

A FLORISTIC INVENTORY OF THE UNIVERSITY OF OKLAHOMA'S KESSLER ATMOSPHERIC AND ECOLOGICAL FIELD STATION, MCCLAIN COUNTY, OKLAHOMA

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ABSTRACT

This paper reports the results of a vascular plant inventory at the University of Oklahoma's Kessler Atmospheric and Ecological Field Station in McClain County in the state of Oklahoma. A total of 388 taxa in 80 families were collected. Two hundred and fifty-seven genera, 361 species, and 27 infraspecific taxa were identified. The largest families were the Poaceae with 66 taxa and the Asteraceae with 55 taxa. Fifty-seven taxa were planted or non-native to the U.S. (14.7 % of the flora). Four taxa tracked by the Oklahoma Natural Heritage Inventory were found.

INTRODUCTION AND STUDY AREA

The Kessler Atmospheric and Ecological Field Station (KAEFS) at the University of Oklahoma was established on properties donated by Dr. Edwin Kessler from 1988 to 2011 (<http://kaefs.ou.edu/>). Located approximately 28 km southwest of the Norman campus, KAEFS promotes and facilitates collaborative research and learning. The station hosts both formal and informal courses, workshops, and numerous meteorological and biological experiments, including a long-term global warming experiment. The goal of this work was to compile a complete list of vascular plant taxa present at the site to assist current and future KAEFS researchers in species identification and documentation.

KAEFS occupies 146 ha in McClain County in central Oklahoma approximately 13 km from the town of Washington (Figure 1). Latitudinal extent ranges from

34°58'15.99"N to 34°59'10.61"N and longitudinal extent from 97°30'32.88"W to 97°31'42.63"W. Physiographically, the site is located within the Western Red-bed Plains geomorphic province, which consists of gently rolling hills of red sandstone and shale of Permian age (Curtis et al. 2008; Johnson 2008). Two soil associations predominate at KAEFS: the Nash-Lucent-Grant (deep to shallow, gently sloping to moderately steep loams over sandstone uplands) and the Port-Pulaski-Keokuk (deep, nearly level loamy soils on floodplains; Moebius and Sparwasser 1979). KAEFS is located within the subtropical humid (Cf) climate zone (Trewartha 1968), with a mean annual temperature of 16°C. Low temperatures (to 3°C) occur in January, while the warmest temperatures occur in July (to 28°C; Oklahoma Climatological Survey 2016). The month of May is typically the wettest, with an average precipitation of 13.5 cm. Mean annual precipitation is

96.7 cm (Oklahoma Climatological Survey 2016). Elevation ranges from 332 m to 343 m. The dominant potential vegetation type is tallgrass prairie (Duck and Fletcher 1943).

The KAEFS property has a long history of farming and livestock grazing. The first homestead was established in 1904, and crops such as cotton, sorghum, and wheat were grown on the property up until the early 1970s. The property has an equally long history of cattle grazing, and a small herd still roams the grasslands today (<http://kaefs.ou.edu/>). A population of the Mediterranean basin native *Carthamus lanatus* L. was discovered at the site in the mid-1970s and grew to approximately 3000 plants by 1989. It was eradicated in the early 1990s with a strict regime of hand-pulling (Kessler unpublished).

METHODS

Vouchers of vascular plant taxa encountered at KAEFS were made throughout the growing seasons (March through October) of 2013, 2014, and 2015. Vouchers for U.S. non-native or planted taxa were only collected from naturalized populations. Specimens were processed according to standard procedures. In addition to these vouchers, collections from an earlier, unpublished study were also examined to see if additional taxa had been collected. Manuals used for identification included Diggs et al. (1999) and Tyril et al. (2015). Identifications were verified by comparison with specimens from the Robert Bebb Herbarium at the University of Oklahoma (OKL). Duration, growth habit, vegetation type, and nativity were determined using the PLANTS database (USDA-NRSC 2016) and Taylor and Taylor (1991). Classification and nomenclature follow Angiosperm Phylogeny Group III (Stevens 2001 onward) and the Integrated Taxonomic Information System (ITIS 2016). All specimens were deposited at OKL.

RESULTS AND DISCUSSION

A total of 388 taxa in 80 families were collected (Appendix). Two hundred and fifty-seven genera, 361 species, and 27 infraspecific taxa were identified. Two hundred and fifty-two taxa were perennials; there were 133 annuals and three biennials. The largest families were the Poaceae with 66 taxa and the Asteraceae with 55 taxa. Two-hundred and fifty-one taxa were forbs, and 91 were graminoids. There were 26 trees, 12 shrubs, and eight vines. Four taxa tracked by the Oklahoma Natural Heritage Inventory were found (Table 1). Three-hundred and seventy-nine of the 388 taxa were collected by the authors. Nine additional taxa were found during an earlier survey by former KAEFS researcher Becky Sherry.

Fifty-seven taxa were planted and naturalized or non-native to the U.S. (14.7 % of the flora). Fifty-six of these were non-native. This number is high when compared to surveys from other Oklahoma grassland-dominated sites (Table 2), but it is not surprising given the land use history at KAEFS. *Taxodium distichum*, which is native to southeastern Oklahoma, was also found but was planted by the former property owner and has since naturalized. The Poaceae had the greatest number of exotic taxa with 13. The Fabaceae followed with nine exotics. *Carthamus lanatus*, reported from the property as late as 1991, was not relocated (Kessler 1987; Hoagland et al. 2012; Kessler unpublished).

The predominant vegetation type encountered at KAEFS was the *Schizachyrium scoparium-Sorghastrum nutans* association, a herbaceous vegetation type found throughout Oklahoma on uplands with well-drained soils. Associated taxa included *Amorpha canescens*, *Dichanthelium oligosanthes* var. *oligosanthes*, *Panicum virgatum*, and *Symphotrichum ericoides* var. *ericoides* (Hoagland 2000).

We encountered three community types dominated by woody plants at KAEFS. The *Populus deltoides-Ulmus americana-Celtis laevigata* forest association was found on the bottomlands surrounding the property's larger order streams. This vegetation type is found frequently throughout the state (excluding the panhandle) on moist or wet soils along riparian corridors. Associated taxa found in this association included *Carya illinoensis*, *Symphoricarpos orbiculatus*, and *Toxicodendron radicans* (Hoagland 2000). Small stands of *Quercus muehlenbergii* were encountered in mesic situations. Associated taxa included *Amphicarpaea bracteata*, *Desmodium glutinosum*, *Elephantopus carolinianus*, and *Phryma leptostachya*. Upland woodlands of the *Juniperus virginiana-Schizachyrium scoparium* association intergraded with the grasslands and the

riparian zones of low order streams. This vegetation type is common throughout Oklahoma (excluding the panhandle) and is the product of fire suppression and land-use change. Associated taxa included *Andropogon virginicus*, *Cirsium altissimum*, *Quercus marilandica*, and *Smilax bona-nox* (Hoagland 2000).

