THE VASCULAR FLORA OF MCKINNEY ROUGHS

BASTROP COUNTY, TEXAS

THESIS

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By

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THE VASCULAR FLORA OF MCKINNEY ROUGHS

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The Lower Colorado River Authority opened McKinney Roughs in Bastrop County, Texas, to the hikers and equestrians in 1996. Past uses of the 648-hectare tract near the western margin of the Oak Woodlands include farming, ranching, and surface mining. The vascular flora was surveyed during the growing seasons of 1999 and 2000 and a series of line-intercept transects was used to determine the composition of the least-disturbed woodland and forest stands. Qualitative data collected along these transects were used to represent the stands in ordination space and to refine the classification of the woody plant communities on-site. The flora consisted of 372 species in 284 genera and 93 families. Non-native species constituted 8.9 percent of the flora. Cluster analysis indicated the presence of one woodland and six forest associations on the property. The upland associations were a *Juniperus virginiana-Quercus stellata-Quercus marilandica* woodland, *Q. stellata-J. virginiana-Carya texana* forest and *J. virginiana-Q. stellata-Ulmus crassifolia* forest. Ravines along slopes leading to the Colorado River were characterized by *Q. stellata-J. virginiana-Fraxinus texensis* and *Pinus taeda-Q. stellata-Q. marilandica* forests, while the terraces of the Colorado River floodplain were occupied by *Ulmus americana-Celtis laevigata-Salix nigra* and *U. crassifolia-C. laevigata-Quercus sinuata* forests.

INTRODUCTION

McKinney Roughs (MR) comprises the ravines and interfluves of the dissected plain to the west and south of Wilbarger Bend on the Colorado River in western Bastrop County, Texas (Figure 1). The Lower Colorado River Authority (LCRA) purchased the site in 1995 "to preserve the diversity of life [there], while providing visitor access" (LCRA 1999). Facilities include an environmental learning center, a wheelchair-accessible interpretative trail, and a "green-living" demonstration area. Twenty-four kilometers of hiking and equestrian trails provide access to the 648-hectare site.

Several factors, including surficial geology, topographic relief, soil variety, and disturbance history influence the flora and vegetation at MR. Sediments deposited in both marine and terrestrial environments underlie the site (Bureau of Economic Geology 1974, Durden 1996). Marine deposits of the Wilcox Group from the early Eocene extend from the interfluves on the northwestern two-thirds of the site to the alluvium deposited recently by the Colorado River. Fluviatile terrace deposits from the late Pleistocene cover the uplands in the southeastern one-third of the site. The elevation ranges from 107 m along the river to 177 m on the top of Caldwell Knob along Pope Bend Road (United States Geological Survey 1982). Five interfluves provide slopes of diverse steepness and aspect. Four of the five soil orders recognized in Bastrop County are present at MR (Baker 1979). Alfisols overlie the uplands, vertisols extend along the drainageways, entisols cover the wide upstream floodplain and mollisols occupy the

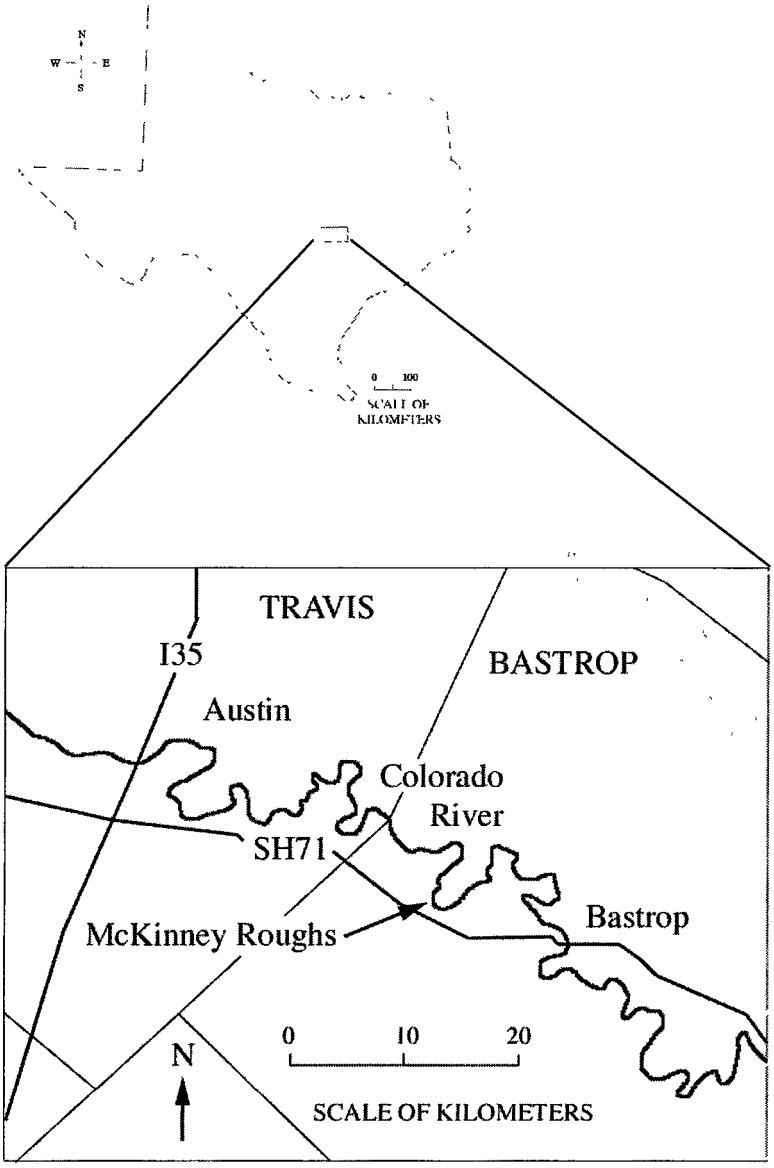

Figure 1. Location of McKinney Roughs in Bastrop County.

narrow downstream floodplain. Historical uses of this tract, like many others in the Oak Woodlands (Bartlett 1995), include farming and ranching. Old fields, improved pastures, gravel pits, and road cuts provide areas in various stages of secondary succession.

McKinney Roughs is located slightly closer to the Travis County National Weather Station at Robert Mueller Municipal Airport in Austin than it is to the Bastrop County station in Smithville. Therefore, the average annual precipitation is expected to fall between the 81-cm average recorded in Austin and the 92-cm average recorded in Smithville (Ramos 1999). This estimated amount places MR close to the xeric end of the 89–114-cm range documented throughout the Oak Woods & Prairies region (Lyndon B. Johnson School of Public Affairs 1978). Both stations experience two peak periods, May–June and September–October, of rainfall and a July mean maximum of 35°C. Averaging the data from the two stations indicates a January mean minimum of 3°C and an average growing season of 269 days.

Along the Colorado River below Austin, Dumble (1898) noted "broad skirts of post-oak timber, cedar brakes, or open prairies" in the uplands and cottonwood, ash, walnut, and elm in the valley. Tharp (1926) documented the dominance of *Quercus stellata*, *Q. marilandica*, and *Carya texana* in the uplands and the presence of *Carya illinoinensis*, *Ulmus* spp., and *Celtis* spp. along the streams in the "deciduous formation" of eastern Texas. Citing Tharp, Braun (1950) included this area in the "Forest–Prairie Transition of the Southern Division of the Oak–Hickory Forest Region." Gould (1962) delineated this area of Texas as the Post Oak Savannah with *Bothriochloa laguroides*, *Chasmanthium* spp., *Nassella leucotricha*, *Panicum virgatum*, *Schizachyrium scoparium*, *Sorgastrum nutans*, and *Tridens flavus* as the climax grasses.

The Post Oak Savannah was later designated as the Oak Woodlands subregion of the Oak Woods & Prairies region (Lyndon B. Johnson School of Public Affairs 1978). Diamond et al. (1987) listed eight communities in the Oak Woodlands: five forest/ woodland types (*Celtis laevigata-Ulmus* spp., *Quercus lyrata*, *Q. stellata-C. texana*, *Quercus incana-Pinus* spp. and *Q. stellata-Q. marilandica*), two marshes (*Juncus* spp. and *Spartina spartinae*), and one bog (*Sphagnum* spp.-*Rhynchospora* spp.). Most of these communities were noted on the basis of communities from the surrounding regions due to the lack of information from the Oak Woodlands. Data obtained from east Texas (McBryde 1933, McCaleb 1954, Marietta and Nixon 1983, Ward 1983) as well as north Texas and Oklahoma (Dyksterhuis 1948, Rice and Penfound 1959, Risser and Rice 1971, Marcy 1982) were used to define the upland forests in the Oak Woodlands. Data from east Texas (Allen 1974, Mohler 1979), north Texas (Nixon 1975), and central Texas (Ford and Van Auken 1982, Van Auken and Bush 1985, Gehlbach 1988, Riskind and Diamond 1988) were used to define the riparian forests. Descriptions of an east-central Texas bog (Rowell 1949) and southern marshes (Penfound 1952) were used to define the herbaceous wetlands. In a summary of the plant communities that occur in Texas, biologists from the Texas Natural Heritage Program (TNHP) provided a qualitative description and the conservation status for each of these communities (TNHP 1993). Subsequently, Gibson (1996) and MacRoberts et al. (2002) completed floristic research in the Oak Woodlands. Additional qualitative information on these and similar communities is available on-line (NatureServe 2000).

The development of MR by the LCRA presented the opportunity to conduct floristic research near the western extent of the Oak Woodlands. Previous floristic

research at MR consists of several qualitative efforts. Mahler (1997) combined the plant lists of Schumann (1996), Cheatham (1996), and Carr (1996) with the list of plants he observed during trail design and construction to create a species list for MR comprising 440 taxa. In addition to listing 136 plant species, Schumann mapped nine vegetation communities, including 425 hectares (ha) of *Q. stellata-Q. marilandica* woodland. The map also delineated eight small (1–27 ha) areas dominated by *C. illinoinensis-C. laevigata*, *Pinus taeda-Quercus* spp., *Platanus occidentalis-Salix nigra*, *C. laevigata-Ulmus* spp., grasses, *Q. stellata-C. texana*, or wetland species. In addition to annotating his list of 354 plant species, Carr (1996) described four major plant communities including *Q. stellata-C. texana* woodlands and associated grasslands occupying the uplands, *P. taeda-Q. stellata* woodlands and *Prosopis glandulosa-C. laevigata* woodlands and associated grasslands along some slopes, and *C. illinoinensis-Ulmus* spp.-*C. laevigata* woodlands on river terraces.

The purpose of this investigation was to supplement qualitative descriptions of the vegetation at MR with quantitative data. The specific objectives were to 1) survey the vascular flora over an entire growing season, 2) determine importance values for the species in the least-disturbed stands, 3) represent these stands in ordination space, and 4) refine the classification of the plant communities at MR. This investigation provided site-specific floristic data that can be incorporated into the existing environmental education curriculum used by McKinney Roughs Environmental Learning Center and contributed stand data that can be applied to the ongoing development of the U. S. National Vegetation Classification (Grossman et al. 1998).

METHODS

Forty-two collecting trips were conducted throughout the tract during the growing seasons of 1999 and 2000. Specimens with reproductive structures were collected in quadruplicate (when available) with location, habitat, associated species, and abundance being recorded in a field notebook at the time of collection. The abundance of each species was assessed according to the scale (Table 1) proposed by Palmer et al. (1995).

Specimens were identified using one or more of the following manuals: Gould (1975), Correll and Johnston (1979), Diggs et al. (1999), and Hatch et al. (1999). Identification was verified by comparison with specimens deposited in the Herbarium of Southwest Texas State University (SWT). Voucher specimens were deposited at SWT. Duplicates of some specimens were deposited at McKinney Roughs Environmental Learning Center, the Botanical Research Institute of Texas (BRIT) in Fort Worth, and the Plant Resources Center of the University of Texas at Austin (TEX-LL).

The listing for each species included the following information: the Latin binomial with authority, vernacular name(s), an assessment of abundance, indication of native/introduced status, collection number(s) and indication of protected or noxious weed status (Palmer et al. 1995). Nomenclature, the arrangement of taxa in the checklist, protected status, and noxious weed status followed Jones et al. (1997). Vernacular names and native/introduced status followed Hatch et al. (1990). The floristic information was

Table 1. Abundance scale modified from Palmer (1995).

Abundance	Description
Abundant	Dominant or codominant in one or more common habitats
Frequent	Easily found in one or more common habitats but not dominant in any common habitat
Occasional	Widely scattered but not difficult to find
Infrequent	Difficult to find with few individuals or colonies but found in several locations
Rare	Very difficult to find and limited to one or very few locations or uncommon habitats

summarized in a table showing the total number of families, genera, and species in each of the major taxonomic groups present at MR.

The species composition of the least-disturbed stands at MR was determined through a series of transects "subjectively placed in areas of homogenous vegetation" (Grossman et al. 1998). Quantitative data were collected using the line intercept method (Brower et al. 1998). Transects followed established footpaths in the uplands, channel beds along the drainages, and terraces bordering the Colorado River. Along each of the transects, the starting points of the intervals were randomly located at distances between 25 and 50 paces (approximately 20 and 40 m) apart. Upland intervals were oriented at a right angle to the footpath and started 5 m from the footpath. Intervals along the ephemeral streams were oriented up the slope from the channel wall. Along both the footpaths and ephemeral streams, the intervals alternated to the left and right. Intervals along the first and second terraces of the Colorado River floodplain were oriented up the slope from the risers. Along both the ephemeral streams and the terraces of the Colorado River, the intervals started at a point along an imaginary line connecting perennial vegetation.

A measuring tape was extended to mark the intervals. The canopy, understory, and herbaceous layers were surveyed separately for a predetermined length of the tape. I determined appropriate interval lengths for the different strata using species-interval and performance curves (Brower et al. 1998) through pilot studies conducted during the spring of 2000. Interval length for large trees with a diameter at breast height (DBH) greater than or equal to 10 cm was 20 m. For shrubs, small trees (DBH < 10 cm), and woody vines, a randomly-located, 5-m segment of the 20-m interval was surveyed and

for the herbaceous plants a randomly-located, 2-m segment of the 20-m interval was surveyed. Intercept length was recorded for all plants whose aerial foliage overlaid the tape measure. The number of intervals along each transect was proportional to the size of the community being sampled (Cox 1996). As sampling advanced along each transect, species-interval curves were utilized to determine adequacy of sampling (Brower et al. 1998).

After the raw data were summarized, the following quantities were determined for each species *i*: linear coverage index, relative coverage, frequency, and relative frequency (Brower et al. 1998). The linear coverage index for species *i* (LCI_i) was calculated as

$$LCI_i = l_i/L$$

where l_i is the sum of the intercept lengths for species *i* and L is the total length of all intervals sampled along the transect. The relative coverage for species *i* (RC_i) was calculated as

$$RC_i = l_i/\sum l,$$

where $\sum l$ is the sum of the intercept lengths for all species. If the foliage of the plants in a given stratum overlapped, the sum of the intercept lengths might be larger than the sum of the interval lengths. The frequency of species *i* (f_i) was calculated as

$$f_i = j_i/k,$$

where j_i is the number of intervals containing species *i*, and k is the total number of intervals along the transect. The relative frequency of species *i* was calculated as

$$Rf_i = f_i/\sum f,$$

where $\sum f$ is the sum of the frequencies of all species. For each taxon, the importance value of species *i* (IV_i) was calculated as

$$IV_i = RC_i + Rf_i.$$

The composition of the stands, in terms of the importance values of the species, was summarized in a series of tables. The relationships between the stands were examined using ordination and classification. Both techniques yielded graphic arrangements of the stands. The ordination diagram plotted the stands in two-dimensional space based on dissimilarity in species composition. The classification dendrogram clustered the actual stands into artificial groups based on similarity in species composition.

