i>Panicum dichotomiflorum</i>	Fall panicum	n	G,O	V		V
<i>Panicum virgatum</i>	Switchgrass	n	G,P		R	V
<i>Paspalum laeve</i>	Smooth paspalum	n	G			V
<i>Paspalum pubiflorum</i>	Hairyflower paspalum	n	A,O			R
<i>Paspalum setaceum</i>	Sand paspalum	n	G,O	R		R
<i>Phalaris arundinacea</i>	Reed canarygrass	n	A		V	V
<i>Phleum pratense</i>	Timothy	i	G,O	V		V
<i>Poa compressa</i>	Canada bluegrass	i	G,O,P	V		V
<i>Poa pratensis</i>	Kentucky bluegrass	i	G,O,P	V	R	V
<i>Poa sylvestris</i>	Woodland bluegrass	n	F			V

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Poaceae, cont.						
<i>Schedonnardus paniculatus</i>	Tumblegrass	n	O			V
<i>Secale cereale</i>	Rye	i	O			R
<i>Setaria faberi</i>	Chinese foxtail	i	A,O	V	R	V
<i>Setaria glauca</i>	Yellow foxtail	i	A,O	V		V
<i>Setaria parviflora</i>	Knotroot bristlegrass	n	G,P			V
<i>Setaria viridis</i>	Green foxtail	i	O	V	R	V
<i>Sorghastrum nutans</i>	Indiangrass	n	P			V
<i>Sorghum halepense</i>	Johnsongrass	i	O	V	R	V
<i>Spartina pectinata</i>	Prairie cordgrass	n	A		V	R
<i>Sphenopholis obtusata</i> var. <i>major</i>	Slender wedgegrass	n	A,P	V	R	V
<i>Sporobolus asper</i>	Rough dropseed	n	G,O,P	R	R	V
<i>Sporobolus cryptandrus</i>	Sand dropseed	n	G		R	
<i>Sporobolus heterolepis</i>	Prairie dropseed	n	P			V
<i>Sporobolus neglectus</i>	Puffsheath dropseed	n	O	R		
<i>Sporobolus vaginiflorus</i>	Poverty dropseed	n	O			V
<i>Stipa spartea</i>	Porcupinegrass	n	P			V
<i>Tridens flavus</i>	Purpletop	n	G,O,P	V	R	V
<i>Tripsacum dactyloides</i>	Eastern gammagrass	n	O,P	R	R	V
Polemoniaceae						
<i>Phlox divaricata</i> ssp. <i>laphamii</i>	Sweetwilliam phlox	n	F	V	V	R
<i>Phlox pilosa</i>	Prairie phlox	n	P			V
Polygalaceae						
<i>Polygala verticillata</i>	Whorled milkwort	n	G,P	V		V
Polygonaceae						
<i>Polygonum amphibium</i>	Water smartweed	n	A	R	R	
<i>Polygonum arenastrum</i>	Prostrate knotweed	i	O	V		R
<i>Polygonum convolvulus</i>	Wild buckwheat	i	O			V
<i>Polygonum hydropiper</i>	Waterpepper smartweed	n	A			V
<i>Polygonum hydropiperoides</i>	Mild waterpepper smartweed	n	A		R	V
<i>Polygonum lapathifolium</i>	Pale smartweed	n	A		R	V
<i>Polygonum pensylvanicum</i>	Pennsylvania smartweed	n	A	V		V
<i>Polygonum persicaria</i>	Lady's-thumb smartweed	i	A,O	V		
<i>Polygonum punctatum</i>	Dotted smartweed	n	A	V		R
<i>Polygonum ramosissimum</i>	Bush knotweed	n	A		R	V
<i>Polygonum scandens</i>	Climbing false buckwheat	n	F,O	R	R	R
<i>Polygonum scandens</i> var. <i>dumetorum</i>	Climbing false buckwheat	i	F,O	V		
<i>Polygonum virginianum</i>	Virginia knotweed	n	F	V	V	V
<i>Rumex altissimus</i>	Pale dock	n	A,G	V	R	V
<i>Rumex crispus</i>	Curly dock	i	G,O	R	R	V
Polypodiaceae						
<i>Adiantum pedatum</i>	Maidenhair fern	n	F	V		
<i>Asplenium platyneuron</i>	Ebony spleenwort	n	F	V		V
<i>Cystopteris protrusa</i>	Lowland fragile fern	n	F	V		V
<i>Cystopteris tennesseensis</i>	Tennessee bladder fern	n	F	R		
<i>Woodsia obtusa</i>	Bluntlobe woodsia	n	F	V		
Pontederiaceae						
<i>Heteranthera limosa</i>	Blue mudplantain	n	A			V
<i>Heteranthera rotundifolia</i>	Roundleaf mudplantain	n	A			V
Portulacaceae						
<i>Claytonia virginica</i>	Virginia springbeauty	n	F	V		
<i>Portulaca oleracea</i>	Common purslane	i	O			V

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Potamogetonaceae						
<i>Potamogeton diversifolius</i>	Waterthread pondweed	n	A			V
<i>Potamogeton foliosus</i>	Leafy pondweed	n	A			V
<i>Potamogeton nodosus</i>	Longleaf pondweed	n	A			V
<i>Potamogeton pusillus</i>	Baby pondweed	n	A			V
Primulaceae						
<i>Anagallis arvensis</i>	Scarlet pimpernel	i	O			V
<i>Androsace occidentalis</i>	Western rockjasmine	n	O			R
<i>Lysimachia nummularia</i>	Moneywort	n	A	V		
Ranunculaceae						
<i>Anemone canadensis</i>	Meadow anemone	n	A			R
<i>Anemone virginiana</i>	Tall anemone	n	F	V		V
<i>Anemonella thalictroides</i>	Rue anemone	n	F	V		
<i>Delphinium carolinianum</i> ssp. <i>virescens</i>	Prairie larkspur	n	P	R	R	V
<i>Delphinium tricorne</i>	Dwarf larkspur	n	F	V		V
<i>Isopyrum biternatum</i>	False rue anemone	n	F	V	R	R
<i>Myosurus minimus</i>	Mousetail	n	O	R		
<i>Ranunculus abortivus</i>	Littleleaf buttercup	n	F	V	V	V
<i>Ranunculus hispidus</i> var. <i>hispidus</i>	Bristly buttercup	n	F	R		
<i>Ranunculus recurvatus</i>	Hooked buttercup	n	F	V		
<i>Ranunculus sceleratus</i>	Cursed crowfoot	n	A			V
<i>Thalictrum dasycarpum</i>	Purple meadowrue	n	F	V		V
Rhamnaceae						
<i>Ceanothus americanus</i> var. <i>pitcheri</i>	New Jersey tea	n	P	R		
<i>Ceanothus herbaceus</i> var. <i>pubescens</i>	Inland ceanothus	n	P	R		V
<i>Rhamnus lanceolata</i> var. <i>glabrata</i>	Lanceleaf buckthorn	n	F	R		V
Rosaceae						
<i>Agrimonia parviflora</i>	Smallflower agrimony	n	F	V	V	V
<i>Agrimonia pubescens</i>	Downy agrimony	n	F	V		R
<i>Agrimonia rostellata</i>	Woodland agrimony	n	F	V		
<i>Crataegus crus-galli</i>	Cockspur hawthorn	n	F,O	R		R
<i>Crataegus mollis</i>	Downy hawthorn	n	F,O	R	V	V
<i>Fragaria virginiana</i>	Wild strawberry	n	G,O,P	V		V
<i>Geum canadense</i>	White avens	n	F,O	V	R	V
<i>Geum vernum</i>	Heartleaf avens	n	F	V		R
<i>Potentilla norvegica</i>	Norwegian cinquefoil	n	P			R
<i>Potentilla recta</i>	Sulphur cinquefoil	i	G,O,P	V		V
<i>Potentilla rivalis</i>	Brook cinquefoil	n	A			V
<i>Potentilla simplex</i>	Old-field cinquefoil	n	F	V		V
<i>Prunus americana</i>	American plum	n	F,G		V	R
<i>Prunus angustifolia</i>	Chickasaw plum	n	F			R
<i>Prunus hortulana</i>	Hortulan plum	n	F			R
<i>Prunus mexicana</i>	Mexican plum	n	F,G		R	V
<i>Prunus persica</i>	Peach	i	F,O	V		R
<i>Prunus serotina</i>	Black cherry	n	F	V	R	V
<i>Prunus virginiana</i>	Choke cherry	n	F	R		
<i>Pyrus communis</i>	Pear	i	O			V
<i>Pyrus ioensis</i>	Iowa crab	n	F	R	V	V
<i>Pyrus malus</i>	Apple	i	O			
<i>Rosa arkansana</i>	Arkansas rose	n	G,P		R	V
<i>Rosa multiflora</i>	Multiflora rose	i	G,O		R	V
<i>Rosa setigera</i>	Climbing rose	n	F,G,O	V	V	V

**VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)**

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
<b>Rosaceae, cont.</b>						
<i>Rubus allegheniensis</i>	Common blackberry	n	F,O	V		
<i>Rubus flagellaris</i>	Northern dewberry	n	F,P	V	R	V
<i>Rubus occidentalis</i>	Black raspberry	n	F	V	V	R
<i>Rubus ostryifolius</i>	Highbush blackberry	n	F,G,O	V		V
<i>Rubus pensilvanicus</i>	Pensylvania blackberry	n	F,O	V		
<i>Spirea prunifolia</i>	Bridal-wreath	i	O			R
<b>Rubiaceae</b>						
<i>Galium aparine</i>	Catchweed bedstraw	n	F,G,O	V	R	V
<i>Galium circaeazans</i>	Woods bedstraw	n	F	V		V
<i>Galium concinnum</i>	Shining bedstraw	n	F	V		
<i>Galium obtusum</i>	Bluntleaf bedstraw	n	F	R	V	V
<i>Hedyotis crassifolia</i>	Small bluets	n	G,P			V
<b>Rutaceae</b>						
<i>Zanthoxylum americanum</i>	Prickly ash	n	F,O	V	R	V
<b>Salicaceae</b>						
<i>Populus deltoides</i> ssp. <i>monilifera</i>	Plains cottonwood	n	A,F	R	R	V
<i>Salix amygdaloides</i>	Peachleaf willow	n	A,F	R		V
<i>Salix eriocephala</i>	Diamond willow	n	A			R
<i>Salix exigua</i>	Sandbar willow	n	A			R
<i>Salix humilis</i>	Dwarf prairie willow	n	P			V
<i>Salix nigra</i>	Black willow	n	A,F	R	V	
<b>Santalaceae</b>						
<i>Comandra umbellata</i> ssp. <i>pallida</i>	Pale bastard toadflax	n	P	R		
<i>Comandra umbellata</i> ssp. <i>umbellata</i>	Bastard toadflax	n	P	V		V
<b>Saxifragaceae</b>						
<i>Heuchera richardsonii</i>	Alumroot	n	F	R		
<b>Scrophulariaceae</b>						
<i>Agalinis tenuifolia</i>	Slender agalinis	n	P	R		
<i>Dasistoma macrophylla</i>	Mullein foxglove	n	F,P	V	R	V
<i>Leucospora multifida</i>	Paleseed	n	A	V		V
<i>Lindernia dubia</i>	Yellow falsepimpernel	n	A			V
<i>Mimulus alatus</i>	Sharpwing monkeyflower	n	A	V	R	R
<i>Penstemon cobaea</i> var. <i>cobaea</i>	Cobaea beardtongue	n	P			R
<i>Penstemon digitalis</i>	Smooth beardtongue	n	O	V		
<i>Penstemon tubaefflorus</i>	Tube beardtongue	n	O,P	R		V
<i>Scrophularia marilandica</i>	Maryland figwort	n	F	V	R	V
<i>Tomanthera auriculata</i>	Earleaf foxglove	n	P			V
<i>Verbascum blattaria</i>	Moth mullein	i	G,O	V	R	V
<i>Verbascum thapsus</i>	Woolly mullein	i	O	V	V	V
<i>Veronica agrestis</i>	Wayside speedwell	i	A	V		V
<i>Veronica arvensis</i>	Corn speedwell	i	A,O	V		V
<i>Veronica peregrina</i> var. <i>peregrina</i>	Smooth purslane speedwell	n	A,O	V		V
<i>Veronica peregrina</i> var. <i>xalapensis</i>	Glandular purslane speedwell	n	A,O	V		
<i>Veronicastrum virginicum</i>	Culver's root	n	P		R	V
<b>Simaroubaceae</b>						
<i>Ailanthus altissima</i>	Tree-of-heaven	i	F		V	R
<b>Smilacaceae</b>						
<i>Smilax herbacea</i>	Carrionflower greenbriar	n	F	V		V
<i>Smilax hispida</i>	Bristly greenbriar	n	F	V	V	R

VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
<b>Solanaceae</b>						
<i>Datura stramonium</i>	Jimson weed	n	O			R
<i>Lycium barbatum</i>	Matrimony vine	i	O			V
<i>Physalis heterophylla</i>	Clammy groundcherry	n	O,P	V		R
<i>Physalis longifolia</i>	Spearleaf groundcherry	n	O	V		V
<i>Physalis pubescens</i>	Downy groundcherry	n	O			R
<i>Physalis pumila</i>	Hairy groundcherry	n	P		R	V
<i>Physalis virginiana</i>	Virginia groundcherry	n	O		R	R
<i>Solanum carolinense</i>	Carolina horsenettle	n	G,O,P	V	R	V
<i>Solanum elaeagnifolium</i>	Silverleaf nightshade	n	O	R		
<i>Solanum interius</i>	Plains black nightshade	n	O	V	R	
<i>Solanum ptycanthum</i>	Black nighshade	n	O			R
<i>Solanum rostratum</i>	Buffalo bur nightshade	n	O	R	V	R
<b>Staphyleaceae</b>						
<i>Staphylea trifolia</i>	American bladdernut	n	F	V		V
<b>Tiliaceae</b>						
<i>Tilia americana</i>	American basswood	n	F	V		V
<b>Typhaceae</b>						
<i>Typha angustifolia</i>	Narrowleaf cat-tail	n	A			V
<i>Typha latifolia</i>	Common cat-tail	n	A			V
<b>Ulmaceae</b>						
<i>Celtis laevigata</i>	Sugarberry	n	F	R		
<i>Celtis occidentalis</i>	Common hackberry	n	F	V	V	V
<i>Ulmus americana</i>	American elm	n	F	V	R	V
<i>Ulmus pumila</i>	Siberian elm	i	F,O	V		R
<i>Ulmus rubra</i>	Slippery elm	n	F	V	R	V
<b>Urticaceae</b>						
<i>Boehmeria cylindrica</i>	Bog hemp	n	A	R		V
<i>Laportea canadensis</i>	Wood nettle	n	A,F	V	V	R
<i>Parietaria pensylvanica</i>	Pennsylvania pellitory	n	F	V		R
<i>Pilea pumila</i>	Clearweed	n	A,F	V		
<i>Urtica dioica</i> ssp. <i>gracilis</i>	Stinging nettle	n	A,F	V	V	R
<b>Verbenaceae</b>						
<i>Lippia lanceolata</i>	Lanceleaf frogfruit	n	A		R	V
<i>Phryma leptostachya</i>	Lopseed	n	F	V		V
<i>Verbena bracteata</i>	Prostrate verbena	n	O	V		
<i>Verbena canadensis</i>	Rose verbena	n	O,P	V		V
<i>Verbena hastata</i>	Blue verbena	n	A	V	V	V
<i>Verbena stricta</i>	Woolly verbena	n	O	R	R	R
<i>Verbena urticifolia</i>	Nettleleaf verbena	n	F,G	V	R	V
<b>Violaceae</b>						
<i>Viola pedata</i>	Bird's-foot violet	n	F,P	V		
<i>Viola pedatifida</i>	Prairie violet	n	P		R	V
<i>Viola pratincola</i>	Meadow violet	n	F	V	V	R
<i>Viola pubescens</i>	Downy yellow violet	n	F	V		V
<i>Viola rafinesquii</i>	Johnny-jump-up	n	F,O	V	V	R
<i>Viola sororia</i>	Downy blue violet	n	F	V	R	V
<b>Vitaceae</b>						
<i>Ampelopsis cordata</i>	Raccoon grape	n	F	V	R	V
<i>Parthenocissus inserta</i>	Woodbine	n	F	R		
<i>Parthenocissus quinquefolia</i>	Virginia creeper	n	F	V	R	V
<i>Vitis aestivalis</i>	Pigeon grape	n	F		V	

**VASCULAR PLANTS OF THE KANSAS ECOLOGICAL RESERVES (cont.)**

Family/Genus/Species	Common Name	Origin	Habitat	Occurrence		
				BW	RT	TC
Vitaceae, cont.						
<i>Vitis cinerea</i>	Graybark grape	n	F	V	R	
<i>Vitis riparia</i>	Riverbank grape	n	F	V	R	V
<i>Vitis vulpina</i>	Winter grape	n	F	V		R

## BRYOPHYTES OF THE KANSAS ECOLOGICAL RESERVES

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Bryophytes (Division Bryophyta) consist of three groups of plants: mosses, liverworts, and hornworts. Mosses (Class Musci) are the largest group, worldwide as well as in Kansas. For Kansas there are 166 species of mosses recorded, 66 known taxa of liverworts (Class Hepaticae) and 3 species of hornworts (Class Anthocerotae). At present 84 species of mosses, 24 species of liverworts, and 2 hornworts are recorded for the Kansas Ecological Reserves (KER).

Bryophytes are most numerous in the eastern half of the state, where moisture is more readily available. Mosses and liverworts occur on a variety of substrates: soil, limestone and sandstone outcrops, the bark of living trees, and rotting wood. In Kansas, mosses are more likely to be found in dryer situations than are liverworts and hornworts. Most liverworts and hornworts are found only in moist habitats, but some species are well-adapted to mesic and even xeric conditions. Mosses include species with prostrate, trailing stems as well as those which grow erect, forming tufts or cushions. Liverworts and hornworts differ from mosses in having dorsiventrally flattened, thalloid or leafy plant bodies, and are typically prostrate, growing close to their substrate where water can be effectively absorbed and evaporation is minimized. They also differ from the mosses in the development and morphology of the sporophyte.

The KER is characterized by considerable bryological diversity, which is related to their history, as well as the variety of substrates available. Tracts in the Tri-County area are primarily secondary forest with limestone outcrops, as well as some native prairie, whereas tracts in the Baldwin Woods area are relatively undisturbed mature forest with sandstone outcrops. Several mosses recorded for "Baldwin Woods" represent their only known locality in the state, or are species which are rare in Kansas (although not in the eastern United States generally), such as *Atrichum oerstedianum*, *Bartramia pomiformis*, *Bryhnia graminicolor*, *Bryoandersonia illecebra*, *Diphyscium foliosum*, *Hyophila involuta*, and *Polytrichastrum ohioense*. The Tri-County tracts are the only known locality in the state for *Platydictya confervoides*. Liverworts occurring on KER which are rare in Kansas include *Cephalozia bicuspidata*, *Frullania brittoniae*, *F. squarrosa*, *Geocalyx graveolens*, *Radula obconica*, and *Scapania undulata*.

Douglas County is the most intensively collected county in the state for bryophytes. A favorite locale for class field trips over the years, "Baldwin Woods" has had two earlier lists of bryophytes, one compiled by R. L. McGregor (1966), and one by S. P. Churchill (1982), both unpublished. On the Tri-County tracts, earlier studies include the bryophyte flora of the Fitch Natural History Reservation (Hartman 1956) and a study of prairie bryophytes on the Rockefeller Native Prairie, a native prairie remnant on the Rockefeller Experimental Tract (Duncan 1959). To supplement these earlier lists, we collected bryophytes on the Tri-County tracts (Nelson Environmental Study Area, Rockefeller Native Prairie, Fitch Natural History Reservation) and two KER tracts in Baldwin Woods (Breidenthal Biological Reserve, and Roy and Eleanor Wall Woods) in June of 1991. Two days of intensive collecting resulted in more than a dozen new county moss records and additions to the flora of the Reserves, as well as several additional liverworts (including *Radula obconica*, new to Kansas) and the hornwort *Phaeoceros laevis*.

Voucher specimens of the bryophytes collected by the authors on KER tracts have been deposited in the Reed Bryophyte Herbarium, Kansas State University Herbarium (KSC), or in the Theodore M. Sperry Herbarium, at Pittsburg State University (KST), and a set of duplicate specimens has also been deposited with the Experimental and Applied Ecology Program at the University of Kansas. Hartman's collections from the Fitch Natural History Reservation were formerly in the Emporia State University Herbarium (KSTC); the mosses are now in the Reed Bryophyte Herbarium, and the liverworts at PSC. The bryophyte collections of the University of Kansas Herbarium (KANU) were transferred in 1969 to the New York Botanical Garden (NY). These presumably included the vouchers for the list of McGregor (1966), but none of this material has been examined by the authors in the preparation of this list. The species of mosses from "Baldwin Woods" listed by Churchill (1982) as personally collected or verified have been accepted. Mosses with an asterisk (\*) following the species name have not been seen by the authors but are known to occur in Douglas or Jefferson counties, and are accepted subject to verification. Records which are known to be based on misidentifications have been excluded. Likewise, liverwort and hornwort species followed by an asterisk(\*) are those listed by McGregor (1966) and Hartman (1956), but not personally collected or verified by the authors. Excluded species and taxonomic and nomenclatural changes from earlier lists are available from the authors.

Names of taxa and the sequence of families is based on Anderson et al. (1990) for the mosses, and Stotler and Crandall-Stotler (1977) for liverworts and hornworts. Within families, the genera are presented in alphabetical sequence. The usual substrate for each species is given with S = soil; B = tree bark; W = rotting wood; LS = limestone, and SS = sandstone. Species occurrence (+) is given at the Baldwin Woods area (BW) and the Tri-County area (TC).

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## BRYOPHYTES OF THE KANSAS ECOLOGICAL RESERVES

Family/Species	Substrate	Occurrence	
		BW	TC
MOSSES			
Ditrichaceae			
<i>Ceratodon purpureus</i> *	S	+	
<i>Ditrichum pallidum</i>	S	+	
<i>Pleuridium subulatum</i>	S		+
Dicranaceae			
<i>Dicranella heteromalla</i>	S	+	
<i>Dicranella varia</i>	S	+	
<i>Dicranum condensatum</i>	S	+	
<i>Dicranum scoparium</i>	S	+	
Leucobryaceae			
<i>Leucobryum glaucum</i>	S	+	
Fissidentaceae			
<i>Fissidens bryoides</i>	SS,S,LS	+	+
<i>Fissidens dubius</i>	S	+	
<i>Fissidens obtusifolius</i>	LS,SS	+	+
<i>Fissidens taxifolius</i>	S	+	+
Buxbaumiaceae			
<i>Diphyscium foliosum</i>	S	+	
Pottiaceae			
<i>Astomum muhlenbergianum</i>	S		+
<i>Barbula indica</i>	LS	+	+
<i>Barbula unguiculata</i> *	S	+	
<i>Desmatodon obtusifolius</i>	SS	+	
<i>Desmatodon plinthobius</i>	LS		+
<i>Hyophila involuta</i>	SS	+	
<i>Tortula pagorum</i>	B	+	
<i>Weissia controversa</i>	S	+	+
Grimmiaceae			
<i>Schistidium alpicola</i>	LS,SS	+	+
Funariaceae			
<i>Aphanorrhagma serratum</i>	S	+	
<i>Funaria flavicans</i> *	S	+	
<i>Funaria hygrometrica</i>	S	+	
<i>Physcomitrium collenchymatum</i>	S		+
<i>Physcomitrium pyriforme</i>	S	+	+
Bryaceae			
<i>Bryum argenteum</i>	S	+	+
<i>Bryum caespitium</i> *	S	+	
<i>Bryum lisae</i> var. <i>cuspidatum</i> *	S,W	+	
<i>Bryum pseudotriquetrum</i>	S		+
<i>Pohlia nutans</i>	S	+	
<i>Pohlia wahlenbergii</i>	S	+	
Mniaceae			
<i>Plagiomnium ciliare</i>	S	+	
<i>Plagiomnium cuspidatum</i>	S	+	+
Aulacomniaceae			
<i>Aulacomnium heterostichum</i>	S	+	
Bartramiaceae			
<i>Bartramia pomiformis</i>	S	+	
Timmiaceae			
<i>Timmia megapolitana</i>	S	+	

**BRYOPHYTES OF THE KANSAS ECOLOGICAL RESERVES (cont.)**

Family/Species	Substrate	Occurrence	
		BW	TC
MOSSES, cont.			
Orthotrichaceae			
<i>Orthotrichum pumilum</i>	B	+	+
<i>Orthotrichum pusillum</i>	B	+	+
<i>Orthotrichum strangulatum</i>	LS		+
Anomodontaceae			
<i>Anomodon attenuatus</i>	S,LS,SS	+	+
<i>Anomodon minor</i>	B,S	+	+
<i>Anomodon rostratus</i>	S,LS	+	+
Hedwigiaceae			
<i>Hedwigia ciliata</i> *	SS	+	
Leucodontaceae			
<i>Leucodon julaceus</i>	B	+	
Theliaceae			
<i>Thelia asprella</i>	B	+	+
<i>Thelia lescurii</i>	S	+	
Fabroniaceae			
<i>Fabronia ciliaris</i>	B		+
Leskeaceae			
<i>Bryohaplocladium microphyllum</i>	W		+
<i>Bryohaplocladium virginianum</i>	S	+	
<i>Leskea gracilescens</i>	B,W	+	+
<i>Lindbergia brachyptera</i>	B	+	+
Thuidiaceae			
<i>Thuidium delicatulum</i>	S	+	
<i>Thuidium recognitum</i>	S	+	
Amblystegiaceae			
<i>Amblystegium serpens</i>	S,W	+	+
<i>Amblystegium varium</i>	S,W	+	+
<i>Campylium chrysophyllum</i>	S	+	+
<i>Campylium hispidulum</i>	S	+	
<i>Hygroamblystegium tenax</i>	LS,SS,S	+	+
<i>Leptodictyum humile</i>	S,W	+	+
<i>Leptodictyum riparium</i>	S	+	+
Brachytheciaceae			
<i>Brachythecium acuminatum</i>	B,S,LS	+	+
<i>Brachythecium oxycladon</i>	S	+	+
<i>Bryhnia graminicolor</i>	S	+	
<i>Bryoandersonia illecebra</i>	S	+	
<i>Eurhynchium hians</i>	S	+	+
<i>Eurhynchium pulchellum</i>	S		+
<i>Stereocleus serrulatus</i>	S	+	+
Entodontaceae			
<i>Entodon compressus</i>	W,B	+	+
<i>Entodon seductrix</i>	W,B	+	+
Sematophyllaceae			
<i>Sematophyllum demissum</i>	SS	+	
Hypnaceae			
<i>Homomallium adnatum</i>	LS,SS	+	+
<i>Platydictya confervoides</i>	LS		+
<i>Platygyrium repens</i>	W	+	+

**BRYOPHYTES OF THE KANSAS ECOLOGICAL RESERVES (cont.)**

Family/Species	Substrate	Occurrence	
		BW	TC
<b>MOSSES, cont.</b>			
Hypnaceae, cont.			
<i>Pylaisiella selwynii</i> *	B	+	+
<i>Taxiphyllum deplanatum</i>	S	+	
<i>Taxiphyllum taxirameum</i>	S	+	
Polytrichaceae			
<i>Atrichum angustatum</i>	S	+	+
<i>Atrichum oerstedianum</i>	S	+	
<i>Pogonatum brachyphyllum</i>	S	+	
<i>Polytrichastrum ohioense</i>	S	+	
<i>Polytrichum commune</i>	S	+	
<i>Polytrichum juniperinum</i>	S	+	
<b>HORNWORTS</b>			
Anthocerotaceae			
<i>Anthoceros punctatus</i> *	S	+	
<i>Phaeoceros laevis</i>	S		+
<b>LIVERWORTS</b>			
Cephaloziaceae			
<i>Cephalozia bicuspidata</i> *	S	+	
Cephaloziellaceae			
<i>Cephaloziella hampeana</i> *	S	+	
<i>Cephaloziella rubella</i>	S	+	
Geocalyceae			
<i>Geocalyx graveolens</i> *	S	+	
Lophocoleaceae			
<i>Lophocolea bidentata</i>	W	+	
<i>Lophocolea heterophylla</i> *	W	+	
Jungermanniaceae			
<i>Jamesoniella autumnalis</i> *	S	+	
<i>Jungermannia hyalina</i> *	S	+	
Scapaniaceae			
<i>Scapania nemorosa</i> *	S	+	
<i>Scapania undulata</i>	S	+	
Radulaceae			
<i>Radula obconica</i>	B		+
Jubulaceae			
<i>Frullania brittoniae</i>	B		+
<i>Frullania eboracensis</i> *	B	+	+
<i>Frullania inflata</i>	B	+	+
<i>Frullania riparia</i> *	B	+	+
<i>Frullania squarrosa</i>	B	+	+
Codoniaceae			
<i>Fossombronia brasiliensis</i> *	S	+	
Sphaerocarpaceae			
<i>Sphaerocarpos texanus</i> *	S	+	

**BRYOPHYTES OF THE KANSAS ECOLOGICAL RESERVES (cont.)**

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Family/Species	Substrate	Occurrence	
		BW	TC
LIVERWORTS, cont.			
Aytoniaceae			
<i>Asterella tenella</i>	S	+	+
<i>Reboulia hemisphaerica</i> *	S	+	
Marchantiaceae			
<i>Marchantia polymorpha</i> *	S	+	
Ricciaceae			
<i>Riccia beyrichiana</i>	S	+	+
<i>Riccia hirta</i> *	S	+	+
<i>Riccia lamellosa</i>	S	+	+

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## MACROFUNGI OF THE KANSAS ECOLOGICAL RESERVES

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The term "macrofungus" is used for those fungi with fruiting bodies that are easily seen with the unaided eye. In contrast, "microfungi" typically do not produce fruiting bodies, or their reproductive structures are sufficiently minute to require in some instances the use of a hand lens or microscope to be clearly seen. Microfungi far outnumber macrofungi, but both have essential rôles in the ecosystem, where their decomposition activities recycle constituents of organic matter, releasing them as carbon dioxide, ammonia, phosphates, etc., which allows green plants to flourish and provides animals and other consumers with food. Other important activities of fungi include parasitism of animals and plants, as well as forming beneficial mycorrhizal associations with the roots of plants.