Herbaceous wetland vegetation was restricted to ponds and creek channels. Plants found in this type included *Coleataenia anceps*, *Juncus torreyi*, *Lycopus americanus*, *Teucrium canadense*, and the invasive aquatic *Myriophyllum spicatum*. Disturbed areas included an area around a barn, the parking lots, and gravel roads. Plants in these areas included *Mollugo verticillata*, *Muhlenbergia paniculata*, *Polygonum ramosissimum*, and *Solanum rostratum*.

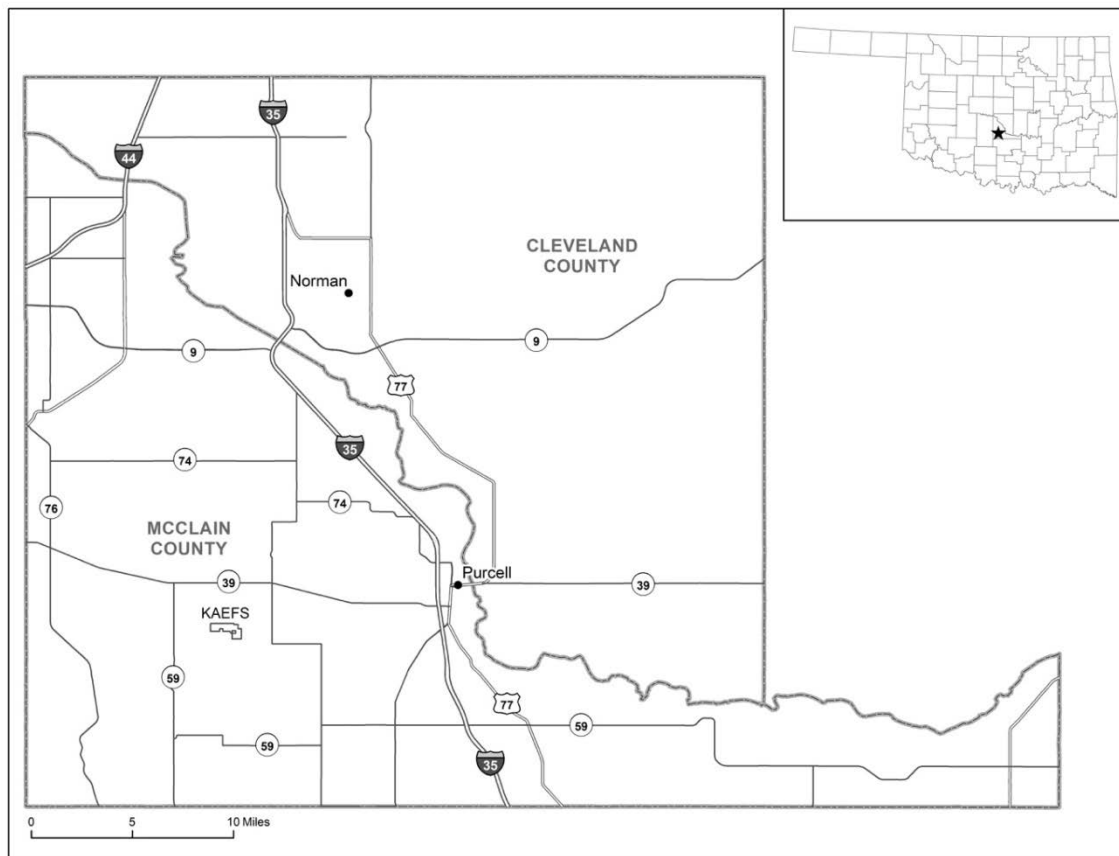


Figure 1 The Kessler Atmospheric and Ecological Field Station. Map by Todd Fagin, Oklahoma Biological Survey

Table 1 Taxa located during this study that are tracked by the Oklahoma Natural Heritage Inventory (Groves 1995; NatureServe Explorer 2016; Oklahoma Natural Heritage Inventory 2016). Status ranks are on a 1–5 scale, with a 1 indicating the taxon is critically imperiled. G ranks are at the global level, and S ranks are at the subnational or state level. Intraspecific taxa are assigned a T rank.

Family	Taxon	Rank
Convolvulaceae	<i>Ipomoea shumardiana</i> (Torr.) Shinnery	S3G2G3
Cyperaceae	<i>Eleocharis geniculata</i> (L.) Roem. & Schult.	S2G5
Fabaceae	<i>Desmodium nuttallii</i> (Schindl.) B.G. Schub.	S1G5
Plantaginaceae	<i>Plantago elongata</i> Pursh ssp. <i>elongata</i>	S3T3G4T4

Table 2 Comparison of exotic taxa from the KAEFS site with other Oklahoma grassland-dominated sites

Study site	Reference	Size of site (ha)	Number of taxa found	Percentage of non-native taxa
Kessler Atmospheric and Ecological Field Station, McClain County	This paper	146.0	388	14.7%
Pontotoc Ridge Nature Preserve, Johnston and Pontotoc Counties	Buthod et al., in preparation	848.2	616	8.8%
Tulsa Botanic Garden, Osage County	Hoagland and Buthod 2007	69.0	293	15.0%
Camp Kickapoo Boy Scout Camp, Canadian County	Hoagland and Buthod 2006	64.7	334	12.3%
Selman Living Laboratory, Woodward County	Buckallew and Caddell 2003	129.5	229	9.0%

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APPENDIX

List of Plant Taxa from the University of Oklahoma's Kessler Atmospheric and Ecological Field Station, McClain County, Oklahoma

Taxa list with duration, growth habit, vegetation type, and nativity. A=annual, B=biennial, P=perennial; F=forb, G=graminoid, S=shrub, T=tree, V=woody vine; DA=disturbed area, GL=*Schizachyrium scoparium-Sorghastrum nutans* grassland, HWV=herbaceous wetland vegetation, MF=*Quercus muehlenbergii* mesic forest, SBL=*Populus deltoides-Ulmus americana-Celtis laevigata* stream bottomland, UWL=*Juniperus virginiana-Schizachyrium scoparium* upland woodland. An asterisk (*) indicates a taxon that is non-native to the United States. A tilde (~) indicates a taxon that is planted but native to Oklahoma. A dagger (†) indicates a tracked taxon. Duration and nativity were determined using the PLANTS Database (USDA-NRSC 2016); if the information from PLANTS was ambiguous, Taylor and Taylor (1991) was consulted. Common names were taken from PLANTS (USDA-NRSC 2016), and vegetation classifications were based on Hoagland (2000). All specimens were collected by the authors with the exception of those marked with the pound sign (#), which were collected by Becky Sherry. Specimens were assigned collection numbers with the prefix KES.

