

Vascular flora and historic vegetation of the Washita Battlefield National Historic Site,  
Roger Mills County, Oklahoma: Final report

Submitted by:

Bruce W. Hoagland\*

Amy Buthod

Wayne Elisens\*\*

Oklahoma Biological Survey  
and Department of Botany and Microbiology  
University of Oklahoma  
Norman, Oklahoma 73019, U.S.A.

\*and Dept. of Geography

\*\*and Dept of Botany and Microbiology

to:

United States National Park Service

## ABSTRACT

This article reports the results of a vascular plant inventory of the Washita Battlefield National Historic Site in western Oklahoma. Two hundred and seventy-two species of vascular plants were collected from 201 genera and 62 families. The most speciose families were the Poaceae (53), Asteraceae (48), Fabaceae (22). One hundred and seventy-five perennials, ninety-five annuals, and 2 biennials. Twenty-eight woody plant species were present. Twenty-one species exotic to North America were collected representing 7.7% of the flora. Five species tracked by the Oklahoma Natural Heritage Inventory were found. This study reports 205 species previously not documented in Roger Mills County.

## INTRODUCTION

The primary objective of this study were twofold; to compile both a comprehensive list of vascular plants and a landcover map, circa 1871, for resource managers at the Washita Battlefield National Historic Site (WBNHS) . Prior to 2002, when collecting began for this study, 446 specific and intraspecific taxa were reported from Roger Mills County (Hoagland 2004). *Erigeron bellidiastrum* Nutt. (western daisy fleabane; Asteraceae), collected by J. Engleman on 3 July 1919, was the first botanical specimen gathered in Roger Mills County. There are no subsequent collection records until 1929. Peak collecting years in Roger Mills County were 1939 (261 specimens), with the return of J. Engleman, and 1976 by Susan Barber and Rahmona Thompson

(124 specimens) on behalf of the Robert Bebb Herbarium at the University of Oklahoma (Hoagland 2004). During the course of this research, Freeman et al. (2002) not included in cited references published a floristic list from the Thurman Ranch in Roger Mills County, located south of WBNHS, which documented 470 species from 85 families.

A number of techniques and data sources are available for the study of historical vegetation composition and structure. One is the analysis of written accounts prepared by early explorers and tourists. Although partial lists of species encountered, often with questionable accuracy regarding species identification, and vague descriptions of vegetation are provided, this information is insufficient for quantitative analysis of species composition and abundance. The most useful historical data source for analysis of landscape structure and vegetation composition are the notes and plats compiled by General Land Office (GLO) surveyors. The first land surveys of what would become Oklahoma were initiated in 1871 with establishment of the Initial Point in Murray County. However, only the western 2/3s of the state were surveyed at this time. It wasn't until the early 1890s the entire state was surveyed.

## **STUDY AREA**

### **STUDY AREA**

The WBNHS was established on 12 November 1996 and encompasses 136 hectares in Roger Mills County (Fig. 1). Latitudinal extent ranges from 35.63°N to 35.62°N and longitudinal extent from 99.70°W to 99.71°W. The WBNHS is located

within the subtropical humid (Cf) climate zone (Trewartha 1968). Summers are warm (mean July temperature = 27.7°C) and humid, whereas winters are relatively short and mild (mean January temperature = 1.9°C). Mean annual precipitation is 105.6 cm, with periodic severe droughts (Oklahoma Climatological Survey 2004). Physiographically, the study area is located in the Osage Plains section of the Central Lowlands province (Hunt 1974) and within the High Plains province of Oklahoma (Curtis & Ham 1979). Elevation in the study area ranges from 588 m along the Washita River to 610 m. The surface geology is primarily Permian red sandstone in the uplands to the south of the Washita River, and Quaternary silt, sand and clay adjacent to and north of the river (Branson & Johnson 1979). The primary soil association at WBNHS is the Yahola-Port, which is composed of alluvial soils on bottomlands and terraces. The Woodward-Quinlan association occurs on uplands and is level to very steep loamy soils underlain by red sandstone (Burgess et al. 1959). The predominant potential vegetation types are mixedgrass prairie with a smaller component of bottomland forests and stabilized dunes (Duck & Fletcher 1943). Much of the Washita River bottomlands were cleared for agriculture and pasturage.

## **METHODS**

Eight collection sites were established at WBNHS for intensive floristic sampling. Sites were selected following a review of US Geological Survey 1:24,000 topographic maps and field reconnaissance. Eleven collection sites were established for intensive

floristic sampling. A collection site is a general area on the landscape. Collections are made as species are encountered. Transects or plots are not used for this type of sampling. However, collecting was not restricted to these sites and previously uncollected species were gathered wherever they were encountered.

The predominant vegetation association at these sites was classified according to Hoagland (2000). Collections also were made randomly throughout the site. Collections were made on a monthly basis from March through October 2002. Vouchers for species exotic to North America were made from naturalized populations only, thus excluding cultivated and ornamental plants. Specimens were processed at the Robert Bebb Herbarium of the University of Oklahoma (OKL) following standard herbarium techniques. Manuals used for specimen identification included Correll and Johnston (1970), Gould (1975), Waterfall (1969) and Great Plains Flora Association (1986). Origin, whether native to introduced to North America, was determined using Taylor and Taylor (1991) and the United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS 2004). Nomenclature follows USDA-NRCS (2004). Voucher specimens were deposited at OKL.

### **Historical Vegetation**

Analyses were conducted to ascertain the spatial distribution of land cover types at WABA. In order to do so, the 1871 township plat containing WABA was digitized using ArcInfo GIS. Plats were obtained from the Archives branch of the Oklahoma Department of Libraries in Oklahoma City. During this research, it was discovered that

the plat for 1897 missing and no longer available, thus it was excluded from analysis. All information digitized from the 1871 plat was attributed to one of the following categories: vegetation (forests, grassland, and wetlands), hydrology (streams, rivers, springs, and ponds), agriculture (cultivated fields), transportation (roads, trails, and railroads), and settlement (residences, schools, and other cultural features).

FRAGSTATS (McGarigal and Marks 1994), a landscape ecology software package, was used to determine landscape composition, defined here as the number of occurrences and area occupied by each land cover type. FRAGSTATS indices used in this study were class area, number of patches, and mean patch size. Number of patches is a measure of individual occurrences of a given land cover type. Mean patch size is an average of the area occupied by all patches of a land cover type (McGarigal and Marks 1994).