Polar ordination of the stands followed the method developed originally by Bray and Curtis (1957) and summarized recently by Kent and Coker (1992) and Cox (1996). The presence/absence data for the woody species sampled in each of the nine stands were tabulated. For each of the 36 possible pairs of stands, a community coefficient of similarity was calculated using the Jaccard coefficient. The Jaccard coefficient (CC_J) was calculated as

$$CC_J = c/S,$$

where c is the number of species common to both stands, and S is the total number of species sampled in the two stands (Brower et al. 1998). These similarity coefficients were converted into dissimilarity coefficients (D_J) by subtracting the Jaccard coefficient from 1.00. The two most dissimilar stands, in terms of species composition, were selected as the reference stands (poles) on the horizontal axis of the ordination diagram. The two most dissimilar stands, in terms of poorness-of-fit, were selected as reference stands on the second axis. The location along the horizontal axis of each of the remaining seven stands (x_{1i}) was calculated as

$$x_{1i} = \frac{d_{1i}^2 - d_{2i}^2 + d_{12}^2}{2d_{12}},$$

where d_{1i} is the distance between the first reference point and *i*, d_{2i} is the distance between the second reference point and *i*, and d_{12} is the distance between the two reference points (Causton 1988). The location along the vertical axis of each of the remaining seven stands (y_{1i}) was calculated as

$$y_{1i} = \frac{d_{1i}^2 - d_{2i}^2 + d_{12}^2}{2d_{12}},$$

where d_{1i} is the distance between the first reference point and *i*, d_{2i} is the distance between the second reference point and *i*, and d_{12} is the distance between the two reference points (Causton 1988). The distance between any two stands in the ordination, the ordination interval (OI) was calculated as

$$OI = \sqrt{dx^2 + dy^2},$$

where dx is the distance between stands on the horizontal axis and dy is the distance between stands on the vertical axis (Cox 1996). A low OI between a pair of stands indicated that the pair was similar in terms of species composition.

Plant communities were delimited using cluster analysis (Mueller-Dombois and Ellenberg 1974) of the qualitative data collected for the woody species. A similarity half-matrix was constructed using the CC_J values obtained for the ordination. The two stands with the highest CC_J were plotted on the horizontal axis as vertical lines and then joined by a horizontal line at that CC_J value. These two stands were lumped into a new, artificial, second-level stand, known as artificial stand 1, and all of the CC_J values were recomputed. This algorithm was repeated until the most dissimilar stand was joined to the artificial stand containing the other eight stands at the lowest calculated CC_J. Any two stands with CC_J greater than or equal to 0.50 on the resulting dendrogram were considered to represent the same association (Barbour et al. 1998).

RESULTS

Floristics

The vascular flora of McKinney Roughs consisted of 372 species in 284 genera and 93 families (Table 2). The taxa in the annotated checklist (Table 3) were arranged by classes according to Cronquist's system of classification (1981). Within each class, the families, genera, and species were alphabetized. The largest families were Asteraceae (60 spp.), Poaceae (42 spp.), Fabaceae (31 spp.), Cyperaceae (17 spp.), and Euphorbiaceae (14 spp.). The largest genus was *Panicum* with seven species. *Cyperus, Desmodium, Euphorbia, Quercus, Solanum,* and *Symphyotrichum* were each represented by four species.

Neither *Abronia macrocarpa* nor *Spiranthes parksii*, the only federally listed endangered species that occur in the Oak Woods & Prairies Region (Texas Parks and Wildlife Department 1997), were observed on the tract. Seven species listed by Diggs et al. (1999) as endemic to Texas were collected, representing 1.9% of the total. Eight of the 42 species that MacRoberts et al. (2002) listed as "fidel to the xeric sandylands of the Post Oak Savanna" were collected. Thirty-three species listed by Hatch et al. (1990) as introduced to Texas were collected, representing 8.9% of the collected species. *Alternanthera philoxeroides*, which is listed as a "harmful or potentially harmful exotic species" (Harvey 1998) occurs occasionally on the banks of the Colorado River.

Table 2. Summary of the plants collected at McKinney Roughs during the 1999 and 2000 growing seasons.

Class	Families	Genera	Species		
			Native	Exotic	Total
Isoëtopsida	1	1	1	0	1
Polypodiopsida	6	6	7	0	7
Pinopsida	3	3	4	0	4
Magnoliopsida	70	225	263	19	282
Liliopsida	13	49	64	14	78
Total	93	284	339	33	372

Table 3. Annotated checklist of the vascular flora collected at McKinney Roughs during the 1999 and 2000 growing seasons. The listing for each species includes the following information: the Latin binomial with authority, vernacular name(s), an assessment of abundance, indication of native/introduced status, collection number(s) and indication of protected or noxious weed status (Palmer 1995).

CLASS ISOËTOPSIDA

SELAGINELLACEAE

Selaginella arenicola L. Underwood subsp. *riddellii* (G. Van Eseltine) R. Tryon; RIDDELL'S SPIKEMOSS; native; fidel to xeric sandylands; occasional in oak-juniper woodlands; *Marr 675*

CLASS POLYPODIOPSIDA

ASPLENIACEAE

Asplenium platyneuron (C. Linnaeus) N. Britton, E. Sterns, & J. Poggenburg; EBONY SPLEENWORT; native; infrequent in pine-oak forest; *Marr 463*

DRYOPTERIDACEAE

Woodsia obtusa (K. Sprengel) J. Torrey; COMMON WOODSIA; native; occasional along the banks of ephemeral streams; *Marr 407*

MARSILEACEAE

Marsilea vestita W. Hooker & R. Greville; WATER CLOVER; native; rare, along the margin of small pond between Pine Ridge Trail and gravel quarry; *Marr 381*, *Marr 523*

POLYPODIACEAE

Pleopeltis polypodioides (C. Linnaeus) E. Andrews & M. Windham var. *michauxiana* (C. Weatherby) E. Andrews & M. Windham; RESURRECTION FERN; native; occasional on branches of mature post oak trees; *Marr 428*, *Marr 481*

PTERIDACEAE

Cheilanthes alabamensis (S. Buckley) G. Kunze; ALABAMA LIP FERN; native; infrequent along gullies in oak-juniper forests; *Marr 406*

Cheilanthes tomentosa J. Link; WOOLLY LIP FERN; native; rare in gully along southeastern segment of Pine Ridge Trail; *Marr 413*

THELYPTERIDACEAE

Thelypteris ovata R. St. John var. *lindheimeri* (C. Christensen) A. R. Smith; LINDHEIMER'S MAIDEN FERN; native; rare: spring-fed stream below Pond Spur Trail; *Marr 574*

CLASS PINOPSIDA

CUPRESSACEAE

Juniperus ashei J. Buchholz; MOUNTAIN CEDAR, SABINO; native; rare, associated with old roads; *Marr 629, Marr 630*

Juniperus virginiana C. Linnaeus var. *virginiana*; EASTERN RED CEDAR; native; abundant; *Marr 247*

PINACEAE

Pinus taeda C. Linnaeus; LOBLOLLY PINE; native; abundant along one ravine; *Marr 248*

TAXODIACEAE

Taxodium distichum (C. Linnaeus) L. C. Richard; BALD CYPRESS; native; infrequent along the banks of the Colorado River; *Marr 319, Marr 599*

CLASS MAGNOLIOPSIDA

ACANTHACEAE

Dicliptera brachiata (F. Pursh) K. Sprengel; FALSE MINT; native; occasional in sugarberry-elm forests; *Marr 529*

Dyschoriste linearis (J. Torrey & A. Gray) K. E. O. Kuntze; NARROW-LEAF SNAKEHERB; native; occasional in oak-juniper woodlands; *Marr 231, Marr 339*

Ruellia drummondiana (C. Nees von Esenbeck) A. Gray; DRUMMOND'S RUELLIA; endemic to Texas; infrequent in pecan grove; *Marr 502*

Ruellia nudiflora (G. Engelmann *ex* A. Gray) I. Urban; VIOLET RUELLIA; native; occasional in disturbed, moist places; *Marr 340, Marr 383, Marr 430*

ACERACEAE

Acer negundo C. Linnaeus; BOX ELDER, arce; native; occasional in sugarberry-elm forests; *Marr 547*

AMARANTHACEAE

Alternanthera philoxeroides (K. von Martius) A. Grisebach; ALLIGATOR WEED; introduced; noxious weed; occasional emergent along the banks of the Colorado River; *Marr 317*

Amaranthus blitoides S. Watson; PROSTRATE PIGWEED, QUELITE MANCHADO; native; occasional along the equestrian trails; *Marr 621*

Amaranthus rudis J. Sauer; NUTTALL'S WATER HEMP; native; infrequent along banks of Colorado River; *Marr 549*

Froelichia gracilis (W. Hooker) C. Moquin-Tandon; SLENDER SNAKE COTTON; native; fidel to xeric sandylands; occasional oak-juniper woodlands; *Marr 380*

ANACARDIACEAE

Rhus aromatica W. Aiton var. *serotina* (E. Greene) A. Rehder; FRAGRANT SUMAC; native; infrequent in oak-juniper woodlands; *Marr 707*

Rhus glabra C. Linnaeus; SMOOTH SUMAC; native; infrequent in oak-juniper woodlands; *Marr 485*

APIACEAE

Bifora americana G. Bentham & W. Hooker *ex* S. Watson; PRAIRIE BISHOP'S WEED; native; occasional in oak-juniper woodlands; *Marr 292*

Chaerophyllum tainturieri W. Hooker var, *dasycarpum* W. Hooker *ex* S. Watson; HAIRY-FRUIT CHERVIL; native; occasional in oak-juniper woodlands; *Marr 227*

Daucus pusillus A. Michaux; RATTLESNAKE-WEED; native; occasional in oak-juniper woodlands; *Marr 200*

Hydrocotyle umbellata C. Linnaeus; WATER PENNY-WORT; native; occasional emergent along the banks of the Colorado River; *Marr 585*

Limnosciadium pinnatum (A. P. de Candolle) M. Mathias & L. Constance; ARKANSAS DOGSHADE; native; infrequent in gravel pits; *Marr 383*

Spermolepis echinata (T. Nuttall *ex* A. P. de Candolle) A. A. Heller; BRISTLY SCALESEED; native; occasional in oak-juniper woodlands; *Marr 203*

AQUIFOLIACEAE

Ilex decidua T. Walter; POSSUM-HAW, DECIDUOUS HOLLY; native; occasional along ephemeral streams; *Marr 499*

Ilex vomitoria W. Aiton; YAUPON, CASSINE; native; frequent in oak-juniper woodlands; *Marr 608*

ASCLEPIADACEAE

Asclepias asperula (J. Decaisne) R. Woodson subsp. *capricornu* (R. Woodson) R. Woodson; ANTELOPE-HORNS; native; occasional in oak-juniper woodlands; *Marr 192*

Asclepias oenotheroides A. von Chamisso & D. von Schlechtendal; CLUSTERED MILKWEED, HIERBA DE ZIZOTES; native; rare in disturbed communities; *Marr 605*

Asclepias verticillata C. Linnaeus; WHORLED MILKWEED; native; infrequent in oak-juniper forests; *Marr 278*, *Marr 361*, *Marr 425*

Cynanchum barbigerum (G. Scheele) L. Shinners; BEARDED SWALLOW-WORT; native; occasional in cedar elm-mesquite woodlands; *Marr 310*

Matelea reticulata (G. Engelmann *ex* A. Gray) R. Woodson; GREEN MILKWEED VINE; native; occasional in cedar elm and oak-juniper woodlands; *Marr 222*

ASTERACEAE

Achillea millefolium C. Linnaeus; COMMON YARROW; native; occasional along edges of oak-juniper forests; *Marr 124*

Acmella oppositifolia (J. de Lamarck) R. Jansen var. *repens* (T. Walter) R. Jansen; CREEPING SPOTFLOWER; native; rare along bank of Colorado River; *Marr 587*

Ambrosia psilostachya A. P. de Candolle; WESTERN RAGWEED; native; occasional in disturbed communities; *Marr 514*

Ambrosia trifida C. Linnaeus; GIANT RAGWEED; native; occasional in disturbed areas; *Marr 527*

Amphiachyris dracunculoides (A. P. de Candolle) T. Nuttall; COMMON BROOMWEED; native; occasional in disturbed areas; *Marr 564*

Aphanostephus skirrhobasis (A. P. de Candolle) W. Trelease var. *skirrhobasis*; ARKANSAS LAZY DAISY; native; occasional in oak-juniper woodlands; *Marr 355*

Bidens frondosa C. Linnaeus; DEVIL'S BEGGAR'S-TICKS; native; infrequent along the Colorado River; *Marr 573*

Brickellia eupatorioides (C. Linnaeus) L. Shinners; FALSE BONESET; native; frequent in grasslands along Grassland and Ranch Ridge Trails; *Marr 536*

Calyptocarpus vialis C. Lessing; STRAGGLER DAISY, HIERBA DEL CABALLO; native, frequent in sugarberry-elm forests; *Marr 286*

Chaetopappa asteroides T. Nuttall *ex* A. P. de Candolle; COMMON LEAST DAISY; native; frequent in openings of oak-juniper woodlands; *Marr 202*

Chaptalia texana E. Greene; SILVERPUFF; endemic to Texas, infrequent in oak-juniper forests; *Marr 234*

Chloracantha spinosa (G. Bentham) G. Nesom; SPINY-ASTER; native; occasional on sandy beaches along Colorado River; *Marr 320*

Chrysopsis pilosa T. Nuttall; SOFT GOLDEN-ASTER; native; frequent in disturbed areas; *Marr 437*

Conoclinium coelestinum (C. Linnaeus) A. P. de Candolle; MISTFLOWER; native; occasional in sugarberry-elm forests; *Marr 572*, *Marr 584*

Coreopsis wrightii (A. Gray) H. Parker; ROCK COREOPSIS; native; frequent in oak-juniper woodlands; *Marr 357*, *Marr 374*

Croptilon divaricatum (T. Nuttall) C. Rafinesque-Schmaltz; SCRATCH DAISY; native; occasional in gravel quarry; *Marr 570*

Echinacea angustifolia A. P. de Candolle; PURPLE CONEFLOWER; native; infrequent in oak-juniper woodlands; *Marr 346*, *Marr 472*

Eclipta prostrata (C. Linnaeus) C. Linnaeus; PIEPLANT, YERBA DE TAGO; native; frequent in disturbed areas; *Marr 293*

Erigeron strigosus G.H. Muhlenberg *ex* C. von Willdenow; PRAIRIE FLEABANE; native; infrequent in cedar elm woodlands; *Marr 255*