Acanthaceae

Ruellia humilis Nutt. (denseflowered waterwillow); P; F; GL; KES-327

Adoxaceae

Viburnum rufidulum Raf. (rusty blackhaw); P; S; UWL; KES-077

Amaranthaceae

**Chenopodium album* L. (lambsquarters); A; F; DA; KES-428

Chenopodium pratericola Rydb. (desert goosefoot); A; F; DA; KES-066

Iresine rhizomatosa Standl. (Juda's bush); P; F; SBL; KES-054

Amaryllidaceae

Allium canadense L. var. *fraseri* Ownbey (Fraser meadow garlic); P; F; GL; KES-152

Nothoscordum bivalve (L.) Britton (crow-poison); P; F; GL; KES-153

Anacardiaceae

Rhus copallinum L. (winged sumac); P; S; GL; KES-239

Rhus glabra L. (smooth sumac); P; S; GL; KES-052

Toxicodendron radicans (L.) Kuntze (eastern poison ivy); P; V; SBL; KES-051

Apiaceae

Ammoselinum butleri (Engelm. ex S. Watson) J.M. Coult. & Rose (Butler's sandparsley); A; F; GL; KES-050

#*Ammoselinum popei* Torr. & A. Gray (plains sandparsley); A; F; GL; KES-407

Chaerophyllum tainturieri Hook. var. *tainturieri* (hairyfruit wild chervil); A; F; SBL; KES-087

Daucus pusillus Michx. (American wild carrot); A; F; GL; KES-047

Sanicula canadensis L. (snakeroot); B; F; MF; KES-048

Spermolepis inermis (Nutt. ex DC.) Mathias & Constance (Red River scaleseed); A; F; GL; KES-049

**Torilis arvensis* (Huds.) Link (hedge parsley); A; F; DA; KES-227

Apocynaceae

- Apocynum cannabinum* L. (Indian hemp); P; F; GL; KES-046
Asclepias amplexicaulis Sm. (clasping milkweed); P; F; GL; KES-387
Asclepias stenophylla A. Gray (narrowleaf milkweed); P; F; GL; KES-041
Asclepias tuberosa L. (butterfly milkweed); P; F; GL; KES-040
Asclepias viridiflora Raf. (green comet milkweed); P; F; GL; KES-042
Asclepias viridis Walter (green milkweed); P; F; GL; KES-043
 **Vinca major* L. (greater periwinkle); P; F; SBL; KES-045

Araliaceae

- **Hedera helix* L. (English ivy); P; V; SBL; KES-044

Asparagaceae

- Androstaphium coeruleum* (Scheele) Greene (blue funnel lily); P; F; GL; KES-154
Yucca glauca Nutt. (common yucca); P; S; GL; KES-393

Aspleniaceae

- Asplenium platyneuron* (L.) Britton, Sterns & Poggenb. (ebony spleenwort); P; F; UWL; KES-379

Asteraceae

- Achillea millefolium* L. (yarrow); P; F; GL; KES-030
Ambrosia psilostachya DC. (western ragweed); P; F; GL; KES-004
Ambrosia trifida L. (giant ragweed); A; F; GL; KES-006
Amphiachyris dracunculoides (DC.) Nutt. (broomweed); A; F; GL; KES-014
 #*Antennaria parlinii* Fernald ssp. *fallax* (Greene) Bayer & Stebbins (Parlin's pussytoes); P; F; MF; KES-408
Artemisia ludoviciana Nutt. ssp. *mexicana* (Willd. ex Spreng.) D.D. Keck (white sagebrush); P; F; GL; KES-347
Berlandiera x betonicifolia (Hook.) Small (Texas greeneyes); P; F; GL; KES-008
Bidens bipinnata L. (Spanish needles); A; F; SBL; KES-012
Bradburia pilosa (Nutt.) Semple (golden aster); A; F; GL; KES-031
Cirsium altissimum (L.) Hill (tall thistle); B; F; UWL; KES-017
Cirsium undulatum (Nutt.) Spreng. (wavyleaf thistle); P; F; GL; KES-013
Conoclinium coelestinum (L.) DC. (mist flower); P; F; SBL; KES-019
Conyza canadensis (L.) Cronquist (horseweed); A; F; GL; KES-370
Conyza ramosissima Cronquist (dwarf horseweed); A; F; DA; KES-429
Diaperia verna (Raf.) Morefield (spring pygmyweed); A; F; GL; KES-035
Echinacea angustifolia DC. (blacksamson); P; F; GL; KES-021
Eclipta prostrata (L.) L. (false daisy); A; F; HWV; KES-374
Elephantopus carolinianus Raeusch. (elephant's foot); P; F; MF; KES-376
Erechtites hieraciifolius (L.) Raf. ex DC. (American burnweed); A; F; GL; KES-423
Erigeron philadelphicus L.; (Philadelphia fleabane); P; F; SBL; KES-039
Erigeron strigosus Muhl. ex Willd. (prairie fleabane); A; F; GL; KES-003
Gaillardia aestivalis (Walter) H. Rock (summer gaillardia); P; F; GL; KES-027
Gamochaeta purpurea (L.) Cabrera (purple cudweed); P; F; GL; KES-313
Grindelia ciliata (Nutt.) Spreng. (wax goldenweed); A; F; GL; KES-011
Helianthus annuus L. (common sunflower); A; F; GL; KES-005
Helianthus maximiliani Schrad. (Maximilian sunflower); P; F; GL; KES-346