The list which follows contains 212 fungi included in two subdivisions of "higher" fungi: the Basidiomycotina and Ascomycotina. The Basidiomycotina (basidiomycetes) include gilled mushrooms, boletes, corals, tooth fungi and polypores, and a range of other interesting fungi commonly known as jelly fungi, earthstars, puffballs, bird's nests, and stinkhorns. The Ascomycotina (ascomycetes) actually comprise a larger subdivision of higher fungi than the Basidiomycotina, but many species do not produce fruiting bodies, or their fruiting bodies are not as obvious as are mushrooms, bracket fungi, and the like. Well known exceptions include the morels and false morels, often—and incorrectly—called "the mushroom" and "the beefsteak." A large number of nonfleshy or hard fruiting bodies of Ascomycotina can be found on wood.

The list of macrofungi of the Kansas Ecological Reserves (KER) was derived from several sources, including class field trips and forays by groups or individuals. The author compiled this checklist with the assistance of Bruce W. Horn, Richard Kay, Sherry N. Kay, and Dean Abel. The fungal species in many cases are substantiated by specimens, field notes, or photographs, but there are no organized permanent collections to serve as a reference. Our records go back more than 30 years in some cases, but the pace of collecting and identifying macrofungi has increased in the last decade, primarily because of a growing core of local persons interested in fungi, many of whom are knowledgeable and enthusiastic amateurs, including some of the contributors to this list who were instrumental in founding the Kaw Valley Mycological Society. Kay (1989) was used as a basic reference in compiling the macrofungi list.

It should not be assumed that our list is complete. There are records of many macrofungi in northeastern Kansas that have not yet been found on KER. How many macrofungi occur at KER? A very subjective estimate is that there may be more than one thousand, depending on what fungi one would include as "macrofungi." Excluded from our list are all "lower" fungi (phycomycetes), molds and other such microfungi, most plant parasites, and the slime molds (myxomycetes).

Of the KER tracts north of the Kansas River, we have included only the Fitch Natural History Reservation (FR), because collections are relatively sparse in the other tracts. South of the Kansas River, the Breidenthal Biological Reserve and Rice Woodland of the Baldwin Woods (BW) area have dramatically more species, according to our list. In part, there has been less collecting in the Fitch Natural History Reservation than in Baldwin Woods tracts. But this, in turn, is because there is a consensus among persons collecting macrofungi—at least among the contributors to this list—that the Breidenthal Biological Reserve and Rice Woodland do indeed contain more species of macrofungi than any of the KER tracts north of

the Kansas River. There have been no studies to explain this apparent discrepancy in species richness, and any attempt at an explanation now would be too speculative.

Common English names of most macrofungi are not used as uniformly and consistently as they are for some groups of animals and plants. Consequently, common names vary from one mushroom field guide to another. Unfortunately, many scientific Latin names of fungi also are not stable. Fungal nomenclature follows the International Code of Botanical Nomenclature, but despite these binding rules there are many legitimate reasons why fungal names may end up as synonyms or suffer some other fate that would cause them to be discarded. Especially irksome for specialists and nonspecialists alike are changes in generic names. We have tried to use the most accepted current binomial for each species. The reader will find that most good mushroom field guides often list in their indices the most common synonyms for scientific names.

#### Literature Cited

Kay, R. 1989. A checklist of Kansas mushrooms. Published by the author, 601 Mississippi St., Lawrence, KS 66044, for the Kaw Valley Mycological Society, Lawrence, KS. 77 p.

## MACROFUNGI OF THE KANSAS ECOLOGICAL RESERVES

ORDER/Family/Species	Common name	Occurrence	
		BW	FR
BASIDIOMYCOTINA			
AGARICALES			
Agaricaceae			
<i>Agaricus abruptibulbus</i>	Abruptly bulbous agaric	+	
<i>Agaricus silvicola</i>	Forest agaric	+	
Amanitaceae			
<i>Amanita bisporigera</i>	Bi-spored amanita	+	
<i>Amanita citrina</i> var. <i>citrina</i>	Citron amanita	+	
<i>Amanita flavoconia</i>	Yellow warts	+	
<i>Amanita fulva</i>	Tawny ringless grisette	+	
<i>Amanita muscaria</i> var. <i>alba</i>	Fly agaric	+	
<i>Amanita pantherina</i>	The panther	+	
<i>Amanita pantherina</i> var. <i>velatipes</i>	Booted amanita	+	
<i>Amanita rubescens</i>	Reddish amanita	+	
<i>Amanita spreta</i>	Hated amanita	+	
<i>Limacella illinita</i>	White limacella		+
<i>Limacella illinita</i> var. <i>argillacea</i>	Clay-colored limacella		+
Boletaceae			
<i>Boletellus russellii</i>	Russell's jagged bolete	+	
<i>Boletus affinis</i>	Related bolete	+	
<i>Boletus campestris</i>	Field bolete	+	
<i>Boletus edulis</i>	King bolete	+	
<i>Boletus variipes</i>	Bloomless queen bolete	+	
<i>Gyroporus castaneus</i>	Chestnut-colored bolete	+	
<i>Gyroporus purpurinus</i>	Rosy bolete	+	
<i>Leccinum griseum</i>	Gray scaly-stalk	+	
<i>Strobilomyces floccopus</i>	Old man of the woods	+	
Coprinaceae			
<i>Coprinus comatus</i>	Shaggy mane	+	
<i>Coprinus lagopus</i>	Wooly-stalked inky cap	+	
<i>Coprinus micaceus</i>	Little inky cap	+	+
<i>Coprinus radians</i>	Orange-mat inky cap	+	
<i>Psathyrella hydrophila</i>	Clustered psath	+	
<i>Psathyrella velutina</i>	Weeping widow	+	
Cortinariaceae			
<i>Cortinarius albidus</i>	White cortinarius	+	
<i>Cortinarius bolaris</i>	Collared cortinarius	+	
<i>Cortinarius cinnabarinus</i>	Cinnabar cort	+	
<i>Cortinarius cinnamomeus</i>	Cinnamon cort	+	
<i>Cortinarius cotoneus</i> gp.	Scaly cortinarius	+	
<i>Cortinarius distans</i>	Wide-gilled cort	+	
<i>Galerina autumnalis</i>	Deadly galerina	+	+
<i>Hebeloma mesophaeum</i>	Veiled hebeloma	+	
<i>Inocybe geophylla</i>	Little white inocybe	+	

MACROFUNGI OF THE KANSAS ECOLOGICAL RESERVES (cont.)

ORDER/Family/Species	Common name	Occurrence	
		BW	FR
BASIDIOMYCOTINA, cont.			
AGARICALES, cont.			
Hygrophoraceae			
<i>Hygrocybe conica</i>	Witch's hat		+
<i>Hygrocybe miniata</i>	Miniature waxy cap	+	
<i>Hygrophorus puniceus</i>	Scarlet waxy cap	+	
Lepiotaceae			
<i>Lepiota procera</i>	Tall parasol	+	
Paxillaceae			
<i>Phylloporus rhodoxanthus</i>	Yellow-rose pax	+	
Pluteaceae			
<i>Pluteus admirabilis</i>	Yellow pluteus	+	
<i>Pluteus cervinus</i>	The fawn	+	+
<i>Pluteus longistriatus</i>	Pleated pluteus	+	
<i>Volvariella bombycina</i>	The silky	+	
<i>Volvariella volvacea</i>	Sooty cloak		+
Russulaceae			
<i>Lactarius alnicola</i>	Golden milk cap	+	
<i>Lactarius corrugis</i>	Corrugated-cap milky	+	
<i>Lactarius hygrophoroides</i>	Distant-gilled milky	+	
<i>Lactarius indigo</i>	Blue milky	+	
<i>Lactarius minusculus</i>	Tiny little lactarius	+	
<i>Lactarius piperatus</i>	Pepper milky	+	
<i>Lactarius piperatus</i> var. <i>glaucescens</i>	Green-staining pepper milky	+	
<i>Lactarius psammicola</i>	Sandy milky	+	
<i>Lactarius subplinthogalus</i>	Salmon-staining milky	+	
<i>Lactarius subvellereus</i> var. <i>subdistans</i>	Velvety pepper milky	+	
<i>Lactarius torminosus</i>	Bearded milky	+	
<i>Lactarius volemus</i>	Velvety milky	+	
<i>Russula albonigra</i>	Blackening russula	+	
<i>Russula crustosa</i>	Encrusted green-quilt russula	+	
<i>Russula emetica</i>	Emetic russula	+	+
<i>Russula fragrantissima</i>	Stinking russula	+	
<i>Russula mariae</i>	Powdered russula	+	
<i>Russula pectinatoides</i>	Comb	+	
<i>Russula virescens</i>	Green crust	+	
Strophariaceae			
<i>Pholiota albocrenulata</i>	White-edged pholiota	+	
<i>Pholiota polychroa</i>	Variable flammula	+	
Tricholomataceae			
<i>Armillaria mellea</i>	Honey mushroom	+	
<i>Armillariella tabescens</i>	Veil-less honey mushroom	+	
<i>Asterophora lycoperdoides</i>	Powder cap	+	
<i>Clitocybe epichysium</i>	Brownish clitocybe	+	
<i>Clitocybe gibba</i>	The funnel	+	
<i>Clitocybe odora</i>	Anise funnel	+	
<i>Flammulina velutipes</i>	Velvet foot	+	+
<i>Laccaria amethystina</i>	Amethyst laccaria	+	
<i>Laccaria laccata</i>	Waxy laccata	+	

MACROFUNGI OF THE KANSAS ECOLOGICAL RESERVES (cont.)

ORDER/Family/Species	Common name	Occurrence	
		BW	FR
BASIDIOMYCOTINA, cont.			
AGARICALES, cont.			
Tricholomataceae, cont.			
<i>Lentinellus ursinus</i>	The bear	+	
<i>Marasmiellus nigripes</i>	Black-footed marasmius	+	
<i>Marasmius capillaris</i>	Hair marasmius	+	
<i>Marasmius delectans</i>	Delightful marasmius	+	
<i>Marasmius rotula</i>	Pinwheel	+	+
<i>Marasmius siccus</i>	Orange pinwheel	+	+
<i>Marasmius sullivanii</i>	Sullivant's marasmius	+	
<i>Mycena inclinata</i>	Tilted mycena	+	
<i>Mycena haematopus</i>	Bleeding mycena	+	
<i>Mycena luteopallens</i>	Walnut mycena	+	
<i>Omphalotus olearius</i>	Jack o'lantern	+	
<i>Oudemansiella radicata</i>	The rooter	+	+
<i>Panellus stipticus</i>	Bitter pan		+
<i>Phyllotopsis nidulans</i>	Orange mock oyster	+	+
<i>Pleurotus ostreatus</i>	Oyster mushroom	+	+
<i>Rhodotus palmatus</i>	Netted rhodotus	+	+
<i>Tricholomopsis platyphylla</i>	Broadgill	+	
APHYLLOPHORALES			
Cantharellaceae			
<i>Cantharellus cibarius</i>	Golden chanterelle	+	+
<i>Cantharellus cinnabarinus</i>	Little red chanterelle	+	
<i>Cantharellus lateritius</i>	Gill-less chanterelle	+	
<i>Craterellus cornucopioides</i>	Trumpet of death	+	
<i>Craterellus fallax</i>	Horn of plenty	+	
Clavariaceae			
<i>Clavaria flava</i>	Pale yellow-tipped coral	+	
<i>Clavariadelphus pistillaris</i>	Indian club	+	
<i>Clavicornia pyxidata</i>	Crown-tipped coral	+	
<i>Ramaria formosa</i>	Yellow-tipped pink coral	+	
Coniophoraceae			
<i>Serpula lacrimans</i>	Dry rot		+
Hydnaceae			
<i>Dentinum repandum</i>	Spreading hydnum	+	
<i>Hericium coralloides</i>	Coral tooth	+	+
<i>Hericium erinaceus</i>	Hedgehog	+	
<i>Hydnellum spongiosipes</i>	Spongy-footed tooth fungus	+	
<i>Hydnellum zonatum</i>	Zoned tooth	+	
<i>Hydnum imbricatum</i>	Shingle tooth	+	
<i>Phellodon niger</i>	Black tooth	+	
Polyporaceae			
<i>Cerrena unicolor</i>	Unicolored daedalea	+	
<i>Daedaleopsis ambigua</i>	Ambiguous maze-polypore	+	+
<i>Daedaleopsis ambigua</i> var. <i>coronata</i>	Crowned puzzling maze-polypore		+

**MACROFUNGI OF THE KANSAS ECOLOGICAL RESERVES (cont.)**

ORDER/Family/Species	Common name	Occurrence	
		BW	FR
BASIDIOMYCOTINA, cont.			
APHYLLOPHORALES, cont.			
Polyporaceae, cont.			
<i>Daedaleopsis confragosa</i>	Thin-walled polypore	+	+
<i>Favolus alveolaris</i>	Diamond polypore	+	+
<i>Fomes fomentarius</i>	Tinder conk	+	+
<i>Fomitopsis cajanderi</i>	Rosy conk	+	
<i>Ganoderma applanatum</i>	Artist's conk	+	+
<i>Gloeophyllum sepiarium</i>	Sepia-gilled shelf	+	
<i>Grifola frondosa</i>	Hen-of-the-woods	+	+
<i>Irpex lacteus</i>	Milk-white toothed polypore	+	+
<i>Laetiporus sulphureus</i>	Sulfur shelf	+	+
<i>Lenzites betulina</i>	Razor-strop shelf	+	+
<i>Meripilus giganteus</i>	Big rosette	+	
<i>Perenniporia fraxinophila</i>	Ash-loving poria	+	
<i>Phellinus gilvus</i>	Oak conk	+	+
<i>Polyporus arcularius</i>	Angular-pored polypore	+	+
<i>Polyporus badius</i>	Black-footed polypore	+	+
<i>Polyporus balsameus</i>	Balsam polypore		+
<i>Polyporus elegans</i>	Elegant polypore	+	
<i>Polyporus radicans</i>	Rooting polypore	+	
<i>Polyporus varius</i>	Blackfoot	+	
<i>Poria spissa</i>	Dense poria		+
<i>Poronidulus conchifer</i>	Little-nest polypore	+	+
<i>Pycnoporus cinnabarinus</i>	Cinnabar polypore	+	+
<i>Pycnoporus sanguineus</i>	Blood-red polypore	+	
<i>Trametes elegans</i>	Ambiguous polypore	+	
<i>Trametes versicolor</i>	Turkey tail	+	+
<i>Trichaptum bififormis</i>	Biformed bracket fungus	+	
Schizophyllaceae			
<i>Schizophyllum commune</i>	Common split-gill	+	+
Stereaceae			
<i>Stereum albobadium</i>	Rufous-white parchment	+	+
<i>Stereum complicatum</i>	Crowded parchment leaves	+	+
<i>Stereum hirsutum</i>	Hairy parchment	+	+
<i>Stereum ostrea</i>	False turkey tail	+	+
<i>Xylobolus frustulatus</i>	Ceramic parchment	+	+
AURICULARIALES			
Auriculariaceae			
<i>Auricularia auricula</i>	Ear fungus	+	+
TREMELLALES			
Tremellaceae			
<i>Calocera cornea</i>	Staghorn	+	
<i>Dacrymyces palmatus</i>	Orange fairy butter	+	
<i>Exidia glandulosa</i>	Black witch's butter	+	+
<i>Tremella foliacea</i>	Brown jelly-leaf	+	+
<i>Tremella fuciformis</i>	White jelly fungus	+	
<i>Tremella mesenterica</i>	Golden witch's butter	+	+
<i>Tremellodendron pallidum</i>	False white coral	+	

MACROFUNGI OF THE KANSAS ECOLOGICAL RESERVES (cont.)

ORDER/Family/Species	Common name	Occurrence	
		BW	FR
BASIDIOMYCOTINA, cont.			
LYCOPERDALES			
Geastraceae			
<i>Geastrum fornicatum</i>	Arched earthstar	+	
<i>Geastrum rufescens</i>	Reddening earthstar	+	
<i>Geastrum saccatum</i>	Common earthstar	+	
<i>Geastrum triplex</i>	Saucered earthstar	+	+
Lycoperdaceae			
<i>Calvatia craniiformis</i>	Brain-shaped puffball	+	+
<i>Calvatia rubro-flava</i>	Orange staining puffball	+	
<i>Lycoperdon marginatum</i>	Peeling puffball	+	
<i>Lycoperdon perlatum</i>	Gem-studded puffball	+	
<i>Lycoperdon pyriforme</i>	Pear-shaped puffball	+	+
NIDULARIALES			
Nidulariaceae			
<i>Crucibulum laeve</i>	Common bird's nest	+	+
<i>Cyathus stercoreus</i>	Dung-loving bird's nest	+	
<i>Cyathus striatus</i>	Grooved bird's nest	+	
PHALLALES			
Phallaceae			
<i>Phallus hadriani</i>	Purple-egg stinkhorn		+
SCLERODERMATALES			
Sclerodermataceae			
<i>Scleroderma citrinum</i>	Common earthball	+	
UREDINALES			
Pucciniaceae			
<i>Gymnosporangium juniperi-virginianae</i>	Cedar-apple rust gall	+	+
ASCOMYCOTINA			
CLAVICIPITALES			
Clavicipitaceae			
<i>Cordyceps melolanthae</i>	Rhinoceros-beetle cordyceps	+	
<i>Cordyceps militaris</i>	Orange club cordyceps	+	
<i>Cordyceps ophioglossoides</i>	Golden-thread cordyceps	+	
Hypomycetaceae			
<i>Hypomyces chrysospermus</i>	Golden mold	+	
<i>Hypomyces hyalinus</i>	Whitish lobster mushroom	+	
<i>Hypomyces lactifluorum</i>	Lobster mold	+	
DOTHIDIALES			
Venturiaceae			
<i>Apiosporina morbosa</i>	Black knot (on cherry)	+	
ELAPHOMYCETALES			
Elaphomycetaceae			
<i>Elaphomyces granulatus</i>	Common deer truffle	+	
HELOTIALES			
Helotiaceae			
<i>Bisporella citrina</i>	Citron cup	+	
<i>Bulgaria inquinans</i>	Black saucer cup	+	

MACROFUNGI OF THE KANSAS ECOLOGICAL RESERVES (cont.)

ORDER/Family/Species	Common name	Occurrence	
		BW	FR
ASCOMYCOTINA, cont.			
HELOTIALES, cont.			
Helotiaceae, cont.			
<i>Chlorociboria aeruginascens</i>	Green stain	+	
<i>Leotia lubrica</i>	Yellow jelly club	+	
<i>Leotia viscosa</i>	Green-headed jelly club	+	
HYSTERIALES			
Hysteriaceae			
<i>Hysterographium elongatum</i>	Elongate boat-shaped crust	+	
<i>Hysterographium mori</i>	Boat-shaped crust	+	
PEZIZALES			
Humariaceae			
<i>Humaria hemisphaerica</i>	Brown-haired white cup	+	
<i>Pyronema omphalodes</i>	Depressed disk		+
<i>Scutellinia scutellata</i>	Eyelash cup	+	
Sarcosomataceae			
<i>Galiella rufa</i>	Filled rubber cup	+	
<i>Microstoma floccosa</i>	Shaggy scarlet cup	+	
<i>Sarcoscypha coccinea</i>	Earley scarlet cup	+	+
<i>Sarcoscypha occidentalis</i>	Little summer cup	+	+
<i>Urnula craterium</i>	Devil's gray goblet	+	
Pezizaceae			
<i>Peziza repanda</i>	Wavy peziza	+	+
Helvellaceae			
<i>Gyromitra fastigiata</i>	False morel	+	+
<i>Helvella acetabulum</i>	Brown-veined peziza	+	
<i>Helvella crispa</i>	Saddleback	+	+
<i>Helvella queletii</i>	Ribbed elfin saucer	+	
<i>Helvella stevensii</i>	Steven's helvella	+	
Morchellaceae			
<i>Morchella angusticeps</i>	Narrow-headed black morel	+	
<i>Morchella esculenta</i>	Common morel	+	+
<i>Morchella semilibera</i>	Half-free morel	+	+
<i>Verpa bohemica</i>	Early false morel	+	+
<i>Verpa conica</i>	Smooth thimblecap		+
SPHAERIALES			
Xylariaceae			
<i>Daldinia concentrica</i>	Zoned cramp balls	+	
<i>Entonaema liquescens</i>	Bag-of-water		+
<i>Hypoxylon fragiforme</i>	Red cushion hypoxylon		+
<i>Hypoxylon mediterraneum</i>	Black crust	+	
<i>Hypoxylon rubiginosum</i>	Reddish crust		+
<i>Hypoxylon sassafras</i>	Sassafras crust	+	
<i>Hypoxylon xanthocreas</i>	Yellow-flesh hypoxylon		+
<i>Xylaria hypoxylon</i>	Carbon antlers	+	+
<i>Xylaria polymorpha</i>	Dead man's fingers	+	+

## MAMMALS OF THE KANSAS ECOLOGICAL RESERVES

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Thirty-eight species of mammals have been recorded from the Kansas Ecological Reserves (KER) as shown in the following list. A hypothetical list of species that may have occurred, or may still occur, on KER areas has 15 additional species including 5 that were extirpated in Kansas in the 19th century (Black Bear, Gray Wolf, Mountain Lion, Bison and Wapiti), six wide-ranging bats (Big Brown Bat, Evening Bat, Hoary Bat, Silver-haired Bat, Brazilian Free-tailed Bat and Eastern Pipistrelle), two semi-aquatic species known to live in the general area (Mink and River Otter) and two species typical of shortgrass plains that also have been found nearby (Badger and Black-tailed Jackrabbit). Alleged recent sightings of the Mountain Lion in the Tri-County areas of KER require verification. Humans, as well as their domesticated (and feral) livestock and pets, have not been included in this list even though their activity can have significant impact on the areas.

Of the 38 species actually recorded, 17 have transcontinental ranges, 13 others are most typical of the Eastern Deciduous Forest Biome (Virginia Opossum, Elliot's Short-tail Shrew, Least Shrew, Gray Squirrel, Fox Squirrel, Southern Flying Squirrel, Eastern Chipmunk, White-footed Mouse, Woodland Vole, Southern Bog Lemming, Eastern Woodrat, and Eastern Cottontail); six others are most typical of Great Plains grasslands (Plains Pocket Gopher, Franklin's Ground Squirrel, Western Harvest Mouse, Plains Harvest Mouse and Prairie Vole); and two are introduced commensals (House Mouse and Norway Rat).

Several types of small live-traps have been used for mammal sampling, with hundreds of thousands of "trap nights" on the Tri-County area between 1948 and the present. Relatively little sampling has been done with bat nets. Little sampling of any kind has been done in the KER tracts of the Baldwin Woods area. Information concerning mammal species larger than rabbit size has been based mainly on casual sight records and tracks.