Eupatorium serotinum A. Michaux; FALL BONESET; native; occasional along margins of ponds and banks of the Colorado River; *Marr 450*, *Marr 532*

Evax verna C. Rafinesque-Schmaltz; RABBIT-TOBACCO; native; occasional in oak-juniper woodlands; *Marr 223*

Facelis retusa (J. de Lamarck) K. H. Schultz-Bipontinus; FACELIS; introduced; infrequent in disturbed areas of the oak-juniper woodlands; *Marr 238*

Gaillardia aestivalis (T. Walter) H. Rock; PRAIRIE GAILLARDIA; native; occasional in oak-juniper woodlands; *Marr 265*, *Marr 360*

Gaillardia amblyodon J. Gay; RED GAILLARDIA; native, infrequent in oak-juniper woodlands; *Marr 356*

Helenium amarum (C. Rafinesque-Schmaltz) H. Rock var. *amarum*; BITTERWEED; native; frequent in disturbed areas; *Marr 566*

Helenium quadridentatum J. de Houtton Labillardière; ROSILLA; native; infrequent on sandy beaches of Colorado River; *Marr 321*

Helianthus annuus C. Linnaeus; COMMON SUNFLOWER, MIRASOL; native; occasional in disturbed areas; *Marr 398*

Helianthus debilis T. Nuttall; WEAK-STEM SUNFLOWER; endemic to Texas; occasional in oak-juniper woodlands; *Marr 471*

Heterotheca subaxillaris (J. de Lamarck) N. Britton & H. Rusby; CAMPHOR WEED; native; frequent in disturbed areas; *Marr 506*

Hieracium gronovii C. Linnaeus; GRONOVIUS' HAWKWEED; native; occasional in oak-pine forest; *Marr 480*

Iva annua C. Linnaeus; SHARP-BRACT SUMPWEED; native; occasional along the banks of Colorado River; *Marr 595*

Krigia occidentalis T. Nuttall; WESTERN DWARF DANDELION; native; frequent in oak-juniper woodlands; *Marr 236*

Krigia virginica (C. Linnaeus) C. von Willdenow; CAROLINA DWARF DANDELION; native; occasional in oak-juniper woodlands; *Marr 229*

Lactuca floridana (C. Linnaeus) J. Gaertner; WOODLAND LETTUCE; native; occasional in sugarberry-elm forests; *Marr 526*

Liatris aspera A. Michaux; ROUGH GAYFEATHER; native; infrequent in pine-oak forest; *Marr 537*

Liatris elegans (T. Walter) A. Michaux; PINK-SCALE GAYFEATHER; native; occasional in oak-juniper woodlands; *Marr 470*

Liatris mucronata A. P. de Candolle; NARROW-LEAF GAYFEATHER; native; occasional in oak-juniper woodlands; *Marr 350, Marr 466*

Lindheimera texana A. Gray & G. Engelmann; TEXAS YELLOW STAR; native; occasional in cedar elm and oak-juniper woodlands; *Marr 303*

Lygodesmia texana (J. Torrey & A. Gray) E. Greene; SKELETON-PLANT; native; occasional in cedar elm and oak-juniper woodlands; *Marr 298*

Mikania scandens (C. Linnaeus) C. von Willdenow; CLIMBING HEMP-WEED; native; occasional along the banks of the Colorado River; *Marr 533*

Palafoxia reverchonii (B. Bush) V. Cory; REVERCHON'S PALAFOXIA; endemic to Texas; fidel to xeric sandylands; occasional in oak-juniper woodlands; *Marr 349, Marr 467*

Parthenium hysterophorus C. Linnaeus; FALSE RAGWEED, CICUTILLA; native; frequent in disturbed areas; *Marr 528*

Pluchea camphorata (C. Linnaeus) A. P. de Candolle; CAMPHOR WEED; native; occasional in sugarberry-elm forest; *Marr 514*

Pluchea purpurascens (O. Swartz) A. P. de Candolle; PURPLE MARSH-FLEABANE, CANELA; native; occasional along ephemeral streams and Colorado River; *Marr 550*

Pseudognaphalium obtusifolium (C. Linnaeus) O. Hilliard & B. D. Burtt; FRAGRANT CUDWEED; native; infrequent in disturbed upland areas; *Marr 469*

Ratibida columnifera (T. Nuttall) E. Wooton & P. Standley; MEXICAN-HAT; native; occasional in cedar elm woodlands; *Marr 313*

Rudbeckia hirta C. Linnaeus; BLACK-EYED-SUSAN; native; occasional in disturbed areas; *Marr 260, Marr 311*

Sclerocarpus uniserialis (G. Bentham) W. Hemsley; MEXICAN BONE-BRACT; native; occasional in disturbed areas; *Marr 596, Marr 620*

Senecio ampullaceus W. Hooker; TEXAS GROUNDSEL; endemic to Texas; occasional in cedar elm woodlands; *Marr 117*

Senecio glabellus J. Poiret; BUTTERWEED; native; infrequent in cedar-elm woodlands; *Marr 256*

Solidago canadensis C. Linnaeus; COMMON GOLDENROD; native; occasional in disturbed areas along floodplain; *Marr 594*

Solidago radula T. Nuttall; ROUGH GOLDENROD; native; occasional in oak-juniper woodlands; *Marr 276, Marr 424, Marr 539*

Symphyotrichum divaricatum (T. Nuttall) G. Nesom; ANNUAL ASTER, HIERBA DEL MARRANO; native; occasional in moist, disturbed places; *Marr 603*

Symphyotrichum drummondii (J. Lindley) G. Nesom var. *texanum* (E. S. Burgess) G. Nesom; TEXAS ASTER; native; occasional in oak-juniper woodlands; *Marr 601*

Symphyotrichum ericoides (C. Linnaeus) G. Nesom; HEATH ASTER; native; occasional in disturbed areas; *Marr 616*

Symphyotrichum pratense (C. Rafinesque-Schmaltz) G. Nesom; MEADOW ASTER; native; occasional in disturbed areas; *Marr 617*

Verbesina encelioides (A. Cavanilles) G. Bentham & J. Hooker *ex* A. Gray; GOLDEN-CROWNBEARD; native; infrequent in disturbed areas; *Marr 444*

Verbesina virginica C. Linnaeus var. *virginica*; FROSTWEED; native; frequent in sugarberry-elm forests; *Marr 530*

Vernonia texana (A. Gray) J. K. Small; TEXAS IRONWEED; native; occasional in oak-juniper woodlands; *Marr 389*

Xanthium strumarium C. Linnaeus; COCKLEBUR, ABROJO; native; occasional in disturbed, moist soils; *Marr 522, Marr 552*

BERBERIDACEAE

Berberis trifoliolata M. Moricand; AGARITO, CURRANT-OF-TEXAS; native; infrequent in oak-juniper woodlands; *Marr 676*

BIGNONIACEAE

Campsis radicans (C. Linnaeus) B. Seemann *ex* E. Bureau; TRUMPET CREEPER; native; occasional along ephemeral streams; *Marr 281, Marr 333*

BORAGINACEAE

Heliotropium amplexicaule M. H. Vahl; VIOLET HELIOTROPE; introduced; infrequent in disturbed areas; *Marr 409, Marr 441*

BRASSICACEAE

Descurainia pinnata (T. Walter) N. Britton; TANSY MUSTARD; native; infrequent in disturbed areas; *Marr 120*

Lepidium virginicum C. Linnaeus; PEPPERWORT; native; occasional in disturbed areas; *Marr 190*

BUDDLEJACEAE

Polypremum procumbens C. Linnaeus; JUNIPER LEAF; native; frequent in oak-juniper woodlands; *Marr 206, Marr 270*

CACTACEAE

Echinocereus reichenbachii (Terscheck *ex* W. Walpers) F. A. Haage; LACE CACTUS; native; occasional in oak-juniper woodlands; *Marr 366*

Opuntia engelmannii J.Salm-Reifferscheid-Dyck var. *lindheimeri* (G, Engelmann) B. Parfitt & D. Pinkava; TEXAS PRICKLY PEAR, NOPAL; native; occasional in oak-juniper woodlands; *Marr 348*

Opuntia humifusa (C. Rafinesque-Schmaltz) C. Rafinesque-Schmaltz; EASTERN PRICKLY PEAR; native; occasional in oak-juniper woodlands; *Marr 295*

Opuntia leptocaulis A. P. de Candolle; TASAJILLO, PENCIL CACTUS; native; occasional in disturbed upland areas; *Marr 451*

Thelocactus setispinus (G. Engelmann) E. Anderson; HEDGEHOG CACTUS; native; rare in oak-juniper woodlands; *Marr 366*

CAMPANULACEAE

Triodanis perfoliata (C. Linnaeus) J. Nieuwland var. *biflora* (H. Ruiz López & J. Pavón) T. Bradley; SMALL VENUS LOOKING-GLASS; native; occasional in oak-juniper woodlands; *Marr 230*

CAPPARACEAE

Polanisia dodecandra A. P. de Candolle; CLAMMY WEED; native; infrequent in disturbed upland areas; *Marr 379*

CAPRIFOLIACEAE

Lonicera japonica C. Thunberg; JAPANESE HONEYSUCKLE; introduced; rare: along north-facing slope of easternmost drainage; *Marr 677*

Symphoricarpos orbiculatus C. Moench; CORALBERRY; native; rare in cedar-elm forest; *Marr 253*

Viburnum rufidulum C. Rafinesque-Schmaltz; RUSTY BLACKHAW; native; occasional along ephemeral stream; *Marr 304*, *Marr 520*

CARYOPHYLLACEAE

Polycarpon tetraphyllum (C. Linnaeus) C. Linnaeus; POLYCARP; native; occasional in disturbed upland areas; *Marr 173*

CISTACEAE

Helianthemum rosmarinifolium F. Pursh; ROSEMARY SUN-ROSE; native; occasional in oak-juniper woodlands; *Marr 193*

Lechea san-sabeana (S. Buckley) A. Hogdon; SAN SABA PINWEED; endemic to Texas; infrequent in oak-juniper woodlands; *Marr 207*

Lechea tenuifolia A. Michaux; NARROWLEAF PINWEED; native; occasional in oak-juniper woodlands; *Marr 242*

CLUSIACEAE

Hypericum drummondii (R. Greville & W. Hooker) J. Torrey ; NITS-AND-LICE; native; frequent in oak-juniper woodlands; *Marr 478*

Hypericum hypericoides (C. Linnaeus) H. von Crantz subsp. *hypericoides*
ST. ANDREW'S CROSS; native; occasional in oak-juniper and oak-pine forests; *Marr 411*

CONVOLVULACEAE
Dichondra carolinensis A. Michaux; CAROLINA PONYFOOT; native; infrequent along channels of ephemeral streams; *Marr 262*
Evolvulus sericeus O. Swartz var. *sericeus*; WHITE EVOLVULUS; native; occasional in oak-juniper woodlands; *Marr 273*
Ipomoea cordatotriloba A. Dennstaedt; PURPLE BINDWEED; native; infrequent in disturbed areas; *Marr 373*; *Marr 390*; *Marr 673*

CORNACEAE
Cornus drummondii C. von Meyer; ROUGH-LEAF DOGWOOD; native; occasional along ephemeral streams; *Marr 369*

CUCURBITACEAE
Cucumis melo C. Linnaeus subsp. *melo*; MUSKMELON; introduced; rare, near homesite at end of road to Windmill Ranch; *Marr 593*
Cucurbita foetidissima K. Kunth; BUFFALO GOURD, CALABA ILLA LOCA; native; occasional in disturbed areas; *Marr 563*
Melothria pendula C. Linnaeus var. *pendula*; MELONCITA, SPECKLED GOURD; native; infrequent in sugarberry-elm forest; *Marr 283*

CUSCUTACEAE
Cuscuta coryli G. Engelmann; HAZEL DODDER; native; rare in disturbed habitats; *Marr 513*

EBENACEAE
Diospyros texana G. Scheele; MEXICAN PERSIMMON, CHAPOTE; native; occasional in oak-juniper and cedar elm woodlands; *Marr 386*

ERICACEAE
Vaccinium arboreum H. Marshall var. *arboreum*; FARKLEBERRY; native; infrequent in oak-juniper and oak-pine forests; *Marr 280*

EUPHORBIACEAE
Acalypha gracilens A. Gray var. *monococca* G. Engelmann *ex* A. Gray; SLENDER ONE-SEED COPPERLEAF; native; frequent in oak-juniper woodlands; *Marr 458*, *Marr 498*
Acalypha ostryifolia J. Riddell; HOP-HORNBEAN COPPERLEAF; native; infrequent in sugarberry-elm forests; *Marr 403*
Cnidoscolus texanus (J. Müller) J. K. Small; BULL NETTLE, MALA MUJER; native; fidel to xeric sandylands; occasional in disturbed areas; *Marr 266*
Croton capitatus A. Michaux var. *lindheimeri* (G. Engelmann & A. Gray) J. Müller; WOOLLY CROTON; native; frequent in disturbed areas; *Marr 468*

Croton monanthogynus A. Michaux; PRAIRIE TEA; native; frequent in disturbed upland areas; *Marr 434*

Croton texensis (J. Klotzch) J. Müller var. *texensis*; TEXAS CROTON; native; occasional in disturbed areas; *Marr 556*

Euphorbia dentata A. Michaux; TOOTHED SPURGE; native; infrequent in oak-juniper woodlands; *Marr 258*, *Marr 475*

Euphorbia marginata F. Pursh; SNOW-ON-THE-MOUNTAIN; native; occasional in disturbed bottomland areas; *Marr 512*

Euphorbia nutans M. Lagasca y Segura; EYEBANE; native; occasional in disturbed areas; *Marr 561*, *Marr 602*

Euphorbia prostrata W. Aiton; PROSTRATE SPURGE; native; frequent in disturbed areas; *Marr 394*

Phyllanthus polygonoides T. Nuttall *ex* K. Sprengel; KNOTWEED LEAF-FLOWER; native; occasional in disturbed areas; *Marr 232*; *Marr 417*

Ricinus communis C. Linnaeus; CASTOR BEAN, HIGUERILLA; introduced; rare along the Colorado River; *Marr 667*

Sapium sebiferum (C. Linnaeus) W. Roxburg; CHINESE TALLOW TREE; introduced; infrequent along the Colorado River and ephemeral streams; *Marr 610*, *Marr 666*

Tragia brevispica G. Engelmann & A. Gray; SHORT-SPIKE NOSEBURN; native; occasional in cedar elm-mesquite woodlands; *Marr 309*

FABACEAE

Amorpha fruticosa C. Linnaeus; FALSE INDIGO; native; infrequent in sugarberry-elm forests; *Marr 674*

Centrosema virginianum (C. Linnaeus) G. Bentham; BUTTERFLY PEA; native; occasional in oak-juniper and cedar elm woodlands; *Marr 352*

Chamaecrista fasciculata var. *fasciculata* (A. Michaux) E. Greene; PARTRIDGE PEA; native; occasional in disturbed upland areas; *Marr 405*

Dalea aurea T. Nuttall *ex* F. Pursh; GOLDEN DALEA; native; infrequent in disturbed upland areas; *Marr 343*