Helianthus mollis Lam. (ashy sunflower); P; F; GL; KES-015
Heterotheca subaxillaris (Lam.) Britt. & Rusby (camphorweed); A; F; GL; KES-344
Hieracium longipilum Torr. (longbeard hawkweed); P; F; GL; KES-001
Krigia caespitosa (Raf.) K.L. Chambers (common dwarf dandelion); A; F; GL; KES-395
Lactuca canadensis L. (Canada lettuce); A; F; SBL; KES-368
**Lactuca serriola* L. (prickly lettuce); A; F; DA; KES-022
Liatris pycnostachya Michx. (button snakeroot); P; F; GL; KES-363
Liatris squarrosa (L.) Michx. (gayfeather); P; F; GL; KES-010
Pseudognaphalium obtusifolium (L.) Hilliard & B.L. Burt (rabbit-tobacco); A; F; GL; KES-009
Pyrrhopappus carolinianus (Walter) DC. (Carolina desert-chicory); A; F; GL; KES-294
Pyrrhopappus grandiflorus (Nutt.) Nutt. (false dandelion); P; F; GL; KES-026
Ratibida columnifera (Nutt.) Woot. & Standl. (yellow coneflower); P; F; GL; KES-033
Rudbeckia hirta L. (black-eyed Susan); P; F; GL; KES-028
Silphium asteriscus L. (starry rosinweed); P; F; GL; KES-430
Solidago missouriensis Nutt. (Missouri goldenrod); P; F; GL; KES-034
Solidago radula Nutt. (rough goldenrod); P; F; GL; KES-357
Solidago rigida L. (stiff prairie goldenrod); P; F; GL; KES-366
**Sonchus asper* (L.) Hill (spiny sowthistle); A; F; DA; KES-303
Symphotrichum drummondii (Lindl.) G.L. Nesom var. *texanum* (E.S. Burgess) G.L. Nesom (blue wood aster); P; F; UWL; KES-356
Symphotrichum ericoides (L.) G.L. Nesom var. *ericoides* (heath aster); P; F; GL; KES-353
Symphotrichum patens (Aiton) G.L. Nesom var. *patens* (spreading aster); P; F; GL; KES-425
Symphotrichum subulatum (Michx.) G.L. Nesom (salt marsh aster); P; F; HWV; KES-018
**Taraxacum erythrospermum* Andr. ex Besser (rock dandelion); P; F; DA; KES-394
Tetranneuris linearifolia (Hook.) Greene (fineleaf fournerved daisy); A; F; GL; KES-037
#*Thelesperma filifolium* (Hook.) A. Gray (greenthread); P; F; GL; KES-411
**Tragopogon dubius* Scop. (yellow salsify); A; F; GL; KES-023
Verbesina virginica L. (Virginia crownbeard); P; F; SBL; KES-020
Vernonia baldwinii Torr. (western ironweed); P; F; GL; KES-007
Xanthium strumarium L. (cocklebur); A; F; HWV; KES-371

Boraginaceae

Lithospermum incisum Lehm. (narrowleaf puccoon); P; F; GL; KES-091

Brassicaceae

**Camelina microcarpa* DC. (littlepod false flax); A; F; GL; KES-079
**Capsella bursa-pastoris* (L.) Medik. (shepherd's purse); A; F; GL; KES-083
Cardamine pensylvanica Muhl. ex Willd. (Pennsylvania bittercress); A; F; SBL; KES-088
Descurainia pinnata (Walter) Britton (western tansymustard); A; F; GL; KES-089
Draba brachycarpa Nutt. ex Torr. & A. Gray (shortpod draba); A; F; GL; KES-080
Draba cuneifolia Nutt. ex Torr. & A. Gray (wedgeleaf draba); A; F; GL; KES-081
Lepidium austrinum Small (southern pepperweed); A; F; DA; KES-084
Lepidium oblongum Small (veiny pepperweed); A; F; GL; KES-082
Lepidium virginicum L. (Virginia peppergrass); A; F; GL; KES-078
Physaria ovalifolia (Rydb.) O'Kane & Al-Shehbaz ssp. *ovalifolia* (roundleaf bladderpod); P; F; GL; KES-086
Rorippa palustris (L.) Besser ssp. *palustris* (bog yellowcress); A; F; HWV; KES-297

Cactaceae

Escobaria missouriensis (Sweet) D.R. Hunt (Missouri foxtail cactus); P; F; GL; KES-250
Opuntia humifusa (Raf.) Raf. (devil's tongue); P; S; GL; KES-339

Campanulaceae

Triodanis perfoliata (L.) Nieuwl. ssp. *perfoliata* (clasping Venus' looking-glass); A; F; GL; KES-388

Cannabaceae

Celtis laevigata Willd. (sugarberry); P; T; SBL; KES-245

Caprifoliaceae

**Lonicera japonica* Thunb. (Japanese honeysuckle); P; V; SBL; KES-076
Symphoricarpos orbiculatus Moench (coralberry); P; S; SBL; KES-075

Caryophyllaceae

**Arenaria serpyllifolia* L. (thyme-leaved sandwort); A; F; GL; KES-072
 **Cerastium pumilum* W. Curtis (European chickweed); A; F; GL; KES-073
 **Dianthus armeria* L. (Deptford pink); A; F; GL; KES-068
Minuartia michauxii (Fenzl) Farw. (rock sandwort); P; F; GL; KES-382
Paronychia jamesii Torr. & A. Gray (James' nailwort); P; F; GL; KES-069
Sagina decumbens (Elliott) Torr. & A. Gray (beach pearlwort); A; F; GL; KES-071
Silene antirrhina L. (sleepy catchfly); A; F; GL; KES-067
 **Stellaria media* (L.) Vill. (common chickweed); A; F; SBL; KES-074

Commelinaceae

Commelina erecta L. (whitemouth dayflower); P; F; SBL; KES-065
Tradescantia occidentalis (Britton) Smyth (prairie spiderwort); P; F; GL; KES-316

Convolvulaceae

Cuscuta cuspidata Engelm. (cusp dodder); P; F; GL; KES-055
Cuscuta pentagona Engelm. (fiveangled dodder); A; F; GL; KES-056
 †*Ipomoea shumardiana* (Torr.) Shinnars (narrowleaf morning-glory); P; F; GL; KES-064; S3G2G3

Cornaceae

Cornus drummondii C.A. Mey. (rough-leaf dogweed); P; T; SBL; KES-062

Cucurbitaceae

Cucurbita foetidissima Kunth (buffalo gourd); P; F; GL; KES-240
Melothria pendula L. (Guadeloupe cucumber); P; F; DA; KES-059

Cupressaceae

Juniperus virginiana L. (eastern red cedar); P; T; UWL; KES-057
 ~*Taxodium distichum* (L.) Rich. (bald cypress); P; T; SBL; KES-431

Cyperaceae

Carex aureolensis Steud. (goldenfruit sedge); P; G; HWV; KES-139
Carex blanda Dewey (eastern woodland sedge); P; G; UWL; KES-358