## **RESULTS AND DISCUSSION**

### **Floristic Inventory**

A total of 272 vascular plants in 201 genera and 62 families were collected (Appendix 1). Among the angiosperms, 67 were monocots and 204 were dicots. One gymnosperm was found. The most species were collected from the families Poaceae (53), Asteraceae (48), Fabaceae (22), and Euphorbiaceae (14). The genera *Chamaesyce* (Euphorbiaceae, 5), *Eragrostis* (Poaceae, 4), *Dalea* (Fabaceae, 4), and *Solanum* (Solanaceae, 4) had the most species. Twenty-eight woody plant species were present. Ninety-five species were annual, two biennials, and 175 perennial.

Twenty-one exotic species from 14 families were collected, representing 7.7% of the flora. The greatest number of exotic species were in the families Poaceae (11) and Asteraceae (4). This is less than the 10% exotic flora reported from the Thurman Ranch (Freeman et al. 2003), but is comparable to recent floristic inventories from other areas in Oklahoma. For example, a flora of the Chickasaw National Recreation Area reported 12% exotic species (Hoagland & Johnson 2001), 9% at Oologah Wildlife Management Area (Hoagland & Wallick 2003), 15% at Keystone Wildlife Management Area, and 11% for an inventory of Tillman County (Hoagland et al., 2004). However, the percentage was lower, 6.6%, at Red Slough and Grassy Slough in southeastern Oklahoma (Hoagland & Johnson, in press).

The majority of exotic species reported here are not a threat to the biodiversity or species managed of WBNHS. Some, such as *Arenaria serpyllifolia* (thymeleaf sandwort; Caryophyllaceae), *Capsella bursa-pastoris* (shepherd's purse, Brassicaceae), *Stellaria media* (common chickweed; Caryophyllaceae), and *Taraxacum officinale* (dandelion; Asteraceae) are lawn weeds. Others, including *Chenopodium album* (lambsquarter, Chenopodiaceae), *Convolvulus arvensis* (field vineweed, Convolvulaceae), and *Tragopogon dubius* (yellow salsify, Asteraceae) are restricted to disturbed areas. The most aggressive weedy species present at WBNHS are *Kochia scoparia* (kochia, Chenopodiaceae), *Sorghum halepense* (Johnsongrass, Poaceae), and *Tamarix ramosissima* (saltcedar, Tamaricaceae).

Five species tracked by the Oklahoma Natural Heritage Inventory were found: *Argythamnia humilis* (low silverbush; Euphorbiaceae; G5S2S3), *Gaura brachycarpa*

(plains beeblossom; Onagraceae; G4G5 S1S2), *Solanum triflorum* (cutleaf nightshade; Solanaceae; G5S1S2), *Sporobolus giganteus* (giant dropseed; Poaceae; G5S1S3), and *Zinnia grandiflora* (prairie zinnina; Asteraceae; G5S?)(Oklahoma Natural Heritage Inventory 2004). Species are ranked according to level of imperilment at the state (S) and global (G) levels on a scale of 1-5; 1 represents a species that is imperiled and 5 one that is secure (Groves et al, 1995). It should be noted that none of these species are listed as threatened or endangered by the U.S. Fish and Wildlife Service. Furthermore, although consider rare in Oklahoma, they are more common in adjoining states.

As a result of this study, 651 species are now known to occur in Roger Mills County. Of the 361 species reported in this study, 156 had been previously collected in the county (Hoagland 2004). This study documented 205 species not previously reported from Roger Mills County. When compared with the Dempsey Divide site (Freeman et al. 2002), there were 219 species found at both sites. However, 53 species were documented at WBNHS that were not reported at Dempsey Divide. Two hundred and fifty-one additional species were found on the Dempsey Divide that were not found at the WBNHS. This discrepancy is no doubt a result of difference of area between the two sites; the Thurman Ranch is 3,755 hecatres in area and contains 19 vegetation types not in cited references.

We believe that this floristic list represents 90% of the plants present at WBNHS. However, an exact determination is not possible. The WBNHS list could be compared with a Roger Mills County listed generated by Hoagland (2004) or Freeman et al.(2002),

but this would not provide an accurate assessment, due to the difference in total area and habitat complexity.

The 8 collection sites occurred within four vegetation associations. A brief description of each follows:

*Sapindus saponaria* woodland association

This association was limited to large sand dunes located on the northside of the Washita River. Although *S. drummondii* (soapberry; Sapindaceae) was abundant, dominance was locally variable. *Celtis laevigata* var. *reticulata* (netleaf hackberry; Ulmaceae). *Ulmus pumila* (Siberian elm; Ulmaceae) , which was introduced to western Oklahoma for shelterbelt plantings, was also a woody species. Other common woody species included *Forestiera pubescens* (elbowbush; Oleaceae), *Gymnocladus dioicus* (Kentucky coffee-tree; Fabaceae), *Prunus angustifolia* (sand plum; Rosaceae), *Ribes aureum* (golden currant; Grossulariaceae), and *Sideroxylon lanuginosum* (gumbully; Sapotaceae). Associated herbaceous species included *Andropogon hallii* (sand bluestem; Poaceae), *Argemone polyanthemos* (prickly poppy; Papavaraceae) , *Asclepias arenaria* (sand milkweed; Asclepiadaceae), *Cyclanthera dissecta* (winged pigweed; Chenopodiaceae), *Dimorphocarpa candicans* (Palmer's spectacle pod; Brassicaceae), *Froelichia gracilis* (slender snakeroot; Amaranthaceae), and *Funastrum cynanchoides* (fringed twinevine; Asclepiadaceae).

### *Schizachyrium scoparium* \_ *Bouteloua hirsuta* herbaceous association

Occurred on Permian red sandstone in the uplands overlain by the Woodward-Quinlan soil association. Associated species included *Aristida oligantha* (prairie threeawn; Poaceae), *Artemisia psiolstachya* (western ragweed; Asteraceae), *Bouteloua curtipendula* (sideoats grama; Poaceae), *Eriogonum annuum* (annual buckwheat; Polygonaceae), *Penstemon albidus* (white penstemon; Scrophulariaceae), *Sphaeralcea coccinea* (scarlet globemallow; Malvaceae), *Thelesperma megapotamicum* (greenthread; Asteraceae), and *Yucca glauca* (soapweed; Agavaceae).

### Disturbed areas and old-field vegetation

This includes much of the Washita River floodplain, which had been under cultivation for many years. It also includes roadsides and areas visited by WBNHS visitors and other areas exhibiting signs of physical disruption. Common plants in disturbed areas and old fields included *Ambrosia trifida* (giant ragweed; Asteraceae), *Bothriochloa ischaemum* (old world bluestem; Poaceae), *Chenopodium simplex* (mapleleaf goosefoot; Chenopodiaceae), *Cynodon dactylon* (Bermudagrass; Poaceae), *Digitaria ciliaris* (southern crabgrass; Poaceae), *Melilotus officinalis* (yellow sweetclover; Fabaceae), and *Sorghum halepense* (Johnsongrass; Poaceae).