Dalea multiflora (T. Nuttall) L. Shinners; WHITE PRAIRIE CLOVER; native; occasional in grassy openings over clayey soils; *Marr 347*

Desmanthus illinoënsis (A. Michaux) C. MacMillan *ex* B. Robinson & M. Fernald; ILLINOIS BUNDLEFLOWER; native; infrequent in oak-pine forest; *Marr 376*

Desmanthus virgatus (C. Linnaeus) C. von Willdenow; TWIGGY BUNDLEFLOWER; native; occasional in oak-pine forest and oak-juniper forests; *Marr 279*

Desmodium ciliare (G. H. Muhlenberg *ex* C. von Willdenow) A. P. de Candolle; PANICLED TICK-CLOVER; native; occasional in oak-juniper and oak-pine forests; *Marr 277*

Desmodium nudiflorum (C. Linnaeus) A. P. de Candolle; BARE-STEM TICK-CLOVER; native; occasional in oak-juniper woodlands; *Marr 362*

Desmodium obtusum (G. H. Muhlenberg *ex* C. von Willdenow) A. P. de Candolle; RIGID TICK-CLOVER; native; occasional in oak-pine forest; *Marr 332*

Desmodium paniculatum (C. Linnaeus) A. P. de Candolle; PANICLED TICK-CLOVER; native; occasional in oak-juniper and cedar elm woodlands; *Marr 483*

Eysenhardtia texana G. Scheele; BEE BUSH, VARA DULCE; native; occasional in disturbed upland areas; *Marr 308*, *Marr 421*

Galactia volubilis (C. Linnaeus) N. Britton; DOWNY MILKPEA; native; occasional in oak-juniper woodlands; *Marr 410*

Glottidium vesicaria (N. von Jacquin) R. Harper; BLADDER POD; native; infrequent near ponds and Colorado River; *Marr 567*

Indigofera miniata C. Ortega; SCARLET PEA; native; occasional in cedar elm woodlands; *Marr 419*

Lespedeza procumbens A. Michaux; TRAILING BUSH CLOVER; native; occasional in oak-juniper woodlands; *Marr 576*

Lespedeza virginica C. Linnaeus; SLENDER BUSH CLOVER; native; infrequent in pine-oak forest; *Marr 482*

Medicago sativa C. Linnaeus; ALFALFA, LUCERNE; introduced; occasional in disturbed areas; *Marr 240*

Melilotus albus F. Medikus; SWEET WHITE CLOVER, HUBAM; introduced; infrequent in disturbed areas; *Marr 433*

Mimosa aculeaticarpa C. Ortega var. *biuncifera*; CAT'S CLAW MIMOSA; native; occasional in disturbed upland areas; *Marr 345*

Mimosa nuttallii (A. P. Candolle) B. L. Turner; SENSITIVE BRIER; native; occasional in disturbed areas; *Marr 364*

Neptunia lutea (M. Leavenworth) G. Bentham; YELLOW-PUFF; native; occasional in oak-juniper and cedar elm woodlands; *Marr 336*

Parkinsonia aculeata C. Linnaeus; RETAMA; native; occasional in oak-juniper and cedar elm woodlands; *Marr 296*, *Marr 327*

Prosopis glandulosa J. Torrey; HONEY MESQUITE; native; frequent in disturbed upland areas; *Marr 216*

Sesbania drummondii (P. Rydberg) V. Cory; RATTLEBUSH; native; occasional near ponds and along the Colorado River; *Marr 378*

Sesbania exaltata (C. Rafinesque-Schmaltz) P. Rydberg *ex* A. Hill; BEQUILLA; native; infrequent on gravel bars in the Colorado River; *Marr 548*

Sophora affinis J. Torrey & A. Gray; EVE'S NECKLACE; native; occasional in oak-juniper forests; *Marr 476*

Strophostyles helvula (C. Linnaeus) S. Elliott; AMBERIQUE BEAN; native; occasional in disturbed upland areas; *Marr 408*, *Marr 439*

Stylosanthes biflora (C. Linnaeus) N. Britton, E. Sterns, & J. Peggenburg; PENCIL-FLOWER; native; occasional in oak-juniper woodlands; *Marr 275*, *Marr 334*

Tephrosia virginiana (C. Linnaeus) C. Pearson; GOAT'S RUE; native; infrequent in oak-pine forest; *Marr 288*

Zornia bracteata J. F. Gmelin; VIPERINA; native; fidel to xeric sandylands; occasional in disturbed upland areas; *Marr 359*

FAGACEAE

Quercus marilandica O. von Münchhausen; BLACKJACK OAK; native; occasional in oak-juniper and oak-pine communities; *Marr 609*

Quercus shumardii S. Buckley; SHUMARD OAK; native; rare in sugarberry- elm forest; *Marr 691*

Quercus sinuata T. Walter var. *sinuata*; BLUFF OAK; native; occasional in sugarberry-elm forest; *Marr 574*, *Marr 579*
Quercus stellata F. von Wangenheim var. *stellata*; POST OAK; native; abundant in oak-juniper and oak-pine forests; *Marr 524*

GENTIANACEAE
Centaurium texense (A. Grisebach *ex* W. Hooker) M. Fernald; LADY BIRD'S CENTAURY; native; occasional in cedar elm and oak-juniper woodlands; *Marr 301*
Sabatia campestris T. Nuttall; PRAIRIE ROSE-GENTIAN; native; occasional in oak-juniper woodlands; *Marr 254*

HYDROPHYLLACEAE
Hydrolea ovata T. Nuttall; WATERLEAF; native; rare: gravel pits; *Marr 568*
Nemophila phacelioides T. Nuttall; BABY BLUE EYES; native; occasional in sugarberry-elm forests; *Marr 113*
Phacelia congesta W. Hooker; BLUE-CURLS; native; occasional in sugarberry-elm forests; *Marr 259*

JUGLANDACEAE
Carya illinoinensis (F. von Wangenheim) K. Koch; PECAN, NOGAL MORADO; native; abundant in sugarberry-elm forests; *Marr 284*
Carya texana S. Buckley; BLACK HICKORY; native; occasional in oak-juniper and oak-pine forests; *Marr 220*, *Marr 565*

KRAMERIACEAE
Krameria lanceolata J. Torrey; CRAMERIA; native; occasional in oak-juniper woodlands; *Marr 225*

LAMIACEAE
Hedeoma acinoides G. Scheele; SLENDER HEDEOMA; native; infrequent in oak-juniper woodlands; *Marr 228*
Monarda citriodora V. de Cervantes *ex* M. Lagusca y Segura; LEMON BEEBALM; native; frequent in disturbed upland areas; *Marr 326*
Scutellaria drummondii G. Bentham; DRUMMOND'S SKULLCAP; native; occasional in oak-juniper woodlands; *Marr 204*
Stachys crenata C. Rafinesque-Schmaltz; LAMB'S EARS; native; occasional in cedar elm woodlands; *Marr 257*
Teucrium canadense C. Linnaeus; AMERICAN GERMANDER; native; infrequent in moist soil of disturbed areas; *Marr 416*

LINACEAE
Linum hudsonioides J. Planchon; FLAX; native; occasional in oak-juniper woodlands; *Marr 235*
Linum medium (J. Planchon) N. Britton var. *texanum* (J. Planchon) M. Fernald; TEXAS FLAX; native; occasional in gravel pits and washes; *Marr 385*, *Marr 415*

Linum rigidum F. Pursh var. *rigidum*; STIFF-STEM FLAX; native; occasional in oak-juniper woodlands; *Marr 358*

LYTHRACEAE

Ammannia coccinea C. Rottbøll; TOOTH-CUP; native; occasional near ponds; *Marr 461*, *Marr 586*

MALVACEAE

Abutilon fruticosum J. Guillemin & G. Perrottet; INDIAN MALLOW, PELOTAZO; native; occasional in openings of oak-juniper woodlands; *Marr 325*

Malvaviscus drummondii J. Torrey & A. Gray; TEXAS MALLOW; native; occasional in sugarberry-elm forests; *Marr 402*

Modiola caroliniana (C. Linnaeus) G. Don.; CAROLINA MODIOLA; native; occasional in cedar elm woodlands; *Marr 125*

Sida abutifolia P. Miller; SIDA; native; occasional in disturbed upland areas; *Marr 455*

Sida lindheimeri G. Engelmann & A. Gray; LINDHEIMER'S SIDA; native; infrequent in oak-juniper woodlands; *Marr 338*

MELIACEAE

Melia azedarach C. Linnaeus; CHINABERRY-TREE, CAVELÓN; introduced; frequent in disturbed sections of sugarberry-elm forest; *Marr 545*

MENISPERMACEAE

Cocculus carolinus (C. Linnaeus) A.P. de Candolle; CAROLINA SNAILSEED; native; occasional in sugarberry-elm forests; *Marr 404*, *Marr 457*, *Marr 600*

MOLLUGINACEAE

Mollugo verticillata C. Linnaeus; GREEN CARPETWEED; native; occasional in disturbed areas; *Marr 173*; *Marr 372*

MORACEAE

Maclura pomifera (C. Rafinesque-Schmaltz) C. Schneider; BOIS D'ARC, NARANJO CHINO; native; infrequent in sugarberry-elm forest; *Marr 403*

Morus alba C. Linnaeus; WHITE MULBERRY, MORAL BLANCO; introduced; occasional along ravines in oak-juniper forests; *Marr 412*

Morus rubra C. Linnaeus var. *rubra*; RED MULBERRY, MORAL; native; infrequent in sugarberry-elm forests; *Marr 510*

NYCTAGINACEAE

Boerhavia coccinea P. Miller; SCARLET SPIDERLING; native; occasional in disturbed areas; *Marr 454*, *Marr 558*

Boerhavia linearifolia A. Gray; NARROWLEAF SPIDERLING; native; infrequent in disturbed upland areas; *Marr 377*

Mirabilis jalapa C. Linnaeus; COMMON FOUR O'CLOCK; introduced; occasional in sugarberry-elm forest; *Marr 618*

Mirabilis linearis (F. Pursh) A. Heimerl; LINEAR-LEAF FOUR O'CLOCK; native; infrequent in oak-juniper and cedar elm woodlands; *Marr 400, Marr 422*

OLEACEAE

Forestiera pubescens T. Nuttall var. *pubescens* SPRING HERALD; native; occasional in oak-juniper and cedar elm woodlands; *Marr 269*

Fraxinus pennsylvanica H. Marshall; GREEN ASH; native; frequent in sugarberry-elm forests; *Marr 387, Marr 671*

Fraxinus texensis (A. Gray) C. Sargent; TEXAS ASH; native; locally frequent in the ravine that bisects the nature preserve; *Marr 396*

Ligustrum japonicum C. Thunberg; JAPANESE PRIVET; introduced; rare along eastern property boundary; *Marr 679*

ONAGRACEAE

Calylophus berlandieri E. Spach; SQUARE-BUD PRIMROSE; native; occasional in oak-pine forest; *Marr 271*

Gaura parviflora D. Douglas *ex* J. Lehmann; LIZARD TAIL; native; occasional in oak-juniper and cedar elm woodlands; *Marr 314*

Gaura sinuata T. Nuttall *ex* N. Séringe; WAVY-LEAVED GAURA; native; occasional in oak-juniper and cedar elm woodlands; *Marr 122*

Ludwigia octovalvis (N. von Jacquin) P. Raven subsp. *octovalvis*; SHRUBBY WATER PRIMROSE; native; occasional along banks of Colorado River; *Marr 583*

Ludwigia peploides (K. Kunth) P. Raven subsp. *glabrescens* (K. E. O. Kuntze) P. Raven; WATER-PRIMROSE; native; infrequent along pond margins; *Marr 495*

Oenothera speciosa T. Nuttall; SHOWY PRIMROSE, AMAPOLA DEL CAMPO; native; frequent in oak-juniper and cedar elm woodlands; *Marr 127*

PAPAVERACEAE

Argemone albiflora C. Linnaeus; WHITE PRICKLY POPPY; native; occasional in disturbed upland areas; *Marr 479*

PASSIFLORACEAE

Passiflora lutea C. Linnaeus; YELLOW PASSION FLOWER; native; occasional in oak-juniper woodlands; *Marr 426*

PHYTOLACCACEAE

Phytolacca americana C. Linnaeus var. *americana*; POKEWEED; native; occasional in pecan grove; *Marr 401*

Rivina humilis C. Linnaeus; PIGEON BERRY; native; frequent in sugarberry-elm forests; *Marr 424, Marr 504*

PLANTAGINACEAE

Plantago aristata A. Michaux ; BUCKTHORN; native; occasional in openings of oak-juniper woodlands; *Marr 191*

PLATANACEAE

Platanus occidentalis C. Linnaeus; AMERICAN SYCAMORE; native; frequent on floodplain of the Colorado River; *Marr 541*, *Marr 668*

POLEMONIACEAE

Gilia incisa (A. Brand) V. Cory & H. Parks; CUT-LEAF GILIA; native; infrequent in oak-juniper woodlands; *Marr 274*, *Marr 423*

POLYGALACEAE

Polygala incarnata C. Linnaeus; PINK MILKWORT; native; rare in oak-pine forest; *Marr 330*

POLYGONACEAE

Eriogonum longifolium T. Nuttall var. *longifolium*; LONG-LEAF WILD BUCKWHEAT; native; fidel to xeric sandylands; locally frequent in gravel pits; *Marr 384*

Polygonum densiflorum C. Meisner; SNOUT SMARTWEED; native; occasional on margins of ponds; *Marr 445*, *Marr 516*

Polygonum punctatum S. Elliott; WATER SMARTWEED; native; occasional emergent along Colorado River; *Marr 316*

Rumex hastatulus W. Baldwin; HEART-WING SORREL; native; occasional in oak-juniper woodlands; *Marr 196*

PORTULACEAE

Portulaca pilosa C. Linnaeus; SHAGGY PORTULACA, CHÍSME; native; occasional in disturbed upland areas; *Marr 456*

Portulaca umbraticola K. Kunth subsp. *lanceolata* (G. Engelmann) J. Matthews & Ketron; WING-POD PORTULACA; native; occasional in trails; *Marr 436*, *Marr 452*

Talinum parviflorum T. Nuttall; FLAME-FLOWER; native; infrequent in oak-juniper woodlands; *Marr 474*

PRIMULACEAE

Anagallis minima (C. Linnaeus) E. Krause; CHAFFWEED; introduced; infrequent in damp sand along the Colorado River; *Marr 627*

Samolus valerandi C. Linnaeus subsp. *parviflorus* (C. Rafinesque-Schmaltz) O. Hultén; THIN-LEAF BROOKWEED; native; infrequent in Colorado River; *Marr 589*

RANUNCULACEAE

Anemone berlandieri G. Pritzel; TEN-PETAL ANEMONE; native; occasional in disturbed areas; *Marr 121*

Clematis pitcheri J. Torrey & A. Gray; PUPRLE LEATHERFLOWER; native; infrequent in sugarberry-elm forest; *Marr 318*, *Marr 388*

Ranunculus sardous H. von Crantz; ROUGHSEED BUTTERCUP; introduced; infrequent along banks of Colorado River; *Marr 115*

RHAMNACEAE

Berchemia scandens (J. Hill) K. Koch; ALABAMA SUPPLE-JACK; native; occasional in sugarberry-elm forests; *Marr 680*