Carex brevior (Dewey) Mack. (shortbeak sedge); P; G; GL; KES-402
Carex cephalophora Muhl. ex Willd. (oval-leaf sedge); P; G; MF; KES-403
Carex gravida L.H. Bailey (heavy sedge); P; G; GL; KES-321
Cyperus acuminatus Torr. & Hook. ex Torr. (taperleaf flatsedge); P; G; HWV; KES-319
Cyperus echinatus (L.) Alph. Wood (globe flatsedge); P; G; GL; KES-138
*#*Cyperus esculentus* L. (chufa flatsedge); P; G; DA; KES-406
Cyperus lupulinus (Spreng.) Marcks (Great Plains flatsedge); P; G; GL; KES-134
Cyperus squarrosus L. (bearded flatsedge); A; G; HWV; KES-140
†*Eleocharis geniculata* (L.) Roem. & Schult. (Canada spikesedge); A; G; HWV; KES-335
Eleocharis montevidensis Kunth (sand spikesedge); P; G; HWV; KES-320
Eleocharis obtusa (Willd.) Schult. (blunt spikesedge); A; G; HWV; KES-382
Eleocharis palustris (L.) Roem. & Schult. (common spikerush); P; G; HWV; KES-137
Fimbristylis puberula (Michx.) Vahl var. *puberula* (hairy fimbry); P; G; GL; KES-336
Fuirena simplex Vahl var. *aristulata* (Torr.) Kral (umbrella sedge); P; G; HWV; KES-331
Lipocarpa drummondii (Nees) G.C. Tucker (Drummond's halfchaff sedge); A; G; HWV; KES-325
Schoenoplectus pungens (Vahl) Palla var. *longispicatus* (Britton) S.G. Sm. (common threesquare); P; G; HWV; KES-136
Scirpus atrovirens Willd. (darkgreen bulrush); P; G; HWV; KES-135
Scleria ciliata Nees (fringed nutrush); P; G; GL; KES-301

Ebenaceae

Diospyros virginiana L. (persimmon); P; T; SBL; KES-230

Elaeagnaceae

**Elaeagnus umbellata* Thunb. (oleaster); P; S; SBL; KES-169

Equisetaceae

Equisetum hyemale L. ssp. *affine* (Engelm.) Calder & Roy (scouring horsetail); P; F; SBL; KES-133

Euphorbiaceae

Acalypha ostryifolia Riddell (pineland threeseed mercury); A; F; SBL; KES-122
Acalypha virginica L. (Virginia threeseeded mercury); A; F; SBL; KES-131
Croton capitatus Michx. (wooly croton); A; F; GL; KES-123
Croton glandulosus L. (croton); A; F; GL; KES-121
Croton monanthogynus Michx. (one-seed croton); A; F; GL; KES-127
Euphorbia corollata L. (flowering spurge); P; F; GL; KES-124
Euphorbia dentata Michx. (toothed spurge); A; F; SBL; KES-120
Euphorbia maculata L. (spotted sandmat); A; F; GL; KES-129
Euphorbia marginata Pursh (snow on the mountain); A; F; GL; KES-125
Euphorbia nutans Lag. (eyebane); A; F; GL; KES-373
Euphorbia prostrata Aiton (prostrate sandmat); A; F; GL; KES-132
Stillingia sylvatica L. (queen's delight); P; F; GL; KES-126
Tragia betonicifolia Nutt. (betonyleaf noseburn); P; F; GL; KES-130

Fabaceae

Amorpha canescens Pursh (leadplant); P; F; GL; KES-098
Amorpha fruticosa L. (false indigo); P; S; HWV; KES-381

- Amphicarpaea bracteata* (L.) Fernald (hog peanut); A; F; MF; KES-112
Astragalus lotiflorus Hook. (lotus milkvetch); P; F; GL; KES-115
Baptisia australis (L.) R. Br. (blue wild indigo); P; F; GL; KES-390
Baptisia leucophaea Nutt. (plains wild indigo); P; F; GL; KES-118
Cercis canadensis L. (redbud); P; T; UWL; KES-119
Chamaecrista fasciculata (Michx.) Greene (partridge pea); A; F; GL; KES-097
Dalea aurea Nutt. ex Fraser (golden prairie clover); P; F; GL; KES-104
Dalea candida Michx. ex Willd. (white prairie clover); P; F; GL; KES-101
Dalea enneandra Nutt. ex Fraser (nine-anther prairie clover); P; F; GL; KES-092
Dalea purpurea Vent. (purple prairie clover); P; F; GL; KES-107
Desmanthus illinoensis (Michx.) MacMill. ex B.L. Rob. & Fernald (bundleflower); P; F; GL; KES-111
Desmodium glutinosum (Muhl. ex Willd.) Alph. Wood (large-flowered tickclover); P; F; MF; KES-249
† *Desmodium nuttallii* (Schindl.) B.G. Schub. (Nuttall's ticktrefoil); P; F; GL; KES-113; S1G5
Desmodium sessilifolium (Torr.) Torr. & A. Gray (sessile tickclover); P; F; GL; KES-105
Indigofera miniata Ortega (coastal indigo); P; F; GL; KES-110
* *Kummerowia stipulacea* (Maxim.) Makino (Korean clover); A; F; GL; KES-305
* *Lathyrus hirsutus* L. (Caley pea); A; F; GL; KES-306
Lespedeza capitata Michx. (bush clover); P; F; GL; KES-378
* *Lespedeza cuneata* (Dum. Cours.) G. Don (sericea lespedeza); P; F; GL; KES-103
Lespedeza procumbens Michx. (trailing lespedeza); P; F; MF; KES-367
Lespedeza stuevei Nutt. (Stueve's lespedeza); P; F; UWL; KES-369
* *Medicago minima* (L.) L. ex Bartal. (small medic); A; F; GL; KES-117
* *Melilotus albus* Medik. (white sweetclover); A; F; GL; KES-432
* *Melilotus officinalis* (L.) Lam. (yellow sweetclover); A; F; GL; KES-096
Mimosa nuttallii (DC. ex Britton & Rose) B.L. Turner (sensitive briar); P; F; GL; KES-094
Oxytropis lambertii Pursh (purple locoweed); P; F; GL; KES-386
Psoraleidum tenuiflorum (Pursh) Rydb. (wild alfalfa); P; F; GL; KES-100
Robinia pseudoacacia L. (black locust); P; T; UWL; KES-114
* *Securigera varia* (L.) Lassen (crownvetch); P; F; GL; KES-109
Strophostyles helvola (L.) Elliott (wild bean); A; F; GL; KES-106
Strophostyles leiosperma (Torr. & A. Gray) Piper (smoothseed wild bean); A; F; GL; KES-377
* *Vicia sativa* L. (common vetch); A; F; GL; KES-116
* *Vicia villosa* Roth (winter vetch); A; F; GL; KES-396

Fagaceae

- Quercus macrocarpa* Michx. (bur oak); P; T; MF; KES-235
Quercus marilandica Münchh. (blackjack oak); P; T; UWL; KES-231
Quercus muehlenbergii Engelm. (chinquapin oak); P; T; MF; KES-234