Notable changes in the mammal faunas of the KER areas have been observed. Like other large mammals the White-tailed Deer was extirpated in Kansas in the late 1800s. As a result of a successful conservation program in Missouri deer regained their abundance there, reinvaded Kansas in the 1930s and were first seen on FNHR in 1949. They increased to a peak population there in the 1960s (before an open season was declared). The Eastern Chipmunk was reintroduced to the FNHR (with more than 30 releases) in the late 1980s and apparently is now well established. The Plains Pocket Gopher, Great Plains Harvest Mouse and Deer Mouse, all typical of shortgrass habitat, have disappeared from the FNHR as a result of successional changes. The Muskrat and (much less frequently) Beaver have temporarily established individuals or small colonies at the FNHR pond, but they invariably disappear when the aquatic habitat deteriorates, as in time of drought. The Long-tailed Weasel, Eastern Spotted Skunk and Red Fox have not been observed in recent decades at FNHR and their present status is uncertain. The Eastern Woodrat was at a population peak in the late 1940s, declined precipitously in the 1950s and 60s, and by 1990 had again become abundant. The Southern Bog Lemming was abundant in the late 1920s and again in the late 60s but extremely rare during most of the intervening period. The Hispid Cotton Rat formerly had a more southern range, reaching only to southern Kansas in the 1920s but spread northward into the northeastern part of the state in the late 1940s. It is subject to drastic reductions, with die-off in unusually severe winter weather. Numerous studies on the ecology of the more common small

mammals of the Tri-County areas have been published and should be consulted for specific information (e.g., Fitch 1958; Gaines and Johnson 1982; Fitch et al. 1984; Swihart and Slade 1990; and Foster and Gaines 1991).

The following list is presented in phylogenetic sequence, and scientific and common names follow Jones et al. (1986). Generalized habitat preferences for each species has been recorded as follows: A=aquatic tendencies, F=forest, P=prairie or pasture, E=edge or forest-grassland contact, and C=commensals. A generalized key to abundance and occurrence is given with the following codes: a=abundant, m=moderately abundant, r=rare, s=single record of occurrence, and i=introduced species with no extant population. With recognition of the problem of oversimplification, each species has been placed in a single habitat type and, generally, has been assigned to one of three abundance categories. Obviously certain species (particularly larger species) utilize several habitats and many populations undergo changes in density. Despite these reservations, it is beneficial to provide the reader (especially one unfamiliar with the local fauna) with coarse data on the local faunal ecology.

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**MAMMALS OF THE KANSAS ECOLOGICAL RESERVES**

Order/Family/Genus/Species	Common Name	Habitat	Abundance
<b>Marsupialia</b>			
<b>Didelphidae</b>			
<i>Didelphis virginiana</i>	Virginia Opossum	F	m
<b>Insectivora</b>			
<b>Soricidae</b>			
<i>Blarina hylophaga</i>	Elliot's Short-tailed Shrew	F	m
<i>Cryptotis parva</i>	Least Shrew	P	m
<b>Talpidae</b>			
<i>Scalopus aquaticus</i>	Eastern Mole	F	a
<b>Chiroptera</b>			
<b>Vespertilionidae</b>			
<i>Myotis lucifugus</i>	Little Brown Myotis	F	t
<i>Lasiurus borealis</i>	Red Bat	F	t
<b>Lagomorpha</b>			
<b>Leporidae</b>			
<i>Sylvilagus floridanus</i>	Eastern Cottontail	E	a
<b>Rodentia</b>			
<b>Sciuridae</b>			
<i>Tamias striatus</i>	Eastern Chipmunk	F	r
<i>Marmota monax</i>	Woodchuck	E	r
<i>Spermophilus franklinii</i>	Franklin's Ground Squirrel	P	s
<i>Spermophilus tridecemlineatus</i>	Thirteen-lined Ground Squirrel	P	i
<i>Sciurus carolinensis</i>	Gray Squirrel	F	m
<i>Sciurus niger</i>	Fox Squirrel	F	a
<i>Glaucomys volans</i>	Southern Flying Squirrel	F	s
<b>Geomyidae</b>			
<i>Geomys bursarius</i>	Plains Pocket Gopher	P	m
<b>Castoridae</b>			
<i>Castor canadensis</i>	Beaver	A	r
<b>Cricetidae</b>			
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse	P	a
<i>Reithrodontomys montanus</i>	Plains Harvest Mouse	P	r
<i>Peromyscus leucopus</i>	White-footed Mouse	F	a
<i>Peromyscus maniculatus</i>	Deer Mouse	P	a
<i>Sigmodon hispidus</i>	Hispid Cotton Rat	P	a
<i>Neotoma floridana</i>	Eastern Woodrat	F	a
<i>Microtus ochrogaster</i>	Prairie Vole	P	a
<i>Microtus pinetorum</i>	Woodland Vole	F	r
<i>Ondatra zibethicus</i>	Muskrat	A	m
<i>Synaptomys cooperi</i>	Southern Bog Lemming	P	r
<b>Muridae</b>			
<i>Rattus norvegicus</i>	Norway Rat	C	r
<i>Mus musculus</i>	House Mouse	C	m
<b>Zapodidae</b>			
<i>Zapus hudsonius</i>	Meadow Jumping Mouse	E	m
<b>Carnivora</b>			
<b>Canidae</b>			
<i>Canis latrans</i>	Coyote	P	m
<i>Vulpes vulpes</i>	Red Fox	P	r
<i>Urocyon cinereoargenteus</i>	Gray Fox	F	r
<b>Procyonidae</b>			
<i>Procyon lotor</i>	Raccoon	F	a

MAMMALS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Order/Family/Genus/Species	Common Name	Habitat	Abundance
Carnivora, cont.			
Mustelidae			
<i>Mustela frenata</i>	Long-tailed Weasel	F	r
<i>Spilogale putorius</i>	Eastern Spotted Skunk	P	r
<i>Mephitis mephitis</i>	Striped Skunk	P	m
Felidae			
<i>Felis rufus</i>	Bobcat	F	r
Artiodactyla			
Cervidae			
<i>Odocoileus virginianus</i>	White-tailed Deer	E	a

## BIRDS OF THE KANSAS ECOLOGICAL RESERVES

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There are 215 bird species that have been observed on Kansas Ecological Reserves (KER) lands, 82 of which are known breeding birds. The avifauna of KER is diverse (40 families) and is a reflection of the varied habitats that constitute KER. The KER tracts of the Tri-County area have second-growth woodland, grassland, open scrubland, and aquatic habitats that attract many "open country" and "edge" species as well as "water" birds. The KER tracts in Baldwin Woods have essentially one habitat type (mature eastern deciduous forest) and therefore a much less diverse avifauna than the Tri-County tracts. This single habitat produces a smaller and more specialized avifauna with several species that have very limited occurrence in Kansas (e.g., Pileated Woodpecker, Acadian Flycatcher, Golden-winged Warbler, Cerulean Warbler, and Worm-eating Warbler). Collectively, the area's birdlife represents a primarily eastern fauna, but is situated at or near the western range limit for many species.

Only about 20% of the birds that occur on KER are year-round residents. Another 10% are winter residents and about 25% are summer only residents. Nearly half (45%) of the birds encountered on KER are strictly migrants or temporary visitants and very few species are found in widespread locales throughout the tracts. Thus, the composition of a daily bird list recorded on KER is greatly influenced by the time of year and the particular location being censused.

The accompanying checklist of the birds of the Kansas Ecological Reserves was compiled from the field records of H.S. Fitch, R.L. Boyd, C.L. Cink, R.F. Johnston, and G.L. Pittman and covers the period 1948 - present. Particular attention was given to field surveys by the author from 1985 to the present. The nomenclature and arrangement used follows the Check-list of North American birds, 6th edition, American Ornithologists' Union, 1983.

The checklist contains the following notations for occurrence: BW = Baldwin Woods, TC = Tri-County area, "blank" = absent, "+" = present, and "\*" = known breeding either past or present. The following notations are used for seasonal abundance: A = Accidental- extremely rare, not to be expected; extralimital in occurrence. R = Rare- few records, erratic in occurrence due either to very little suitable habitat or very low population densities. O = Occasional- irregular either during the seasons indicated or in annual frequency; present in low densities with records infrequent. U = Uncommon- present during the seasons indicated in low densities; regularly occurring but only in the appropriate habitat. C = Common- present in moderate to high densities and to be expected on almost any visit to the field during the seasons indicated. And finally, the notations for the seasons are as follows: Sp = Spring (March - May), Su = Summer (June - August), F = Fall (September - November), W = Winter (December - February).

## BIRDS OF THE KANSAS ECOLOGICAL RESERVES

Order/Family/Species	Common Name	Seasonal Abundance				Occurrence	
		Sp	Su	F	W	BW	TC
Podicipediformes							
Podicipedidae							
<i>Podilymbus podiceps</i>	Pied-billed Grebe	R	R	R			+
Pelecaniformes							
Pelecanidae							
<i>Pelecanus erythrorhynchos</i>	American White Pelican	U		O			+
Phalacrocoracidae							
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	U		U			+
Ciconiiformes							
Ardeidae							
<i>Botaurus lentiginosus</i>	American Bittern	R					+
<i>Ardea herodias</i>	Great Blue Heron	C	C	U			+
<i>Egretta caerulea</i>	Little Blue Heron		U	O			+
<i>Bubulcus ibis</i>	Cattle Egret		O				+
<i>Butorides striatus</i>	Green-backed Heron	C	C	O			*
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	R					+
Anseriformes							
Anatidae							
<i>Anser albifrons</i>	Greater White-fronted Goose	R		R			+
<i>Chen caerulescens</i>	Snow Goose	C		C	O		+
<i>Branta canadensis</i>	Canada Goose	U					+
<i>Aix sponsa</i>	Wood Duck	U		U	U	*	*
<i>Anas crecca</i>	Green-winged Teal	U		U	O		+
<i>Anas rubripes</i>	American Black Duck			R			+
<i>Anas platyrhynchos</i>	Mallard	U	U	U	U	+	+
<i>Anas acuta</i>	Northern Pintail	O		O	O		+
<i>Anas discors</i>	Blue-winged Teal	U	O	U		+	*
<i>Anas clypeata</i>	Northern Shoveler	R	R				+
<i>Anas strepera</i>	Gadwall		O	O			+
<i>Aythya americana</i>	Redhead			O			+
<i>Aythya collaris</i>	Ring-necked Duck	O		O	O		+
<i>Aythya affinis</i>	Lesser Scaup	U					+
<i>Lophodytes cucullatus</i>	Hooded Merganser			O			+
Falconiformes							
Cathartidae							
<i>Cathartes aura</i>	Turkey Vulture	C	C	C	R	*	*
Accipitridae							
<i>Pandion haliaetus</i>	Osprey	R		O			+
<i>Ictinia mississippiensis</i>	Mississippi Kite		A				+
<i>Haliaeetus leucocephalus</i>	Bald Eagle			U	O		+
<i>Circus cyaneus</i>	Northern Harrier	U	O	C	C		*
<i>Accipiter striatus</i>	Sharp-shinned Hawk	U			U	+	+
<i>Accipiter cooperii</i>	Cooper's Hawk	O	O	O	O	+	*
<i>Accipiter gundlachi</i>	Northern Goshawk				R	+	+
<i>Buteo lineatus</i>	Red-shouldered Hawk	O	O	O	O	+	*
<i>Buteo platypterus</i>	Broad-winged Hawk	U	U	U		+	*
<i>Buteo swainsoni</i>	Swainson's Hawk		U	U			+
<i>Buteo jamaicensis</i>	Red-tailed Hawk	C	C	C	C	*	*
<i>Buteo lagopus</i>	Rough-legged Hawk			O	O		+
<i>Aquila chrysaetos</i>	Golden Eagle			R			+

BIRDS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Order/Family/Species	Common Name	Seasonal Abundance				Occurrence	
		Sp	Su	F	W	BW	TC
Falconiformes, cont.							
Falconidae							
<i>Falco sparverius</i>	American Kestrel	U	U	U	U	*	+
<i>Falco columbarius</i>	Merlin			O			+
<i>Falco mexicanus</i>	Prairie Falcon	R		R	R		+
Galliformes							
Phasianidae							
<i>Phasianus colchicus</i>	Ring-necked Pheasant			R	R		+
<i>Bonasa umbellus</i>	Ruffed Grouse		R		R	*	
<i>Meleagris gallopavo</i>	Wild Turkey	U	U	U	U	*	*
<i>Colinus virginianus</i>	Northern Bobwhite	C	C	C	C	*	*
Gruiformes							
Rallidae							
<i>Coturnicops noveboracensis</i>	Yellow Rail	R					+
<i>Rallus limicola</i>	Virginia Rail	R		R			+
<i>Porzana carolina</i>	Sora	O		O			+
<i>Fulica americana</i>	American Coot	O		O			+
Gruidae							
<i>Grus canadensis</i>	Sandhill Crane			R			+
Charadriiformes							
Charadriidae							
<i>Charadrius vociferus</i>	Killdeer	U	U	U	O	+	*
Scolopacidae							
<i>Tringa melanoleuca</i>	Greater Yellowlegs	O					+
<i>Tringa flavipes</i>	Lesser Yellowlegs	O		O			+
<i>Tringa solitaria</i>	Solitary Sandpiper	O	O	O		+	+
<i>Actitis macularia</i>	Spotted Sandpiper	O	O	O		+	+
<i>Bartramia longicuada</i>	Upland Sandpiper	O	O	O			+
<i>Calidris mauri</i>	Western Sandpiper	O					+
<i>Calidris minutilla</i>	Least Sandpiper		O				+
<i>Calidris fuscicollis</i>	White-rumped Sandpiper	O					+
<i>Calidris melanotos</i>	Pectoral Sandpiper	O					+
<i>Gallinago gallinago</i>	Common Snipe	U		O		+	+
<i>Scolopax minor</i>	American Woodcock	U	U	U		*	*
Laridae							
<i>Larus pipixcan</i>	Franklin's Gull	O		U			+
<i>Larus philadelphia</i>	Bonaparte's Gull	O					+
<i>Larus delawarensis</i>	Ring-billed Gull	O	O	O			+
<i>Chlidonias niger</i>	Black Tern		O				+
Columbiformes							
Columbidae							
<i>Columba livia</i>	Rock Dove	O	O	O	O		+
<i>Zenaida macroura</i>	Mourning Dove	C	C	C	O	*	*
Cuculiformes							
Cuculidae							
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo	U	U	O			+
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	C	C	O		*	*
Strigiformes							
Tytonidae							
<i>Tyto alba</i>	Common Barn-Owl				R		+
Strigidae							
<i>Otus asio</i>	Eastern Screech-Owl	U	U	U	U	*	*

BIRDS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Order/Family/Species	Common Name	Seasonal Abundance				Occurrence	
		Sp	Su	F	W	BW	TC
Strigiformes, cont.							
Strigidae, cont.							
<i>Bubo virginianus</i>	Great Horned Owl	C	C	C	C	*	*
<i>Strix varia</i>	Barred Owl	C	C	C	C	*	*
<i>Asio otus</i>	Long-eared Owl	O	O	O	O	+	+
<i>Asio flammeus</i>	Short-eared Owl				R		+
<i>Aegolius acadicus</i>	Northern Saw-whet Owl				R		+
Caprimulgiformes							
Caprimulgidae							
<i>Chordeiles minor</i>	Common Nighthawk	O	O	O		+	+
<i>Caprimulgus carolinensis</i>	Chuck-will's-widow	U	U	R		*	*
<i>Caprimulgus vociferus</i>	Whip-poor-will	C	C	O		*	*
Apodiformes							
Apodidae							
<i>Chaetura pelagica</i>	Chimney Swift	U	U	U		+	+
Trochilidae							
<i>Archilochus colubris</i>	Ruby-throated Hummingbird	U	U	U		*	*
Coraciiformes							
Alcedinidae							
<i>Ceryle alcyon</i>	Belted Kingfisher	U	O	U	O	+	+
Piciformes							
Picidae							
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	C	C	C	C	*	*
<i>Melanerpes carolinus</i>	Red-bellied Woodpecker	C	C	C	C	*	*
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker	O		O	O	+	+
<i>Picoides pubescens</i>	Downy Woodpecker	C	C	C	C	*	*
<i>Picoides villosus</i>	Hairy Woodpecker	U	U	U	U	*	*
<i>Colaptes auratus</i>	Northern Flicker	C	C	C	C	*	*
<i>Dryocopus pileatus</i>	Pileated Woodpecker	O	O			+	
Passeriformes							
Tyrannidae							
<i>Contopus borealis</i>	Olive-sided Flycatcher	O		O		+	+
<i>Contopus virens</i>	Eastern Wood-Pewee	C	C	U		*	*
<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher	O				+	
<i>Empidonax virescens</i>	Acadian Flycatcher	R	R			*	
<i>Empidonax alnorum</i>	Alder Flycatcher	U	O				+
<i>Empidonax traillii</i>	Willow Flycatcher	U	O			+	
<i>Empidonax minimus</i>	Least Flycatcher	C	O	O		+	+
<i>Sayornis phoebe</i>	Eastern Phoebe	C	C	U		*	*
<i>Myiarchus crinitus</i>	Great Crested Flycatcher	C	C	U		*	*
<i>Tyrannus verticalis</i>	Western Kingbird	O					+
<i>Tyrannus tyrannus</i>	Eastern Kingbird	C	C	O		+	*
<i>Tyrannus forficatus</i>	Scissor-tailed Flycatcher	O	O				+
Alaudidae							
<i>Eremophila alpestris</i>	Horned Lark	O	O	O	O	+	*
Hirundinidae							
<i>Progne subis</i>	Purple Martin	O	U			+	*
<i>Tachycineta bicolor</i>	Tree Swallow	O		O		+	+
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow	O	O	O		*	*
<i>Riparia riparia</i>	Bank Swallow	O				+	+
<i>Hirundo pyrrhonota</i>	Cliff Swallow		U	O			+
<i>Hirundo rustica</i>	Barn Swallow	C	C	U		+	*

BIRDS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Order/Family/Species	Common Name	Seasonal Abundance				Occurrence	
		Sp	Su	F	W	BW	TC
Passeriformes, cont.							
Corvidae							
<i>Cyanocitta cristata</i>	Blue Jay	C	C	C	C	*	*
<i>Corvus brachyrhynchos</i>	American Crow	C	C	C	C	*	*
Paridae							
<i>Parus atricapillus</i>	Black-capped Chickadee	C	C	C	C	*	*
<i>Parus bicolor</i>	Tufted Titmouse	C	C	C	C	*	*
Sittidae							
<i>Sitta canadensis</i>	Red-breasted Nuthatch			U	O	+	+
<i>Sitta carolinensis</i>	White-breasted Nuthatch	C	C	C	C	*	*
Certhiidae							
<i>Certhia americana</i>	Brown Creeper	U		U	U	+	+
Troglodytidae							
<i>Thryothorus ludovicianus</i>	Carolina Wren	U	U	U	U	*	*
<i>Troglodytes aedon</i>	House Wren	U	U	U		+	*
<i>Troglodytes troglodytes</i>	Winter Wren			O	O	+	+
<i>Cistothorus platensis</i>	Sedge Wren	O	O	O			+
Muscicapidae							
<i>Regulus satrapa</i>	Golden-crowned Kinglet	O		O	U	+	+
<i>Regulus calendula</i>	Ruby-crowned Kinglet	U		C	O	+	+
<i>Polioptila caerulea</i>	Blue-gray Gnatcatcher	U	U	O		*	*
<i>Sialia sialis</i>	Eastern Bluebird	C	C	C	U	*	*
<i>Catharus fuscescens</i>	Veery	O		O		+	
<i>Catharus minimus</i>	Gray-cheeked Thrush	U		O		+	+
<i>Catharus ustulatus</i>	Swainson's Thrush	C		U		+	+
<i>Catharus guttatus</i>	Hermit Thrush	U		O	O	+	+
<i>Hylocichla mustelina</i>	Wood Thrush	C	C	O		*	*
<i>Turdus migratorius</i>	American Robin	C	C	C	U	*	*
Mimidae							
<i>Dumetella carolinensis</i>	Gray Catbird	C	U	O		*	*
<i>Mimus polyglottos</i>	Northern Mockingbird	O	O	O	O	+	+
<i>Toxostoma rufum</i>	Brown Thrasher	C	C	O		*	*
Bombycillidae							
<i>Bombycilla cedrorum</i>	Cedar Waxwing	U		O	O	+	+
Laniidae							
<i>Lanius ludovicianus</i>	Loggerhead Shrike	O	O	O	O	+	*
Sturnidae							
<i>Sturnus vulgaris</i>	European Starling	U	O	C	U	*	*
Vireonidae							
<i>Vireo griseus</i>	White-eyed Vireo	R	R	R		*	*
<i>Vireo bellii</i>	Bell's Vireo	C	C	U		*	*
<i>Vireo solitarius</i>	Solitary Vireo	U		U		+	+
<i>Vireo flavifrons</i>	Yellow-throated Vireo	O	O	O		+	
<i>Vireo gilvus</i>	Warbling Vireo	U	O	O		*	*
<i>Vireo philadelphicus</i>	Philadelphia Vireo	O	R	O		+	+
<i>Vireo olivaceus</i>	Red-eyed Vireo	C	C	U		*	*
Emberizidae							
<i>Vermivora chrysoptera</i>	Golden-winged Warbler	R				+	
<i>Vermivora peregrina</i>	Tennessee Warbler	C	R	U		+	+
<i>Vermivora celata</i>	Orange-crowned Warbler	U		U		+	+
<i>Vermivora ruficapilla</i>	Nashville Warbler	C		U		+	+
<i>Parula americana</i>	Northern Parula	U	C	O		*	*

BIRDS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Order/Family/Species	Common Name	Seasonal Abundance				Occurrence	
		Sp	Su	F	W	BW	TC
Passeriformes, cont.							
Emberizidae, cont.							
<i>Dendroica petechia</i>	Yellow Warbler	C		O		+	+
<i>Dendroica pensylvanica</i>	Chestnut-sided Warbler	O		O		+	+
<i>Dendroica magnolia</i>	Magnolia Warbler	O		O		+	+
<i>Dendroica tigrina</i>	Cape May Warbler	R				+	
<i>Dendroica caerulescens</i>	Black-throated Blue Warbler			R			+
<i>Dendroica coronata</i>	Yellow-rumped Warbler	C		C	O	+	+
<i>Dendroica virens</i>	Black-throated Green Warbler	O		O		+	+
<i>Dendroica fusca</i>	Blackburnian Warbler	O		O		+	+
<i>Dendroica palmarum</i>	Palm Warbler	O				+	
<i>Dendroica castanea</i>	Bay-breasted Warbler			R			+
<i>Dendroica striata</i>	Blackpoll Warbler	O				+	+
<i>Dendroica cerulea</i>	Cerulean Warbler	R				+	
<i>Mniotilta varia</i>	Black-and-white Warbler	U	U	O		*	+
<i>Setophaga ruticilla</i>	American Redstart	U	O	O		*	+
<i>Protonotaria citrea</i>	Prothonotary Warbler	O				+	
<i>Helmitheros vermivorus</i>	Worm-eating Warbler	R				+	
<i>Seiurus aurocapillus</i>	Ovenbird	U	U	O		*	+
<i>Seiurus noveboracensis</i>	Northern Waterthrush	O		O		+	+
<i>Seiurus motacilla</i>	Louisiana Waterthrush	U	U			*	*
<i>Oporornis formosus</i>	Kentucky Warbler	C	C	O		*	*
<i>Oporornis philadelphia</i>	Mourning Warbler	U		O		+	+
<i>Geothlypis trichas</i>	Common Yellowthroat	C	C	O		*	*
<i>Wilsonia pusilla</i>	Wilson's Warbler	U		O		+	+
<i>Wilsonia canadensis</i>	Canada Warbler	O		O		+	+
<i>Icteria virens</i>	Yellow-breasted Chat	U	U	O		+	*
<i>Piranga rubra</i>	Summer Tanager	U	U	O		*	*
<i>Piranga olivacea</i>	Scarlet Tanager	U	U	O		*	*
<i>Piranga ludoviciana</i>	Western Tanager		A				+
<i>Cardinalis cardinalis</i>	Northern Cardinal	C	C	C	C	*	*
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	C	C	O		*	*
<i>Guiraca caerulea</i>	Blue Grosbeak	O	U	O		+	+
<i>Passerina cyanea</i>	Indigo Bunting	U	U	O		*	*
<i>Passerina ciris</i>	Painted Bunting	O				+	+
<i>Spiza americana</i>	Dickcissel	U	C	U		+	*
<i>Pipilo erythrophthalmus</i>	Rufous-sided Towhee	U	U	U	U	*	*
<i>Spizella arborea</i>	American Tree Sparrow	C		U	C	+	+
<i>Spizella passerina</i>	Chipping Sparrow	U	U	O			*
<i>Spizella pallida</i>	Clay-colored Sparrow	U		O		+	+
<i>Spizella pusilla</i>	Field Sparrow	C	C	U	O	*	*
<i>Pooecetes gramineus</i>	Vesper Sparrow	U	U	U		+	+
<i>Chondestes grammacus</i>	Lark Sparrow	U	U			+	*
<i>Passerculus sandwichensis</i>	Savannah Sparrow	U		O			+
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	U	U			+	*
<i>Ammodramus leconteii</i>	LeConte's Sparrow	U		U			+
<i>Passerella iliaca</i>	Fox Sparrow	U		U	U	+	+
<i>Melospiza melodia</i>	Song Sparrow	U		U	U	+	+
<i>Melospiza lincolni</i>	Lincoln's Sparrow	U		U	O	+	+
<i>Melospiza georgiana</i>	Swamp Sparrow	U		U	O		+
<i>Zonotrichia albicollis</i>	White-throated Sparrow	U		U	U	+	+
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	U		U	O	+	+

BIRDS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Order/Family/Species	Common Name	Seasonal Abundance				Occurrence	
		Sp	Su	F	W	BW	TC
Passeriformes, cont.							
Emberizidae, cont.							
<i>Zonotrichia querula</i>	Harris Sparrow	C		C	C	+	+
<i>Junco hyemalis</i>	Dark-eyed Junco	C		C	C	+	+
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	C	U	C	U	*	*
<i>Sturnella magna</i>	Eastern Meadowlark	C	C	C	U	*	*
<i>Sturnella neglecta</i>	Western Meadowlark			U	U		+
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird			O			+
<i>Euphagus carolinus</i>	Rusty Blackbird	U		U	O		+
<i>Quiscalus mexicanus</i>	Great-tailed Grackle	O					+
<i>Quiscalus quiscula</i>	Common Grackle	U	U	U	U	*	*
<i>Molothrus ater</i>	Brown-headed Cowbird	C	C	U	O	*	*
<i>Icterus spurius</i>	Orchard Oriole	U	U			+	+
<i>Icterus galbula</i>	Northern Oriole	C	C			*	*
Fringillidae							
<i>Carpodacus purpureus</i>	Purple Finch	U		U	U	+	+
<i>Carduelis pinus</i>	Pine Siskin	U		C	C	+	+
<i>Carduelis tristis</i>	American Goldfinch	C	C	C	C	*	*
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	O			O		+
Passeridae							
<i>Passer domesticus</i>	House Sparrow	C	C	C	C	*	*

## REPTILES AND AMPHIBIANS OF THE KANSAS ECOLOGICAL RESERVES

Henry S. Fitch

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Forty species of amphibians and reptiles have been found on the Kansas Ecological Reserves (KER), and others are to be expected as some of these areas have not been thoroughly sampled. The Fitch Natural History Reservation (FNHR) has been sampled the most thoroughly, with thousands of records based upon almost continuous live trapping over a 43-year period. Sampling of the Rockefeller Experimental Tract was begun in 1957 and has been carried on sporadically. On the Nelson Environmental Study Area (NESA) sampling has been mainly in the southeastern part (the Kansas Biotic Succession Facility) where artificial shelters have been used since 1986. However, the forested portions of NESA have been sampled only casually, and the same applies to the Robinson Tract, and the KER tracts in Baldwin Woods (Breidenthal Biological Reserve, Rice Woodland and the Roy and Eleanor Wall Woods).