### **Historical vegetation**

Only two land cover types occurred within the boundaries of WABA (Fig. 1). Riparian areas covered 18.7 acres and grasslands 316.7 acres. No settlements or

cultivated fields were present in 1871. Although the surveyors noted the battle had occurred in this area, a precise location was not mapped. Because the plat for 1897 was not available from ODL, an analysis of land cover change could not be made.

Surveyor's recorded two cottonwood trees along the along the Washita River. The diameter of one measured at inches, the other 24 inches. Although specimens were not taken from these trees, they were most likely eastern cottonwoods (*Populus deltoides*). In the written description of the river, surveyors list coffee tree, elm, and hackberry as present, but did not provide any measurements.

## **CONCLUSIONS**

We recommend that WBNHS develop a monitoring schema in order to evaluate changes in vegetation composition and species diversity. Since the installation is initiating fire and other management, a network of permanent plots is crucial for managers to evaluate the impact of management treatments. Regular sampling of plots would also alert managers to any rapid change in the number and abundance of exotic plant species.

## **REFERENCES**

Branson C.C. and K.S. Johnson. 1979. Generalized geologic map of Oklahoma. In: K.S. Johnson, C.C. Branson, N.M. Curtis, W.E. Ham, W.E. Harrison, M.V. Marcher, and J.F. Roberts, J.F., editors, Geology and Earth Resources of Oklahoma. Oklahoma Geological Survey, Norman. P. 4.

- Burgess, D.L., J.D. Nichols, and O. G. Henson. 1959. Soil survey of Love County, Oklahoma. United States Department of Agriculture, Washington D.C.
- Correll, D. S. and M. C. Johnston. 1970. Manual of the vascular plants of Texas. Texas Research Foundation, Renner.
- Curtis N.M. and W.E. Ham. 1979. Geomorphic provinces of Oklahoma. In: K.S. Johnson, C.C. Branson, N.M. Curtis, W.E. Ham, W.E. Harrison, M.V. Marcher, and J.F. Roberts, J.F., editors, Geology and Earth Resources of Oklahoma. Oklahoma Geological Survey, Norman. P. 45.
- Duck L.G. and J.B. Fletcher. 1943. A game type map of Oklahoma. Oklahoma Department of Wildlife Conservation, Oklahoma City.
- Freeman, C.C., C.A. Morse, and J.P. Thurmond. 2003. The vascular flora of the Ogallala ecotone on the Dempsey Divide, Roger Mills County, Oklahoma. *Sida* 20:1217-1245.
- Great Plains Flora Association. 1986. Flora of the Great Plains. University Press of Kansas, Lawrence.
- Groves C.R., M.L. Klein, and T.F. Breden. 1995. Natural heritage programs: public-private partnerships for biodiversity conservation. *Wildlife Soc. Bull.* 23:784-790.
- Gould, F.W. 1975. The Grasses of Texas. Texas A&M University Press, College Station.
- Hoagland BW. 2000. The vegetation of Oklahoma: a classification of landscape mapping and conservation planning. *Southwest Nat.* 45:385-420.
- Hoagland, BW. 2004. Atlas of the flora of Oklahoma [online]. Available:

[www.biosurvey.ou.edu](http://www.biosurvey.ou.edu). (Accessed on 14 January 2004).

Hoagland B.W. and F.L. Johnson. In press. The vascular flora of Red Slough and Grassy Slough Wildlife Management Areas, Gulf Coastal Plain, McCurtain County, Oklahoma. *Castanea* 69.

Hoagland B.W. and F.L. Johnson. 2001. Vascular flora of the Chickasaw National Recreation Area, Murray County, Oklahoma. *Castanea* 66:383--400.

Hoagland B.W. and K. Wallick. 2003. Vascular flora of Oologah Wildlife Management Area, Nowata County, Oklahoma. *Proceedings of the Oklahoma Academy of Science* 83:47-62.

Hoagland B.W., P. Crawford-Callahan, P. Crawford, and F.L. Johnson. 2004. Vascular Flora of Hackberry Flat, Frederick Lake, and Suttle Creek, Tillman County, Oklahoma. *Sida* 21: 429-445.

Hunt C.B. 1974. *Natural Regions of the United States and Canada*. W. H. Freeman, San Francisco.

Oklahoma Climatological Survey. 2004. Oklahoma Climatological Data [online]. Available: <http://www.ocs.ou.edu/>. (Accessed on 1 March 2004).

Oklahoma Natural Heritage Inventory. 2004. ONHI working list of rare Oklahoma plants [online]. Available: <http://www.biosurvey.ou.edu/publicat.html>. (Accessed on 1 March 2004).

Palmer M.W., G.L. Wade, and P. Neal, P. 1995. Standards for the writing of floras. *Bioscience* 45:339-345.

Taylor R.J. and C.S. Taylor. 1991. An annotated list of the ferns, fern allies,

gymnosperms, and flowering plants of Oklahoma. Southeastern Oklahoma State University, Durant.

Trewartha G.T. 1968. An Introduction to Climate. McGraw-Hill, New York.

USDA-NRCS 2004. The PLANTS database [online]. Available:

<http://plants.usda.gov/plants>. National Plant Data Center, Baton Rouge, LA.

(Accessed on 14 January 2004).

Waterfall, U.T. 1969. Keys to the flora of Oklahoma. 4<sup>th</sup> edition. Published by the author, New York.

Figure 1: Location of floristic collection sites at WBNHS.