Gentianaceae

- Eustoma exaltatum* (L.) Salisb. ex G. Don ssp. *russellianum* (Hook.) Kartesz (showy prairie gentian); A; F; GL; KES-375
Sabatia campestris Nutt. (pink gentian); A; F; GL; KES-150

Geraniaceae

- * *Erodium cicutarium* (L.) L'Hér. ex Aiton (redstem stork's bill); A; F; DA; KES-149
Geranium texanum (Trel.) A. Heller (Texas geranium); A; F; GL; KES-148

Haloragaceae

**Myriophyllum spicatum* L. (Eurasian water-milfoil); P; F; HWV; KES-341

Heliotropiaceae

Heliotropium tenellum (Nutt.) Torr. (pasture heliotrope); A; F; GL; KES-090

Hydrocharitaceae

Najas guadalupensis (Spreng.) Magnus (southern waternymph); A; F; HWV; KES-311

Hypericaceae

Hypericum drummondii (Grev. & Hook.) Torr. & A. Gray (nits-and-lice); A; F; GL; KES-380

Iridaceae

**Iris germanica* L. (German iris); P; F; SBL; KES-439

Sisyrinchium angustifolium Mill. (blue-eyed grass); P; F; GL; KES-146

Juglandaceae

Carya illinoensis (Wangenh.) K. Koch; (pecan); P; T; SBL; KES-323

Juncaceae

Juncus brachyphyllus Wiegand (tuftedstem rush); P; G; HWV; KES-145

Juncus dudleyi Wiegand (Dudley's rush); P; G; GL; KES-398

Juncus interior Wiegand (inland rush); P; G; GL; KES-397

Juncus marginatus Rostk. (grassleaf rush); P; G; HWV; KES-144

Juncus torreyi Coville (Torrey's rush); P; G; HWV; KES-143

Krameriaceae

Krameria lanceolata Torr. (trailing ratany); P; F; GL; KES-164

Lamiaceae

Hedeoma drummondii Benth. (false pennyroyal); P; F; GL; KES-161

Hedeoma hispida Pursh (rough pennyroyal); A; F; GL; KES-159

**Lamium amplexicaule* L. (henbit deadnettle); A; F; GL; KES-162

**Lamium purpureum* L. (purple deadnettle); A; F; SBL; KES-163

Lycopus americanus Muhl. ex W.P.C. Bartram (American bugleweed); P; F; HWV; KES-158

Monarda clinopodioides A. Gray (basil beebalm); A; F; GL; KES-160

Monarda fistulosa L. (wild bergamot); P; F; GL; KES-156

Salvia azurea Michx. ex Lam. (blue sage); P; F; GL; KE-157

Teucrium canadense L. (American germander); P; F; HWV; KES-155

Linaceae

Linum sulcatum Riddell (grooved flax); A; F; GL; KES-151

Lythraceae

Ammannia coccinea Rottb. (valley redstem); A; F; HWV; KES-364

Malvaceae*Callirhoe involucrata* (Torr. & A. Gray) A. Gray (winecup); P; F; GL; KES-168**Menispermaceae***Cocculus carolinus* (L.) DC. (Carolina snailseed); P; F; UWL; KES-233**Molluginaceae***Mollugo verticillata* L. (green carpetweed); A; F; DA; KES-167**Montiaceae***Claytonia virginica* L. (springbeauty); P; F; GL; KES-282*Phemeranthus parviflorus* (Nutt.) Kiger (sunbright); P; F; GL; KES-317**Moraceae***Maclura pomifera* (Raf.) C.K. Schneid. (bois d'arc); P; T; SBL; KES-248**Morus alba* L. (white mulberry); P; T; DA; KES-166*Morus rubra* L. (red mulberry); P; T; SBL; KES-165**Nyctaginaceae***Mirabilis albida* (Walter) Heimerl (white four o'clock); P; F; GL; KES-361*Mirabilis linearis* (Pursh) Heimerl (narrowleaf four o'clock); P; F; GL; KES-383**Oleaceae***Fraxinus pennsylvanica* Marsh. (green ash); P; T; SBL; KES-379**Onagraceae***Oenothera berlandieri* (Spach) Steud. ssp. *berlandieri* (Spach) Steud. (Berlandier's sundrops); P; F; GL; KES-218*Oenothera curtiflora* W.L. Wagner & Hoch (velvety gaura); A; F; GL; KES-217*Oenothera glaucifolia* W.L. Wagner & Hoch (false gaura); P; F; GL; KES-221*Oenothera laciniata* Hill (cut-leaf evening primrose); P; F; GL; KES-220*Oenothera macrocarpa* Nutt. (large-fruited evening primrose); P; F; GL; KES-219*Oenothera rhombipetala* Nutt. ex Torr. & A. Gray (fourpoint evening primrose); P; F; GL; KES-222*Oenothera sinuosa* W.L. Wagner & Hoch (wavyleaf gaura); P; F; GL; KES-223*Oenothera triangulata* (Buckley) W.L. Wagner & Hoch (prairie beeblossom); A; F; GL; KES-391**Ophioglossaceae***Ophioglossum engelmannii* Prantl (limestone adder's tongue); P; F; GL; KES-216**Orchidaceae***Spiranthes cernua* (L.) Rich. (nodding lady's tresses); P; F; GL; KES-385**Orobanchaceae***Agalinis heterophylla* (Nutt.) Small (prairie false foxglove); A; F; GL; KES-381*Buchnera americana* L. (American blue hearts); P; F; GL; KES-266*Castilleja indivisa* Engelm. (Indian paintbrush); A; F; GL; KES-267

Oxalidaceae

Oxalis corniculata L. (yellow wood-sorrel); P; F; GL; KES-215

Oxalis violacea L. (violet wood-sorrel); P; F; GL; KES-384

Penthoraceae

Penthorum sedoides L. (ditch stonecrop); P; F; HWV; KES-061

Phrymaceae

Phryma leptostachya L. (American lopseed); P; F; MF; KES-293

Phytolaccaceae

Phytolacca americana L. (pokeweed); P; F; DA; KES-334

Plantaginaceae

Leucospora multifida (Michx.) Nutt. (narrowleaf paleseed); A; F; HWV; KES-265

Nuttallanthus texanus (Scheele) D.A. Sutton (Texas toadflax); B; F; GL; KES-392

Penstemon cobaea Nutt. (large beardtongue); P; F; GL; KES-385

Plantago aristata Michx. (bottlebrush plantain); A; F; GL; KES-289

† *Plantago elongata* Pursh ssp. *elongata* (prairie plantain); A; F; GL; KES-290; S3T3G4T4