Frangula caroliniana (T. Walter) A. Gray; CAROLINA BUCKTHORN; native; rare in oak-juniper forest (nature preserve ravine); *Marr 692*

Ziziphus obtusifolia (W. Hooker *ex* J. Torrey & A. Gray) A. Gray var. *obtusifolia*; LOTEBUSH, CLEPE; native; occasional in disturbed areas; *Marr 287, Marr 302*

ROSACEAE

Geum canadense N. von Jaquin; WHITE AVENS; native; occasional in sugarberry-elm forest; *Marr 249*

Prunus mexicana S. Watson; MEXICAN PLUM; native; occasional along ephemeral streams; *Marr 477*

Prunus persica (C. Linnaeus) A. Batsch; PEACH, DURANZO; introduced; rare: home site at end of entrance road to Windmill Ranch; *Marr 592*

Rubus oklahomus L. Bailey; DEWBERRY; native; occasional in oak-juniper woodlands; *Marr 237*

RUBIACEAE

Cephalanthus occidentalis C. Linnaeus var. *californicus* G. Bentham; COMMON BUTTONBUSH; native; infrequent along banks of Colorado River; *Marr 502*

Diodia teres T. Walter var. *teres*; BUTTONWEED; native; occasional in oak-juniper woodlands; *Marr 354, Marr 371*

Galium pilosum W. Aiton var. *pilosum* W. Aiton; HAIRY BEDSTRAW; native; occasional in oak-juniper and oak-pine forests; *Marr 329*

Galium virgatum T. Nuttall; SOUTHWEST BEDSTRAW; native; occasional in disturbed areas; *Marr 221*

Hedyotis nigricans (J. de Lamarck) F. Fosberg; PRAIRIE BLUETS; native; occasional in disturbed areas; *Marr 351, Marr 484*

Richardia tricocca (J. Torrey & A. Gray) P. Standley; PRAIRIE BUTTONWEED; native; infrequent in disturbed areas; *Marr 370*

RUTACEAE

Ptelea trifoliata C. Linnaeus; HOPTREE, COLA DE ZORRILLO; native; occasional in oak-juniper and cedar elm woodlands; *Marr 264, Marr 305*

Zanthoxylum clava-herculis C. Linnaeus; HERCULES'- CLUB; native; infrequent in oak-juniper forests; *Marr 692*

Zanthoxylum hirsutum S. Buckley; TICKLETONGUE; native; infrequent in disturbed areas; *Marr 672*

SALICACEAE

Populus deltoides W. Barton *ex* H. Marshall; COTTONWOOD; native; frequent in sugarberry-elm forests; *Marr 543*

Salix nigra H. Marshall; BLACK WILLOW, SAÚZ; native; frequent along bank of Colorado River; *Marr 682*

SAPINDACEAE

Cardiospermum halicacabum C. Linnaeus; COMMON BALLON-VINE; FAROLITOS; native; occasional in disturbed areas; *Marr 531*

Sapindus saponaria C. Linnaeus var. *drummondii* (W. Hooker & G. Arnott) L. Benson; WESTERN SOAPBERRY, JABONCILLO; native; occasional in sugarberry-elm forests; *Marr 554*

Ungnadia speciosa S. Endlicher; MEXICAN BUCKEYE, MONILLA; native; occasional in sugarberry-elm forests; *Marr 525*

SAPOTACEAE

Sideroxylon lanuginosum A. Michaux subsp. *oblongifolium* (T. Nuttall) T. Pennington; COMA; native; infrequent in oak-juniper woodlands; *Marr 367*

SCROPHULARIACEAE

Agalinis purpurea (C. Linnaeus) F. Pennell; PURPLE GERARDIA; native; occasional in disturbed areas; *Marr 449, Marr 546*

Castilleja indivisa G. Engelmann; TEXAS PAINTBRUSH; native; occasional in oak-juniper and cedar elm woodlands; *Marr 195*

Lindernia dubia (C. Linnaeus) F. Pennell var. *anagallidea* (A. Michaux) T. Cooperrider; CLASPING FALSE PIMPERNEL; native; infrequent along pond margins; *Marr 496*

Mecardonia procumbens (P. Miller) J. K. Small; YELLOW-FLOWERED MECARDONIA; native; infrequent in cedar elm woodlands; *Marr 126*

Nuttallanthus texanus (G. Scheele) D. Sutton; TEXAS TOAD FLAX; native; infrequent in oak-juniper woodlands; *Marr 239*

Penstemon australis J. K. Small subsp. *laxiflorus* (F. Pennell) A. Bennett; LOOSE-FLOWERED PENSTEMON; native; infrequent in oak-pine forest; *Marr 272*

Verbascum thapsus C. Linnaeus; COMMON MULLEIN; introduced; infrequent in disturbed areas; *Marr 619*

Veronica peregrina C. Linnaeus subsp. *veronica*; PURSLANE SPEEDWELL; native; occasional along bank of Colorado River; *Marr 114*

SOLANACEAE

Bouchetia erecta A. P de Candolle; ERECT BOUCHETIA; native; infrequent in disturbed areas; *Marr 337*

Capsicum annuum C. Linnaeus var. *aciculare* (J. Dierbach) W. D´Arcy & W. Eshbaugh; BIRD PEPPER, CHILI PEQUIN; native; occasional in sugarberry-elm forest; *Marr 503*

Physalis angulata C. Linnaeus; CUT-LEAF GROUND CHERRY; native; infrequent along banks of Colorado River; *Marr 560*

Solanum dimidiatum C. Rafinesque-Schmaltz; WESTERN HORSE NETTLE; native; infrequent in disturbed areas; *Marr 312*

Solanum elaeagnifolium A. Cavanilles; SILVER-LEAF NIGHTSHADE, TROMPILLO; native; occasional in disturbed areas; *Marr 399*

Solanum ptycanthum M. Dunal; AMERICAN NIGHTSHADE, HIERBA MORA NEGRA; native; infrequent in disturbed areas; *Marr 438, Marr 519*

Solanum rostratum M. Dunal; BUFFALO BUR, MALA MUJER; native; infrequent in disturbed areas; *Marr 324, Marr 397*

ULMACEAE

Celtis laevigata C. von Willdenow var. *laevigata*; TEXAS SUGARBERRY, PALO ALTO; native, abundant in riparian corridor; *Marr 597*

Ulmus crassifolia T. Nuttall; CEDAR ELM, OLMO; native; abundant in sugarberry-elm forests and recovering upland forests; *Marr 683*

Ulmus americana C. Linnaeus; AMERICAN ELM; native; abundant in riparian corridor; *Marr 694*

URTICACEAE

Boehmeria cylindrica (C. Linnaeus) O. Swartz; SMALL-SPIKE FALSE NETTLE; native; occasional in sugarberry-elm forest; *Marr 581*

VALERIANACEAE

Valerianella radiata (C. Linnaeus) P. Dufresne; BEAKED CORNSALAD; native; occasional in sugarberry-elm forests; *Marr 119*

VERBENACEAE

Callicarpa americana C. Linnaeus var. *americana*; AMERICAN BEAUTY-BERRY, FILIGRANA DE MAJORCA; native; occasional in oak-juniper and pine-oak forests; *Marr 331*

Lantana urticoides A. von Hayek; TEXAS LANTANA, HIERBA DEL CRISTO; native; occasional in cedar elm woodlands; *Marr 267*, *Marr 487*

Phyla nodiflora (C. Linnaeus) E. Greene; FROGFRUIT, HIERBA DE LA VIRGIN MARÍA; native; occasional in cedar elm forests; *Marr 299*, *Marr 394*

Verbena brasiliensis J. Velloso de Miranda; BRAZILIAN VERVAIN; introduced; occasional in disturbed areas; *Marr 344*, *Marr 465*

Verbena halei J. K. Small; TEXAS VERVAIN; native; occasional in oak-juniper and cedar elm woodlands; *Marr 210*

Vitex agnus-castus C. Linnaeus; COMMON CHASTE-TREE; introduced; infrequent along riparian corridor; *Marr 685*

VIOLACEAE

Hybanthus verticillatus (C. Ortega) H. Baillon; WHORLED NOD-VIOLET; native; infrequent in oak-juniper woodlands; *Marr 299*

Viola sororia C. von Willdenow var. *missouriensis* (E. Greene) L. McKinney; MISSOURI VIOLET; native; occasional in sugarberry-elm forests; *Marr 233*

VITACEAE

Ampelopsis arborea (C. Linnaeus) B. Köhne; PEPPERVINE; native; frequent along bank of Colorado River; *Marr 588*

Cissus incisa C. Des Moulins; COW-ITCH, HIERBA DEL BUEY; native; occasion in cedar elm woodlands; *Marr 511*

Parthenocissus quinquefolia (C. Linnaeus) J. Planchon var. *quinquefolia*; VIRGINIA CREEPER, HIEDRA; native; occasional in sugarberry-elm forest; *Marr 509*

Vitis cinerea (G. Engelmann) G. Engelmann *ex* P. M. Millardet var. *cinerea*; GRAYBARK GRAPE, PARRA SILVESTRE; native; occasional in sugarberry-elm forest; *Marr 500, Marr 699*

Vitis mustangensis S. Buckley; MUSTANG GRAPE; native; infrequent in disturbed areas; *Marr 559*

CLASS LILIOPSIDA

AGAVACEAE

Yucca louisianensis W. Trelease; LOUISIANA YUCCA; native; fidel to xeric sandylands; rare: northeast of southern intersection of Ranch Ridge and Grassland Trails; *Marr 604*

ALISMATACEAE

Sagittaria graminea A. Michaux subsp. *graminea*; GRASS-LIKE ARROWHEAD; native; infrequent along margins of ponds; *Marr 268*

Sagittaria platyphylla (G. Engelmann) J. G. Smith; DELTA ARROWHEAD; native; infrequent along margins of ponds; *Marr 448*

ARACEAE

Colocasia esculenta (C. Linnaeus) H. Schott; ELEPHANT'S EAR, TARO; introduced; rare along bank of Colorado River (east of intersection of Cypress Trail with Riverside Trail); *Marr 613*

BROMELIACEAE

Tillandsia recurvata (C. Linnaeus) C. Linnaeus; SMALL BALL MOSS, GALLITOS; native; occasional in oak-juniper woodlands; *Marr 453*

Tillandsia usneoides (C. Linnaeus) C. Linnaeus; SPANISH MOSS, PASTLE; native; occasional in sugarberry-elm forests; *Marr 431*

COMMELINACEAE

Commelina diffusa N. L. Burnman; SPREADING DAYFLOWER; native; occasional in sugarberry-elm forests; *Marr 562*

Commelina erecta C. Linnaeus var. *angustifolia* (A. Michaux) M. Fernald; WIDOW'S TEARS; ERECT DAYFLOWER; native; occasional in oak-juniper woodlands; *Marr 224, Marr 375*

Tinantia anomala (J. Torrey) C. B. Clarke; FALSE DAY-FLOWER; endemic; occasional in sugarberry-elm forest; *Marr 282*

Tradescantia reverchonii B. Bush; REVERCHON'S SPIDERWORT; native; fidel to xeric sandylands; occasional in sugarberry-elm forests; *Marr 118*

CYPERACEAE

Bulbostylis capillaris (C. Linnaeus) K. Kunth *ex* C. B. Clarke; HAIR-SEDGE; native; occasional along margins of ponds; *Marr 491*

Carex cherokeënsis L. Schweinitz; CHEROKEE CARIC SEDGE; native; occasional in cedar elm woodlands; *Marr 132*

Carex planostachys G. Kunze; CEDAR CARIC SEDGE; native; occasional in oak-juniper woodlands; *Marr 712*
Carex retroflexa G. H. Muhlenberg *ex* C. von Willdenow; REFLEXED-FRUIT CARIC SEDGE; native; infrequent in oak-juniper woodlands; *Marr 250*
Cyperus ochraceus M. H. Vahl; FLAT SEDGE; native; occasional along bank of Colorado River; *Marr 557, Marr 582*
Cyperus pseudovegetus E. von Steudel var. *pseudovegetus*; FLAT SEDGE; native; infrequent in disturbed upland areas; *Marr 335*
Cyperus reflexus M. H. Vahl; BENT-AWN FLAT SEDGE; native; infrequent in oak-pine forest; *Marr 290*
Cyperus retrorsus A. Chapman; FLAT SEDGE; native; occasional in oak-juniper woodlands; *Marr 212, Marr 241*
Eleocharis geniculata (C. Linnaeus) J. J. Römer & J. A. Schultes; JOINTED SPIKE-RUSH; native; occasional along margins of ponds; *Marr 490*
Eleocharis montevidensis K. Kunth; SPIKE-RUSH; native; infrequent along margins of ponds, habitat, *Marr 569*
Eleocharis quadrangulatum (A. Michaux) J. J. Römer & J. A. Schultes; SQUARE-STEM SPIKE-RUSH; native; infrequent along margins of ponds; *Marr 508*
Fimbristylis autumnalis (C. Linnaeus) J. J. Römer & J. A. Schultes; SLENDER FIMBRISTYLIS; native; occasional along margins of ponds; *Marr 492*
Fimbristylis puberula (A. Michaux) M. H. Vahl *ex* J. K Small & N. Britton; FIMBRISTYLIS; native; infrequent in oak-juniper woodlands; *Marr 205*
Fimbristylis vahlii (J. de Lamarck) J. Link; VAHL'S FIBRISTYLIS; native; occasional along pond margins; *Marr 459*
Kyllingia brevifolia C. Rottbøll; SHORT-LEAF FLAT SEDGE; native; rare in pine-oak forest; *Marr 538*
Schoenoplectus saximontanus (M. Fernald) J. Raynal; ROCKY MOUNTAIN BULRUSH; native; occasional along pond margins; *Marr 493*
Scleria triglomerata A. Michaux; WHIP NUT-RUSH; native; occasional in oak-juniper and cedar elm woodlands; *Marr 306*

IRIDACEAE
Alophia drummondii (R. Graham) R. Foster; PURPLE PLEAT LEAF; native; infrequent in oak-juniper woodlands; *Marr 123*
Sisyrinchium angustifolium P. Miller; BERMUDA BLUE-EYED GRASS; native; occasional in cedar elm woodlands; *Marr 129*

JUNCACEAE
Juncus dichotomus S. Elliott; FORKED RUSH; native; occasional along margins of ponds; *Marr 263, Marr 291*

LEMNACEAE
Spirodela polyrhiza (C. Linnaeus) M. Schleiden; COMMON DUCKMEAT; native; infrequent in ponds; *Marr 446*

LILIACEAE

Cooperia pedunculata W. Herbert; GIANT RAIN-LILY; native; occasional in oak-juniper woodlands; *Marr 206*

Nothoscordum bivalve (C. Linnaeus) N. Britton; CROW POISON; native; frequent in disturbed areas; *Marr 614*

ORCHIDACEAE

Spiranthes lacera (C. Rafinesque-Schmaltz) C. Rafinesque-Schmaltz var. *gracilis* (J. Bigelow) C. Luer; GREEN-LIP LADIES TRESSES; native; infrequent in oak-juniper woodlands; *Marr 591*