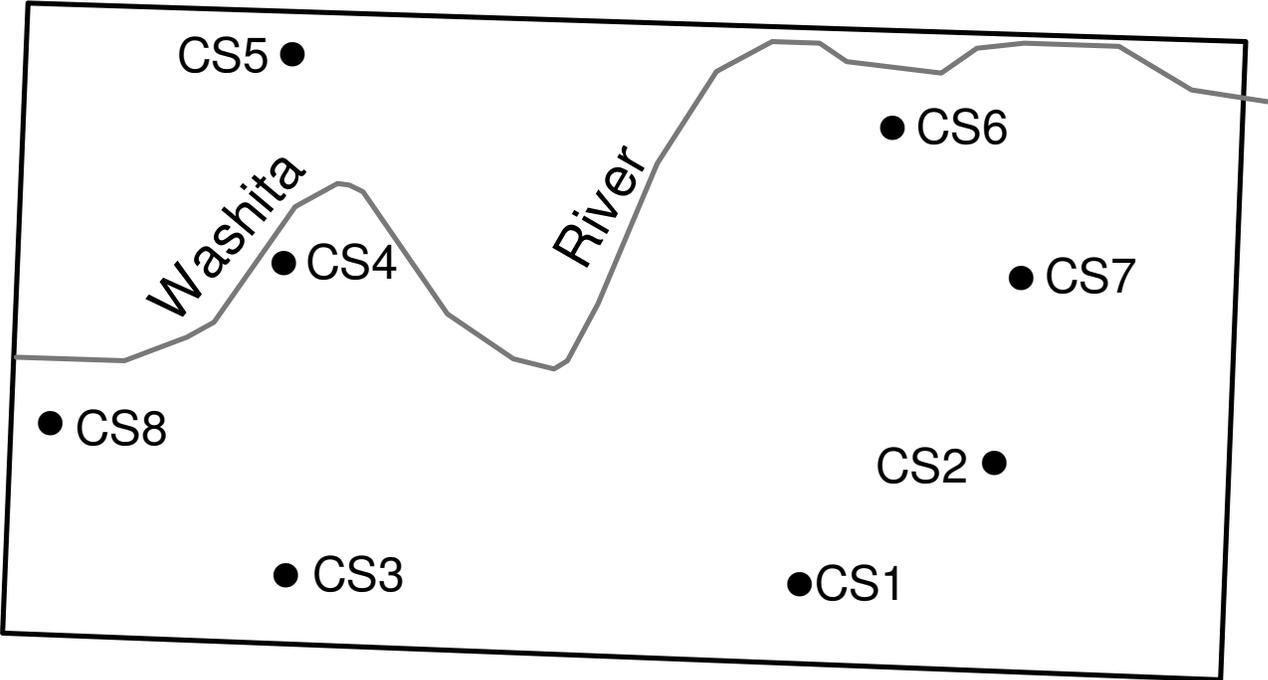


Figure 2: Historical vegetation of Roger Mills County and the Washita Battlefield National Historic Site.

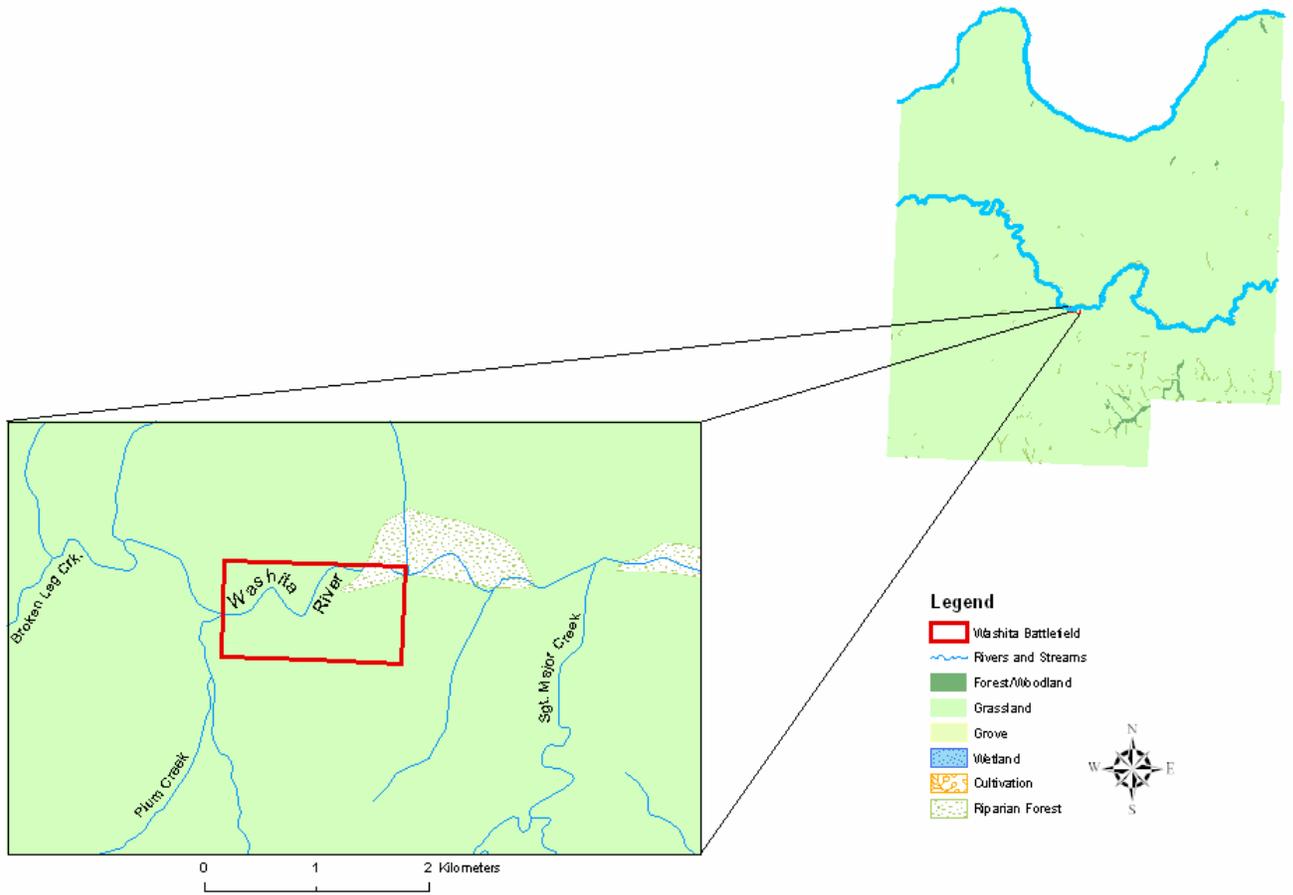


Table 1: Summary of floristic collections at the Washita Battlefield National Historic Site, Roger Mills County, Oklahoma. Table format follows Palmer et al. (1995).

Taxonomic Group	Species	Native spp.	Introduced spp.
Equisetophyta	0	0	0
Pteridophyta	0	0	0
Coniferophyta	1	1	0
Magnoliophyta			
Magnoliopsida	205	184	22
Liliopsida	67	56	10
Total	272	240	32

## APPENDIX 1

Annotated species list for the Washita Battlefield National Historic Site. The first entry indicates growth form (F=forb, V=woody vine, S=shrub, T=tree), life history (A=annual, B=biennial, P=perennial), species not native to North America (designated with an asterisk), and habitat (DAOF=disturbed area/ old-field; MGP=mixed grass prairie; RA=riparian area; SW=sandy woodland). Species introduced to North America are denoted by an asterisks. Voucher specimens were deposited at the Robert Bebb Herbarium at the University of Oklahoma (OKL).