Plantago patagonica Jacq. (wooly plantain); A; F; GL; KES-309

Plantago rhodosperma Decne. (redseed plantain); A; F; GL; KES-291

Plantago rugelii Decne. (blackseed plantain); P; F; SBL; KES-433

* *Veronica arvensis* L. (common speedwell); A; F; GL; KES-268

*# *Veronica peregrina* L. (purslane speedwell); A; F; GL; KES-410

Platanaceae

Platanus occidentalis L. (American sycamore); P; T; SBL; KES-389

Poaceae

* *Aegilops cylindrica* Host (jointed goatgrass); A; G; GL; KES-170

Agrostis hyemalis (Walter) Britton, Sterns & Poggenb. (ticklegass); P; G; GL; KES-214

Andropogon gerardii Vitman (big bluestem); P; G; GL; KES-213

Andropogon ternarius Michx. (splitbeard bluestem); P; G; GL; KES-351

Andropogon virginicus L. (broomsedge); P; G; GL; KES-424

Aristida longespica Poir. (slimspike threeawn); A; G; GL; KES-178

Aristida purpurea Nutt. var. *longiseta* (Steud.) Vasey (Fendler threeawn); P; G; GL; KES-211

Aristida purpurea Nutt var. *purpurea* (purple threeawn); P; G; GL; KES-175

* *Bothriochloa ischaemum* (L.) Keng (yellow bluestem); P; G; GL; KES-210

Bothriochloa laguroides (DC.) Herter var. *torreyana* (Steud.) M. Marchi & Longhi-Wagner (silver beardgrass); P; G; GL; KES-209

Bouteloua curtipendula (Michx.) Torr. (sideoats grama); P; G; GL; KES-208

Bouteloua dactyloides (Nutt.) Columbus (buffalo grass); P; G; GL; KES-376

Bouteloua gracilis (Kunth) Lag. ex Griffiths (blue grama); P; G; GL; KES-207

Bouteloua hirsuta Lag. (hairy grama); P; G; GL; KES-206

Bouteloua rigidiseta (Steud.) Hitchc. (Texas grama); P; G; GL; KES-205

* *Bromus arvensis* L. (field brome); A; G; GL; KES-204

* *Bromus catharticus* Vahl (rescue grass); A; G; GL; KES-173

- Bromus pubescens* Muhl. ex Willd. (Canada brome); P; G; UWL; KES-203
 **Bromus tectorum* L. (cheatgrass); A; G; GL; KES-174
Cenchrus spinifex Cav. (coastal sandbur); P; G; GL; KES-383
Chasmanthium latifolium (Michx.) H.O. Yates (inland sea oats); P; G; SBL; KES-202
Chloris verticillata Nutt. (windmill grass); P; G; GL; KES-201
Chloris virgata Sw. (feather fingergrass); A; G; GL; KES-434
Coleataenia anceps (Michx.) Soreng (beaked panicgrass); P; G; HWV; KES-187
 **Cynodon dactylon* (L.) Pers. (Bermuda grass); P; G; GL; KES-228
Dichantherium acuminatum (Sw.) Gould & C.A. Clark var. *lindheimeri* (Nash) Gould & C.A. Clark
 (Lindheimer panicgrass); P; G; GL; KES-296
Dichantherium malacophyllum (Nash) Gould (softleaf rosette grass); P; G; UWL; KES-194
Dichantherium oligosanthes (Schult.) Gould var. *oligosanthes* (Heller's rosette grass); P; G; GL; KES-193
Dichantherium sphaerocarpon (Elliott) Gould (roundseed panicgrass); P; G; GL; KES-426
Digitaria ciliaris (Retz.) Pers. (southern crabgrass); A; G; GL; KES-435
Digitaria cognata (Schult.) Pilg. (fall witchgrass); P; G; GL; KES-198
Distichlis spicata (L.) Greene (saltgrass); P; G; GL; KES-378
Echinochloa muricata (P. Beauv.) Fernald (rough barnyard grass); A; G; HWV; KES-298
Elymus canadensis L. (Canada wildrye); P; G; GL; KES-197
Elymus virginicus L. (Virginia wild rye); P; G; UWL; KES-196
 **Eragrostis cilianensis* (Bellardi) Vignolo ex Janch. (stinkgrass); A; G; GL; KES-384
Eragrostis curtipedicellata Buckley (gummy lovegrass); P; G; GL; KES-192
 **Eragrostis curvula* (Schrad.) Nees (weeping lovegrass); P; G; GL; KES-329
Eragrostis hirsuta (Michx.) Nees (bigtop lovegrass); P; G; GL; KES-191
Eragrostis secundiflora J. Presl ssp. *oxylepis* (Torr.) S.D. Koch (red lovegrass); P; G; GL; KES-190
Eragrostis sessilispica Buckley (tumble lovegrass); P; G; GL; KES-200
 #*Eragrostis trichodes* (Nutt.) Alph. Wood (sand lovegrass); P; G; GL; KES-412
Hordeum pusillum Nutt. (little barley); A; G; GL; KES-377
Leersia virginica Willd. (whitegrass); P; G; HWV; KES-189
 **Lolium perenne* L. (perennial ryegrass); P; G; GL; KES-188
Mnesithea cylindrica (Michx.) de Koning & Sosef (mousetail); P; G; GL; KES-199
 #*Muhlenbergia capillaris* (Lam.) Trin. (hairawn muhly); P; G; GL; KES-199
Muhlenbergia paniculata (Nutt.) Columbus (tumblegrass); P; G; DA; KES-330
Panicum capillare L. (witchgrass); A; G; GL; KES-186
Panicum philadelphicum Bernh. ex Trin. (Philadelphia witchgrass); A; G; GL; KES-345
Panicum virgatum L. (switchgrass); P; G; GL; KES-185
 **Paspalum dilatatum* Poir. (Dallis grass); P; G; GL; KES-184
Paspalum distichum Houtt. (knotgrass); P; G; GL; KES-183
Paspalum setaceum Michx. (thin paspalum); P; G; GL; KES-182
Phalaris caroliniana Walter (maygrass); A; G; GL; KES-386
 **Poa annua* L. (annual bluegrass); A; G; GL; KES-172
Schizachyrium scoparium (Michx.) Nash (little bluestem); P; G; GL; KES-181
Setaria parviflora (Poir.) Kerguelen (knotroot foxtail); P; G; GL; KES-326
 **Setaria viridis* (L.) P. Beauv. (green bristlegrass); A; G; GL; KES-315
Sorghastrum nutans (L.) Nash (Indian grass); P; G; GL; KES-372
 **Sorghum halepense* (L.) Pers. (Johnson grass); P; G; GL; KES-180
Sphenopholis obtusata (Michx.) Scribn. (prairie wedgescale); P; G; HWV; KES-176
Sporobolus cryptandrus (Torr.) A. Gray (sand dropseed); P; G; GL; KES-314