Spiranthes tuberosa C. Rafinesque-Schmaltz; LITTLE LADIES TRESSES; native; infrequent in oak-juniper and oak-pine forests; *Marr 395*

POACEAE

Agrostis hyemalis (T. Walter) N. Britton, E. Sterns, & J. Poggenburg; SPRING BENTGRASS; native; occasional in oak-juniper woodlands; *Marr 218*

Aristida oligantha A. Michaux; OLDFIELD THREEAWN; native; frequent in disturbed areas; *Marr 615*

Aristida purpurea T. Nuttall; PURPLE THREEAWN; native; occasional in oak-juniper woodlands; *Marr 199*

Axonopus fissifolius (G. Raddi) J. Kuhlmann; COMMON CARPETGRASS; native; infrequent along ephemeral streams; *Marr 542*

Bothriochloa barbinodis (M. Lagasca y Segura) W. Herter var. *perforata* (E. Fournier) F. Gould; CANE BLUESTEM; native; occasional in disturbed areas; *Marr 507*

Bothriochloa laguroides (A. P. de Candolles) W. Herter subsp. *torreyana* (E. von Steudel) K. Allred & F. Gould; SILVER BLUESTEM; native; frequent throughout the uplands; *Marr 429*

Bouteloua curtipendula (A. Michaux) J. Torrey; SIDE-OATS GRAMA; native; occasional in oak-juniper woodlands; *Marr 392*, *Marr 488*

Bouteloua hirsuta M. Lagasca y Segura; HAIRY GRAMA; native; occasional in cedar elm woodlands; *Marr 418*, *Marr 487*

Bouteloua rigidiseta (E. von Steudel) A. Hitchcock; TEXAS GRAMA; native; infrequent in disturbed areas; *Marr 341*

Bromus catharticus M. A. Vahl; RESCUE GRASS; introduced; occasional in oak-juniper woodlands; *Marr 211*

Cenchrus spinifex A. Cavanilles; COMMON SANDBUR; native; occasional in disturbed areas; *Marr 198*, *Marr 440*

Chasmanthium latifolium (A. Michaux) H. Yates; BROADLEAF WOODOATS; native; occasional along ephemeral streams; *Marr 307*

Chasmanthium laxum (C. Linnaeus) H. Yates var. *sessiliflorum* (J. Poiret) J. Wipff & S. D. Jones; NARROWLEAF WOODOATS; native; occasional in oak-juniper forests; *Marr 365*

Chloris cucullata G. Bishoff; HOODED WINDMILL GRASS; native; occasional in disturbed areas; *Marr 215*; *Marr 363*

Cynodon dactylon (C. Linnaeus) C. Persoon var. *dactylon*; BERMUDAGRASS, PATO DE GALLO; introduced; abundant in pastures along Grassland Trail; *Marr 261*

Digitaria cognata (O. Swartz) R. Pilger ssp. *pubiflora* (G. Vasey) J. Wipff; FALL WITCHGRASS; native; occasional in oak-juniper and oak-pine forests; *Marr 197, Marr 243*

Digitaria sanguinalis (C. Linnaeus) J. Scopoli; HAIRY CRAB GRASS; introduced, occasional in cedar elm forest; *Marr 518*

Echinocloa walteri (F. Pursh) A. A. Heller; BARNYARD GRASS; native; infrequent along bank of Colorado River; *Marr 535, Marr 551*

Eragrostis pilosa (C. Linnaeus) A. Palisot de Beauvois; INDIA LOVEGRASS; introduced; occasional in oak-juniper woodlands; *Marr 209*

Eragrostis secundiflora J. Presl subsp. *oxylepis* (J. Torrey) S. Koch; RED LOVEGRASS; native; occasional in oak-juniper woodlands; *Marr 219, Marr 473*

Eragrostis superba J. Peyritsch; WILLMANN'S LOVEGRASS; introduced; infrequent in disturbed areas; *Marr 391*

Hordeum pusillum T. Nuttall; LITTLE BARLEY; native; occasional in disturbed areas; *Marr 213, Marr 285, Marr 289*

Lolium perenne C. Linnaeus; RYEGRASS; introduced; occasional in disturbed areas; *Marr 116*

Nassella leucotricha (K. von Trinius & F. Ruprecht) R. Pohl; TEXAS WINTERGRASS; native; occasional in cedar elm woodlands; *Marr 131*

Oplismenus hirtellus (C. Linnaeus) A. Palisot de Beauvois; BASKETGRASS; introduced; occasional in sugarberry-elm forests; *Marr 670*

Panicum acuminatum; O. Swartz; WOOLLY ROSETTE GRASS; native; occasional; occasional in oak-juniper woodlands; *Marr 130*

Panicum anceps A. Michaux; BEAKED PANICUM; native; occasional along ephemeral streams; *Marr 540*

Panicum hians S. Elliott; GAPING PANICUM; native; occasional along ephemeral streams; *Marr 494*

Panicum linearifolium F. Lamson-Scribner *ex* G. Nash; SLIM-LEAF ROSETTE GRASS; native; occasional in oak-juniper woodlands; *Marr 689*

Panicum obtusum K. Kunth; VINE MESQUITE; native; infrequent in disturbed areas; 328

Panicum oligosanthes J. A. Schultes var. *scribnerianum* (G. Nash) M. Fernald; native; SCRIBNER'S ROSETTE GRASS; *Marr 208, Marr 244*

Panicum sphaerocarpon S. Elliott; ROUND-SEED ROSETTE GRASS; native; occasional in oak-juniper woodlands; *Marr 217*

Paspalum plicatulum A. Michaux var. *plicatulum*; BROWNSEED PASPALUM; native; occasional in oak-juniper woodlands; *Marr 414*

Paspalum pubiflorum F. Ruprecht *ex* E. Fournier var. *pubiflorum*; HAIRY-FLOWER PASPALUM; native; occasional along margins of ponds; *Marr 323, Marr 515*

Paspalum urvillei E. von Steudel; VASEY GRASS; introduced; infrequent in disturbed areas; *Marr 442*

Phalaris caroliniana T. Walter; CAROLINA CANARY GRASS; native; infrequent along margins of ponds; *Marr 245*

Poa annua C. Linnaeus; ANNUAL BLUEGRASS; introduced; infrequent in disturbed areas; *Marr 625*

Schizachyrium scoparium (A. Michaux) G. Nash var. *scoparium*; LITTLE BLUESTEM; native; occasional in oak-juniper woodlands; *Marr 577, Marr 611*

Setaria parviflora (J. Poiret) M. Kerguélen; KNOTROOT BRISTLE GRASS; native; occasional along bank of Colorado River; *Marr 534*, *Marr 628*

Sorghum halepense (C. Linnaeus) J. Persoon; JOHNSON GRASS; introduced; occasional in disturbed areas; *Marr 443*

Tridens flavus (C. Linnaeus) A. Hitchcock; PURPLETOP; native; occasional in oak-juniper woodlands; *Marr 505*

Vulpia bromoides (C. Linnaeus) A. Gray; BROME SIXWEEKS GRASS; introduced; infrequent in disturbed areas; *Marr 246*

SMILACACEAE

Smilax bona-nox C. Linnaeus var. *bona-nox*; SAW GREENBRIAR, ZARZAPARRILLA; native; occasional in oak-juniper woodlands and sugarberry-elm forests; *Marr 315*

Physiognomy

I sampled nine of the least-disturbed stands at MR through a series of line-intercept transects during the summer and fall of 2000 (Table 4). Stands that had obviously been disturbed by mining, selective logging, road construction, or farming and stands that were even-aged were not surveyed. Pit-and-mound topography, as well as, snags and coarse woody debris characterized the surveyed stands (White and White 1996). The larger trees in these stands were near the maximum size of those present at MR. These large trees had spreading crowns and lacked large lower branches. The placement of these transects (Figure 2) encompassed both terraces of the Colorado River floodplain (transects FT1 and FT2), three ravines formed by ephemeral streams (transects RWR, RNP and RPG) and four upland sites on the surrounding plain (transects URS, UBS, UBW and UBN). The number of intervals sampled along the transects ranged from five to 20 depending on the size of the stand.

Woody vegetation dominated each of these stands (Table 5). The linear coverage index (LCI) for woody vegetation with DBH≥10 cm ranged from 0.50 along UBN to 1.38 along FT2. The eight stands with LCIs greater than 60% were classified as forests (Diamond et al. 1987). For woody vegetation with DBH<10 cm, the LCI ranged from 0.35 along FT2 to 0.93 along RWR. For herbaceous vegetation, the LCI ranged from 0.01 along RPG to 0.40 along RNP. Deciduous trees had higher RC than evergreen trees on the floodplain terraces, along two of the three ravines, and along three of the four upland stands (Table 6). Evergreen shrubs and saplings had higher RC than deciduous species along two of the ravines and along three of the four uplands stands. Annual herbs

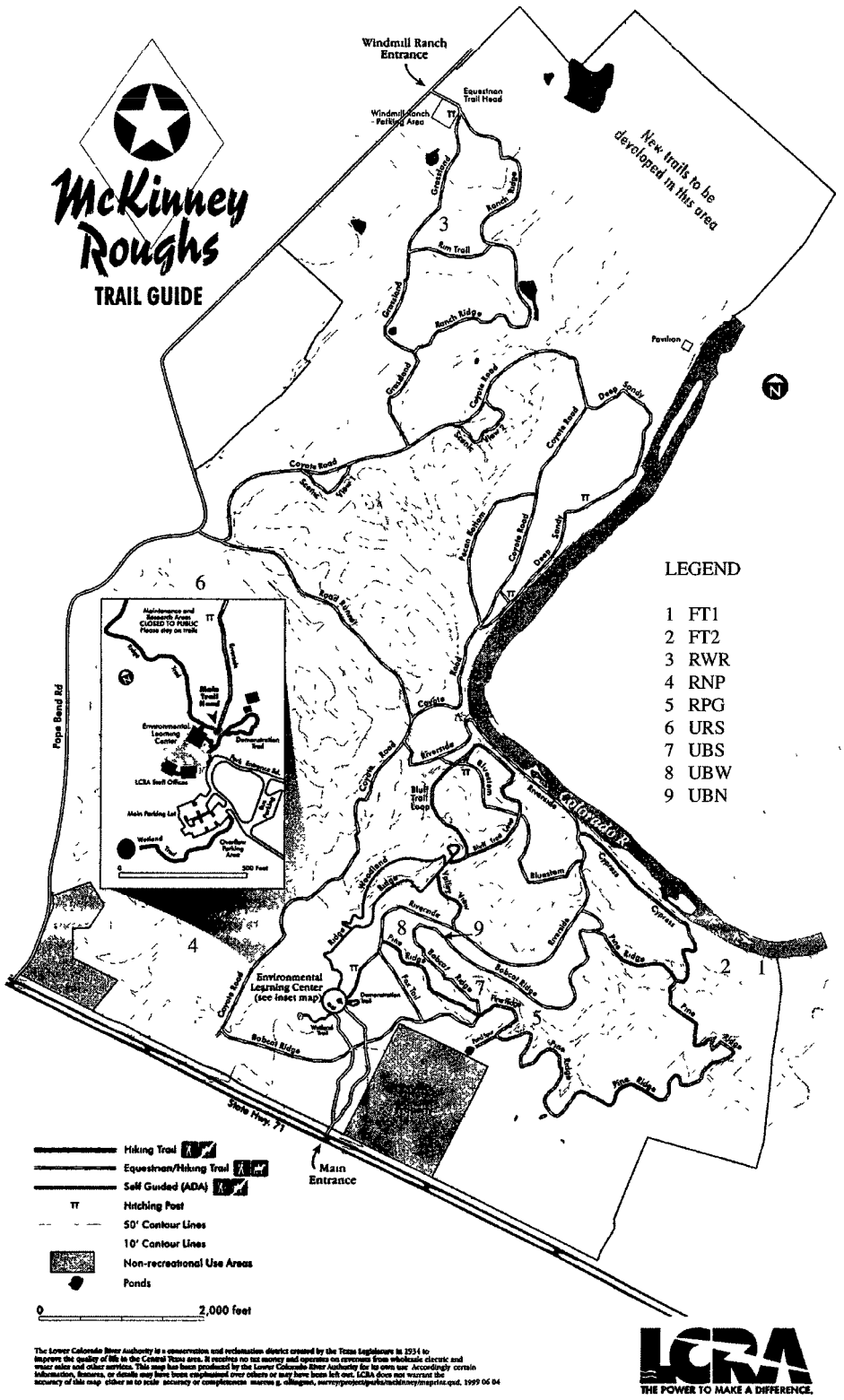

Figure 2. Trail map showing the starting points of the transects.

Table 4. Landform, specific location and number of intervals for each transect.

Transect	Landform	Specific Location	Intervals
FT1	Floodplain	First terrace, downstream segment	5
FT2	Floodplain	Second terrace, downstream segment	10
RWR	Ravine	Windmill Ranch	20
RNP	Ravine	Nature preserve	20
RPG	Ravine	Pine gulch	7
URS	Upland	Road Runner Trail, interfluve to the south	15
UBS	Upland	Bobcat Ridge Trail, south of pine gulch	10
UBW	Upland	Bobcat Ridge Trail, west of pine gulch	6
UBN	Upland	Bobcat Ridge Trail, north of pine gulch	18

Table 5. Linear coverage indices for the vegetation sampled along the transects.

Vegetation	FT1	FT2	RWR	RNP	RPG	URS	UBS	UBW	UBN
Woody									
DBH≥10 cm	1.01	1.38	1.07	0.97	1.06	0.98	0.61	0.91	0.50
DBH<10 cm	0.63	0.35	0.93	0.88	0.67	0.58	0.68	0.87	0.54
Herbaceous	0.16	0.15	0.15	0.40	0.01	0.06	0.11	0.06	0.11

Table 6. Relative coverage for the vegetation sampled along the transects.

Vegetation	FT1	FT2	RWR	RNP	RPG	URS	UBS	UBW	UBN
Woody, DBH≥10 cm									
Deciduous	1.00	0.99	0.84	0.70	0.42	0.49	0.64	0.76	0.63
Evergreen	0.00	0.01	0.16	0.30	0.58	0.51	0.36	0.24	0.37
Woody, DBH<10 cm									
Deciduous	0.77	0.93	0.68	0.46	0.26	0.53	0.06	0.19	0.30
Evergreen	0.23	0.07	0.32	0.54	0.74	0.47	0.94	0.81	0.70
Herbaceous									
Annual	0.00	0.28	0.00	0.00	0.00	0.00	0.64	0.19	0.66
Perennial	1.00	0.72	1.00	1.00	1.00	1.00	0.36	0.81	0.34

had higher RC than perennial herbs in the two stands, UBN and UBS, having the lowest LCIs for trees with DBH≥10 cm (Tables 5 and 6).