### **PINOPHYTA**

#### **Cupressaceae**

*Juniperus virginiana* L. (eastern redcedar): T, P, SW

### **MAGNOLIOPHYTA**

#### **MAGNOLIOPSIDA**

#### **Amaranthaceae**

*Amaranthus albus* L. (prostrate pigweed): F, A, MGP

*A. palmeri* S. Wats. (carelessweed): F, A, DAOF

*Froelichia gracilis* (Hook.) Moq. (slender snakeroot): F, A, SW

#### **Anacardiaceae**

*Rhus aromatica* L. (fragrant sumac, skunkbrush): S, P, MGP

*R. glabra* L. (smooth sumac): S, P; MGP

*Toxicodendron radicans* (L.) Kuntze (eastern poison ivy): V, P, RA

### **Apiaceae**

*Chaerophyllum tainturieri* Hook. (hairyfruit chervil): F, A, MGP

*Cymopterus macrorhizus* Buckl. (bigroot springparsley): F, P, MGP

### **Apocynaceae**

*Apocynum cannabinum* L. (indianhemp): F, P, SW

### **Asclepiadaceae**

*Asclepias arenaria* Torr. (sand milkweed): F, P, MGP, SW

*A. asperula* (Dcne.) Schlechter (spider milkweed): F, P, MGP

*A. stenophylla* Gray (slimleaf milkweed): F, P, MGP

*A. syriaca* L. (common milkweed): F, P, MGP

*Funastrum cynanchoides* (Dcne.) Schlechter (fringed twinevine): F, P, SW

### **Asteraceae**

*Ambrosia psilostachya* DC. (western ragweed): F, P, MGP

*A. trifida* L. (gaint ragweed): F, A, MGP

*Amphiachyris dracunculoides* (DC.) Nutt. (broomweed): F, A, MGP

*Aphanostephus skirrhobasis* (DC.) Trel. (lazydaisy): F, A, MGP

*Artemisia dracunculus* L. (tarragon): F, P, MGP

*A. filifolia* Torr. (sandsage): S, P, MGP  
*A. ludoviciana* Nutt. (white sage): F, P, MGP  
*Baccharis salicina* Torr. & Gray (false willow): S, P, RA  
*Brickellia eupatorioides* (L.) Shinnars (false boneset): F, P, MGP  
*Chaetopappa ericoides* (Torr.) Nesom (rose heath): F, P, MGP  
*Cirsium undulatum* (Nutt.) Spreng. (wavyleaf thistle): F, P, MGP  
*Cirsium vulgare* (Savi) Ten. (bull thistle): F, B, MGP  
*Conyza canadensis* (L.) Cronq. (horseweed): F, A, DAOF  
*Eclipta prostrata* (L.) L. (false daisy): A, RA  
*Engelmannia peristenia* (Raf.) Goodman & Lawson (Engelmann's daisy): F, P, MGP  
*Erigeron bellidiastrum* Nutt. (western daisy fleabane): F, A, MGP, SW  
*Eupatorium serotinum* Michx. (lateflowering throughwort): F, P, RA  
*Euthamia gymnospermoides* Greene (Texas goldentop): F, P, DAOF  
*Gaillardia pulchella* Foug. (Indian blanket): F, A, MGP  
*G. suavis* (Gray & Engelm.) Britt. & Rusby (perfumeballs): F, P, MGP  
*Grindelia papposa* Nesom & Suh (Spanish gold): F, A, MGP  
*Helianthus annuus* L. (annual sunflower): F, A, DAOF  
*H. maximiliani* Schrad. (Maxmillian's sunflower): F, P, DAOF  
*H. petiolaris* Nutt. (prairie sunflower): F, A, DAOF  
*Heterotheca subaxillaris* (Lam.) Britt. & Rusby (camphorweed): F, A, MGP  
*H. villosa* (Pursh) Shinnars (hairy false goldenaster): F, P, MGP  
*Hymenopappus flavescens* Gray (old plainsman): F, B, MGP

*Iva annua* L. (annual marshalder): F, P, DAOF, RA

*Lactuca serriola* L.\* (prickly lettuce): F, A, MGP

*Liatris pycnostachya* Michx. (prairie blazing star): F, P, MGP

*Lygodesmia juncea* (Pursh) D. Don ex Hook. (skeletonweed): F, P, MGP

*Machaeranthera pinnatifida* (Hook.) Shinnars (tansyaster): F, P, MGP

*Pluchea odorata* (L.) Cass. var. *odorata* (sweetscent): F, A, RA

*Ratibida columnifera* (Nutt.) Woot. & Standl. (prairie coneflower): F, P, MGP

*Solidago canadensis* L. (Canada goldenrod): F, P, DAOF

*S. gigantea* Ait. (giant goldenrod): F, P, DAOF

*S. petiolaris* Ait. (downy ragged goldenrod): F, P, MGP

*Symphotricum ericoides* (L.) Nesom (white heath aster): F, P, DAOF

*S. oblongifolium* (Nutt.) Nesom (aromatic aster): F, P, MGP

*S. subulatum* (Michx.) Nesom (saltmarsh aster): F, A, RA

*Taraxacum officinale* G.H. Weber ex Wiggers\* (dandelion): F, P, DAOF

*Tetraneuris scaposa* (DC.) Greene (four-nerve daisy): F, P, MGP

*Thelesperma megapotamicum* (Spreng.) Kuntze (greenthread): F, P, MGP

*Tragopogon dubius* Scop.\* (yellow salsify): F, A, DAOF

*Verbesina encelioides* (Cav.) Benth. & Hook. f. ex Gray (golden crownbeard): F, A,  
DAOF