Approximately 70 percent of the 56 species in the local herpetofauna have been recorded on the Tri-County area of KER (Fitch Natural History Reservation, Nelson Environmental Study Area, and Rockefeller Experimental Tract). Missing are 8 fluviatile species: *Necturus maculosus*, *Graptemys pseudogeographica*, *Trachemys scripta*, *Trachemys floridana*, *Apalone mutica*, *Apalone spinifera*, *Nerodia erythrogaster*, *Nerodia rhombifera*; also 7 floodplain or wetland species: *Ambystoma texanum*, *Rana areolata*, *Bufo cognatus*, *Thamnophis proximus*, *Thamnophis radix*, *Regina grahami*, *Sistrurus catenatus*; 3 forest species: *Eumeces anthracinus*, *Opheodrys aestivus*, *Storeria occipitomaculata*; and one arenicolous species, *Heterodon platirhinos*.

Most records have been gathered from the FNHR, but with the successional habitat changes from field, pasture, and prairie to brush and woodland, the following species have been eliminated from the Reservation: *Gastrophryne olivacea*, *Terrapene ornata*, *Crotaphytus collaris*, *Eumeces obsoletus*, *Eumeces septentrionalis*, *Cnemidophorus sexlineatus*, *Pituophis catenifer*, *Tantilla gracilis*, and *Crotalus horridus*. All these species except *Crotaphytus collaris*, *Cnemidophorus sexlineatus*, *Eumeces septentrionalis* (and possibly *Tantilla gracilis*) are still present on NESA. Six of the species in our lists (*Ambystoma tigrinum*, *Scaphiopus bombifrons*, *Chrysemys picta*, *Terrapene carolina*, *Elaphe guttata* and *Lampropeltis getula*) are thought to have reached the Tri-County area of KER as occasional dispersers from more favorable habitats, or to have been brought and released by people, but without establishing permanent populations. No species has gained in numbers as a result of the successional changes on FNHR, but the following have been drastically reduced: *Ophisaurus attenuatus*, *Eumeces fasciatus*, *Carphophis amoenus*, *Coluber constrictor*, and *Diadophis punctatus*.

Of the 40 species occurring on KER, 7 (*Bufo woodhousii*, *Rana catesbeiana*, *Chrysemys picta*, *Coluber constrictor*, *Diadophis punctatus*, *Lampropeltis getula*, *Thamnophis sirtalis*) are transcontinental in distribution; 9 (*Scaphiopus bombifrons*, *Rana blairi*, *Gastrophryne olivacea*, *Terrapene ornata*, *Crotaphytus collaris*, *Eumeces obsoletus*, *E. septentrionalis*, *Tantilla gracilis*, and *Tropidoclonion lineatum*) are characteristic of the Great Plains; 1 (*Pituophis catenifer*) is mainly western, and the remaining 23 species (57%) are most characteristic of the Eastern Deciduous Forest Biome. Of the 23, 12 (*Hyla chrysoscelis*, *Bufo americanus*, *Terrapene carolina*, *Eumeces anthracinus*, *E. fasciatus*, *Scincella lateralis*, *Carphophis amoenus*, *Elaphe obsoleta*, *Storeria occipitomaculata*, *Virginia valeriae*, *Agkistrodon contortrix* and *Crotalus horridus*) have overall ranges corresponding well with the Forest Biome; 8 others (*Ambystoma tigrinum*, *Acris crepitans*, *Pseudacris triseriata*, *Ophisaurus attenuatus*, *Cnemidophorus sexlineatus*, *Elaphe guttata*, *Lampropeltis calligaster*,

and *Nerodia sipedon*) have ranges extending west far into the Great Plains grasslands, while 3 (*Chelydra serpentina*, *Lampropeltis triangulum*, and *Storeria dekayi*) range southward into the tropics.

In the accompanying lists, species are presented in phylogenetic sequence by family and scientific and common (species or subspecies) names follow Conant and Collins (1991). Generalized habitat preferences for each species has been recorded as follows: A=aquatic tendencies, B=barren soil, sand or rock, C=cultivated land, F=forest, P=prairie or pasture, and E=edge or forest-grassland contact. A generalized key to abundance and occurrence is given with the following codes: a=abundant, m=moderately abundant, r=rare, s=single record of occurrence, and i=introduced species with no extant population.

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## AMPHIBIANS OF THE KANSAS ECOLOGICAL RESERVES

Family/Species	Common Name	Habitat	Abundance
Ambystomatidae			
<i>Ambystoma tigrinum</i>	Eastern Tiger Salamander	C	r
Pelobatidae			
<i>Scaphiopus bombifrons</i>	Plains Spadefoot	C	r
Bufo			
<i>Bufo americanus</i>	Eastern American Toad	F	m
<i>Bufo woodhousii</i>	Woodhouse's Toad	P	m
Hylidae			
<i>Acris crepitans</i>	Blanchard's Cricket Frog	A	a
<i>Hyla chrysoscelis</i>	Cope's Gray Treefrog	F	m
<i>Pseudacris triseriata</i>	Western Chorus Frog	C	a
Ranidae			
<i>Rana blairi</i>	Plains Leopard Frog	A	m
<i>Rana catesbeiana</i>	Bullfrog	A	a
Microhylidae			
<i>Gastrophryne olivacea</i>	Great Plains Narrowmouth Toad	F	m

## REPTILES OF THE KANSAS ECOLOGICAL RESERVES

Family/Species	Common Name	Habitat	Abundance
Chelydridae			
<i>Chelydra serpentina</i>	Snapping Turtle	A	m
Emydidae			
<i>Chrysemys picta</i>	Midland Painted Turtle	A	s
<i>Terrapene carolina</i>	Three-toed Box Turtle	F	s
<i>Terrapene ornata</i>	Ornate Box Turtle	P	r
Crotaphytidae			
<i>Crotaphytus collaris</i>	Eastern Collared Lizard	B	i
Teiidae			
<i>Cnemidophorus sexlineatus</i>	Six-lined Racerunner	B	r
Scincidae			
<i>Eumeces anthracinus</i> <sup>1</sup>	Northern Coal Skink	F	m
<i>Eumeces fasciatus</i>	Five-lined Skink	F	m
<i>Eumeces obsoletus</i>	Great Plains Skink	P	m
<i>Eumeces septentrionalis</i>	Northern Prairie Skink	P	r
<i>Scincella lateralis</i>	Ground Skink	E	r
Anguidae			
<i>Ophisaurus attenuatus</i>	Western Slender Glass Lizard	P	m
Colubridae			
<i>Carphophis amoenus</i>	Western Worm Snake	F	r
<i>Coluber constrictor</i>	Eastern Yellowbelly Racer	P	a
<i>Diadophis punctatus</i>	Prairie Ringneck Snake	E	a
<i>Elaphe guttata</i>	Great Plains Rat Snake	P	r
<i>Elaphe obsoleta</i>	Black Rat Snake	F	m
<i>Lampropeltis calligaster</i>	Prairie Kingsnake	P	m
<i>Lampropeltis getula</i>	Speckled Kingsnake	E	r
<i>Lampropeltis triangulum</i>	Red Milk Snake	E	r
<i>Nerodia sipedon</i>	Northern Water Snake	A	m
<i>Pituophis catenifer</i>	Bullsnake	P	r
<i>Storeria dekayi</i>	Texas Brown Snake	E	m
<i>Storeria occipitomaculata</i> <sup>1</sup>	Northern Redbelly Snake	F	r
<i>Tantilla gracilis</i> <sup>2</sup>	Flathead Snake	B	r
<i>Thamnophis sirtalis</i>	Red-sided Garter Snake	A	m
<i>Tropidoclonion lineatum</i> <sup>3</sup>	Lined Snake	P	r
<i>Virginia valeriae</i>	Western Earth Snake	F	r
Viperidae			
<i>Agkistrodon contortrix</i>	Osage Copperhead	E	m
<i>Crotalus horridus</i>	Timber Rattlesnake	E	r

<sup>1</sup>Baldwin Woods only; <sup>2</sup>no recent records; <sup>3</sup>NESA only.

## SPIDERS OF THE KANSAS ECOLOGICAL RESERVES

Hank Guarisco

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and Henry S. Fitch

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Spiders are a conspicuous and ecologically important group of predators although they may serve as prey for other species. Despite their importance, research in araneology has been hampered by the difficulty of making accurate identifications and the lack of natural history information for even many common species. Information concerning the spider fauna of Kansas is very limited. The only surveys of this group within the state are those by Cragin (1886), Scheffer (1904, 1905), Fitch (1963, 1965), Fitch and Fitch (1966), Guarisco and Kinman (1990), and Guarisco and Mott (1990). Although a thorough knowledge of the Kansas spider fauna is presently a distant goal, intensive study in the relatively small area of the Kansas Ecological Reserves (KER) has provided a working knowledge of the identity and habits of the local fauna.

This checklist is based on earlier work at the Fitch Natural History Reservation (FNHR) and Rockefeller Experimental Tract (Fitch 1963) and collections by the first author, primarily from the FNHR and Nelson Environmental Study Area, from 1972 to the present. Only very limited collecting has been done at the Baldwin Woods area. More field work, especially in the Baldwin Woods area, will undoubtedly add more species to this checklist. Voucher specimens are located in the preserved collections of the Kansas Biological Survey, the University of Kansas Snow Entomological Museum, and the senior author's personal collection.

The current KER spider checklist contains a total of 236 species (about one half of the currently reported fauna for Kansas). Thirty-six species are first reported from the KER and 21 of these are new state records. Each new state record is followed by an asterisk (\*) and a new KER record is followed by a plus symbol (+). Some species have a question mark (?) before the scientific name. This indicates that it is a questionable record and more field work is needed to verify the species' presence. For example, *Spirembolus* sp. was recorded by Fitch (1963) but a recent revision (Millidge 1980) indicated that it is a genus which is restricted to the western United States and no Kansas localities were given. Therefore, although a species of this genus may occur here, in the absence of a voucher specimen the previous record is questionable. A recent revision of *Cyclosa* indicates that *C. caroli* (Hentz) is a southeastern species and many identifications of species within this genus were erroneous in earlier publications (Levi 1977). Both *C. conica* (Pallas) and *C. turbinata* (Walckenaer) occur in this part of Kansas and the latter species occurs on the KER. Kaston (1981) indicated that he had misidentified *Philodromus praelustris* Keyserling and *P. vulgaris* (Hentz) as *P. pernix* Blackwell. Because collecting on the KER has revealed many specimens of *P. vulgaris* but none of *P. pernix*, the record for the latter species is called into question. *Metaphidippus castaneus* (Hentz) is considered a southeastern species (Richman and Cutler 1978) and closely resembles *M. barrowsi* Kaston which does occur on the KER.

Recent taxonomic advances have made many of the scientific names used in earlier surveys obsolete. Therefore, this list provides the currently recognized scientific name and the describer followed by older names placed in synonymy. The list is arranged phylogenetically by family following (Platnick 1989). The next section provides habitat information: F = forest/woodland, O = open areas such as fields and prairie, F/O = forest edge, E = edificarian (e.g., associated with houses, barns, and bridges), and W = wetland. These are general

designations and many species occur in more than one habitat. The letter "U" indicates that the habitat information is unrecorded. The final section of the checklist indicates the source of the record as either a voucher specimen (v) or reported in literature (r).

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**SPIDERS OF THE KANSAS ECOLOGICAL RESERVES**

Family/Species	Habitat	Source
<b>Atypidae</b>		
<i>Sphodros fitchi</i> Gertsch and Platnick [= <i>Atypus sp.</i> ]	F	v
<i>Sphodros niger</i> (Hentz) [= <i>Atypus niger</i> Emerton]	F/O O	v
<i>Sphodros rufipes</i> (Latreille)	F	v
<b>Antrodiaetidae</b>		
<i>Antrodiaetus lincolnianus</i> (Worley)	F/O	r
<b>Ctenizidae</b>		
<i>Ummidia sp.</i>	F/O	v
<b>Loxoscelidae</b>		
<i>Loxosceles reclusa</i> Gertsch and Mulaik	E	r
<b>Pholcidae</b>		
<i>Pholcus muralicola</i> Maughan and Fitch [= <i>Pholcus sp.</i> ]	E F	v
<i>Psilochorus pullulus</i> (Hentz)	E	r
<i>Spermophora meridionalis</i> Hentz	E	r
<b>Mimetidae</b>		
<i>Mimetus notius</i> Chamberlin	F	v
<i>Mimetus puritanus</i> Chamberlin	E F	v
<b>Uloboridae</b>		
<i>Uloborus glomosus</i> (Walckenaer)	F	r
<b>Nesticidae</b>		
<i>Eidmannella pallida</i> (Emerton)	F	v
<b>Theridiidae</b>		
<i>Achaearanea porteri</i> (Banks)	E	v
<i>Achaearanea tepidariorum</i> (C.L. Koch)	E	r
<i>Argyrodes cancellatus</i> (Hentz)	F F/O	v
<i>Argyrodes trigonum</i> (Hentz)	F	v
<i>Crustulina altera</i> Gertsch and Archer	F	r
<i>Dipoena nigra</i> (Emerton)	F	v
<i>Enoplognatha marmorata</i> (Hentz)	F	r
<i>Enoplognatha tecta</i> (Keyserling)	U	v
<i>Euryopis limbata</i> (Walckenaer)	F	v
<i>Latrodectus variolus</i> Walckenaer [=Misidentified as <i>Latrodectus curacaviensis</i> Muller]	F F/O	v
<i>Steatoda americana</i> (Emerton)	O F	v
<i>Steatoda borealis</i> (Hentz)	E F	v
<i>Steatoda triangulosa</i> (Walckenaer)	E	r
<i>Theridion albidum</i> Banks *	F	v
<i>Theridion differens</i> Emerton	F/O	v
<i>Theridion murarium</i> Emerton	F	v
<i>Theridion pennsylvanicum</i> Emerton *	U	v
<i>Thymoites unimaculatum</i> (Emerton) [= <i>Sphyrotinus imparatus</i> Bishop and Crosby]	F	r
<b>Linyphiidae</b>		
<i>Centromerus latidens</i> (Emerton)	F	r
<i>Ceraticelus micropalpis</i> (Emerton)	U	r

SPIDERS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Species	Habitat	Source
Linyphiidae, cont.		
<i>Ceraticelus minutus</i> (Emerton)	F	r
<i>Ceratinella brunnea</i> Emerton	F	r
<i>Eperigone maculata</i> (Banks)	F	r
<i>Erigone autumnalis</i> Emerton	F	r
<i>Erigone praecursora</i> Chamberlin and Ivie	U	r
<i>Frontinella pyramitela</i> (Walckenaer)	F F/O	v
<i>Lepthyphantes appalachia</i> Chamberlin and Ivie	U	r
<i>Lepthyphantes sabulosa</i> (Keyserling)	F	r
<i>Meioneta micaria</i> (Emerton)	F	r
<i>Neriene radiata</i> (Walckenaer)	F F/O	r
[= <i>Linyphia marginata</i> C.L. Koch]		
<i>Origanates rostratus</i> (Emerton)	F	r
<i>Scylaceus pallidus</i> (Emerton)	F	r
<i>Sisicus penifusiferus</i> Bishop and Crosby	U	r
<i>Souessoula parva</i> (Banks)	U	r
<i>Tapinocyba</i> sp.	U	r
(?) <i>Spirembolus</i> sp.	U	r
<i>Walckenaeria indirecta</i> (O.P. Cambridge)	F	r
[= <i>Cornicularia indirecta</i> (Cambridge)]		
Tetragnathidae		
<i>Tetragnatha elongata</i> Walckenaer	W	r
<i>Tetragnatha laboriosa</i> Hentz	O	v
Argiopidae		
<i>Acacesia hamata</i> (Hentz)	F/O	v
<i>Acanthepeira cherokee</i> Levi *	F	v
<i>Acanthepeira stellata</i> (Walckenaer)	O	v
<i>Araneus bicentenarius</i> McCook	F	v
[=misidentified as <i>Araneus saevus</i> (L. Koch)		
= <i>Araneus solitarius</i> (Emerton)]		
<i>Araneus cingulatus</i> (Walckenaer)*	F	v
<i>Araneus guttulatus</i> (Walckenaer)*	F	v
<i>Araneus juniperi</i> (Emerton)	O	r
[= <i>Conaranea juniperi</i> (Emerton)]		
<i>Araneus marmoreus</i> Clerck	F F/O	v
<i>Araneus pratensis</i> (Emerton)	O	v
[= <i>Singa pratensis</i> Emerton]		
<i>Araneus thaddeus</i> (Hentz)+	F	v
<i>Araniella displicata</i> (Hentz)	O F/O	r
<i>Argiope aurantia</i> Lucas	O	v
<i>Argiope trifasciata</i> (Forsk.)	O	v
<i>Colphepeira catawba</i> (Banks)	F	r
(?) <i>Cyclosa caroli</i> (Hentz)	F	r
<i>Cyclosa turbinata</i> (Walckenaer)	F/O E	v
<i>Eustala anastera</i> (Walckenaer)	F F/O	v
<i>Eustala cepina</i> (Walckenaer)	F/O	r
<i>Gea heptagon</i> (Hentz)	O	v
<i>Glenognatha foxi</i> (McCook)	O	r
[= <i>Mimognatha foxi</i> (McCook)]		

SPIDERS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Species	Habitat	Source
Argiopidae, cont.		
<i>Hyposinga rubens</i> (Hentz) [= <i>Singa truncata</i> Banks]	F	v
<i>Larinia directa</i> (Hentz) +	O	v
<i>Leucauge venusta</i> (Walckenaer)	F	v
<i>Mangora gibberosa</i> (Hentz)	F/O	v
<i>Mangora maculata</i> (Keyserling) [= <i>Mangora ornata</i> (Walckenaer)]	F	v
<i>Mangora placida</i> (Hentz)	F	r
<i>Metepeira labyrinthea</i> (Hentz)	F F/O	v
<i>Micrathena gracilis</i> (Walckenaer)	F	v
<i>Micrathena mitrata</i> (Hentz)	F	v
<i>Micrathena sagittata</i> (Walckenaer)	F	v
<i>Neoscona arabesca</i> (Walckenaer)	O F/O	v
<i>Neoscona crucifera</i> (Lucas) [= <i>Neoscona hentzii</i> (Keyserling) = <i>Neoscona benjamina</i> (Walckenaer)]	E F F/O	r
<i>Neoscona pratensis</i> (Hentz)	O	v
<i>Nuctenea cornuta</i> (Clerck) +	F	v
<i>Verrucosa arenata</i> (Walckenaer)	F	v
<i>Wixia ectypa</i> (Walckenaer) *	F	v
Lycosidae		
<i>Allocosa funerea</i> (Hentz) [= <i>Arctosa funerea</i> (Hentz)]	O	r
<i>Allocosa noctuabunda</i> (Montgomery) [= <i>Arctosa noctuabunda</i> Montgomery]	U	r
<i>Allocosa sublata</i> (Montgomery) [= <i>Arctosa sublata</i> Montgomery]	F	v
<i>Geolycosa missouriensis</i> (Banks)	O	r
<i>Gladicosa gulosa</i> (Walckenaer) [= <i>Lycosa gulosa</i> Walckenaer]	F	v
<i>Hogna aspersa</i> (Hentz) [= <i>Lycosa aspersa</i> Hentz]	F F/O	v
<i>Hogna carolinensis</i> (Walckenaer) [= <i>Lycosa carolinensis</i> (Walckenaer)]	O	r
<i>Hogna helluo</i> (Walckenaer) [= <i>Lycosa helluo</i> Walckenaer]	F W	r
<i>Hogna punctulata</i> (Hentz) [= <i>Lycosa punctulata</i> (Hentz)]	O	v
<i>Hogna rabida</i> (Walckenaer) [= <i>Lycosa rabida</i> Walckenaer]	O	v
<i>Pardosa milvina</i> (Hentz)	W	r
<i>Pardosa lapidicina</i> Emerton	W	r
<i>Pardosa saxatilis</i> (Hentz)	O F	r
<i>Pirata alachuus</i> Gertsch and Wallace *	F	v
<i>Pirata aspirans</i> Chamberlin [= <i>Pirata arenicola</i> Emerton]	W F	r
<i>Pirata insularis</i> Emerton	F	r

**SPIDERS OF THE KANSAS ECOLOGICAL RESERVES (cont.)**

Family/Species	Habitat	Source
Lycosidae, cont.		
<i>Pirata sedentarius</i> Montgomery [= <i>Pirata maculatus</i> Emerton]	F	v
<i>Varacosa avara</i> (Keyserling) [= <i>Lycosa avara</i> (Keyserling)]	F/O	v
<i>Schizocosa avida</i> (Walckenaer)	O	v
<i>Schizocosa bilineata</i> (Emerton)	O	v
<i>Schizocosa ocreata</i> (Hentz) [= <i>Schizocosa crassipes</i> (Walckenaer)]	F F/O	v
<i>Schizocosa saltatrix</i> (Hentz)	F	v
Pisauridae		
<i>Dolomedes albineus</i> Hentz *	E F	v
<i>Dolomedes tenebrosus</i> Hentz	E F W	v
<i>Dolomedes triton</i> (Walckenaer) [= <i>Dolomedes sexpunctatus</i> Hentz]	W	r
<i>Dolomedes vittatus</i> Walckenaer [= <i>Dolomedes urinator</i> Hentz]	F	r
<i>Pisaurina dubia</i> (Hentz)+	F F/O	v
<i>Pisaurina mira</i> (Walckenaer) [= <i>Dapanus mirus</i> (Walckenaer)]	F F/O	v
<i>Pisaurina undulata</i> (Keyserling) [= <i>Pelopatis undulata</i> (Keyserling)]	O	r
Agelenidae		
<i>Agelenopsis naevia</i> (Walckenaer)	E F O	v
<i>Agelenopsis oklahoma</i> (Gertsch)	E F/O	r
<i>Agelenopsis pennsylvanica</i> (C.L. Koch)	E O F	v
<i>Cicurina arcuata</i> Keyserling	F	v
<i>Cicurina ludoviciana</i> Simon	F/O	r
<i>Coras lamellosus</i> (Keyserling)	F	v
<i>Tegenaria domestica</i> (Clerck)	E	v
Hahnüidae		
<i>Neoantistea agilis</i> (Keyserling)+	O	v
Dictynidae		
<i>Dictyna bellans</i> Chamberlin+	O	v
<i>Dictyna foliacea</i> (Hentz)	U	r
<i>Dictyna formidolosa</i> Gertsch and Ivie	U	r
<i>Dictyna sublata</i> (Hentz)	F	r
<i>Dictyna volucripes</i> Keyserling	O	r
Amaurobiidae		
<i>Titanoeca americana</i> Emerton	F F/O	v
Oxyopidae		
<i>Oxyopes salticus</i> Hentz	O	v
<i>Oxyopes scalaris</i> Hentz	F/O	v
Anyphaenidae		
<i>Anyphaena fraterna</i> (Banks)	U	r
<i>Anyphaena pectorosa</i> L. Koch *	F	v
<i>Aysha gracilis</i> (Hentz)	E F	v
<i>Wulfila saltabunda</i> (Hentz)	F	v

SPIDERS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Species	Habitat	Source
<b>Clubionidae</b>		
<i>Castianeira cingulata</i> (C.L. Koch)	F	v
<i>Castianeira descripta</i> (Hentz)	O F/O	v
<i>Castianeira longipalpus</i> (Hentz)	F	v
<i>Castianeira trilineata</i> (Hentz)	F	r
<i>Castianeira variata</i> Gertsch	E F F/O	v
<i>Cheiracanthium inclusum</i> (Hentz)	E F/O	r
<i>Clubiona kastoni</i> Gertsch	U	r
<i>Clubiona quebecana</i> Dondale and Redner *	F	v
<i>Clubionoides excepta</i> (C.L.Koch)	E F	v
<i>Phrurotimpus alarius</i> (Hentz)	U	r
<i>Phrurotimpus borealis</i> (Emerton)	F	r
<i>Scotinella redempta</i> (Gertsch)	U	r
<i>Trachelas deceptus</i> (Banks)	O	v
[= <i>Meriola decepta</i> Banks]		
<i>Trachelas tranquillus</i> (Hentz)	E O	r
<b>Gnaphosidae</b>		
<i>Callilepis imbecilla</i> (Keyserling)	F/O	r
<i>Drassodes auriculoides</i> Barrows	F/O F O	v
<i>Drassyllus aprilinus</i> (Banks)	F	v
<i>Drassyllus gynosaphes</i> Chamberlin	F	v
<i>Drassyllus lepidus</i> (Banks) +	O	v
<i>Drassyllus nannellus</i> Chamberlin and Gertsch	F	v
<i>Drassyllus novus</i> (Banks) +	F	v
<i>Gnaphosa fontinalis</i> Keyserling	F/O	v
<i>Gnaphosa sericata</i> (L. Koch) +	O	v
<i>Haplodrassus bicornis</i> (Emerton)	O F	v
<i>Herpyllus ecclesiasticus</i> Hentz	F	v
[= <i>Herpyllus vasifer</i> (Walckenaer)]		
<i>Micaria longipes</i> Emerton	F	v
<i>Sergiolus capulatus</i> (Walckenaer)	F/O	v
<i>Sergiolus cyaneiventris</i> Simon	F/O	v
<i>Sosticus insularis</i> (Banks)	U	v
<i>Sosticus loricatus</i> (L. Koch)	U	v
<i>Synaphosus paludis</i> (Chamberlin and Gertsch) +	O	v
<i>Zelotes duplex</i> Chamberlin	F F/O	v
<i>Zelotes hentzi</i> Barrows	F F/O	v
<i>Zelotes laccus</i> (Barrows) *	O	v
<b>Philodromidae</b>		
<i>Philodromus keyserlingi</i> Marx +	E	v
<i>Philodromus marxi</i> Keyserling	F/O	v
(?) <i>Philodromus pernix</i> Blackwall	F	r
<i>Philodromus pratariae</i> (Scheffer)	O	v
<i>Philodromus vulgaris</i> (Hentz)+	F	v
<i>Thanatus formicinus</i> (Clerck)	O	r
<i>Thanatus rubicellus</i> Mello-Leitao *	O E	v
<i>Tibellus duttoni</i> (Hentz) *	O	v
<i>Tibellus oblongus</i> (Walckenaer)	O	r