Floodplain Terrace Transects

The Colorado River forms two kilometers of the eastern boundary of McKinney Roughs. Data were collected from stands on the first and second terraces of the floodplain. The eastern segment of Cypress Trail provided access to this area (Figure 2). Other than a seldom-used path along the second terrace, there was little evidence of recent anthropogenic disturbance in the area. The presence of trash stranded in the branches of trees indicated that the area experiences periodic temporary flooding. Of the 30 species sampled on the first and second terraces, only ten were sampled on both terraces. Woody species with DBH≥10 cm sampled along both terraces included *Ulmus americana*, *C. laevigata*, *Ulmus crassifolia* and *C. illinoinensis* (Table 7). Woody species with DBH<10 cm included *C. laevigata*, *Ilex vomitoria*, *Acer negundo*, *U. crassifolia*, *Sapindus saponaria* and *Smilax bona-nox* (Table 8). Herbaceous species common to both floodplain terraces included *Dicliptera brachiata* and *Viola sororia* var. *missouriensis* (Table 9).

Transect FT1 consisted of five intervals. The elevation of the first terrace was approximately 107 m, the slope varied from 2° to 8°, and the aspect was north-northeast. The alluvium consisted of well-drained, sandy loam. Litter and duff covered unvegetated surfaces. Beavers had girdled several trees along the first terrace. For woody vegetation with DBH≥10 cm, the LCI was 1.01 (Table 5) and the RC of deciduous species was 1.00 (Table 6). *Ulmus americana and C. laevigata* had the highest IVs of the six sampled species (Table 7). Trees observed from, but not sampled along FT1, included *Fraxinus*

Table 7. Importance values of woody vegetation with DBH≥10 cm sampled on the terraces.

Species	FT1	FT2
Ulmus americana	0.61	0.13
Celtis laevigata	0.44	0.75
Ulmus crassifolia	0.30	0.34
Acer negundo	0.22	
Carya illinoinensis	0.22	0.58
Salix nigra	0.21	
Prunus mexicana		0.06
Sapindus saponaria		0.06
Juniperus virginiana		0.05
Diospyros texana		0.04

Table 8. Importance values of woody vegetation with DBH<10 cm sampled on the terraces.

Species	FT1	FT2
Celtis laevigata	0.70	0.39
Ulmus americana	0.33	
Ilex vomitoria	0.25	0.05
Acer negundo	0.24	0.14
Ulmus crassifolia	0.17	0.42
Sapindus saponaria	0.16	0.16
Smilax bona-nox	0.15	0.17
Diospyros texana		0.20
Toxicodendron radicans		0.14
Callicarpa americana		0.16
Sideroxylon lanuginosum		0.09
Viburnum rufidulum		0.08

Table 9. Importance values of herbaceous vegetation sampled on the terraces.

Species	**FT1**	**FT2**
Toxicodendron radicans	0.88	
Smilax bona-nox	0.47	
Chasmanthium latifolium	0.24	
Dicliptera brachiata	0.21	0.13
Viola sororia var. *missouriensis*	0.20	0.03
Verbesina virginica		0.35
Galium aparine		0.29
Nemophila phacelioides		0.27
Calyptocarpus vialis		0.22
Carex spp.		0.17
Oplismenus hirtellus		0.16
Chaerophyllum tainturieri		0.10
Geum canadense		0.09
Nothoscordum bivalve		0.05
Rivina humilis		0.04
Paspalum langei		0.04
Parthenocissus quinquefolia		0.04

pennsylvanica, *P. occidentalis*, and *Taxodium distichum*. For woody vegetation with DBH<10 cm, the LCI was 0.63 (Table 5) and the RC of the deciduous species was 0.77 (Table 6). *Celtis laevigata* and *U. americana* had the highest IVs of the seven sampled species (Table 8). For herbaceous vegetation, the LCI was 0.16 (Table 5) and the RC of perennial species was 1.00 (Table 6). *Toxicodendron radicans* and *S. bona-nox* had the highest IVs of the five sampled species (Table 9).

Transect FT2 consisted of ten intervals. The elevation was approximately 110 m, the slope varied from 2° to 12°, and the aspect was north-northeast. The alluvium consisted of well-drained loam. Litter and duff covered unvegetated surfaces. For woody vegetation with DBH≥10 cm, the LCI was 1.38 (Table 5) and the RC of deciduous species was 0.99 (Table 6). *Celtis laevigata* and *C. illinoinensis* had the highest IVs of the eight sampled species (Table 7). *Quercus sinuata* var. *sinuata* occurred on the second terrace but not along the transect. For woody vegetation with DBH<10 cm, the LCI was 0.35 (Table 5) and the RC of deciduous species was 0.93 (Table 6). *Ulmus crassifolia* and *C. laevigata* had the highest IVs of the eleven sampled species (Table 8). For herbaceous vegetation, the LCI was 0.15 (Table 5) and the RC of perennial species was 0.72 (Table 6). *Verbesina virginica* and *Galium aparine* had the highest IVs of the 14 sampled species (Table 9).

Ravine Transects

Three unnamed branches of the Colorado River descend to Wilbarger Bend from the uplands of McKinney Roughs. Data were collected from stands along each of the ravines formed by these ephemeral streams. The intersection of their first-order streams marked the starting point for each of the streamside transects. Of the 47 species sampled

in the ravines, only five were sampled in all three ravines. Woody vegetation with DBH≥10 cm sampled along all three ravines included *Q. stellata* and *Juniperus virginiana* (Table 10). Woody vegetation with DBH<10 cm sampled along all three ravines included *I. vomitoria*, *Callicarpa americana*, and *Ilex decidua* (Table 11). Not a single herbaceous species was sampled along all three ravine transects (Table 12).

Transect RWR consisted of 20 intervals. Grassland Trail provided access to the starting point (Figure 2). The stream channel descended from 131 m to 122 m along the transect length. The slope varied from 2° to 6° and the aspect changed constantly with the winding course of the channel and the alternating placement of the intervals. Well-drained, loamy soils occurred along the ravine. Litter and duff covered unvegetated surfaces. Recently traveled livestock trails cut deeply into the channel walls in numerous places. The drift consisted of naturally occurring woody debris and household trash. For woody vegetation with DBH≥10 cm, the LCI was 1.07 (Table 5) and the RC of deciduous species was 0.84 (Table 6). *Ulmus crassifolia* and *J. virginiana* had the highest IVs of the ten sampled species (Table 10). For woody vegetation with DBH<10 cm, the LCI was 0.93 (Table 5) and the RC of the deciduous species was 0.68 (Table 6). *Ilex vomitoria* and *S. bona-nox* had the highest IVs of the 19 sampled species (Table 11). *Quercus sinuata* var. *sinuata* was sampled exclusively along this transect. For herbaceous vegetation, the LCI was 0.15 (Table 5) and the RC of the perennial species was 1.00 (Table 6). *Chasmanthium latifolium* and *Malvaviscus arboreus* had the highest IVs of the twelve sampled species (Table 12).

Table 10. Importance values of woody vegetation with DBH≥10 cm sampled along the ravines.

Species	RWR	RNP	RPG
Ulmus crassifolia	0.85	0.23	
Juniperus virginiana	0.37	0.64	0.12
Celtis laevigata	0.25	0.03	
Quercus sinuata var. *sinuata*	0.19		
Sapindus saponaria	0.11		
Prunus mexicana	0.08		
Quercus stellata	0.08	0.75	0.69
Sideroxylon lanuginosum	0.02		
Ulmus americana	0.02		
Morus rubra	0.02	0.02	
Fraxinus texensis		0.28	
Quercus marilandica		0.05	0.35
Pinus taeda			0.84

Table 11. Importance values of woody vegetation with DBH<10 cm sampled along the ravines.

Species	RWR	RNP	RPG
Ilex vomitoria	0.49	0.71	1.14
Smilax bona-nox	0.27	0.08	
Celtis laevigata	0.20	0.01	
Ulmus crassifolia	0.15	0.11	
Cornus drummondii	0.14		
Diospyros texana	0.12		
Forestiera pubescens	0.11		
Campsis radicans	0.10		
Viburnum rufidulum	0.09	0.15	
Callicarpa americana	0.06	0.18	0.18
Prunus mexicana	0.06	0.02	
Quercus sinuata var. *sinuata*	0.04		
Sapindus saponaria	0.03	0.04	
Cocculus carolinus	0.03		
Ilex decidua	0.03	0.04	0.26
Sideroxylon lanuginosum	0.03	0.04	
Toxicodendron radicans	0.02		
Vaccinium arboreum	0.02		
Vitis mustangensis	0.02		
Berchemia scandens		0.20	
Quercus stellata		0.13	
Fraxinus texensis		0.16	
Juniperus virginiana		0.08	0.20
Frangula caroliniana		0.04	
Pinus taeda			0.22

Table 12. Importance values of herbaceous vegetation sampled along the ravines.

Species	RWR	RNP	RPG
Chasmanthium latifolium	0.48	0.04	
Malvaviscus arboreus	0.41	0.03	
Carex spp.	0.26	0.33	
Scleria triglomerata	0.16	0.09	
Verbesina virginica	0.15		
Rubus sp.	0.12		
Campsis radicans	0.11		
Viola sororia var. *missouriensis*	0.09		
Elymus canadensis	0.06		
Chasmanthium laxum var. *sessiliflorum*	0.06	1.11	
Geum canadense	0.05		
Parthenocissus quinquefolia	0.05		
Desmodium psilophyllum		0.11	
Lespedeza repens		0.10	
Galium pilosum		0.05	
Toxicodendron radicans		0.04	
Vernonia texana		0.03	
Panicum linearifolium		0.03	
Sporobolus cryptandrus		0.03	
Panicum hians			1.00
Solidago radula			1.00

Transect RNP consisted of 20 intervals. The southwestern terminus of Bobcat Ridge Trail provided access to one of the first-order streams above the starting point (Figure 2). The channel descended from 137 m to 131 m along the transect length. The slope varied from 2° to 15° and the aspect changed constantly. Moderately well drained, clayey soils occurred along this ravine. Litter and duff covered unvegetated surfaces. The drift line consisted of naturally occurring woody debris and leaf litter. Trails that showed little evidence of recent use occasionally crossed the channel. In several places, recently uprooted trees occupied the channel. For woody vegetation with DBH≥10 cm, the LCI was 0.97 (Table 5) and the RC of deciduous species was 0.70 (Table 6). *Quercus stellata* and *J. virginiana* had the highest IVs of the seven sampled species with DBH ≥10 cm (Table 10). For woody vegetation with DBH<10 cm, the LCI was 0.88 (Table 5) and the RC of deciduous species was 0.46 (Table 6). *Ilex vomitoria* and *Berchemia scandens* had the highest IVs of the 15 sampled species with DBH<10 cm (Table 11). *Fraxinus texensis* and *Frangula caroliniana* were sampled exclusively along this transect. For herbaceous species, the LCI was 0.40 (Table 5) and the RC of perennial species was 1.00 (Table 6). *Chasmanthium laxum* var. *sessiliflorum* and *Carex* spp. had the highest IVs of the twelve taxa sampled (Table 12).

Transect RPG consisted of seven intervals. Pine Ridge Trail, opposite the Pond Spur, provided access to one of the first-order streams above the starting point (Figure 2). The channel descended from 152 m to 143 m along the transect length. The slope ranged from 16° to 24° and the aspect was generally to the northeast. Well-drained, gravelly sandy loam occurred along this ravine. Pine needles covered unvegetated surfaces. The intervals ran parallel to and at a random distance above the channel due to the steep slope

and loose surface material. Numerous livestock trails crisscrossed the ravine. The first-order stream below the Pond Spur Trail appeared to be spring-fed as this was the only stream on the site that ran continuously throughout the 1999 and 2000 growing seasons. For woody vegetation with DBH≥10 cm, the LCI was 1.06 (Table 5) and the RC of deciduous species was 0.42 (Table 6). *Pinus taeda* and *Q. stellata* had the highest IVs of the four sampled species (Table 7). For woody vegetation with DBH<10 cm, the LCI was 0.67 (Table 5) and the RC of the deciduous species was 0.26 (Table 6). *Ilex vomitoria* and *I. decidua* had the highest IVs of the five sampled species (Table 11). *Pinus taeda* was sampled exclusively along this transect. For herbaceous vegetation, the LCI was 0.01 (Table 5) and the RC of the perennial species was 1.00 (Table 6). *Panicum hians* and *Solidago radula* had the same IV and were the only herbaceous species sampled along this transect (Table 12).

Upland Transects

The uplands comprised the interfluves and rolling plains to the northeast and to the southeast of Caldwell Knob. Data were collected from one stand on an interfluve and from three stands on the plain. Of the 55 species sampled in the uplands, only six were sampled along all four transects. Woody vegetation with DBH≥10 cm sampled along all four upland transects included *J. virginiana*, *Q. stellata*, and *Q. marilandica* (Table 13). Woody vegetation with DBH<10 cm sampled along these four transects included *I. vomitoria*, *Q. stellata*, *J. virginiana*, and *Q. marilandica* (Table 14). Herbaceous vegetation sampled along all four upland transects included *Carex planostachys* and *Nothoscordum bivalve* (Table 15).

Table 13. Importance values of woody vegetation with DBH≥10 cm sampled in the uplands.

Species	URS	UBS	UBW	UBN
Juniperus virginiana	0.89	0.79	0.55	0.76
Quercus stellata	0.78	0.68	0.78	0.69
Ulmus crassifolia	0.29			
Quercus marilandica	0.04	0.32	0.09	0.44
Carya texana			0.57	0.07
Ilex vomitoria		0.15		0.04
Prosopis glandulosa		0.06		

Table 14. Importance values of woody vegetation with DBH<10 cm sampled in the uplands.

Species	URS	UBS	UBW	UBN
Ilex vomitoria	0.60	0.97	0.74	0.82
Quercus stellata	0.42	0.06	0.22	0.10
Ulmus crassifolia	0.20	0.06	0.31	
Quercus marilandica	0.13	0.05	0.07	0.24
Juniperus virginiana	0.12	0.69	0.66	0.28
Smilax bona-nox	0.10	0.06		0.15
Sideroxylon lanuginosum	0.07			
Prosopis glandulosa	0.06			
Forestiera pubescens	0.06			0.04
Berchemia scandens	0.05			
Cornus drummondii	0.04			
Carya texana	0.04			
Diospyros texana	0.03			0.16
Rubus sp.	0.03			
Callicarpa americana	0.03			0.05
Opuntia leptocaulis	0.03			0.03
Viburnum rufidulum		0.07		
Opuntia engelmannii		0.05		
Vaccinium arboreum				0.04
Opuntia humifusa				0.03
Celtis laevigata				0.03
Hypericum hypericoides				0.03

Table 15. Importance values of herbaceous vegetation sampled in the uplands.