*Vernonia baldwinii* Torr. (Baldwin's ironweed): F, P, DAOF

*Xanthium strumarium* L. (cocklebur): F, A, RA

*Zinnia grandiflora* Nutt. (prairie zinnina): F, P, MGP

## **Boraginaceae**

*Heliotropium convolvulaceum* (Nutt.) Gray (phlox heliotrope): F, A, SW

*Lithospermum incisum* Lehm. (narrowleaf stoneseed): F, P, MGP

## **Brassicaceae**

*Camelina rumelica* Velen. (graceful false flax): F, A, MGP

*Capsella bursa-pastoris* (L.) Medik.\* (shepherd's purse): F, A, DAOF

*Descurainia pinnata* (Walt.) Britt. (western tansyaster): F, A, MGP

*Dimorphocarpa candicans* (Raf.) Rollins (Palmer's spectacle pod): F, A, SW

*Draba reptans* (Lam.) Fern. (Carolina draba): F, A, MGP

*Lepidium oblongum* Small (veiny pepperweed): F, A, MGP

*Lesquerella gordonii* (Gray) S. Wats. (bladderpod): F, A, MGP

## **Cactaceae**

*Escobaria vivipara* (Nutt.) Buxbaum (pincushion): F, P, MGP

*Opuntia macrorhiza* Engelm. (twistspine pricklypear): F, P, MGP

## **Campanulaceae**

*Triodanis holzingeri* McVaugh (Venus looking-glass): F, A, MGP

## **Caryophyllaceae**

*Arenaria serpyllifolia* L.\* (thymeleaf sandwort): F, A, DAOF

*Paronychia jamesii* Torr. & Gray (James' nailwort): F, P, MGP

*Stellaria media* (L.) Vill.\* (common chickweed): F, A, DAOF

### **Chenopodiaceae**

*Chenopodium album* L.\* (lambsquarter): F, A, MGP

*C. simplex* (Torr.) Raf. (mapleleaf goosefoot): F, A, MGP

*Cycloloma atriplicifolium* (Spreng.) Coult. (winged pigweed): F, A, MGP

*Kochia scoparia* (L.) Schrad.\* (kochia): F, A, MGP

### **Convolvulaceae**

*Convolvulus arvensis* L.\* (field vineweed): F, P, MGP

*Evolvulus nuttallianus* J. A. Schultes (shuggy dwarf morning-glory): F, P, MGP

*Ipomoea leptophylla* Torr. (bush morning-glory): F, P, MGP

### **Cucurbitaceae**

*Cucurbita foetidissima* Kunth (Missouri gourd): F, P, MGP

*Cyclanthera dissecta* (Torr. & Gray) Arn. (cutleaf cucumber): F, A, SW

### **Euphorbiaceae**

*Acalypha ostryifolia* Riddell (threeseed mercury): F, A, MGP

*Argythamnia humilis* (Engelm. & Gray) Muell.-Arg. (low silverbush): F, P, MGP

*Chamaesyce fendleri* (Torr. & Gray) Small (Fendler's sandmat): F, P, MGP  
*C.glyptosperma* (Engelm.) Small - (ribseed sandmat): F, A, MGP, SW  
*C. maculata* (L.) Small (spotted sandmat): F, A, DAOF  
*C. missurica* (Raf.) Shinnery (prairie sandmat): F, A, MGP, DAOF  
*C. stictospora* (Engelm.) Small (slimseed sandmat); A, DAOF  
*Croton glandulosus* L. (vente conmigo): F, A, MGP  
*C. texensis* (Klotzsch) Muell.-Arg. (Texas croton): F, A, MGP  
*Euphorbia dentata* Michx. (toothed spurge): F, A, MGP  
*E. hexagona* Nutt. ex Spreng. (six-angled spurge): F, A, MGP  
*E. longicuris* Scheele (wedgeleaf spurge): F, A, MGP  
*E. marginata* Pursh (snow on the mountain): F, A, DAOF  
*Tragia ramosa* Torr. (branched noseburn): F, P, MGP

## **Fabaceae**

*Amorpha fruticosa* L. (false indigo): S, P, RA  
*Astragalus lotiflorus* Hook. (lotus milkvetch): F, P, MGP  
*A. plattensis* Nutt. (Platte River milkvetch): F, P, MGP  
*Baptisia australis* (L.) R. Br. ex Ait. f. (blue wild indigo): F, P, MGP  
*Caesalpinia jamesii* (Torr. & Gray) Fisher (James holdback): F, P, SW  
*Cercis canadensis* L. (redbud): T, P, DAOF  
*Chamaecrista fasciculata* (Michx.) Greene (partridge pea): F, A, MGP  
*Dalea aurea* Nutt. ex Pursh (golden prairie clover): F, P, MGP

*D. candida* Michx. ex Willd. (white prairie clover): F, P, MGP  
*D. enneandra* Nutt. (nineanther prairie clover): F, P, MGP  
*D. purpurea* Vent. (purple prairie clover): F, P, MGP  
*Desmodium illinoense* Gray (Illinois ticktrefiol): F, P, MGP  
*Gleditsia triacanthos* L. (honeylocust): T, P, SW  
*Gymnocladus dioicus* (L.) K. Koch (Kentucky coffee tree): T, P, SW  
*Indigofera miniata* Ortega (coastal indigo): F, P, SW  
*Medicago minima* (L.) L.\* (burr medick): F, A, DAOF  
*Melilotus officinalis* (L.) Lam.\* (yellow sweetclover): F, A, DAOF  
*Mimosa borealis* Gray (fragrant mimosa): S, P, MGP  
*M. nuttallii* (DC.) B.L. Turner (Nuttall's sensitive briar): V, P, MGP  
*Pediomelum linearifolium* (Torr. & Gray) J. Grimes (narrowleaf breadroot): F, P, MGP  
*Sophora nuttalliana* B.L. Turner (silky sophora): F, P, MGP  
*Strophostyles leiosperma* (Torr. & Gray) Piper (slickseed fuzzybean): F, A, MGP