SPIDERS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Species	Habitat	Source
Thomisidae		
<i>Coriarachne versicolor</i> Keyserling [= <i>Coriarachne lenta</i> (Walckenaer)]	F	r
<i>Misumena vatia</i> (Clerck)	O	r
<i>Misumenoides formosipes</i> (Walckenaer)	O	v
<i>Misumenops asperatus</i> (Hentz)	U	r
<i>Misumenops delphinus</i> (Walckenaer)	U	r
<i>Misumenops oblongus</i> (Keyserling)	E O	v
<i>Ozyptila monroensis</i> Keyserling	O	v
<i>Synema parvulum</i> (Hentz) [= (?) <i>Synema varians</i> (Walckenaer)]	F	v
<i>Tmarus angulatus</i> (Walckenaer)	F	v
<i>Xysticus auctificus</i> Keyserling [= <i>X. lemniscatus</i> Walckenaer]	O	v
<i>Xysticus bicuspis</i> Keyserling	U	r
<i>Xysticus elegans</i> Keyserling	O F	v
<i>Xysticus ferox</i> (Hentz) [= <i>Xysticus transversatus</i> (Walckenaer)]	F F/O	v
<i>Xysticus funestus</i> Keyserling [= <i>Xysticus tumefactus</i> Walckenaer]	E F/O	r
<i>Xysticus pallax</i> O. Pickard-Cambridge	O	r
<i>Xysticus texanus</i> Banks	O	v
<i>Xysticus triguttatus</i> Keyserling	U	r
Salticidae		
<i>Eris aurantia</i> (Lucas) [= <i>Paraphidippus aurantius</i> (Lucas)]	F F/O	v
<i>Eris militaris</i> (Hentz) [= <i>Paraphidippus marginatus</i> Walckenaer]	F F/O	v
(?) <i>Eris pinea</i> (Kaston) [= <i>Paraphidippus pineus</i> Kaston]	U	r
<i>Evarcha hoyi</i> (Peckhams)	E F/O	r
<i>Metaphidippus barrowsi</i> Kaston+	O	v
(?) <i>Metaphidippus castaneus</i> (Hentz)	U	r
<i>Metaphidippus exiguus</i> (Banks)*	F/O	v
<i>Metaphidippus galathea</i> (Walckenaer)	O	v
<i>Metaphidippus protervus</i> (Walckenaer)	F/O F	v
<i>Habrocestum pulex</i> (Hentz)	F F/O	r
<i>Habronattus coecatus</i> (Hentz) [= <i>Habronattus coronatus</i> (Hentz)]	O	v
<i>Habronattus orbis</i> Griswold	U	r
<i>Habronattus viridipes</i> (Hentz)	U	r
<i>Hentzia mitrata</i> (Hentz)	U	r
<i>Hentzia palmarum</i> (Hentz) [= <i>Hentzia ambigua</i> (Walckenaer)]	E F/O O	v
<i>Maevia inclemens</i> (Walckenaer)	E F	v
<i>Marpissa formosa</i> (Banks) [=misidentified as <i>Marpissa bina</i> (Hentz)]	O	v
<i>Marpissa lineata</i> (C.L. Koch)*	O	v

SPIDERS OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Family/Species	Habitat	Source
Salticidae, cont.		
<i>Marpissa pikei</i> (Peckhams)	O	v
<i>Peckhamia americana</i> (Peckhams)	F	r
<i>Phidippus apacheanus</i> Chamberlin and Gertsch	O	r
<i>Phidippus audax</i> (Hentz)	E F F/O	v
[= <i>P. variegatus</i> ] (Lucas)		
<i>Phidippus clarus</i> Keyserling	O	v
[= <i>P. rimator</i> Walckenaer]		
<i>Phidippus insignarius</i> C.L. Koch	U	r
[= (?) <i>Phidippus fraudulentus</i> (Walckenaer)]		
<i>Phidippus pius</i> Scheffer	O	v
<i>Phidippus princeps</i> (Peckhams)	F/O	r
<i>Phidippus putnami</i> (Peckhams)	E F/O F O	v
<i>Phidippus whitmanii</i> Peckhams	O F	v
<i>Platycryptus undatus</i> (DeGeer)	E F	v
[= <i>Metacryba undata</i> (DeGeer)]		
<i>Sarinda hentzi</i> (Banks)	F/O	r
[= <i>Myrmarachne hentzi</i> (Banks)]		
<i>Sassacus papenhoei</i> Peckhams	O	v
<i>Sitticus cursor</i> Barrows *	O	v
<i>Synagles (Gerschia) noxiosus</i> (Hentz)	O	v
[= <i>Gertshia scorpionia</i> (Hentz)]		
<i>Talavera minuta</i> (Banks)*	O	v
<i>Thiodina puerpera</i> (Hentz)	F/O	v
<i>Thiodina sylvana</i> (Hentz)	F	v
[= <i>Thiodina iniquies</i> (Walckenaer)]		
<i>Tuelina elegans</i> (Hentz)	U	r
<i>Tuelina hartii</i> (Emerton)	F	r
[= <i>Icius hartii</i> Emerton]		
<i>Zygoballus rufipes</i> Peckhams	F	v
[= <i>Zygoballus bettini</i> Peckhams]		

## INSECTS OF THE KANSAS BIOTIC SUCCESSION FACILITY

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One important attribute of an ecosystem is that it is constantly changing—a dynamic system, in which both plants and animal communities undergo temporal change. This temporal change is predictable and may be seasonal and therefore cyclic, or directional. Ecological succession is the term used to refer to directional community change of species in time and space for a habitat or patch of land. Insect species make up 70% of the animal kingdom with a total species diversity that is estimated to be in the range of 3 to 30 million. These relatively large numbers coupled with changes in insect communities that closely follow changes in plant communities (Brown 1984) are indicative of the key role that insects play in the succession process. The Kansas Biotic Succession Facility was designed for experimental research on the early stages of old-field succession in the forest–prairie ecotone of eastern Kansas. Because of the relative significance of herbivory in community dynamics, systematic collections of the insect fauna have been made on a biweekly basis since the facility began in 1985.

The total number of insect species in Kansas was estimated to be in the range of 15,000 to 18,000 (Gates and Peters 1962), although these numbers may be a gross underestimate in the light of subsequent surveys and work on smaller species. Because of the central geographic location of Kansas, many species from eastern, western, northern and southern faunal elements also occur in Kansas. Since eastern Kansas is a transitional region from the eastern deciduous forest to the tallgrass prairie, it is an area where much of the eastern fauna ends and the western and southwestern faunas begin. Although no comprehensive survey has been made on the insects of Kansas, taxonomic studies on particular groups of insects are occasionally done. Likewise, a comprehensive survey of the insects and arthropods at the Kansas Ecological Reserves has not been attempted, but a variety of taxonomic and biological studies have been done on selected groups (Fitch 1965). The present list of about 800 or so morphospecies taken from studies of old-field succession should be viewed as a starting point and by no means comprehensive.

The Kansas Biotic Succession Facility is located on a 12 ha site at the Nelson Environmental Study Area that was actively farmed until June 1984. At that time the area was released from farming and was mowed into a series of vegetation patches that were allowed to undergo succession with periodic mowing of the interstitial areas to maintain the integrity of the patches. Three sizes of vegetation patches were established, measuring 50 x 100 m (5000 sq m), 12 x 24 m (488 sq m), and 4 x 8 m (32 sq m). Old-field successional vegetation became established during the first summer and insect sampling commenced in June 1985. Insect sampling has been performed biweekly between May and November every growing season since 1985 using the sweep net and pitfall traps. A reference collection for this study is deposited in the Kansas Biological Survey.

Sweep samples were taken with a standardized protocol along 30 designated transects covering the large, medium and small patches. One hundred sweeps were taken along each transect in the unmowed vegetation patches. Five pitfall traps were situated along the same transects used for sweep sampling and were opened for 48 hours at least 48 hours after the last sweep samples were taken. All specimens were sorted to morphospecies, and the number for each morphospecies recorded. Morphospecies are distinct phenotypes recognizable by morphological characters (Mayr and Ashlock 1991). Since morphological modifications are

usually adaptations to particular selective pressures, i.e., host or habitat, the concept of morphospecies is especially relevant in ecology. Diversity, richness and abundance values were calculated and compared among the different treatments (vegetation patch size) throughout the season in contrast with similar values for plant species. Data analysis has concentrated on correlation, regression and principal components analysis as well as trophic structure pattern delineation. Sampling and data analysis for these ongoing studies continues for each growing season.

In the accompanying list, the numbers following the family-group names refer to the number of morphospecies within that group. Family-group names recognized are based on Borror et al. (1976) and generic/species names are arranged alphabetically under each family. Common names are given for those insects where possible and information on family feeding habits (exceptions within the family are given after the generic/species name) are taken from literature (Borror et al. 1976). All reference specimens have to be sent out for final identification and verification by specialists.

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## INSECTS OF THE KANSAS BIOTIC SUCCESSION FACILITY

ORDER/Family/Species	Common Name	Feeding Habit
<b>EPHEMEROPTERA</b>		
Baetidae 1	Mayflies	Adults do not feed
Ephemeraeidae 1	Mayflies	Adults do not feed
<b>ODONATA</b>		
Coenagrionidae 1-3	Damselfly	Predatory
Libellulidae 1-3	Dragonfly	Predatory
<b>ORTHOPTERA</b>		
Tetrigidae 1-4		Phytophagous
<i>Paratetrix cucullata</i> (Burm.)	Pygmy Locusts	
<i>Tetrix ornatum</i> Say	Pygmy Locusts	
Acrididae 1-17	Short Horned Grasshoppers	Phytophagous
<i>Chartophaga viridifasciata</i> (De Geer)	Green Striped Grasshopper	
<i>Dissosteira carolina</i> (L.)	Carolina Grasshopper	
<i>Melanopus bivittatus</i> (Say)	Two-striped Grasshopper	
<i>M. femurrubrum</i> (De Geer)	Red-legged Grasshopper	
<i>M. differentiales</i> (Thomas)	Differential Grasshopper	
<i>Mermiria</i> sp. 1	Slant Faced Grasshopper	
<i>Pardalophora</i> sp. 1		
<i>Pardalophora</i> sp.2		
<i>Schistocera</i> sp.1	American Grasshopper	
<i>Syrbula</i> sp.1	Slant Faced Grasshopper	
<i>Syrbula</i> sp.2	Slant Faced Grasshopper	
Tettigoniidae 1-3	Long-horned Grasshoppers	Phytophagous
<i>Microcentrum rhombifolium</i>	Broad-winged Katydid	
<i>Orchelimum nigripes</i> Scud.	Meadow Grasshopper	
<i>Orchelimum vulgare</i> Harris	Meadow Grasshopper	
Gryllidae 1-9		Phytophagous
<i>Oecanthus</i> sp.1	Tree Cricket	
<i>Oecanthus</i> sp.2	Tree Cricket	
<i>Gryllus</i> sp.1	Field Cricket	
<b>MANTODEA</b>		
Mantidae 1	Carolina Mantis	Predatory
<i>Stagmatoptera carolina</i> (R&H)		
<b>BLATTODEA</b>		
Blattidae 1	Cockroaches	Omnivourous
<b>PHASMATODEA</b>		
Phasmatidae 1	Walking Sticks	Phytophagous
<i>Diapheromera velii</i> Walsh		
<b>HEMIPTERA</b>		
Cicadidae 1-2	Cicadas	Phytophagous
<i>Tibicens dorsata</i> (Say)		
<i>Tibicens</i> sp. 1		
Aphrophoridae 1-5	Froghoppers	Phytophagous
<i>Lepyronia</i> sp. 1		
<i>Philaenus</i> sp. 1		
Cercopidae 1	Spittlebugs	Phytophagous
Membracidae 1-7	Treehoppers	Phytophagous
<i>Campylenchia latipes</i> (Say)		
<i>Micrutalis calva</i> (Say)		
<i>Stictocephala bubalus</i> (Fabr.)		
Delphacidae 1-6	Planthoppers	Phytophagous
<i>Stobera tricarina</i> (Say)		
<i>Delphacodes</i> sp. 1		



INSECTS OF THE KANSAS BIOTIC SUCCESSION FACILITY (cont.)

ORDER/Family/Species	Common Name	Feeding Habit
HEMIPTERA, cont.		
Ropalidae 1-3	Scentless Plant Bugs	Phytophagous
<i>Arhysus</i> sp. 1		
Tingidae 1-3	Lace Bugs	Phytophagous
<i>Corythucha marmorata</i> (Uhler)		
<i>Piesma cinera</i> (Say)		
Lygaeidae 1-18	Chinch Bugs	Phytophagous
<i>Neacoryphus bicrucis</i> (Say)		
<i>Geocoris bullatus</i> (Say)		Parasitic
Berytidae 1	Stilt Bugs	Phytophagous
PSOCOPTERA	Psocids	Phytophagous
unidentified Family 1		
THYSANOPTERA	Thrips	Phytophagous
unidentified Families 1-5		
NEUROPTERA		
Chrysopidae 1-3	Lacewings	Predaceous
<i>Chrysopa carnea</i> Steph.	Green Lacewing	
<i>Chrysopa oculata</i> Say	Green Lacewing	
<i>Hemerobius stigmaterus</i> Fitch	Brown Lacewing	
COLEOPTERA		
Dytiscidae 1	Predaceous Diving Beetles	Predaceous
Cicindellidae 1-4	Tiger Beetles	Predaceous
Carabidae 1-45	Ground Beetles	Predaceous
Histeridae 1-2	Hister Beetles	Predaceous
Staphylinidae 1-23	Rove Beetles	Predaceous
Scarabaeidae 1-6	Scarab Beetles	Phytophagous
Buprestidae 1-2	Metallic Wood Boring Beetles	Phytophagous
Lampyridae 1-3	Fireflies	Phytophagous
Cantharidae 1-4	Soldier Beetles	Phytophagous
Melyridae 1-2	Soft-Winged Flower Beetles	Predaceous
Cleridae 1-4	Checkered Beetles	Predaceous
Languriidae 1-2	Lizard Beetles	Phytophagous
Coccinellidae 1-6	Ladybird Beetles	Predaceous
Mordellidae 1-5	Tumbling Flower Beetles	Phytophagous
Phalcridae 1	Shining Flower Beetles	Phytophagous
Dermeestidae 1-2	Skin Beetles	Saprophagous
Meloidae 1-5	Blister Beetles	Phytophagous
Pedilidae 1		Phytophagous
Bruchidae 1-2	Seed Beetles	Phytophagous
Elateridae 1-8	Click Beetles	Phytophagous
Cerambycidae 1-7	Long-Horned Beetles	Phytophagous
Chrysomelidae 1-56	Leaf Beetles	Phytophagous
Curculionidae 1-54	Snout Beetles	Phytophagous
Anthribidae 1-2	Fungus Weevils	Phytophagous
DIPTERA		
Simuliidae 1	Black Flies	Blood Sucking
Ceratopogonidae 1	Biting Midges	Blood sucking
Scatopsidae 1	Minute Black Scavenger Flies	Saprophagous
Culicidae 1-4	Mosquitoes	Blood Sucking
Sciaridae 1-4	Dark-Winged Root Gnats	Phytophagous
Tipulidae 1-2	Crane Flies	Phytophagous
Bombyliidae 1-3	Bee Flies	Phytophagous
Pipunculidae 1	Big-Headed Flies	Phytophagous

## INSECTS OF THE KANSAS BIOTIC SUCCESSION FACILITY (cont.)

ORDER/Family/Species	Common Name	Feeding Habit
<b>DIPTERA, cont.</b>		
Tabanidae 1-4	Horse Flies	Blood Sucking
Stratiomyidae 1-2	Soldier Flies	Phytophagous
Asilidae 1-5	Robber Flies	Predaceous
Dolichopodidae 1-6	Long-Legged Flies	Predaceous
Empididae 1-2	Dance Flies	Predaceous
Syrphidae 1-10	Flower Flies	Phytophagous
Lonchopteridae 1	Spear-winged Flies	Phytophagous
Otitidae 1-4	Picture-Winged Flies	Phytophagous
Tephretidae 1-7	Fruit Flies	Phytophagous
Sciomyzidae 1-2	Marsh Flies	Predaceous
Sepsidae 1	Black Scavenger Flies	Saprophagous
Lauxaniidae 1		Saprophagous
Sphaeroceridae 1	Small Dung Flies	Saprophagous
Agromyzidae 1-4	Leafminer Flies	Phytophagous
Drosophilidae 1	Pomace Flies	Phytophagous
Platystomatidae 1	Picture-winged Flies	Phytophagous
Phoridae 1-3	Humpbacked Flies	Saprophagous
Chloropidae 1-10	Chloropids	Phytophagous
Muscidae 1-5	House Flies, etc	Saprophagous, refuse
Anthomyiidae 1-6		Phytophagous
Calliphoridae 1-2	Blow Flies	Saprophagous, refuse
Sarcophagidae 1	Flesh Flies	Phytophagous
Tachinidae 1-6	Tachinid Flies	Phytophagous
unidentified Family 1		unknown
<b>LEPIDOPTERA</b>		
Amatidae 1	Tiger Moths	Phytophagous
Hesperiidae 1-3	Skippers	Phytophagous
Noctuidae 1-2	Noctuids Moths	Phytophagous
Pyralidae 1	Snout and Grass Moths	Phytophagous
Geometridae 1	Measuringworms	Phytophagous
Nymphalidae 1	Brush-Footed Butterflies	Phytophagous
Pieridae 1	Sulfur Butterflies	Phytophagous
Danaidae 1	Milkweed Butterflies	Phytophagous
Lycaenidae 1	Gossamer-Winged Butterflies	Phytophagous
<b>HYMENOPTERA</b>		
Argidae 1-2		Phytophagous
Ichnuemonidae 1-4		Parasitic
Braconidae 1-87		Parasitic
Scelionidae 1-19		Parasitic
Platygastridae 1		Parasitic
Eurytomidae 1-7		Parasitic
Pteromalidae 1-17		Parasitic
Eulophidae 1-7		Parasitic
Torymidae 1-16		Parasitic
Chalcididae 1-18		Parasitic
Trichogrammatidae 1		Parasitic
Mymaridae 1		Parasitic
Diapriidae 1-9		Parasitic
Megasphilidae 1		Parasitic
Eucoilidae 1-3		Gall formers
Figitidae 1-2		Gall formers
Encyrtidae 1-4		Parasitic
Eucharitidae 1-2		Parasitic

## INSECTS OF THE KANSAS BIOTIC SUCCESSION FACILITY

ORDER/Family/Species	Common Name	Feeding Habit
<b>HYMENOPTERA, cont.</b>		
Dryniidae 1-2		Parasitic
Chrysididae 1-4	Cuckoo Wasps	Parasitic
Bethylidae 1-3		Parasitic
Mutillidae 1-8	Velvet Ants	Parasitic
Tiphiidae 1-4		Predaceous
Scoliidae 1-2		Predaceous
Pompilidae 1-6	Spider Wasps	Predaceous
Rhopalosomatidae 1		Predaceous
<i>Olixon</i> sp. 1		
Vespidae 1-8		Predaceous
<i>Polistes</i> sp. 1	Paper Wasps	
Sphécidae 1-9		Predaceous
<i>Sphecius speciosus</i> Dryry	Cicada Killer	
<i>Cerceris</i> sp. 1		
<i>Ammophila</i> sp. 1		
Colletidae 1-4	Yellow-faced Bees	Phytophagous
Halictidae 1-11	Sweat Bees	Phytophagous
<i>Agapostemon</i> sp. 1		
<i>Augochlora pura</i> (Say)		
<i>Augochlorella striata</i> (Prov.)		
<i>Halictus ligatus</i> Say		
<i>Lasioglossum</i> sp. 1		
<i>Nomada</i> sp. 1		
<i>Sphecodes</i> sp. 1		
Megachilidae 1-6	Leafcutting Bees	Phytophagous
Andrenidae 1-2		Phytophagous
Anthophoridae 1-8		Phytophagous
<i>Anthophora</i> sp. 1		
<i>Ceratina</i> sp. 1		
<i>Melissodes</i> sp. 1		
<i>Triepeolus</i> sp. 1		Parasitic
Apidae 1-4		Phytophagous
<i>Apis mellifera</i> L.	Honeybees	
<i>Bombus</i> sp. 1	Bumblebees	
<i>Psithyrus</i> sp. 1		Parasitic
Formicidae 1-12	Ants	Phytophagous/Predaceous
<i>Crematogaster</i> sp.		
<i>Formica</i> sp. 1		
<i>Leptothorax</i> sp. 1		
<i>Monomorium</i> sp. 1		
<i>Myrmica</i> sp. 1		

## CRANE FLIES OF THE KANSAS ECOLOGICAL RESERVES

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Crane flies (Tipulidae) are the largest family of true flies (Order Diptera), represented in North America north of Mexico by approximately 1600 species. Although there are some species whose ranges span the continent, it is possible to recognize in a general way an eastern North American fauna, characteristic of the eastern deciduous and coniferous forests, and a Rocky Mountain and western fauna. These two faunal groups are broadly separated by the Great Plains. Crane flies of eastern Kansas are near the western edge of the range of the eastern group. Nearly all the species occurring in the Kansas Ecological Reserves (KER) have ranges extending far to the east, often to the Atlantic coast, while probably a majority of them are not known from anywhere farther west. In his study of the crane flies of two KER tracts, the Fitch Natural History Reservation (FNHR) and the Breidenthal Biological Reserve (BBR), Young (1978) found eleven species that had not been recorded earlier within 800 km (500 miles) of these sites. Young's study included 95 species from the two reservations together, but his *Nephrotoma euceroidea* proved to be *N. eucera*, which he also included; and his *Tipula triplex* included both *T. colei* and typical *T. triplex*. Only about a dozen additional species are known from various localities elsewhere in eastern Kansas.

Farther east, the local faunas of crane flies that have been examined in detail include significantly more species. For example, Rogers (1942) found 201 species in an area of roughly two square miles, in southeastern Michigan. Since the larval habitats of most crane flies range from moist to wholly aquatic and occur more commonly in woodlands, the relatively impoverished fauna in Kansas can readily be correlated with regional rainfall and the westward extensions of the eastern forests. Young (1978) analyzed the composition of the crane fly faunas of the FNHR and the BBR and noted that eastern genera (and species) conspicuously absent are those whose larvae characteristically inhabit swamps, bogs, marshes or clear streams, that is, habitats rarely found in this region. Examples are *Pedicia*, *Dicranota*, *Antocha*, *Hexatoma* and *Limnophila*.

Composition of the crane fly fauna differs also between the FNHR and the BBR, 38 of the 95 species having been found at only one of these reservations or the other. As pointed out by Young (1978), however, 32 of these have been collected only rarely, so the real difference is probably smaller than indicated. Basically, the BBR is a more uniformly moist habitat than the FNHR. This is due to its essentially climax forest, its shaded, fairly deep ravine along a north-facing escarpment, and its more developed drainage with small tributaries feeding Coal Creek to the extent that it flows during most of the year. On the FNHR, in contrast, the woods are in various successional stages, the streams intermittent, but there is an artificial impoundment (pond) that provides a shore habitat not found in the BBR. The drying effects of hot summer winds from the west and southwest are greater on the FNHR than on the BBR, as a result of topographic differences. These factors probably account for most of the faunal differences noted.

Young's (1978) detailed study was concentrated in the period between May 1974 and September 1975. He collected mainly by net, so as to determine the precise habitats in which the flies occurred. However, in 1975 we also erected a Malaise trap (a kind of flight-intercept trap) alongside Coal Creek in the BBR, and another in the somewhat swampy woods at the upstream end of the impoundment on the FNHR. These two traps were emptied every five days during the flight season. Flies captured by net were mounted and labelled and are preserved in the Snow Entomological Museum, University of Kansas. Those from the Malaise traps were preserved in alcohol, later sorted, the common species counted and discarded but

the less common ones also retained in the Snow Museum. In addition to Young's study, I have made seasonal collections at both reservations during the years 1956 to 1989, using mainly an insect net but also occasionally Malaise traps, pan traps and, in winter, pit-fall traps (e.g., for the flightless *Chionea*). Results of my collecting up to 1976 are included in Young's report, and subsequent collecting has yielded no additional species of Tipulidae. (One species of winter crane fly, family Trichoceridae, however, was collected at the BBR on 23 January 1977, extending its known range westward some 1280 km or 800 miles).

Most of the crane flies of northeastern Kansas are on the wing, that is, reach the adult stage, between mid-May and early July. Some of these are bivoltine, producing by accelerated larval development a second annual generation, usually in mid- to late August. There are, however, some characteristically vernal and autumnal species. The reader may consult Young's (1978) paper for details of flight period, abundance and other aspects of the biology of the various species.

The accompanying checklist is presented in the customary sequence, with genus, species, and author given. Information on larval habitat (for those species for which it could be determined) is abbreviated as follows: al - algae, usually thin film on wet surfaces; aq - aquatic, feeding on organic debris; f - fungi, other than mycelia in decayed wood; m - mosses, less commonly liverworts; mn - mouse nest, feeding on organic debris; om - organic mud, mud with high organic content; s - soil, ordinarily beneath leaf litter in woods; sa - semi-aquatic, in wet soil or sand or other saturated habitat; w - wood, usually decayed and damp to wet. A plus (+) indicates one or more collections of a species at the respective Reserve (BBR or FNHR).

#### Literature Cited

- Rogers, J. S. 1942. The crane flies (Tipulidae) of the George Reserve, Michigan. Univ. Michigan Mus. Zool. Misc. Publ. No. 53: 1-128, pl. 1-8.
- Young, C. W. 1978. Comparison of the crane flies (Diptera: Tipulidae) of two woodlands in eastern Kansas, with a key to the adult crane flies of eastern Kansas. Univ. Kansas Sci. Bull. 51 (12): 407-440.