Sporobolus pyramidatus (Lam.) Hitchc. (Madagascar dropseed); P; G; GL; KES-179
Tridens flavus (L.) Hitchc. (purpletop); P; G; GL; KES-177
Vulpia octoflora (Walter) Rydb. (poverty grass); A; G; GL; KES-171

Polygalaceae

Polygala alba Nutt. (white milkwort); P; F; GL; KES-288
Polygala incarnata L. (pink milkwort); A; F; GL; KES-287
Polygala verticillata L. (whorled milkwort); A; F; GL; KES-286

Polygonaceae

Eriogonum annuum Nutt. (annual buckwheat); A; F; GL; KES-355
Eriogonum longifolium Nutt. (longleaf buckwheat); P; F; GL; KES-284
**Fallopia convolvulus* (L.) Á. Löve (black bindweed); A; F; GL; KES-312
Persicaria lapathifolia (L.) Gray (pale smartweed); A; F; HWV; KES-229
Persicaria punctata (Elliott) Small (dotted smartweed); A; F; HWV; KES-285
Polygonum ramosissimum Michx. (bushy knotweed); A; F; DA; KES-360
**Rumex crispus* L. (curly dock); P; F; HWV; KES-283
#*Rumex hastatulus* Baldwin (heartwing sorrel); P; F; GL; KES-409

Potamogetonaceae

Potamogeton nodosus Poir. (longleaf pondweed); P; F; HWV; KES-322

Primulaceae

Samolus valerandi L. (smallflower brookweed); P; F; HWV; KES-295

Ranunculaceae

Anemone berlandieri Pritz. (ten-petal windflower); P; F; GL; KES-281
Delphinium carolinianum Walter ssp. *virescens* (Nutt.) R.E. Brooks (Carolina larkspur); P; F; GL; KES-391

Rosaceae

Geum canadense Jacq. (white avens); P; F; MF; KES-304
**Potentilla recta* L. (erect cinquefoil); P; F; GL; KES-280
Prunus angustifolia Marshall (Chickasaw plum); P; S; GL; KES-226
Prunus mexicana S. Watson (Mexican plum); P; T; GL; KES-241
**Pyrus calleryana* Decne. (Callery pear); P; T; UWL; KES-278
Rosa foliolosa Nutt. ex Torr. & A. Gray (prairie rose); P; F; GL; KES-224
**Rosa multiflora* Thunb. (multiflora rose); P; V; SBL; KES-277
Rubus pensilvanicus Poir. (Oklahoma blackberry); P; S; GL; KES-436

Rubiaceae

Cephalanthus occidentalis L. (buttonbush); P; S; HWV; KES-337
**Cruciata pedemontana* (Bellardi) Ehrend. (piedmont bedstraw); A; F; GL; KES-275
Diodella teres (Walter) Small (poor-joe); A; F; GL; KES-272
Galium aparine L. (catchweed bedstraw); A; F; GL; KES-276
Galium virgatum Nutt. (southwest bedstraw); A; F; GL; KES-271
Houstonia pusilla Schoepf (prairie bluets); A; F; GL; KES-274
Stenaria nigricans (Lam.) Terrell var. *nigricans* (diamond flowers); P; F; GL; KES-273

Salicaceae*Populus deltoides* W. Bartram ex Marshall (cottonwood); P; T; SBL; KES-236*Salix exigua* Nutt. (narrowleaf willow); P; T; HWV; KES-270*Salix nigra* Marshall (black willow); P; T; HWV; KES-269**Sapindaceae***Acer negundo* L. (boxelder); P; T; SBL; KES-247*Sapindus saponaria* L. var. *drummondii* (Hook. & Arn.) L.D. Benson (western soapberry); P; T; UWL; KES-246**Sapotaceae***Sideroxylon lanuginosum* Michx. (chittamwood); P; T; UWL; KES-237**Smilacaceae***Smilax bona-nox* L. (greenbrier); P; F; UWL; KES-264*Smilax rotundifolia* L. (roundleaf greenbrier); P; F; UWL; KES-300*Smilax tamnoides* L. (bristly greenbrier); P; F; UWL; KES-350**Solanaceae***# *Lycium barbarum* L. (common matrimonyvine); P; S; unknown habitat; KES-427*Physalis cinerascens* (Dunal) Hitchc. (smallflower groundcherry); P; F; GL; KES-260*Solanum dimidiatum* Raf. (horsenettle); P; F; GL; KES-262*Solanum elaeagnifolium* Cav. (silverleaf nightshade); P; F; GL; KES-263*Solanum rostratum* Dunal (buffalo bur); A; F; DA; KES-225**Ulmaceae***Ulmus americana* L. (American elm); P; T; SBL; KES-238* *Ulmus pumila* (Siberian elm); P; T; DA; KES-437*Ulmus rubra* Muhl. (slippery elm); P; T; SBL; KES-387**Urticaceae***Parietaria pensylvanica* Muhl. ex Willd. (Pennsylvania pellitory); A; F; SBL; KES-243**Valerianaceae***Valerianella amarella* (Lindh. ex Engelm.) Krok (hairy cornsalad); A; F; GL; KES-257*Valerianella radiata* (L.) Dufur. (beaked cornsalad); A; F; GL; KES-258**Verbenaceae***Glandularia pumila* (Rydb.) Umber (pink mock vervain); A; F; GL; KES-256*Phyla lanceolata* (Michx.) Greene (lanceleaf fogfruit); P; F; HWV; KES-254*Verbena bracteata* Cav. ex Lag. & Rodr. (bigbract verbena); A; F; GL; KES-232*Verbena halei* Small (slender verbena); P; F; GL; KES-255**Violaceae***Viola bicolor* Pursh (Johnny jump-up); A; F; GL; KES-253*Viola sororia* Willd. var. *missouriensis* (Greene) L.E. McKinney (common blue violet); P; F; MF; KES-252

Vitaceae

Ampelopsis cordata Michx. (heartleaf peppervine); P; V; SBL; KES-388

Parthenocissus quinquefolia (L.) Planch. (Virginia creeper); P; V; SBL; KES-244

Vitis cinerea (Engelm.) Engelm. ex Millard (graybark grape); P; V; SBL; KES-251

Vitis vulpina L. (frost grape); P; V; SBL; KES-302

Xanthorrhoeaceae

**Hemerocallis fulva* (L.) L. (orange daylily); P; F; SBL; KES-440