## **Fumariaceae**

*Corydalis micrantha* (Engelm. ex Gray) Gray (smallflower fumewort): F, A, MGP

## **Geraniaceae**

*Erodium cicutarium* (L.) L'Her. ex Ait.\* (stork's bill): F, A, DAOF

*Geranium pusillum* L.\* (smal geranium): F, A, MGP

## **Grossulariaceae**

*Ribes aureum* Pursh (golden currant): F, P, SW

## **Juglandaceae**

*Juglans microcarpa* Berl. (little walnut): T, P, SW

## **Krameriaceae**

*Krameria lanceolata* Torr. (trailing krameria): F, P, MGP

## **Lamiaceae**

*Lamium amplexicaule* L.\* (henbit): F, A, DAOF

*Lycopus americanus* Muhl. ex W. Bart. (water horehound): F, P, RA

*Monarda clinopodioides* Gray (basil beebalm): F, A, MGP

*M. punctata* L. (spotted beebalm): F, A, MGP

*Salvia azurea* Michx. ex Lam. (azure sage): F, P, MGP

*Scutellaria resinosa* Torr. (sticky skullcap): F, P, MGP

*S. wrightii* Gray (Wright's skullcap): F, P, MGP

*Teurcium canadense* L. (Canada germander): F, P, RA

*T. laciniatum* Torr. (lacy germander): F, P, MGP

## **Linaceae**

*Linum pratense* (J.B.S. Norton) Small (meadow flax): F, A, MGP

*L. rigidum* Pursh (stiffstem flax): F, A, MGP

### **Loasaceae**

*Mentzelia nuda* (Pursh) Torr. & Gray (bractless sand lily): F, P, MGP

### **Lythraceae**

*Ammania coccinea* Rottb. (redstem): F, A, RA

### Malvaceae

*Callirhoe involucrata* (Torr. & Gray) Gray (purple poppymallow): F, P, MGP

*Hibiscus trionum* L.\* (flower of an hour): F, P, MGP

*Sphaeralcea coccinea* (Nutt.) Rydb. scarlet globemallow): F, P, MGP

### **Menispermaceae**

*Cocculus carolinus* (L.) DC. (Carolina snailseed): F, P, SW

### **Molluginaceae**

*Mollugo verticillata* L. (green carpetweed): F, A, DAOF, SW

### **Moraceae**

*Morus alba* L.\* (white mulberry): T, P, DAOF

## **Nyctaginaceae**

*Mirabilis albida* (Walt.) Heimerl (white four o'clock): F, P, MGP

*M. linearis* (Pursh) Heimerl (narrowleaf four o'clock): F, P, MGP

*M. nyctaginea* (Michx.) MacM. (heartleaf four o'clock): F, P, MGP, SW

## **Oleaceae**

*Forestiera pubescens* Nutt. (elbowbush): S, P, SW

## **Onagraceae**

*Calylophus berlandieri* Spach (Berlander's sundrops): P, MGP

*C. hartwegii* (Benth.) Raven (Hartweg's sundrop): F, P, MGP

*C. serrulatus* (Nutt.) Raven (yellow sundrops): F, P, MGP

*Gaura brachycarpa* Small (plains beeblossom): F, A, MGP

*G. parviflora* Dougl. ex Lehm. (velvetweed): F, A, MGP

*Oenothera jamesii* Torr. & Gray (trumpet evening-primrose): F, P, RA

*O. laciniata* Hill (cutleaf evening-primrose): F, P, MGP

*O. rhombipetala* Nutt. ex Torr. & Gray (fourpoint evening-primrose): F, P, MGP

## **Oxalidaceae**

*Oxalis stricta* L. (yellow sorrell): F, P, SW

## **Papaveraceae**

*Argemone polyanthemus* (Fedde) G.B. Ownbey (pricklypoppy): F, A, SW

## **Pedaliaceae**

*Proboscidea louisianica* (P. Mill.) Thellung (ram's horn): F, A, MGP

## **Plantaginaceae**

*Plantago patagonica* Jacq. (wooly plantain): F, A, MGP

*P. rhodosperma* Dcne. (redseed plantain): F, A, MGP

## **Polygonaceae**

*Eriogonum annuum* Nutt. (annual buckwheat): F, A, DAOF, MGP

*E. longifolium* Nutt. (lonflef buckwheat): F, P, MGP

*Polygonum aviculare* L.\* (prostrate knotweed): F, A, MGP

*P. lapathifolium* L. (curlytop knotweed): F, A, RA

*Rumex crispus* L.\* (curly dock): F, P, MGP

## **Portulacaceae**

*Portulaca oleracea* L. (little hogweed): F, A, DAOF

## **Primulaceae**

*Androsace occidentalis* Pursh (western rockjasmine): F, A, MGP

### **Ranunculaceae**

*Delphinium carolinianum* Walt. ssp. *virescens* (Nutt.) Brooks (Carolina larkspur): F, P,  
MGP

### **Rosaceae**

*Prunus angustifolia* Mars. (sand plum): S, P, SW

### **Rubiaceae**

*Cephalanthus occidentalis* L. (buttonbush): S, P, RA

*Galium pilosum* Ait. (hairy bedstraw): F, P, DAOF

*Hedyotis nigricans* (Lam.) Fosberg (diamondflowers): F, P, MGP

### **Salicaceae**

*Populus deltoides* Bartr. ex Marsh. (eastern cottonwood): T, P, RA

*Salix exigua* Nutt. (sandbar willow): S, P, RA

*S. nigra* Marsh. (black willow): S, P, RA

### **Sapindaceae**

*Sapindus saponaria* L. (soapberry): T, P, SW

### **Sapotaceae**

*Sideroxylon lanuginosum* Michx. (gumbully): T, P, SW

### **Scrophulariaceae**

*Castilleja purpurea* (Nutt.) G. Don var. *citrina* (Pennell) Shinnars (downy Indian paintbrush): F, P, MGP

*Penstemon albidus* Nutt. (white penstemon): F, P, MGP

*Veronica arvensis* L.\* (corn speedwel): F, A, DAOF

### **Solanaceae**

*Chamaesaracha conioides* (Moric. ex Dunal) Britt. (gray fine eyes): F, P, MGP

*Physalis cinerascens* (Dunal) A.S. Hitchc. (smallflower groundcherry): F, P, MGP

*P. longifolia* Nutt. (longleaf groundcherry): F, P, MGP

*Quincula lobata* (Torr.) Raf. (Chinese lantern): F, P, DAOF

*Solanum dimidiatum* Raf. (western horsenettle): F, P, DAOF

*S. elaeagnifolium* Cav. (silverleaf nightshade): F, P, DAOF, MGP

*S. rostratum* Dunal (buffalobur): F, A, DAOF, MGP

*S. triflorum* Nutt. (cutleaf nightshade): F, A, MGP

### **Tamaricaceae**

*Tamarix ramosissima* Ledeb.\* (saltcedar): S, P, RA

### **Ulmaceae**

*Celtis laevigata* Willd. var. *reticulata* (Torr.) L. Benson (netleaf hackberry): T, P, SW

*Ulmus pumila* L.\* (Siberian elm): T, P, SW

*U. rubra* Muhl. (red elm): T, P, SW

### **Urticaceae**

*Parietaria pensylvanica* Muhl. ex Willd. (Pennsylvania pellitory): F, A, DAOF, SW