## CRANE FLIES OF THE KANSAS ECOLOGICAL RESERVES

Species	Larval Habitat	Occurrence	
		BBR	FNHR
Subfamily Tipulinae			
<i>Dolichopeza (Oropeza) obscura</i> (Johnson)	m	+	
<i>Dolichopeza (Oropeza) tridenticulata</i> Alexander	m	+	+
<i>Dolichopeza (Oropeza) walleyi</i> (Alexander)	m	+	+
<i>Nephrotoma alterna</i> (Walker)	s	+	+
<i>Nephrotoma eucera</i> (Loew)	s	+	+
<i>Nephrotoma ferruginea</i> (Fabricius)	s	+	+
<i>Nephrotoma macrocera</i> (Say)	s	+	+
<i>Nephrotoma polymera</i> (Loew)	s	+	+
<i>Nephrotoma virescens</i> (Loew)	s	+	+
<i>Tipula (Pterelachisus) ignobilis</i> Loew	m		+
<i>Tipula (Pterelachisus) trivittata</i> Say	w	+	+
<i>Tipula (Lunatipula) australis</i> Doane	s		+
<i>Tipula (Lunatipula) bicornis</i> Forbes	s	+	+
<i>Tipula (Lunatipula) dietziana</i> Alexander		+	+
<i>Tipula (Lunatipula) disjuncta</i> Walker	s		+
<i>Tipula (Lunatipula) dorsimacula</i> Walker	s	+	+
<i>Tipula (Lunatipula) duplex</i> Walker	s	+	+
<i>Tipula (Lunatipula) flavibasis</i> Alexander		+	+
<i>Tipula (Lunatipula) fuliginosa</i> (Say)	s	+	+
<i>Tipula (Lunatipula) mallochi</i> Alexander	s	+	+
<i>Tipula (Lunatipula) morrisoni</i> Alexander		+	+
<i>Tipula (Lunatipula) translucida</i> Doane			+
<i>Tipula (Lunatipula) tuscarora</i> Alexander		+	
<i>Tipula (Platytipula) paterifera</i> Alexander	om	+	+
<i>Tipula (Platytipula) ultima</i> Alexander	om	+	+
<i>Tipula (Trichotipula) stonei</i> Alexander	om	+	
<i>Tipula (Trichotipula) unimaculata</i> Loew		+	+
<i>Tipula (Triplicitipula) colei</i> Alexander included in <i>triplex</i> in Young's list)	s	+	+
<i>Tipula (Triplicitipula) flavoumbrosa</i> Alexander		+	+
<i>Tipula (Triplicitipula) inermis</i> Doane ( <i>integra</i> in Young's list)		+	+
<i>Tipula (Triplicitipula) perlongipes</i> Johnson	s	+	+
<i>Tipula (Triplicitipula) triplex</i> Walker	s	+	+
<i>Tipula (Triplicitipula)</i> new species, near <i>perlongipes</i>	s	+	
<i>Tipula (Yamatotipula) furca</i> Walker	aq	+	+
<i>Tipula (Yamatotipula) sayi</i> Alexander	om	+	
<i>Tipula (Yamatotipula) strepens</i> Loew	aq	+	+
<i>Tipula (Yamatotipula) tricolor</i> Fabricius	aq		+
Subfamily Limoniinae			
<i>Limonia (Limonia) globithorax</i> (Osten Sacken)	w	+	
<i>Limonia (Limonia) rara</i> (Osten Sacken)		+	+
<i>Limonia (Limonia) tristigma</i> (Osten Sacken)		+	+
<i>Limonia (Metalimnobia) cinctipes</i> (Say)	f,w	+	+
<i>Limonia (Metalimnobia) fallax</i> (Johnson)		+	+
<i>Limonia (Metalimnobia) immatura</i> (Osten Sacken)	w		+
<i>Limonia (Metalimnobia) triocellata</i> (Osten Sacken)	f,w	+	+
<i>Limonia (Discobola) annulata</i> (Linnaeus)	w	+	
<i>Limonia (Dicranomyia) divisa</i> Alexander	m,a	+	+
<i>Limonia (Dicranomyia) haeretica</i> (Osten Sacken)	m,a	+	
<i>Limonia (Dicranomyia) humidicola</i> (Osten Sacken)	m,a	+	+

CRANE FLIES OF THE KANSAS ECOLOGICAL RESERVES (cont.)

Species	Larval Habitat	Occurrence	
		BBR	FNHR
Subfamily Limoniinae, cont.			
<i>Limonia (Dicranomyia) immodestoides</i> Alexander	m,a	+	
<i>Limonia (Dicranomyia) liberta</i> (Osten Sacken)		+	+
<i>Limonia (Dicranomyia) pudica</i> (Osten Sacken)		+	+
<i>Limonia (Rhipidia) bryanti</i> (Johnson)			+
<i>Limonia (Rhipidia) domestica</i> (Osten Sacken)	w	+	+
<i>Limonia (Rhipidia) lecontei</i> Alexander			+
<i>Limonia (Geranomyia) communis</i> (Osten Sacken)	al	+	+
<i>Heliopsis (Heliopsis) flavipes</i> (Macquart)	om	+	+
<i>Dicranoptycha elsa</i> Alexander		+	+
<i>Dicranoptycha megaphallus</i> Alexander	s	+	+
<i>Dicranoptycha pallida</i> Alexander			+
<i>Dicranoptycha septemtrionis</i> Alexander		+	
<i>Dicranoptycha sobrina</i> Osten Sacken		+	+
<i>Dicranoptycha tigrina</i> Alexander		+	
<i>Epiphragma fasciapenne</i> Alexander	w	+	+
<i>Epiphragma solatrix</i> (Osten Sacken)	w	+	+
<i>Pseudolimnophila contempta</i> (Osten Sacken)	sa	+	
<i>Pseudolimnophila luteipennis</i> (Osten Sacken)	sa	+	+
<i>Pilaria imbecilla</i> (Osten Sacken)	om		+
<i>Pilaria quadrata</i> (Osten Sacken)	sa		+
<i>Pilaria tenuipes</i> (Say)	om	+	+
<i>Atarba picticornis</i> Osten Sacken	w	+	+
<i>Elephantomyia westwoodi</i> Osten Sacken	w	+	+
<i>Cladura flavoferruginea</i> Osten Sacken	s	+	+
<i>Chionea stoneana</i> Alexander	mn	+	
<i>Teucholabis complexa</i> Osten Sacken	w		+
<i>Teucholabis lucida</i> Alexander		+	+
<i>Gnophomyia tristissima</i> Osten Sacken	w	+	+
<i>Gonomyia (Gonomyia) florens</i> Alexander	sa		+
<i>Gonomyia (Gonomyia) kansensis</i> Alexander	sa		+
<i>Gonomyia (Gonomyia) subcinerea</i> Osten Sacken	sa	+	+
<i>Gonomyia (Lipophleps) manca</i> (Osten Sacken)		+	
<i>Gonomyia (Lipophleps) sulphurella</i> Osten Sacken	sa	+	
<i>Erioptera (Symplecta) cana</i> (Walker)	s	+	+
<i>Erioptera (Erioptera) septemtrionis</i> Osten Sacken	om	+	
<i>Erioptera (Erioptera) vespertina</i> Osten Sacken	om	+	+
<i>Erioptera (Mesocyphona) caliptera</i> (Say)	om	+	+
<i>Erioptera (Mesocyphona) needhami</i> Alexander	om	+	
<i>Erioptera (Mesocyphona) parva</i> Osten Sacken			+
<i>Erioptera (Hoplolabis) armata</i> Osten Sacken	om	+	+
<i>Erioptera (Psiloconopa) graphica</i> Osten Sacken	om		+
<i>Ormosia arcuata</i> (Doane)		+	
<i>Ormosia ingloria</i> Alexander		+	
<i>Ormosia romanovichiana</i> Alexander		+	
<i>Tasiocera (Dasymolophilus) ursina</i> (Osten Sacken)		+	+
<i>Molophilus hirtipennis</i> (Osten Sacken)	om		+
<i>Molophilus pubipennis</i> (Osten Sacken)	om	+	+

## SELECTED AQUATIC INSECTS OF THE KANSAS ECOLOGICAL RESERVES

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Kansas, in general does not have a great variety of aquatic insects in comparison to other states, essentially due to a lack of a diversity of suitable aquatic habitats. The fauna can best be described as being primarily composed of eastern North American species, many of which are at the western limit of their continental range. Exceptions to this generalization are transcontinental species and a few species endemic to the Great Plains' states. The Kansas Ecological Reserves (KER) is within the most species rich portion of Kansas (eastern one-third of the state) which is concurrent with the bulk of the states' available aquatic habitat.

Natural aquatic habitat on KER principally consists of intermittent and ephemeral streams. Seeps or wet areas also can be found but typically only contain surface water for short periods during most annual cycles. The extensive wooded areas of KER provide an additional aquatic habitat, holes in trees that accumulate and hold water long enough for adapted species to utilize. There are also a number of constructed ponds, with the largest concentration on the Nelson Environmental Study Area (NESA), and considerable information is available on species associated with these lentic habitats.

Below is a list of species for five Orders of aquatic insects that occur at KER. The Kansas Biological Survey (KBS) aquatic invertebrate collection was used to construct the list except for one species, *Callibaetis centralis*, which was taken from a published account (Peters 1959) and for which the species type locality is the Fitch Natural History Reservation (FNHR). Specimens in the KBS collection were obtained between 1971 and 1984 and species listed were taken from either the FNHR or NESA.

Only species in five Orders were included because the extensive KBS collection is not yet computer automated to a point that allows site specific retrieval of information making it prohibitively time consuming to extract accounts for all orders. The preponderance of lentic species on the list is a reflection of study efforts on ponds at NESA and should not be considered as a true representation of all the aquatic insects most likely occurring at KER.

Future efforts directed at aquatic habitats other than ponds should give a more complete description of the ecological diversity of KER. Even though permanent flowing water is not prevalent at KER, the number of insect species in intermittent and ephemeral streams can be diverse and often exceeds that of small impoundments. For example, an ephemeral stream on the east edge of FNHR contains a stonefly *Amphinemura varshava* thus far not found in an intermittent, westward flowing stream near the center of FNHR. Conversely, the westward flowing stream contains a dragonfly *Cordulegaster obliqua* not found in the ephemeral stream on east. The two streams are similar in most respects except for permanency of water. The stonefly is a spring emerging (March) species and is not dependent on permanent water. It has a short life keyed to the late fall through mid-spring months when ephemeral streams usually contain water or a least the stream bed is saturated. During the balance of the year when the stream is typically dry the next generation of individuals rests in the egg stage, waiting for a period of sufficient moisture and cool temperatures to hatch. In stark contrast, the aquatic larvae of the dragonfly requires 2-4 years to reach maturity. Not being able to survive without some form of permanent water, an ephemeral stream is not a suitable habitat for the species.

The 45 species listed below combined with other occurrence records for aquatic insects at KER only constitutes a fraction of the actual number of species that likely can be found inhabiting KER. It would not be surprising to find the fauna to be composed of as many as

1,000 species of aquatic insects. Additionally, wind carried adults of riverine aquatic insects from the Kansas River (approx. 4.8 km, 3 mi., south of FNHR) should be expected since sporadic accounts have already been noted. However, appropriate habitat does not exist conducive to their colonization and those species have been intentionally left off of this species list.

All records are from either NESA or FNHR. Ecological information concerning the genera can be found in Merritt and Cummins (1984).

#### Literature Cited

- Peters, W.L. 1959. A new species of *Callibaetis* from Kansas (Ephemeroptera: Baetidae). J. Kansas Entomol. Soc. 32(4): 173-175.
- Merritt, R.W. and K.W. Cummins. 1984. An Introduction to the Aquatic Insects of North America (second ed). Kendall/Hunt Publ. Co. 722 pp.

## SELECTED AQUATIC INSECTS OF THE KANSAS ECOLOGICAL RESERVES

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### Order/Species

Ephemeroptera (Mayflies)  
 Baetidae  
*Baetis intercalaris* McDunnough  
*Callibaetis centralis* Peters  
 Caenidae  
*Caenis latipennis* Banks  
 Ephemeridae  
*Hexagenia bilineata* (Say)  
 Heptageniidae  
*Sienacron interpunctatum* (McDunnough)  
*Stenonema femoratum* (Say)  
 Siphonuridae  
*Siphonurus marshalli* Traver

Lepodoptera (Butterflies and Moths)  
 Pyralidae  
*Synclita oblitalis* (Walker)

Megaloptera (Alderflies, Dobsonflies and Fishflies)  
 Corydalidae  
*Neohermes concolor* (Davis)  
 Sialidae  
*Sialis* spp.

Odonota (Dragonflies and Damselflies)  
 Anisoptera (Dragonflies)  
 Aeshnidae  
*Anax longipes* Hagen  
*Anax junius* Drury  
*Nasiaeschna pentacantha* (Rambur)  
 Cordulegastridae  
*Cordulegaster obliqua* (Say)  
 Corduliidae  
*Epitheca cynosura* (Say)  
*Epitheca princeps* Hagen  
 Gomphidae  
*Progomphus obscurus* (Rambur)  
*Gomphus externus* Hagen  
*Gomphus graslinellus* Walsh  
*Gomphus militaris* Hagen  
 Libellulidae  
*Celithemis eponina* (Drury)  
*Erythemis simplicicollis* (Say)  
*Libellula luctuosa* Burmeister  
*Libellula pulchella* Drury  
*Perithemis tenera* (Say)  
*Pachydiplax longipennis* (Burmeister)  
*Pantala flavescens* (Fabricius)  
*Pantala hymeneae* (Say)  
*Plathemis lydia* Drury  
*Sympetrum corruptum* (Hagen)  
*Tramea lacerata* Hagen  
*Tramea onusta* Hagen

### Order/Species

Zygoptera (Damselflies)  
 Calopterygidae  
*Calopteryx maculata* (Beavois)  
 Coenagrionidae  
*Argia apicalis* (Say)  
*Enallagma aspersum* (Hagen)  
*Enallagma basidens* Calvert  
*Enallagma civile* (Hagen)  
*Enallagma geminatum* Kellicott  
*Enallagma signatum* (Hagen)  
*Ischnura hastata* (Say)  
*Ischnura verticalis* (Say)  
 Lestidae  
*Archilestes grandis* (Rambur)  
*Lestes disjunctus* (Selys)  
*Lestes unguiculatus* Hagen

Plecoptera (Stoneflies)  
 Nemouridae  
*Amphinemura varshava* (Ricker)

## CHIRONOMIDS OF THE NELSON ENVIRONMENTAL STUDY AREA

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The Chironomidae (Diptera) are a family of nonbiting midges whose mating swarms are commonly seen along the banks of freshwater habitats. There are currently 1051 species recognized in North America north of Mexico (Oliver et al. 1990). Chironomid larvae are abundant, in terms of species number and biomass, in most freshwater habitats while a few representatives are found in brackish water, marine water, semiaquatic habitats and terrestrial habitats. Larvae play a vital role in aquatic ecosystems through the breakdown of organic matter, recycling of nutrients, feeding on smaller invertebrates and providing a source of food for other animals (e.g., aquatic invertebrates, fish, and birds). Chironomids have also proven to be beneficial in water quality research due to their usual dominance in freshwater ecosystems and tolerance to a wide range of chemicals and pollutants.

A list of chironomids was compiled from various collections taken from the Nelson Environmental Study Area (NESA) since 1982. The original citations of species are referenced in Oliver et al. (1990) and voucher specimens have been deposited in the chironomid collection of the Kansas Biological Survey. Most specimens were collected from an ongoing project being conducted at the Aquatic Research Facility located within NESA using adult emergence traps or multiplate artificial benthic samplers. This project involves examination of the effects of agricultural pesticides on the flora and fauna of experimental ponds. Additional chironomid data were gathered from two previous projects at NESA (Dewey 1986; Huggins 1990) and random collections by various individuals using light traps to collect adults and D-nets to collect larvae for rearing.

A total of 53 genera and 123 taxa of Chironomidae have been collected from NESA during the previous eight years. Thirty-nine of these species are new records for the state of Kansas. The subfamilies Chironominae, Orthoclaadiinae and Tanypodinae were represented by three, two and five tribes, respectively.

The results of this study generally support previous biogeographic findings in that most chironomids occurring at NESA, located in the glaciated region of Kansas, are either cosmopolitan species or are species widely distributed across the eastern United States. This is consistent with predictions by Ferrington (1983), who demonstrated that six generalized distributional patterns contribute to the species richness of the chironomid fauna of Kansas. He proposed that the fauna of the eastern portion of the state, west to approximately the Flint Hills, would consist predominantly of either cosmopolitan species, or eastern species with western distributional limits in the central plains. In addition to cosmopolitan and eastern species, however, he demonstrated that species with predominantly northern and southeastern distributions extend into Kansas.

Two of the species collected at the NESA ponds, *Psectrocladius simulans* and *Constempellina* n. sp., appear to represent southern extensions of more northerly species. Two other species previously known only from the southeastern portion of the United States, *Fittkaumya* sp. and *Clinotanypus planus*, also occur at NESA, and probably reach their northern and western limits in Kansas. The presence of species with more northern and southern distributions thus adds additional support to the existing hypothesis.

Two species occurring at NESA, *Psectrocladius spinifer* and *Larsia lyra*, have been reported previously only from California (Oliver et al. 1990). If these species are considered to

have a western or southwestern distributional pattern, as the literature records suggest, then their presence at NESAs is of particular interest, since other species characteristic of this type of distributional pattern extend only into the high plains ecophysiological region of western Kansas. Their presence in northeastern Kansas may indicate that the high plains boundary is not a strong barrier for taxa with western or southwestern distributions.

The accompanying list is presented in alphabetical order (subfamily, tribe, and species) and is not intended to suggest phylogenetic relationships. An asterisk (\*) following a species indicates a new state record for Kansas. The collection method is given with ABS = artificial benthic sampler; ET = emergence trap; HP = hand picked; and LT = light trap. The collection at NESAs is given as EX = experimental pond; FP = farm pond; and GA = general area at NESAs, including the reservoir pond and experimental ponds. The life stage for each species record is indicated with A = adult; L = larvae; P = pupae; and R = reared association (larvae, pupae, and adult).

#### Literature Cited

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- Huggins, D. G. 1990. Ecotoxic effects of atrazine on aquatic macroinvertebrates and its impact on ecosystem structure. Doctoral Dissertation, University of Kansas. 378 pp.
- Oliver, D. R., M. E. Dillon and P. S. Cranston. 1990. Catalog of Nearctic Chironomidae. Agriculture Canada Publ. 1857/B. 89 pp.

**CHIRONOMIDAE OF THE NELSON ENVIRONMENTAL STUDY AREA**

Subfamily/Tribe/Species	Collection Method	Collection Site	Life Stage
Chironominae			
Chironomini			
<i>Apedilum elachistus</i> *	ET	EX	A
<i>Axarus festivus</i>	ET	EX	A
<i>Chironomus (Chironomus) sp.</i>	ET	EX	A
<i>Chironomus (Chironomus) decorus</i>	ET,HP	EX,FP	A,R
<i>Chironomus (Lobochironomus) n. sp.</i>	HP	FP	R
<i>Chironomus (Lobochironomus) longipes</i> *	ET	EX	A
<i>Cladopelma collater</i>	ET,HP,LT	EX,FP,GA	A,R
<i>Cladopelma edwardsi</i>	ET	EX	A
<i>Cladopelma viridula</i>	LT	GA	A
<i>Cryptochironomus blarina</i> *	LT	GA	A
<i>Cryptochironomus digitatus</i>	LT	GA	A
<i>Cryptochironomus fulvus</i>	LT	GA	A
<i>Cryptochironomus ponderosus</i> *	ET	EX	A
<i>Cryptotendipes darbyi</i> *	ET,HP	EX	P,A
<i>Cryptotendipes emorsus</i>	ET,LT	EX,GA	A
<i>Demeijerea brachialis</i> *	HP	FP	R
<i>Dicotendipes lucifer</i>	ET	EX	A
<i>Dicotendipes modestus</i>	ET	EX	A
<i>Dicotendipes neomodestus</i>	ABS,ET	EX	L,A
<i>Dicotendipes nervosus</i>	ET	EX	A
<i>Dicotendipes simpsoni</i>	ABS	EX	L
<i>Dicotendipes tritonus</i> *	HP	FP	R
<i>Einfeldia chelonia</i> *	LT	GA	A
<i>Endochironomus nigricans</i>	ABS,ET,LT	EX,GA	L,A
<i>Endochironomus subtendens</i> *	ET,LT	EX,GA	A
<i>Glyptotendipes lobiferus</i> *	ET	EX	A
<i>Glyptotendipes paripes</i> *	ET	EX	A
<i>Goeldichironomus holoprasinus</i>	ABS	EX	L
<i>Harnischia incidata</i>	ABS,ET	EX	L,A
<i>Kiefferulus (Kiefferulus) sp. 1 nr. dux</i>	HP,LT	FP,GA	A,R
<i>Kiefferulus (Kiefferulus) sp. 2 nr. dux</i>	HP	FP	R
<i>Lauterborniella agrayloides</i> *	ET	EX	A
<i>Microchironomus nigrovittatus</i>	ABS,ET	EX	L,A
<i>Microtendipes pedellus</i>	ABS	EX	L
<i>Nilothauma n. sp.</i>	ET	EX	A
<i>Parachironomus n. sp.</i>	ET	EX	A
<i>Parachironomus abortivus</i>	ET	EX	A
<i>Parachironomus carinatus</i>	ET	EX	A
<i>Parachironomus chaetaolus</i>	ET	EX	A
<i>Parachironomus monochromus</i>	ET	EX	A
<i>Parachironomus potamogeti</i>	ET	EX	A
<i>Parachironomus tenuicaudatus</i>	ET	EX	A
<i>Parachironomus varus</i> *	ET	EX	A
<i>Paralauterborniella nigrohalterale</i> *	ET	EX	A
<i>Paratendipes albimanus</i> *	ET	EX	A
<i>Phaenopsectra dyari</i> *	ET	EX	A
<i>Phaenopsectra punctipes</i> *	ABS,ET	EX	L,A
<i>Polypedilum (Pentapedilum) sordens</i> *	ET	EX	A
<i>Polypedilum (Polypedilum) angustum</i> *	HP	FP	R
<i>Polypedilum (Polypedilum) illinoense</i> *	ET	EX	A

CHIRONOMIDAE OF THE NELSON ENVIRONMENTAL STUDY AREA (cont.)

Subfamily/Tribe/Species	Collection Method	Collection Site	Life Stage
Chironominae, cont.			
Chironomini, cont.			
<i>Polypedilum (Polypedilum) ophioides</i> *	ET	EX	A
<i>Polypedilum (Polypedilum) trigonus</i> *	ET,HP	EX,FP	A,R
<i>Polypedilum (Tripodura) digitifer</i> *	ET	EX	A
<i>Polypedilum (Tripodura) c.f. floridense</i> *	ET,LT	EX,GA	A
<i>Polypedilum (Tripodura) simulans</i>	ET,HP	EX,FP	A,R
<i>Stictochironomus varius</i>	ET	EX	A
<i>Tribelos</i> sp.	ABS	EX	L
<i>Xenochironomus xenolabis</i> *	ET,HP,LT	EX,FP,GA	A,R
<i>Zavreliella marmorata</i>	ABS,ET	EX	L,A
Pseudochironomini			
<i>Pseudochironomus pseudoviridis</i>	ET,HP	EX	A,R
<i>Pseudochironomus rex</i> *	ET	EX	A
<i>Pseudochironomus richardsoni</i>	ET,HP	EX	P,A,R
Tanytarsini			
<i>Cladotanytarsus</i> spp. (at least 2 spp.)	ET	EX	A
<i>Constempellina</i> n. sp.	ET	EX	A
<i>Micropsectra</i> sp.	ET	EX	A
<i>Nimbocera</i> sp.	ABS	EX	L
<i>Paratanytarsus dubius</i> *	ET	EX	A
<i>Paratanytarsus recens</i> *	ET	EX	A
<i>Tanytarsus mendax</i> gr. sp.	HP	EX	R
<i>Tanytarsus</i> n. sp. 1	ET	EX	A
<i>Tanytarsus</i> n. sp. 2	ET	EX	A
<i>Tanytarsus</i> n. sp. 3	ET	EX	A
<i>Tanytarsus allicis</i> *	ET	EX	A
<i>Tanytarsus dendyi</i> *	ET	EX	A
<i>Tanytarsus glabrescens</i> *	ET	EX	A
<i>Tanytarsus neoflavellus</i> *	ET	EX	A
Orthoclaadiinae			
"Corynoneurini"			
<i>Corynoneura</i> n. sp. 1	ET	EX	A
<i>Corynoneura</i> n. sp. 2	ET	EX	A
<i>Corynoneura</i> cf. <i>taris</i>	ABS	EX	L
<i>Thienemanniella</i> sp.	ABS	EX	L
"Orthoclaadiini"			
<i>Cricotopus (Cricotopus)</i> n. sp. 1	ET	EX	A
<i>Cricotopus (Cricotopus)</i> n. sp. 2	ET	EX	A
<i>Cricotopus (Cricotopus) bicinctus</i> gr.	ET	EX	A
<i>Cricotopus (Isocladus) sylvestris</i>	ET	EX	A
<i>Cricotopus (Isocladus) tricinctus</i> *	ET	EX	A
<i>Hydrobaenus</i> spp. (at least 2 spp.)	ABS,ET	EX	L,A
<i>Nanocladius (Nanocladius) alternantherae</i> *	ET	EX	A
<i>Nanocladius (Nanocladius) mallochi</i>	ET	EX	A
<i>Orthocladus</i> spp. (at least 2 spp.)	ET	EX	A
<i>Parakiefferiella coronata</i>	ABS,ET	EX	L,A
<i>Psectrocladius spinifer</i> *	ET	EX	A
<i>Psectrocladius (Psectrocladius) simulans</i> *	ET	EX	A
<i>Psectrocladius (Psectrocladius) vernalis</i> *	ET	EX	A

**CHIRONOMIDAE OF THE NELSON ENVIRONMENTAL STUDY AREA (cont.)**

Subfamily/Tribe/Species	Collection Method	Collection Site	Life Stage
<b>Tanypodinae</b>			
<b>Coelotanypodini</b>			
<i>Clinotanypus (Clinotanypus) aureus</i>	HP	FP	R
<i>Clinotanypus (Clinotanypus) pinguis</i>	ET,HP,LT	EX,FP,GA	A,R
<i>Clinotanypus (Clinotanypus) planus</i> *	HP	FP	R
<i>Coelotanypus concinnus</i>	LT	GA	A
<i>Coelotanypus scapularis</i>	HP	FP	R
<b>Macropelopiini</b>			
<i>Fittkaunmyia</i> sp.	ABS	EX	L
<i>Psectrotanypus dyari</i>	HP	FP	R
<b>Pentaneurini</b>			
<i>Ablabesmyia (Ablabesmyia) mallochi</i>	ABS,ET	EX	L,A
<i>Ablabesmyia (Ablabesmyia) monilis</i>	ABS	EX	L
<i>Ablabesmyia (Ablabesmyia) parajanta</i>	ABS	EX	L
<i>Ablabesmyia (Asayia) annulata</i>	ABS	EX	L
<i>Ablabesmyia (Karelia) illinoensis</i>	LT	GA	A
<i>Ablabesmyia (Karelia) peleensis</i>	ABS,HP,LT	EX,FP,GA	L,A,R
<i>Labrundinia neopilosella</i>	ABS,ET	EX	L,A
<i>Labrundinia pilosella</i>	ET,LT	EX,GA	A
<i>Labrundinia</i> spp. (at least 2 spp.)	HP	GA	P
<i>Larsia decolorata</i>	ET,HP	EX,FP	A,R
<i>Larsia lyra</i> *	ET	EX	A
<i>Paramerina smithae</i>	ABS,ET,LT	EX,GA	L,A
<i>Telopelopia okobojii</i>	ET,LT	EX,GA	A
<b>Procladiiini</b>			
<i>Procladius (Holotanypus) sublettei</i>	ABS,ET,HP	EX,FP	L,P,A,R
<i>Procladius (Psilotanypus) bellus</i>	ABS,ET,LT	EX,GA	L,A
<b>Tanypodini</b>			
<i>Tanypus (Apelopia) neopunctipennis</i>	HP	FP	R
<i>Tanypus (Tanypus) concavus</i>	ET	EX	A
<i>Tanypus (Tanypus) punctipennis</i>	ET,HP	EX,FP	A,R
<i>Tanypus (Tanypus) stellatus</i>	ABS,LT	EX,GA	L,A

## RESEARCH AT THE GEOHYDROLOGIC EXPERIMENTAL AND MONITORING SITE (GEMS)

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In recent years, hydrogeologists have been called upon at an increasing frequency to evaluate the threat posed by a waste site to the waters of underlying aquifers. A key element of such an evaluation is the prediction of how a contaminant might move in the subsurface. Since contaminant movement in the subsurface is controlled by physical, chemical, and biological processes, the complexity of the problem makes accurate prediction difficult. Often the assumption that fluid constituents do not react with the formation matrix is resorted to as a perceived worst-case analysis. Even with this simplistic assumption, however, current methodology is often incapable of providing information of the detail and reliability required for evaluation efforts. A primary source of this inadequacy is that many of the methods currently used for the measurement of the properties controlling the flow of ground water in the subsurface are based on the assumption that alluvial aquifers are homogeneous (i.e. have the same properties everywhere in the aquifer). In actuality, these deposits tend to be a complex intermingling of lenses of gravel- through clay-sized materials. This heterogeneity can wreak havoc with efforts to characterize aquifer properties, as major pathways in the subsurface along which contaminants may preferentially move can be completely missed. There is a need to employ techniques that will allow the actual complexity of the geologic system to be assessed. The theoretical and field testing of such techniques is the purpose of a multiyear project of the Kansas Geological Survey (KGS).

In order to assess the potential for a technique to provide information concerning the actual complexity of a geologic system, field testing must be done in a setting with a high degree of subsurface control. The KGS Geohydrologic Experimental and Monitoring Site (GEMS) has been designed for just this purpose. GEMS was established in April of 1988 on the Robinson Tract of the Kansas Ecological Reserve. This land is managed by the Experimental and Applied Ecology Program of the University of Kansas. This particular site was selected due to the underlying geology, the existence of a high-capacity pumping well at the site, and the accessibility of the site to researchers and students from the University of Kansas. Work at the site is currently being directed by Jim Butler and Carl McElwee of the Geohydrology and Mathematical Geology Sections, respectively, of the KGS.

Since its inception in the spring of 1988, GEMS has been the site of two major research projects. The first research effort at this site was directed at increasing knowledge concerning the detailed structure of the alluvial deposits underlying this site. Towards that goal, several groups (nests) of wells have been drilled. Figure II-1 depicts an areal view of the well nests that have been established to this point. Each nest consists of wells drilled to different depths in the underlying alluvium. Figure II-2 is a cross-section through one of the nests at which an additional well was drilled into the bedrock beneath the alluvium. As shown in Figure II-2, the alluvial deposits essentially consist of approximately 35 feet of clay and silt overlying 35 feet of sand and gravel. Although the geology of the near-surface deposits at GEMS is easy to describe in general terms, a detailed description of the deposits is very difficult. A device for taking relatively undisturbed cores of saturated sands and gravels while drilling has been developed by the KGS in order to allow a detailed description of the subsurface at this and similar sites. Over two hundred feet of core have been recovered and have been or are currently being analyzed in a KGS laboratory for permeability, porosity, and the distribution of grain sizes in a core. Over the next two years, an additional 300 feet of core will be recovered and taken to the laboratory for similar analyses. The results of the laboratory analyses will

enable the aquifer underlying GEMS to be described in more detail than has ever been done at a site of this type.

The second major research effort being carried out at GEMS is focussed on well tests. Well tests are a class of techniques that are based on the introduction of a pressure disturbance (e.g., turning on a pump) into a well drilled into the aquifer and the subsequent measurement of how this disturbance evolves with time at the source and neighboring observation wells. The data describing this temporal evolution can be used to obtain estimates of the transmissive and storage properties of an aquifer. Three issues are currently being examined at GEMS: 1) the nature of the pressure disturbance required for obtaining information of different types; 2) where to place the source and observation wells in order to maximize the information that can be obtained from a test; and 3) how to analyze the collected data. If this work is successful, well tests can be used to supplement core data by providing information on the aquifer in areas between wells.

The majority of the work done to date at GEMS has been of an experimental nature. However, as can be deduced from the name of the site, there is also a monitoring component to work at GEMS. Although this component is still in its initial stages, the goal is to use GEMS as a long-term monitoring site to study hydrologic processes in the Kansas River floodplain. In the next several years, we are planning to install a fully equipped weather station as well as equipment to monitor water movement in the unsaturated zone above the water table.

In addition to the extensive KGS research that is currently being carried out at this site, GEMS is also being used in academic activities at the University of Kansas. GEMS serves as the primary field area for the class in hydrogeological field methods taught through the Department of Geology by KGS staff. Five graduate students at the University of Kansas have also worked at GEMS on either M.S. or Ph.D. projects.

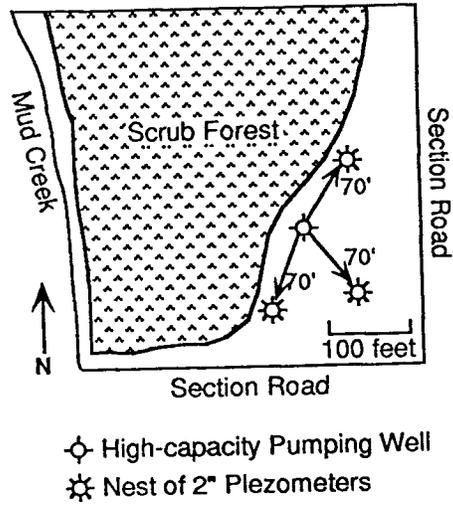


Figure II-1. Areal view of the Geohydrologic Experimental and Monitoring Site (GEMS).

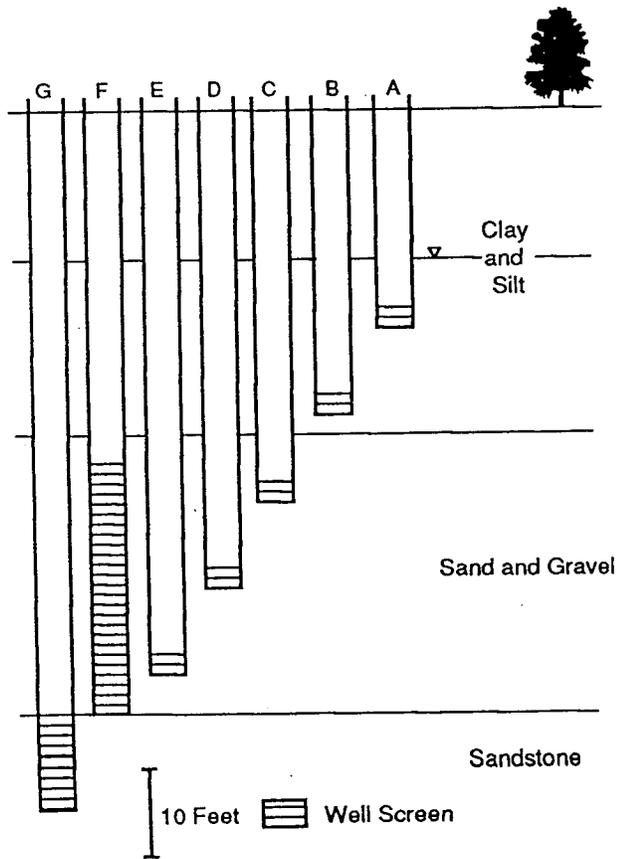


Figure II-2. Cross-sectional view of a well nest at GEMS.

## BAKER UNIVERSITY WETLANDS

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### A. History and Description

The Baker University Wetlands is a 232 ha (573 acre) tract that has been under Baker University's management since 1968. It is mostly in Sec. 18, T13S, R20E, and lies in the Wakarusa River floodplain. It was originally owned and managed by Haskell Institute, a junior college for native Americans. During the 1920s a large effort was made to drain the area and dike it to prevent seasonal flooding so that the area could be farmed. These efforts were never very successful and Haskell ceased their farming practices in 1934. They did, however, continue to lease the areas for row crops, hay, and grazing for a period of time after that date. Baker University received the land from the federal government in August 1968 with a 30 year stipulation to utilize the area for education, research, and preservation.

The area includes 12 ha (30 acre) and 6 ha (15 acre) parcel of native wetland prairies which have never been plowed. Until recently these areas were mowed annually, but since 1982 they have been burned every 2 or 3 years. Both of these areas are on the south side of the center road (Figure 1). The remaining 117 ha (288 acres) on the south have mostly been cultivated, except for a 100 m wide strip of riparian woods along the river. Approximately 81 ha (200 acres) of this cultivated land has been replanted to native grasses and forbs. Most of the north half has been grazed up until the early 1980s. It has been disturbed to various degrees for the purpose of draining the area but has returned to a reasonably diverse wetland prairie with some areas of heavy brush. Burning and selected mowing continues to be our main management tool. Several recent grants have provided us with the opportunity to reverse some of the efforts to drain the area, better manage the precipitation that is received, and retain this water for a longer period of time.

### B. Research and Education

Most research efforts have been with vertebrates and vascular plants. The breeding and wintering bird populations have been monitored fairly regularly since 1974 by Dr. Calvin Cink (Baker University) and others. The small mammal population has been monitored rather sporadically since 1983. Several graduate students from the University of Kansas have conducted research projects on the Hispid Cotton Rat, Northern Harrier, Short-eared Owl, and Maximillian Sunflower. Plant studies have centered on efforts to reestablish native prairie plants on the area. Studies have looked at various methods in seed collection, preparation, and dispersal. Recent seeding operations have used a nesbit-type drill with both grass and forb seed thrown into the hopper together.

This past year several new long-term projects have been initiated. Hydrological studies were initiated in November 1990 with the construction of 11 observation wells in addition to two other established wells and an additional five mark-down sites. These have been measured twice a week since January. The other long-term project is a biodiversity project that was initiated this past summer in the northwest quarter of the area. Since the north half of the center road was to be raised to create a levee we collected quantitative data on all vertebrates and vascular plants that occurred in the area. We will follow up on this in subsequent years to determine what changes have occurred by holding more water.

# Baker University Wetlands

573 acres



- Original Prairie
- Prairie Plantings

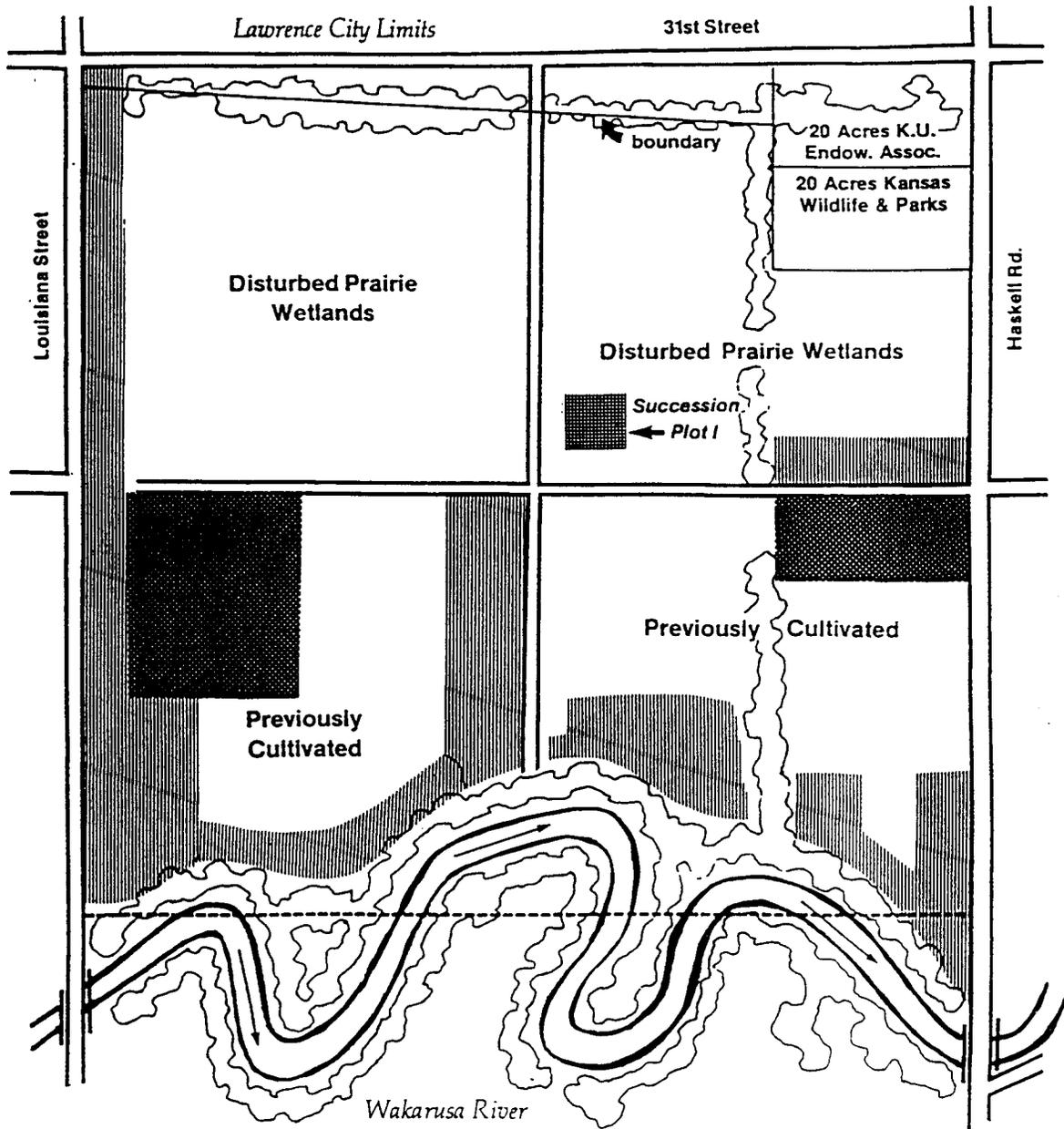


Figure 1. Baker University Wetlands

We have plans to include invertebrate studies next year. There are many possible projects available and we welcome proposals that will not conflict with current management practices.

We have had a number of classes from Baker University that have visited and conducted some research on the area. Periodically the General Biology lab visits the area, but simply for a tour. Botany and General Ecology labs visit the area every year to collect vegetation data. In addition, the General Ecology lab has studied the soil invertebrates from the native prairie plots. The class that spends the most time out there and does the most work is Prairie Ecology class. Labs include capture and banding of birds, brush and tree removal, maintaining bird houses, dam building, fish seining, annual burning, prairie forb transplanting, vegetation surveys and a variety of other miscellaneous activities.

We welcome the opportunity to show groups the Baker University Wetlands. Every year several field trips are given to the area for local grade schools from Baldwin and Lawrence. Other field trips include Jayhawk Audubon, Kansas Wildflower Society, and Elder Hostel. One of the future goals is to have several students trained in conducting field trips so that scheduling is not as difficult.

### C. Vegetation

Wetland prairie, like that present on Baker University Wetlands, has been eliminated from most of the original river bottoms of eastern Kansas due to agricultural practices and flood control structures. Characteristic plant species in the native habitat areas consist primarily of Cordgrass (*Spartina pectinata*), Eastern Gammagrass (*Tripsacum dactyloides*), Switchgrass (*Panicum virgatum*), Big Bluestem (*Andropogon gerardii*), Ironweed (*Vernonia fasciculata*), Coreopsis Beggar-ticks (*Bidens polylepis*), Maximillian Sunflower (*Helianthus maximiliani*), Jerusalem Artichoke (*Helianthus tuberosa*), Large-toothed Sunflower (*Helianthus grosseserratus*) and numerous species of *Carex*, *Eleocharis*, *Cyperus*, and *Scirpus*.

The accompanying checklist of vascular plants is presented in phylogenetic sequence by family follow Great Plains Flora Association (1986). Within each family, species are arranged alphabetically by genus and scientific and common names generally following those given in Great Plains Flora Association (1986). Status of each species is then presented with two letter codes. The first code is for relative abundance of the species with: C=common, U=uncommon, O=occasional, and R=rare. The second letter code refers to habitat with P=prairie, wetlands, and fields; R=riparian (including river); and B=both areas.

### D. Vertebrate Fauna

High densities of sparrows occupy the area in winter including Song, Swamp, Lincoln, Fox, White-crowned and occasionally Savannah and Leconte's. Some years there are numerous waterfowl and shorebirds that stop during migration. During the summer the predominant species of birds are Dickcissel, Eastern Meadowlark, Red-winged Blackbird, Common Yellowthroat and Sedge Wren. There have been a total of 157 bird species recorded on the area. In the accompanying checklist of birds, nomenclature and arrangement follows that of American Ornithologist' Union (1983). Information on status for each species is given with two letter codes. The first code is for relative abundance with C=common, U=uncommon, O=occasional, and R=rare. The second letter refers to habitat with P=prairie, wetlands, and fields; R=riparian (including river); and B=both areas. Information is also given as to whether the species is known to breed on the area "\*"; or is present sometime during the year, or known from the past, but not known to breed there "+".

The most common species of amphibians and reptiles found are Smallmouth Salamander (*Ambystoma texanum*), Blanchard's Cricket Frog, (*Acris crepitans*), Western Chorus Frog (*Pseudacris triseriata*), Gray Treefrog (*Hyla chrysoscelis*), Bullfrog (*Rana catesbeiana*), Plains Leopard Frog (*Rana blairi*), Snapping Turtle (*Chelydra serpentina*), Western Painted Turtle (*Chrysemys picta*), Graham's Crayfish Snake (*Regina grahamii*), Western Ribbon Snake (*Thamnophis proximus*), Yellow-bellied Racer (*Coluber constrictor*), Black Rat Snake (*Elaphe obsoleta*), and Prairie Kingsnake (*Lampropeltis calligaster*). The area is widely known as designated critical habitat for the Northern Crawfish Frog (*Rana aerolata*). The accompanying checklist of amphibians and reptiles was compiled by M. Hubbard and J. T. Collins and is arranged in phylogenetic sequence with nomenclature following that of Conant and Collins (1991). See codes for status of each species (abundance and habitat) under "Birds".

The most abundant mammals are the Prairie Vole (*Microtus ochrogaster*) and Hispid Cotton Rat (*Sigmodon hispidus*). Also present in substantial numbers are the Southern Bog Lemming (*Synaptomys cooperi*), Deer Mouse (*Peromyscus maniculatus*) and White-footed Mouse (*Peromyscus leucopus*). The accompanying checklist of mammals is arranged in phylogenetic sequence, with nomenclature following that of Bee et. al. (1981). See codes for status of each species (abundance and habitat) under "Birds".

The checklist of fishes that is provided indicates species that have occurred in several ponds and waterways within the wetlands. We have not surveyed fish species that occur in the Wakarusa River and consequently these species are missing from this list. The species are arranged in phylogenetic sequence with nomenclature following that of Cross and Collins (1975). See codes for status of each species (abundance only) under "Birds".

#### Literature Cited

- American Ornithologists' Union. 1983. Check-list of North American birds. 6th ed.
- Bee, J. W. , G. Glass, R. S. Hoffman, and R. R. Patterson. 1981. Mammals in Kansas. University of Kansas Publications Museum of Natural History. Lawrence, KS. pp. i-ix, 1-300.
- Conant, R. and J. T. Collins. 1991. Reptiles and amphibians eastern and central North America. Peterson Field Guides. Houghton Mifflin Company, Boston. xviii + 450 pp.
- Cross, F. B. and J. T. Collins. 1975. Fishes in Kansas. University of Kansas Publications Museum of Natural History, Lawrence, KS. pp. i-viii, 1-189.
- Great Plains Flora Association. 1986. Flora of the Great Plains. University Press of Kansas. Lawrence, KS. 1392 pp.

VASCULAR PLANTS OF THE BAKER UNIVERSITY WETLANDS

Family/Species	Common Name	Status
Cupressaceae		
<i>Juniperus virginiana</i>	Red Cedar	C B
Annonaceae		
<i>Asimina triloba</i>	Pawpaw	C R
Ranunculaceae		
<i>Myosurus minimus</i>	Mouse-tail	O P
<i>Thalictrum dasycarpum</i>	Purple Meadow Rue	O B
Papaveraceae		
<i>Menispermum canadense</i>	Moonseed	U R
Platanaceae		
<i>Platanus occidentalis</i>	Sycamore	U R
Ulmaceae		
<i>Celtis occidentalis</i>	Hackberry	C B
<i>Ulmus americana</i>	American Elm	C B
<i>Ulmus rubra</i>	Slippery Elm	C B
Cannabaceae		
<i>Humulus lupulus</i>	Common Hops	O R
Moraceae		
<i>Morus rubra</i>	Red Mulberry	U R
Urticaceae		
<i>Urtica dioica</i>	Stinging Nettle	C R
Juglandaceae		
<i>Carya cordiformis</i>	Bitternut Hickory	O R
<i>Carya ovata</i>	Shagbark Hickory	O R
<i>Juglans nigra</i>	Black Walnut	C R
Fagaceae		
<i>Quercus macrocarpa</i>	Bur Oak	O R
<i>Quercus muehlenbergii</i>	Chinkapin Oak	R R
<i>Quercus stellata</i>	Post Oak	O R
<i>Quercus velutina</i>	Black Oak	O B
<i>Quercus rubra</i>	Red Oak	O B
Betulaceae		
<i>Corylus americana</i>	Hazelnut	O R
Nyctaginaceae		
<i>Mirabilis nyctaginea</i>	Wild Four O'clock	U P
Chenopodiaceae		
<i>Chenopodium album</i>	Lamb's Quarters	U P
<i>Chenopodium gigantospermum</i>	Maple-leaved Goosefoot	U R
Amaranthaceae		

<i>Amaranthus rudis</i>	Water-hemp	U P
Caryophyllaceae		
<i>Silene regia</i>	Royal Catchfly	R P
<i>Silene stellata</i>	Starry Campion	U R
Polygonaceae		
<i>Polygonum amphibium</i>	Water Smartweed	C P
<i>Polygonum arenastrum</i>	Knotweed	U P
<i>Polygonum aviculare</i>	Knotweed	C P
<i>Polygonum hydropiperoides</i>	Mild Water Pepper	C P
<i>Polygonum pensylvanicum</i>	Pennsylvania Smartweed	C P
<i>Polygonum punctatum</i>	Water Smartweed	C P
<i>Polygonum scandens</i>	False Buckwheat	U P
<i>Polygonum virginianum</i>	Jumpseed	C R
<i>Rumex altissimus</i>	Pale Dock	C P
<i>Rumex crispus</i>	Curly Dock	O P
Malvaceae		
<i>Hibiscus lasiocarpus</i>	Rose Mallow	R P
Violaceae		
<i>Viola pratincola</i>	Blue Prairie Violet	O B
Cucurbitaceae		
<i>Echinocystis lobata</i>	Wild Cucumber	O R
<i>Sicyos angulatus</i>	Bur Cucumber	U R
Salicaceae		
<i>Populus deltoides</i>	Cottonwood	C B
<i>Salix amygdaloides</i>	Peaceleaf Willow	C B
<i>Salix nigra</i>	Black Willow	C B
Primulaceae		
<i>Lysimachia ciliata</i>	Fringed Loosestrife	O P
Grossulariaceae		
<i>Ribes missouriense</i>	Missouri Gooseberry	U R
Rosaceae		
<i>Geum candense</i>	White avens	C B
<i>Potentilla norvegica</i>	Norwegian Cinquefoil	O P
<i>Prunus virginiana</i>	Choke Cherry	O P
<i>Rosa multiflora</i>	Multiflora Rose	U P
<i>Rosa setigera</i>	Prairie Rose	O P
<i>Rubus occidentalis</i>	Black Raspberry	O R
Mimosaceae		
<i>Desmanthus illinoensis</i>	Illinois Bundleflower	C P
Caesalpiniaceae		
<i>Cassia chamaecrista</i>	Showy Partridge Pea	U P
<i>Cassia marilandica</i>	Maryland Senna	O P
<i>Cercis canadensis</i>	Redbud	C R
<i>Gleditsia triacanthos</i>	Honey Locust	C B
<i>Gymnocladus dioica</i>	Kentucky Coffee-tree	U R

Fabaceae		
<i>Amorpha fruticosa</i>	False Indigo	U P
<i>Amphicarpaea bracteata</i>	Hog Peanut	U R
<i>Apios americana</i>	American Potato Bean	U P
<i>Baptisia lactea</i>	White Wild Indigo	C P
<i>Desmodium canescens</i>	Canada Tickclover	O P
<i>Lespedeza capitata</i>	Round-head Lespedeza	U P
<i>Lespedeza violacea</i>	Prairie Lespedeza	C P
<i>Melilotus alba</i>	White Sweet Clover	C P
<i>Melilotus officinalis</i>	Yellow Sweet Clover	C P
<i>Robinia pseudo-acacia</i>	Black Locust	O P
<i>Strophostyles leiosperma</i>	Slick-seed Bean	U P
<i>Trifolium hybridum</i>	Alsike Clover	U P
<i>Trifolium pratense</i>	Red Clover	U P
<i>Trifolium repens</i>	White Clover	U P
Lythraceae		
<i>Ammannia coccinea</i>	Toothcup	U P
<i>Lythrum alatum</i>	Winged Loosestrife	C P
Onagraceae		
<i>Gaura parviflora</i>	Velvety Gaura	C P
<i>Oenothera biennis</i>	Common Evening Primrose	O P
Cornaceae		
<i>Cornus drummondii</i>	Rough-leaved Dogwood	C B
Celastraceae		
<i>Celastrus scandens</i>	Bittersweet	C R
<i>Euonymus atropurpureus</i>	Wahoo	U R
Euphorbiaceae		
<i>Acalypha monococca</i>	Three-seeded Mercury	C P
<i>Acalypha virginica</i>	Three-seeded Mercury	C P
<i>Euphorbia cyathophora</i>	Painted Euphorbia	O P
<i>Euphorbia nutans</i>	Eyebane	U P
Vitaceae		
<i>Parthenocissus quinquefolia</i>	Virginia Creeper	C B
<i>Vitis cinerea</i>	Graybark Grape	U R
<i>Vitis riparia</i>	River-bank Grape	C B
Aceraceae		
<i>Acer negundo</i>	Box Elder	U B
<i>Acer saccharinum</i>	Silver Maple	C B
Anacardiaceae		
<i>Rhus glabra</i>	Smooth Sumac	C P
<i>Toxicodendron radicans</i>	Poison Ivy	C R
Simaroubaceae		
<i>Ailanthus altissima</i>	Tree of Heaven	R R
Zygophyllaceae		
<i>Tribulus terrestris</i>	Goat Head	O P
<i>Xanthoxylum americanum</i>	Northern Prickly Ash	O P