### **Verbenaceae**

*Glandularia pumila* (Rydb.) Umber (pink mock vervain): F, A, DAOF, MGP

*Phyla lanceolata* (Michx.) Greene (lanceleaf frogfruit): F, P, RA

### **Violaceae**

*Hybanthus verticillatus* (Ortega) Baill. (babyslippers): F, P, MGP

### **Vitaceae**

*Ampelopsis cordata* Michx. (heartleaf peppervine): V, P, RA

*Cissus incisa* auct. non Des Moulins (possum grape): V, P, SW

*Vitis acerifolia* Raf. (mapleleaf grape): V, P, RA

### **Zygophyllaceae**

*Kallstroemia parviflora* J.B.S. Norton (warty caltrop): F, A, DAOF

*Tribulus terrestris* L.\* (puncturevine): F, A, DAOF

## **LILIOPSIDA**

### **Agavaceae**

*Yucca glauca* Nutt. (soapweed): S, P, MGP

### **Commelinaceae**

*Commelina erecta* L. (whitemouth dayflower): F, P, MGP

*Tradescantia occidentalis* (Britt.) Symth (prairie spiderwort): F, P, MGP

### **Cyperaceae**

*Carex gravida* Bailey (heavy sedge): F, P, MGP

*Cyperus odoratus* L. (lean flatsedge): F, A, MGP

*C. schweinitzii* Torr. (Schweinitz's flatsedge): F, P, MGP

*C. setigerus* Torr. & Hook. (lean flatsedge): F, P, RA

*Fimbristylis vahlii* (Lam.) Link (Vahl's fimbry): F, A, RA

*Schoenoplectus pungens* (Vahl) Pall (threesquare bulrush): F, P, RA

### **Iridaceae**

*Sisyrinchium angustifolium* P. Mill. (blue-eyed grass): F, P, MGP

### **Juncaceae**

*Juncus torreyi* Coville (Torrey's rush): F, P, RA

## Liliaceae

*Allium canadense* L. (meadow garlic): F, P, MGP

*A. drummondii* Regel (Drummond's onion): F, P, MGP

## Poaceae

*Andropogon hallii* Hack. (sand bluestem): F, P, MGP, SW

*Aristida oligantha* Michx. (prairie threeawn): F, A, MGP

*A. purpurea* Nutt. (purple threeawn): F, P, MGP

*Bothriochloa ischaemum* (L.) Keng\* (old world bluestem): P, MGP

*B. laguroides* (DC.) Herter (silver bluestem): F, P, MGP

*Bouteloua curtipendula* (Michx.) Torr. (sideoats grama): F, P, MGP

*B. gracilis* (Willd. ex Kunth) Lag. ex Griffiths (blue grama): F, P, DAOF, MGP

*B. hirsuta* Lag. (hairy grama): F, P, MGP

*Bromus japonicus* Thunb. ex Murr.\* (Japanese brome): F, A, DAOF, SW

*Buchloe dactyloides* (Nutt.) Engelm. buffalograss): F, P, DAOF, MGP

*Cenchrus spinifex* Cav. (coastal sandbur): F, P, SW

*Chloris verticillata* Nutt. (windmill grass): F, P, DAOF, MGP

*Cynodon dactylon* (L.) Pers.\* (bermudagrass); F, P, DAOF

*Dichantherium malacophyllum* (Nash) Gould (softleaf rosette grass): F, P, MGP

*D. oligosanthos* (J.A. Schultes) Gould (Heller's rosette grass): F, P, MGP

*Digitaria ciliaris* (Retz.) Koel. (southern crabgrass); F, P, DAOF

*D. cognata* (J.A. Schultes) Pilger (Carolina crabgrass): F, P, MGP

*Distichlis spicata* (L.) Greene (saltgrass); F, P, DAOF

*Echinochloa crus-galli* (L.) Beauv.\* (barnyard grass): F, A, RA

*Elymus canadensis* L. (Canadian wildrye): F, P, MGP

*E. virginicus* L. (Virginia wildrye): F, P, RA

*Eragrostis barrelieri* Daveau\* (Mediterranean lovegrass): F, A, DAOF

*E. cilianensis* (All.) Vign. ex Janchen\* (stinkgrass): F, A, DAOF

*E. curvula* (Schrad.) Nees\* (weeping lovegrass): F, P, MGP

*E. spectabilis* (Pursh) Steud. (purple lovegrass); F, P, SW

*Erioneuron pilosum* (Buckl.) Nash (wollygrass): F, P, MGP

*Hordeum pusillum* Nutt. (little barley): F, A, DAOF

*Leptochloa fusca* (L.) Kunth ssp. *fascicularis* (Lam.) N. Snow (bearded spangletop): F, A,  
RA

*Lolium perenne* L.\* (perennial ryegrass): F, P, MGP

*Muhlenbergia asperifolia* (Nees & Meyen ex Trin.) Parodi (scratchgrass): F, P, SW

*M. racemosa* (Michx.) B.S.P. (Marsh muhly): F, P, MGP

*M. sobolifera* (Muhl. ex Willd.) Trin. (rock muhly): F, P, MGP

*Panicum capillare* L. (witchgrass): F, A, MGP

*P. obtusum* Kunth (vine mesquite): F, P, MGP, RA

*P. virgatum* L. (switchgrass): F, P, MGP

*Pascopyrum smithii* (Rydb.) A. Love (western wheatgrass): F, P, MGP

*Paspalum setaceum* Michx. thin paspalum): F, P, DAOF

*Poa arachnifera* Torr. (Texas bluegrass); F, P, RA

*Saccharum giganteum* (Walt.) Pers. (sugarcane plumegrass): F, P, RA  
*Schedonnardus paniculatus* (Nutt.) Trel. (tumblegrass): F, P, DAOF  
*Schizachyrium scoparium* (Michx.) Nash (little bluestem): F, P, MGP  
*Setaria parviflora* (Poir.) Kerguelen (marsh bristlegrass): F, P, DAOF  
*S. viridis* (L.) Beauv.\* (green bristlegrass): F, A, MGP  
*Sorghastrum nutans* (L.) Nash (Indiangrass): F, P, MGP  
*Sorghum halepense* (L.) Pers.\* (Johnsongrass): F, P, DAOF  
*Spartina pectinata* Bosc ex Link (prairie cordgrass): F, P, RA  
*Sporobolus cryptandrus* (Torr.) Gray (sand dropseed): F, P, MGP, SW  
*S. giganteus* Nash (giant dropseed): F, P, MGP  
*S. vaginiflorus* (Torr. ex Gray) Wood (poverty dropseed): F, A, SW  
*Tridens flavus* (L.) A.S. Hitchc. (purpletop): F, P, DAOF  
*Triplasis purpurea* (Walt.) Chapman (purple sandgrass): F, A, MGP  
*Triticum aestivum* L.\* (wheat): F, A, DAOF  
*Vulpia octoflora* (Walt.) Rydb. (sixweeks fescue): F, A, MGP