Oxalidaceae		
	<i>Oxalis dillenii</i>	Gray-green Wood Sorrel C P
Apiaceae		
	<i>Cicuta maculata</i>	Common Water Hemlock O B
	<i>Cryptotaenia canadensis</i>	Honewort C R
	<i>Eryngium yuccifolium</i>	Button Snakeroot U P
	<i>Sanicula gregaria</i>	Black Snakeroot C R
	<i>Torilis arvensis</i>	Hedge Parsley C R
Apocynaceae		
	<i>Apocynum cannabinum</i>	Indian Hemp Dogbane C P
Asclepiadaceae		
	<i>Asclepias hirtella</i>	Prairie Milkweed O P
	<i>Asclepias incarnata</i>	Swamp Milkweed U P
	<i>Asclepias sullivantii</i>	Smooth Milkweed C P
	<i>Asclepias verticillata</i>	Whorled Milkweed U P
	<i>Cynanchum laeve</i>	Sand Vine U P
Solanaceae		
	<i>Datura stramonium</i>	Jimson Weed R P
	<i>Physalis heterophylla</i>	Clammy Ground Cherry U P
	<i>Physalis pumila</i>	Prairie Ground Cherry O P
	<i>Physalis virginiana</i>	Virginia Ground Cherry U P
	<i>Solanum carolinense</i>	Carolina Horse Nettle C P
	<i>Solanum rostratum</i>	Buffalo Bur O P
Convolvulaceae		
	<i>Calystegia sepium</i>	Hedge Bindweed U P
Cuscutaceae		
	<i>Cuscuta cuspidata</i>	Cusp Dodder U P
Polemoniaceae		
	<i>Phlox pilosa</i>	Prairie Phlox O P
Verbenaceae		
	<i>Lippia lanceolata</i>	Northern Frog-fruit C P
	<i>Verbena hastata</i>	Blue Vervain U P
	<i>Verbena stricta</i>	Hoary Vervain O P
	<i>Verbena urticifolia</i>	Nettle-leaved Vervain U P
Lamiaceae		
	<i>Lycopus americanus</i>	American Bugleweed C P
	<i>Lycopus virginicus</i>	Virginia Bugleweed O P
	<i>Pycnanthemum tenuifolium</i>	Slender-leaved Mt. Mint U P
	<i>Scutellaria laterifolia</i>	Blue Skullcap O P
	<i>Teucrium canadense</i>	American Germander U P
Plantaginaceae		
	<i>Plantago aristata</i>	Bracted Plantain U P
	<i>Plantago lanceolata</i>	English Plantain O P
	<i>Plantago rugelii</i>	Rugel's Plantain U P

Oleaceae		
	<i>Fraxinus pennsylvanica</i>	Green Ash U B
	<i>Ligustrum vulgare</i>	Common Privet R P
Scrophulariaceae		
	<i>Lindernia dubia</i>	False Pimpernel O P
	<i>Verbascum blattaria</i>	Moth Mullein O P
	<i>Verbascum thapsus</i>	Common Mullein O B
	<i>Veronicastrum virginicum</i>	Culver's Root U P
Acanthaceae		
	<i>Justicia americana</i>	Water Willow O P
	<i>Ruellia humilis</i>	Fringeleaf Ruellia U P
	<i>Ruellia strepens</i>	Limestone Ruellia U R
Bignoniaceae		
	<i>Campsis radicans</i>	Trumpet Vine U B
Campanulaceae		
	<i>Campanula americana</i>	American Bellflower O R
Rubiaceae		
	<i>Cephalanthus occidentalis</i>	Common Buttonbush C P
	<i>Galium aparine</i>	Catchweed Bedstraw C R
	<i>Galium concinnum</i>	Shining Bedstraw C P
	<i>Galium obtusum</i>	Bluntleaf Bedstraw U P
Caprifoliceae		
	<i>Sambucus canadensis</i>	Elderberry O R
	<i>Symphoricarpos orbiculatus</i>	Buckbrush U B
Asteraceae		
	<i>Achillea millefolium</i>	Yarrow C P
	<i>Ambrosia artemisiifolia</i>	Common Ragweed C P
	<i>Ambrosia trifida</i>	Giant Ragweed C P
	<i>Aster ericoides</i>	White Aster U P
	<i>Aster hesperius</i>	Panicled Aster U P
	<i>Aster novae-angliae</i>	New England Aster O P
	<i>Aster pilosus</i>	Aster U P
	<i>Aster simplex</i>	Panicled Aster C P
	<i>Aster subulatus</i>	Saltmarsh Aster O P
	<i>Bidens bipinnata</i>	Spanish Needles U P
	<i>Bidens polylepis</i>	Coreopsis Beggar-ticks C P
	<i>Cacalia plantaginea</i>	Indian Plantain O P
	<i>Cirsium altissimum</i>	Tall Thistle U P
	<i>Conyza canadensis</i>	Horse-weed U P
	<i>Coreopsis palmata</i>	Finger Coreopsis U P
	<i>Erechtites hieracifolia</i>	Fireweed O P
	<i>Erigeron strigosus</i>	Daisy Fleabane C P
	<i>Eupatorium purpureum</i>	Sweet Joe-Pye Weed O R
	<i>Eupatorium rugosum</i>	White Snakeroot U P
	<i>Helianthus annuus</i>	Common Sunflower C P
	<i>Helianthus grosseserratus</i>	Sawtooth Sunflower C P

<i>Helianthus hirsutus</i>	Hairy Sunflower	OP
<i>Helianthus rigidus</i>	Stiff Sunflower	OP
<i>Helianthus tuberosus</i>	Jerusalem Artichoke	CP
<i>Iva annua</i>	Marsh Elder	CP
<i>Lactuca canadensis</i>	Wild Lettuce	UP
<i>Lactuca floridana</i>	Florida Lettuce	UR
<i>Lactuca sirriola</i>	Prickley Lettuce	UP
<i>Liatis pycnostachya</i>	Gayfeather	UP
<i>Pyrhopappus carolinianus</i>	False Dandelion	UP
<i>Ratibida pinnata</i>	Greyheaded Pr. Coneflower	OP
<i>Rudbeckia hirta</i>	Black-eyed Susan	UP
<i>Silphium laciniatum</i>	Compass Plant	CP
<i>Silphium perfoliatum</i>	Cup Plant	UP
<i>Solidago canadensis</i>	Canada Goldenrod	UP
<i>Solidago gigantea</i>	Late Goldenrod	UR
<i>Solidago missouriensis</i>	Prairie Goldenrod	CP
<i>Sonchus asper</i>	Prickley Sow Thistle	OP
<i>Verbesina alternifolia</i>	Wingstem	UR
<i>Vernonia fasciculata</i>	Ironweed	CP
<i>Xanthium strumarium</i>	Cocklebur	RP
Alismataceae		
<i>Alisma triviale</i>	Water Plantain	RR
<i>Sagittaria latifolia</i>	Arrowhead	OR
Lemnaceae		
<i>Lemna minor</i>	Duckweed	CR
<i>Spirodela polyrrhiza</i>	Greater Duckweed	CR
Commelinaceae		
<i>Tradescantia bracteata</i>	Spiderwort	CP
Juncaceae		
<i>Juncus dudleyi</i>	Dudley Rush	UP
<i>Juncus interior</i>	Inland Rush	CP
<i>Juncus tenuis</i>	Path Rush	CP
Cyperaceae		
<i>Carex amphibola</i>	Sedge	CR
<i>Carex annectens</i>	Sedge	OP
<i>Carex brevior</i>	Sedge	CP
<i>Carex bushii</i>	Sedge	OP
<i>Carex crinita</i>	Sedge	OP
<i>Carex granularis</i>	Sedge	CP
<i>Carex gravida</i>	Sedge	UP
<i>Carex hyalinolepis</i>	Sedge	UP
<i>Carex hystericina</i>	Sedge	OP
<i>Carex lanuginosa</i>	Sedge	UP
<i>Carex lacustris</i>	Sedge	OP
<i>Carex muhlenbergii</i>	Sedge	OP
<i>Carex vulpinoidea</i>	Sedge	CP

<i>Cyperus acuminatus</i>	Umbrella Sedge	U P
<i>Cyperus esculentus</i>	Umbrella Sedge	C P
<i>Cyperus pseudovegetus</i>	Umbrella Sedge	U P
<i>Eleocharis macrostachya</i>	Spikerush	C P
<i>Eleocharis obtusa</i>	Spikerush	U P
<i>Eleocharis xyridiformis</i>	Spikerush	C P
<i>Scirpus acutus</i>	Bulrush	U P
<i>Scirpus atrovirens</i>	Bulrush	C P
<i>Scirpus fluviatilis</i>	Bulrush	O P
<i>Scirpus pendulus</i>	Bulrush	C P
Poaceae		
<i>Agropyron elongatum</i>	Tall Wheatgrass	U R
<i>Agrostis hyemalis</i>	Ticklegrass	C P
<i>Andropogon gerardii</i>	Big Bluestem	C P
<i>Andropogon saccharoides</i>	Silver Bluestem	R P
<i>Andropogon scoparius</i>	Little Bluestem	U P
<i>Bouteloua curtipendula</i>	Sideoats Grama	O P
<i>Bromus inermis</i>	Smooth Brome	C P
<i>Bromus japonicus</i>	Japanese Brome	U P
<i>Dactylis glomerata</i>	Orchard Grass	U P
<i>Dichanthelium acuminatum</i>	Witchgrass	U P
<i>Echinochloa muricata</i>	Barnyard Grass	O P
<i>Elymus canadensis</i>	Canada Wild Rye	C P
<i>Elymus virginicus</i>	Virginia Wild Rye	C R
<i>Eragrostis cilianensis</i>	Stinkgrass	U P
<i>Festuca obtusa</i>	Nodding Fescue	U R
<i>Hordeum jubatum</i>	Foxtail Barley	C P
<i>Koeleria pyramidata</i>	Junegrass	U P
<i>Leersia oryzoides</i>	Rice Cutgrass	U P
<i>Muhlenbergia asperfolia</i>	Scratchgrass	U P
<i>Panicum virgatum</i>	Switchgrass	C P
<i>Phalaris arundinacea</i>	Reed Canary Grass	U P
<i>Poa pratensis</i>	Kentucky Bluegrass	C B
<i>Setaria glauca</i>	Yellow Foxtail	C P
<i>Setaria viridis</i>	Green Foxtail	C P
<i>Sorghastrum nutans</i>	Indian Grass	C P
<i>Sorghum halepense</i>	Johnson-grass	O P
<i>Spartina pectinata</i>	Prairie Cordgrass	C P
<i>Sphenopholis obtusata</i>	Wedgegrass	O P
<i>Sporobolus asper</i>	Rough Dropseed	U P
<i>Tripsacum dactyloides</i>	Eastern Gamagrass	C P
Smilacaceae		
<i>Smilax hispida</i>	Bristly Greenbrier	C R

## BIRDS OF THE BAKER UNIVERSITY WETLANDS

Family/Species	Common Name	Status
Podicipedidae		
<i>Podilymbus podiceps</i>	Pied-billed Grebe	O R +
Phalacrocoracidae		
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	O R +
Ardeidae		
<i>Botaurus lentiginosus</i>	American Bittern	R P +
<i>Ardea herodias</i>	Great Blue Heron	C B +
<i>Egretta thula</i>	Snowy Egret	O P +
<i>Egretta caerulea</i>	Little Blue Heron	O B +
<i>Bubulcus ibis</i>	Cattle Egret	O P +
<i>Butorides striatus</i>	Green Heron	C B +
<i>Nycticorax violaceus</i>	Yellow-crowned Night-Heron	U P +
Anatidae		
<i>Anser albifrons</i>	Greater White-fronted Goose	O P +
<i>Chen caerulescens</i>	Snow Goose	U P +
<i>Branta canadensis</i>	Canada Goose	U P *
<i>Aix sponsa</i>	Wood Duck	U B *
<i>Anas crecca</i>	Green-winged Teal	C P +
<i>Anas platyrhynchos</i>	Mallard	C B *
<i>Anas acuta</i>	Northern Pintail	O P +
<i>Anas discors</i>	Blue-winged Teal	C B +
<i>Anas clypeata</i>	Northern Shoveler	C P +
<i>Mergus merganser</i>	Common Merganser	U R +
Cathartidae		
<i>Cathartes aura</i>	Turkey Vulture	C B +
Accipitridae		
<i>Haliaeetus leucocephalus</i>	Bald Eagle	U B +
<i>Circus cyaneus</i>	Northern Harrier	C P *
<i>Accipiter striatus</i>	Sharp-shinned Hawk	U B +
<i>Accipiter cooperii</i>	Cooper's Hawk	O B +
<i>Accipiter gentilis</i>	Northern Goshawk	R B +
<i>Buteo swainsoni</i>	Swainson's Hawk	O P +
<i>Buteo jamaicensis</i>	Red-tailed Hawk	C B *
<i>Buteo regalis</i>	Ferruginous Hawk	R P +
<i>Buteo lagopus</i>	Rough-legged Hawk	U B +
Falconidae		
<i>Falco mexicanus</i>	Prairie Falcon	O B +
<i>Falco sparverius</i>	American Kestrel	C B +

Phasianidae		
<i>Phasianus colchicus</i>	Ring-necked Pheasant	O P +
<i>Colinus virginianus</i>	Northern Bobwhite	C B *
Rallidae		
<i>Coturnicops noveboracensis</i>	Yellow Rail	R P +
<i>Laterallus jamaicensis</i>	Black Rail	R P +
<i>Rallus limicola</i>	Virginia Rail	O P +
<i>Porzana carolina</i>	Sora	U P +
<i>Fulica americana</i>	American Coot	U P +
Gruidae		
<i>Grus canadensis</i>	Sandhill Crane	R P +
Charadriidae		
<i>Pluvialis dominica</i>	Lesser Golden Plover	O P +
<i>Charadrius vociferus</i>	Killdeer	U R +
Scolopacidae		
<i>Tringa melanoleuca</i>	Greater Yellowlegs	U P +
<i>Tringa flavipes</i>	Lesser Yellowlegs	U P +
<i>Tringa solitaria</i>	Solitary Sandpiper	U P +
<i>Catoptrophorus semipalmatus</i>	Willet	U P +
<i>Bartramia longicauda</i>	Upland Sandpiper	O P +
<i>Calidris melanotos</i>	Pectoral Sandpiper	U P +
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher	U P +
<i>Gallinago gallinago</i>	Common Snipe	C P +
<i>Scolopax minor</i>	American Woodcock	U P +
<i>Phalaropus tricolor</i>	Wilson's Phalarope	O P +
Laridae		
<i>Larus pipixcan</i>	Franklin's Gull	U P +
<i>Larus delawarensis</i>	Ring-billed Gull	U P +
<i>Chlidonias niger</i>	Black Tern	O P +
Columbidae		
<i>Columba livia</i>	Rock Dove	U B +
<i>Zenaida macroura</i>	Mourning Dove	C B *
Cuculidae		
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo	U P +
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	C B *
Strigidae		
<i>Otus asio</i>	Eastern Screech-Owl	C B *
<i>Bubo virginianus</i>	Great Horned Owl	C B *
<i>Strix varia</i>	Barred Owl	C R +
<i>Asio flammeus</i>	Short-eared Owl	O P +
Caprimulgidae		
<i>Chordeiles minor</i>	Common Nighthawk	U P +
Apodidae		
<i>Chaetura pelagica</i>	Chimney Swift	C B +

Trochilidae		
<i>Archilochus colubris</i>	Ruby-throated Hummingbird	O B +
Alcedinidae		
<i>Ceryle alcyon</i>	Belted Kingfisher	C B +
Picidae		
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	U R +
<i>Melanerpes carolinus</i>	Red-bellied Woodpecker	C R *
<i>Picoides pubescens</i>	Downy Woodpecker	C B *
<i>Picoides villosus</i>	Hairy Woodpecker	C R +
<i>Colaptes auratus</i>	Northern Flicker	C B *
Tyrannidae		
<i>Contopus virens</i>	Eastern Wood-Pewee	C R +
<i>Empidonax traillii</i>	Willow Flycatcher	O R +
<i>Empidonax minimus</i>	Least Flycatcher	C B +
<i>Sayornis phoebe</i>	Eastern Phoebe	C B *
<i>Myiarchus crinitus</i>	Great Crested Flycatcher	C R +
<i>Tyrannus verticalis</i>	Western Kingbird	U P +
<i>Tyrannus tyrannus</i>	Eastern Kingbird	C P +
<i>Tyrannus forficatus</i>	Scissor-tailed Flycatcher	U P +
Alaudidae		
<i>Eremophila alpestris</i>	Horned Lark	U P +
Hirundinidae		
<i>Progne subis</i>	Purple Martin	C P +
<i>Stelgidopteryx serripennis</i>	N. Rough-winged Swallow	U P +
<i>Hirundo rustica</i>	Barn Swallow	C R *
Corvidae		
<i>Cyanocitta cristata</i>	Blue Jay	C B +
<i>Corvus brachyrhynchos</i>	American Crow	C B *
Paridae		
<i>Parus atricapillus</i>	Black-capped Chickadee	C B *
<i>Parus bicolor</i>	Tufted Titmouse	C R *
Sittidae		
<i>Sitta carolinensis</i>	White-breasted Nuthatch	C B +
Certhiidae		
<i>Certhia americana</i>	Brown Creeper	C R +
Troglodytidae		
<i>Thryothorus ludovicianus</i>	Carolina Wren	C R *
<i>Troglodytes aedon</i>	House Wren	U B +
<i>Troglodytes troglodytes</i>	Winter Wren	U R +
<i>Cistothorus platensis</i>	Sedge Wren	U P +
<i>Cistothorus palustris</i>	Marsh Wren	R P +
Muscicapidae		
<i>Regulus satrapa</i>	Golden-crowned Kinglet	U B +
<i>Regulus calendula</i>	Ruby-crowned Kinglet	U R +
<i>Sialis sialis</i>	Eastern Bluebird	C B *

<i>Catharus ustulatus</i>	Swainson's Thrush	U R +
<i>Turdus migratorius</i>	American Robin	C B *
Mimidae		
<i>Dumetella carolinensis</i>	Gray Catbird	U B +
<i>Mimus polyglottos</i>	Northern Mockingbird	U B +
<i>Toxostoma rufum</i>	Brown Thrasher	C B *
Motacillidae		
<i>Anthus spinoletta</i>	Water Pipit	O P +
Bombycillidae		
<i>Bombycilla cedrorum</i>	Cedar Waxwing	O B +
Laniidae		
<i>Lanius ludovicianus</i>	Loggerhead Shrike	C P *
Sturnidae		
<i>Sturnus vulgaris</i>	European Starling	C R *
Vireonidae		
<i>Vireo bellii</i>	Bell's Vireo	C P *
<i>Vireo gilvus</i>	Warbling Vireo	U R +
<i>Vireo olivaceus</i>	Red-eyed Vireo	U R +
Emberizidae		
<i>Parula americana</i>	Northern Parula	U R *
<i>Dendroica petechia</i>	Yellow Warbler	U B +
<i>Seiurus motacilla</i>	Louisiana Waterthrush	U R +
<i>Oporornis formosus</i>	Kentucky Warbler	O R +
<i>Oporornis philadelphia</i>	Mourning Warbler	O R +
<i>Geothlypis trichas</i>	Common Yellowthroat	C B *
<i>Wilsonia pusilla</i>	Wilson's Warbler	U B +
<i>Cardinalis cardinalis</i>	Northern Cardinal	C B *
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	U R *
<i>Guiraca caerulea</i>	Blue Grosbeak	U P +
<i>Passerina cyanea</i>	Indigo Bunting	C B *
<i>Spiza americana</i>	Dickcissel	C P *
<i>Spizella arborea</i>	American Tree Sparrow	C P +
<i>Spizella pallida</i>	Clay-colored Sparrow	U P +
<i>Spizella pusilla</i>	Field Sparrow	C B *
<i>Poecetes gramineus</i>	Vesper Sparrow	U P +
<i>Chondestes grammacus</i>	Lark Sparrow	U B +
<i>Passerculus sandwichensis</i>	Savannah Sparrow	U P +
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	U P +
<i>Ammodramus leconteii</i>	LeConte's Sparrow	O P +
<i>Passerella iliaca</i>	Fox Sparrow	U B +
<i>Melospiza melodia</i>	Song Sparrow	C P +
<i>Melospiza lincolni</i>	Lincoln's Sparrow	U B +
<i>Melospiza georgiana</i>	Swamp Sparrow	C P +
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	C B +
<i>Zonotrichia querula</i>	Harris' Sparrow	C B +
<i>Junco hyemalis</i>	Dark-eyed Junco	C B +

<i>Calcarius lapponicus</i>	Lapland Longspur	O P +
<i>Dolichonyx oryzivorus</i>	Bobolink	O P +
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	C B *
<i>Sternella magna</i>	Eastern Meadowlark	C P *
<i>Sternella neglecta</i>	Western Meadowlark	U P +
<i>X. xanthocephalus</i>	Yellow-headed Blackbird	O P +
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird	O B +
<i>Quiscalus quiscula</i>	Common Grackle	C B +
<i>Molothrus ater</i>	Brown-headed Cowbird	C B *
<i>Icterus spurius</i>	Orchard Oriole	U B *
<i>Icterus galbula</i>	Northern Oriole	C B *
Fringillidae		
<i>Loxia curvirostra</i>	Red Crossbill	R B +
<i>Carpodacus mexicanus</i>	House Finch	R B +
<i>Carduelis flammea</i>	Common Redpoll	R P +
<i>Carduelis pinus</i>	Pine Siskin	U B +
<i>Carduelis tristis</i>	American Goldfinch	U B *
Passeridae		
<i>Passer domesticus</i>	House Sparrow	U B +

AMPHIBIANS AND REPTILES OF THE BAKER UNIVERSITY WETLANDS

Family/Species	Common Name	Status
<b>AMPHIBIANS</b>		
Ambystomatidae		
<i>Ambystoma texanum</i>	Smallmouth Salamander	C B
Pelobatidae		
<i>Scaphiopus bombifrons</i>	Plains Spadefoot	R P
Bufonidae		
<i>Bufo americanus</i>	American Toad	O P
<i>Bufo w. woodhousii</i>	Woodhouse's Toad	U B
Hylidae		
<i>Acris crepitans blanchardi</i>	Blanchard's Cricket Frog	C B
<i>Hyla chrysoscelis</i>	Gray Treefrog	C B
<i>Hyla versicolor</i>	Gray Treefrog	U P
<i>Pseudacris t. triseriata</i>	Western Chorus Frog	C B
Microhylidae		
<i>Gastrophryne carolinensis</i>	Eastern Narrow-Mouthed Toad	R R
Ranidae		
<i>Rana areolata circulosa</i>	Northern Crawfish Frog	R P
<i>Rana blairi</i>	Plains Leopard Frog	C B
<i>Rana catesbeiana</i>	Bullfrog	C B
<i>Rana utricularia</i>	Southern Leopard Frog	R P
<b>REPTILES</b>		
Chelydridae		
<i>Chelydra serpentina</i>	Snapping Turtle	C R
Emydidae		
<i>Chrysemys picta belli</i>	Western Painted Turtle	C B
<i>Trachemys scripta elegans</i>	Red-eared Slider	O P
Trionychidae		
<i>Apalone spinifera hartwegi</i>	Western Spiny Softshell	O R
Scincidae		
<i>Eumeces fasciatus</i>	Five-Lined Skink	U R
<i>Eumeces obsoletus</i>	Great Plains Skink	O R
Colubridae		
<i>Coluber constrictor flaviventris</i>	E. Yellow-Bellied Racer	C P
<i>Diadophis punctatus arnyi</i>	Prairie Ringneck Snake	C R
<i>Elaphe o. obsoleta</i>	Black Rat Snake	C B
<i>Lampropeltis c. calligaster</i>	Prairie Kingsnake	C P
<i>Lampropeltis getulus holbrooki</i>	Speckled Kingsnake	R P
<i>Lampropeltis triangulum sypila</i>	Red Milk Snake	R P

<i>Nerodia erythrogaster transversa</i>	Blotched Water Snake	U B
<i>Nerodia r. rhombifer</i>	Diamondback Water Snake	O B
<i>Regina grahamii</i>	Graham's Crayfish Snake	C P
<i>Storeria dekayi wrightorum</i>	Midland Brown Snake	O R
<i>Storeria dekayi texana</i>	Texas Brown Snake	O R
<i>Thamnophis p. proximus</i>	Western Ribbon Snake	C P
<i>Thamnophis sirtalis parietalis</i>	Red-sided Garter Snake	C P
<i>Thamnophis radix haydenii</i>	Plains Garter Snake	O P
<i>Tropidoclonion lineatum</i>	Lined Snake	R P

## MAMMALS OF THE BAKER UNIVERSITY WETLANDS

Family/Species	Common Name	Status
Didelphiidae		
<i>Didelphis virginiana</i>	Virginia Opossum	C B
Soricidae		
<i>Blarina carolinensis</i>	S. Short-tailed Shrew	U R
Talpidae		
<i>Scalopus aquaticus</i>	Eastern Mole	U B
Leporidae		
<i>Sylvilagus floridanus</i>	Eastern Cottontail	C B
Sciuridae		
<i>Sciurus carolinensis</i>	Gray Squirrel	C R
<i>Sciurus niger</i>	Fox Squirrel	O R
Castoridae		
<i>Castor canadensis</i>	Beaver	C B
Cricetidae		
<i>Microtus ochrogaster</i>	Prairie Vole	C P
<i>Peromyscus leucopus</i>	White-footed Mouse	C B
<i>Peromyscus maniculatus</i>	Deer Mouse	U P
<i>Sigmodon hispidus</i>	Hispid Cotton Rat	C P
<i>Synaptomys cooperi</i>	Southern Bog Lemming	U P
Muridae		
<i>Mus musculus</i>	House Mouse	U B
Canidae		
<i>Canis latrans</i>	Coyote	U B
Procyonidae		
<i>Procyon lotor</i>	Raccoon	C B
Mustelidae		
<i>Mephitis mephitis</i>	Striped Skunk	C B
Cervidae		
<i>Odocoileus virginianus</i>	White-tailed Deer	C B

FISHES OF THE BAKER UNIVERSITY WETLANDS

Family/Species	Common Name	Status
Cyprinidae		
<i>Cyprinus carpio</i>	Carp	U
<i>Notemigonus crysoleucas</i>	Golden Shiner	C
<i>Pimephales promelas</i>	Fathead Minnow	C
Catostomidae		
<i>Ictiobus bubalus</i>	Smallmouth Buffalo	R
Ictaluridae		
<i>Ictalurus melas</i>	Black Bullhead	C
<i>Ictalurus natalis</i>	Yellow Bullhead	O
<i>Ictalurus punctatus</i>	Channel Catfish	O
Poeciliidae		
<i>Gambusia affinis</i>	Mosquitofish	C
Centrarchidae		
<i>Lepomis cyanellus</i>	Green Sunfish	C
<i>Lepomis macrochirus</i>	Bluegill	C