Species	URS	UBS	UBW	UBN
Carex planostachys	0.67	0.17	0.13	0.06
Paspalum laeve	0.26			
Scleria triglomerata	0.21		0.10	
Bothriochloa laguroides	0.17			
Solidago radula	0.15			
Solidago nemoralis	0.14			
Chaptalia texana	0.11			
Eragrostis spectabilis	0.09			
Achillea millefolium	0.08			
Sporobolus cryptandrus	0.07			
Nothoscordum bivalve	0.06	0.08	0.09	0.06
Aristida basiramea			0.34	
Schizachyrium scoparium			0.32	
Cooperia pedunculata		0.08	0.19	
Desmodium ciliare			0.19	
Panicum oligosanthes			0.19	0.03
Opuntia humifusa			0.19	
Digitaria cognata			0.13	0.06
Matelea reticulata			0.12	
Euphorbia corollata		0.50		
Croton monanthogynus		0.43		0.24
Acalypha gracilens		0.28		0.40
Polypremum procumbens		0.20		0.32
Aristida longespica		0.16		0.22
Oxalis violacea		0.10		0.10
Bothriochloa ischaemum				0.18
Chrysopsis pilosa				0.08
Tridens flavus				0.07
Unknown				0.05
Eragrostis hirsuta				0.04
Euphorbia maculata				0.03
Euphorbia dentata				0.03
Lespedeza repens				0.03

Transect URS consisted of 15 intervals. The road cut running south from the western terminus of Road Runner Trail provided access to the starting point (Figure 2). The transect started on the northwestern knob, crossed over the saddle, and ended on the southeastern knob. The elevation ranged from 143 m to 168 m along the transect length. The slope varied from 2° to 16° and the aspect changed with the placement of the intervals. Well-drained, sandy loam occurred along the interfluve. Litter and gravel covered unvegetated surfaces. Charred stumps occurred along several intervals. For woody vegetation with DBH≥10 cm, the LCI was 0.98 (Table 5) and the RC of deciduous species 0.49 (Table 6). *Juniperus virginiana* and *Q. stellata* had the highest IVs of the four sampled species (Table 13). For woody vegetation with DBH<10 cm, the LCI was 0.58 (Table 5) and the RC of deciduous species was 0.53 (Table 6). *Ilex vomitoria* and *Q. stellata* had the highest IVs of the 16 sampled species (Table 11). For herbaceous vegetation, the LCI was 0.06 (Table 5) and the RC of perennial species was 1.00 (Table 6). *Carex planostachys* and *Paspalum laeve* had the highest IVs of the eleven sampled species (Table 15).

Transect UBS consisted of ten intervals. Bobcat Ridge Trail formed the transect. The southern junction of Bobcat Ridge Trail with Pine Ridge Trail marked the starting point (Figure 2). The elevation ranged from 162 m to 165 m along the transect length. The slope varied from 0° to 4° and the aspect was to the northeast. Well-drained, gravelly sandy loam occurred along the transect. Leaf litter or gravelly sand covered unvegetated surfaces. Cryptogamic crusts occurred occasionally in open areas. For woody vegetation with DBH≥10 cm, the LCI was 0.61 (Table 5) and the RC of deciduous species was 0.64 (Table 6). *Juniperus virginiana* and *Q. stellata* had the highest IVs of the five sampled

sampled species (Table 13). For woody species with DBH<10 cm, the LCI was 0.68 (Table 5) and the RC of deciduous species was 0.06 (Table 6). *Ilex vomitoria* and *J. virginiana* had the highest IVs of the eight sampled species (Table 14). For herbaceous species, the LCI was 0.11 (Table 5) and the RC of perennial species was 0.36 (Table 6). *Euphorbia corollata* and *Croton monanthogynus* had the highest IVs of the nine sampled species (Table 15).

Transect UBW consisted of six intervals. Bobcat Ridge Trail formed the transect. The first fence row north of Pine Ridge Trail marked the starting point (Figure 2). The elevation along the transect ranged from 158 m to 161 m. The slope varied from 2° to 4° and the aspect shifted from northeast to southeast as Bobcat Ridge Trail crossed the ravine above the pine gulch. Well-drained gravelly sand occurred along this transect. Leaf litter and gravelly sand covered unvegetated surfaces. For woody vegetation with DBH≥10 cm, the LCI was 0.91 (Table 5) and the RC of deciduous species was 0.76 (Table 6). *Quercus stellata*, *C. texana* and *J. virginiana* had the highest IVs of the four sampled species (Table 13). For woody vegetation with DBH<10 cm, the LCI was 0.87 (Table 5) and the RC of deciduous species was 0.19 (Table 6). *Ilex vomitoria* and *J. virginiana* had the highest IVs of the five sampled species (Table 14). For herbaceous species, the LCI was 0.06 (Table 5) and the RC of perennial species was 0.81 (Table 6). *Aristida basiramea* and *S. scoparium* had the highest IVs of the eleven species sampled along the transect (Table 12).

Transect UBN consisted of 18 intervals. Bobcat Ridge Trail formed the transect. The second fencerow north of Pine Ridge Trail (southern segment) marked the starting point (Figure 2). The elevation ranged from 162 m to 165 m along the transect length.

The slope varied from 0° to 4° and the aspect fluctuated between southeast and southwest as Bobcat Ridge Trail followed the northern rim of the ravine forming the pine gulch. Well-drained, gravelly sandy loam occurred along the transect length. Crytogamic crusts occurred commonly in open areas. Gravelly sand or leaf litter covered unvegetated surfaces. For woody vegetation with DBH≥10 cm, the LCI was 0.50 (Table 5) and the RC of deciduous species was 0.63 (Table 6). *Juniperus virginiana* and *Q. stellata* had the highest IVs of the five sampled species (Table 13). For woody vegetation with DBH<10 cm, the LCI was 0.54 (Table 5) and the RC of deciduous species was 0.30 (Table 6). *Ilex vomitoria* and *J. virginiana* had the highest IVs of the eleven sampled species (Table 14). For herbaceous species, the LCI was 0.11 (Table 5) and the RC of perennial species was 0.34 (Table 6). *Acalypha gracilens* var. *monococca* and *Polypremum procumbens* had the highest IVs of the 17 sampled species (Table 15).

Numerous woody species that occur at McKinney Roughs were not sampled for different reasons. *Ferocactus setispinus* (small areal cover), *Taxodium distichum* (infrequent occurrence), *Ungnadia speciosa* (associated landform), and *Juniperus ashei* (disturbed sites) were among the 25 woody species that were collected but not sampled along any transect. The following analyses were based on the qualitative data for the 38 woody species that were sampled along one or more transects. These transects were not representative of the site as a whole, but rather they were indicative of the species composition of the areas that had experienced minimum anthropogenic disturbance.

Ordination

The ordination diagram (Figure 3) depicts the nine stands in a two-dimensional space using Jaccard's coefficient of community dissimilarity. The ordination interval

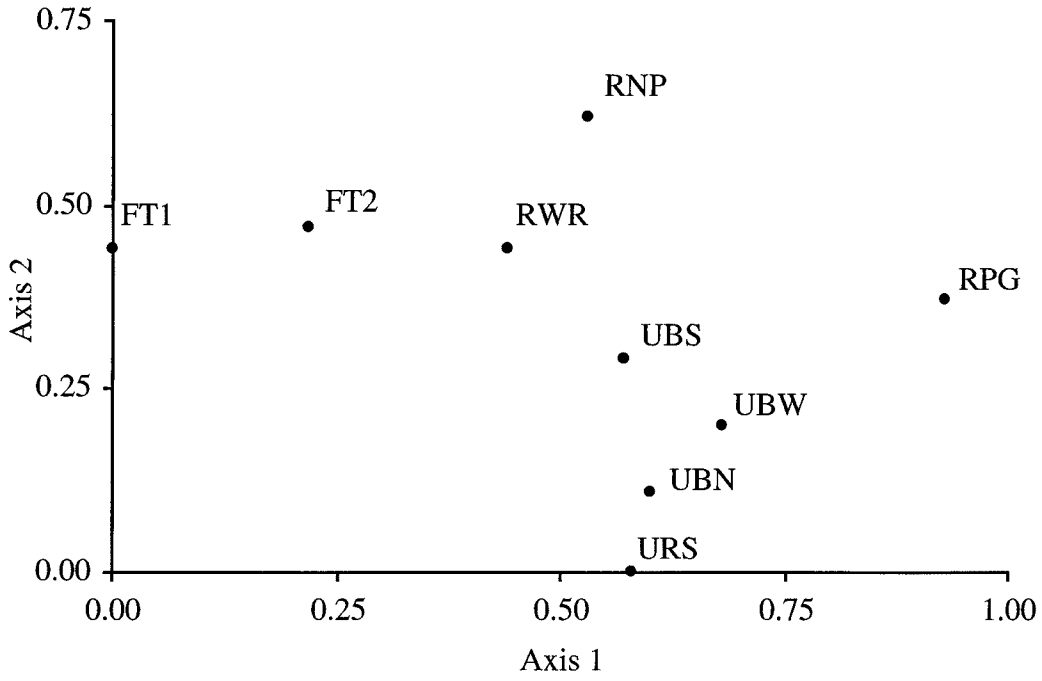

Figure 3. Ordination diagram for the transect stands.

values ranged from 0.11 (URS-UBN) to 0.93 (FT1-RPG). The closeness of FT1 and FT2 and the closeness of URS, UBS, UBW and UBN illustrated the minor differences in species composition between the two stands along the terrace transects and among the four stands along the upland transects, respectively. The separation of RPG from RWR and RNP highlighted the major differences in species composition between the pine gulch stand and the other two ravine communities. Furthermore, the ordination indicated that RPG was more similar to three of the four upland transects (UBW, UBS and UBN) than it was to either of the two ravine transects. The proximity of RWR to both UBS and FT2 reflected both the transitional nature of this stand and the difficulty of delimiting the plant communities.

Classification

The classification dendrogram (Figure 4) grouped the nine transect stands in eight artificial stands (A1–A8). The cluster analysis of the qualitative data yielded a sequence of Jaccard's coefficient of community similarity (CC_J) values from 0.52 to 0.21. Three pairs of stands (FT2-RWR, URS-UBN, and UBS-UBW) had a CC_J value equal to or greater than 0.50. Although URS and UBN had a CC_J value equal to 50, they were enough dissimilar in terms of linear coverage to be placed in different physiognomic classes and therefore, in different associations. Data from the other two pairs of stands that constitute artificial stands 1 and 3 were combined to determine the IVs of the woody species (Tables 16 and 17).

Artificial stand 1 (A1) consisted of the 30 intervals comprising FT2 and RWR. For woody vegetation with DBH≥10 cm, *U. crassifolia* and *C. laevigata* had the highest IVs

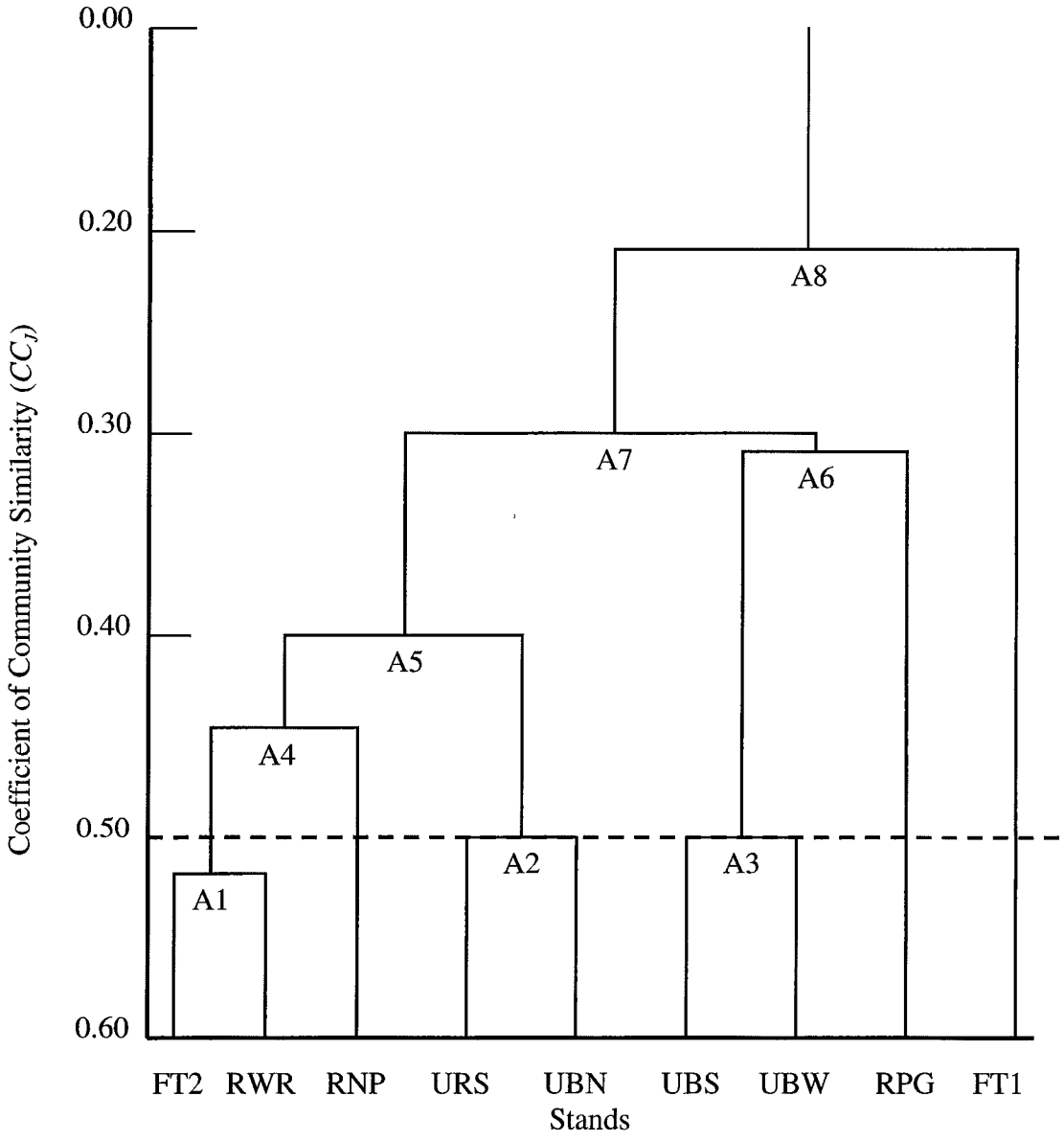

Figure 4. Classification dendrogram for the transect stands.

of the twelve sampled species (Table16). *Ilex vomitoria* and *C. laevigata* had the highest IVs of the 20 sampled species (Table 17) for woody vegetation with DBH<10 cm. Artificial stand 3 (A3) consisted of the 16 intervals comprising UBS and UBW. For woody vegetation with DBH≥10 cm, *Q. stellata* and *J. virginiana* had the highest IVs of the six sampled species (Table 16). *Ilex vomitoria* and *J. virginiana* had the highest IVs of the eight sampled species (Table 17) with DBH<10 cm. Using the classification dendrogram and linear coverage data, I delimited seven associations (Table 18). The name of each association indicated the two woody species with DBH≥10 cm having the highest IVs and one woody species unique to the stand.

Table 16. Importance values of woody vegetation with DBH≥10 cm for the artificial stands resulting from the cluster analysis.

Species	**A1**	**A3**
Carya illinoinensis	0.22	
Carya texana		0.26
Celtis laevigata	0.44	
Diospyros texana	0.02	
Ilex vomitoria		0.08
Juniperus virginiana	0.25	0.68
Morus rubra	0.01	
Prosopis glandulosa		0.04
Prunus mexicana	0.07	
Quercus marilandica		0.21
Quercus sinuata var. *sinuata*	0.12	
Quercus stellata	0.05	0.73
Sapindus saponaria	0.09	
Sideroxylon lanuginosum	0.02	
Ulmus americana	0.06	
Ulmus crassifolia	0.65	

Table 17. Importance values of woody vegetation with DBH<10 cm for the artificial stands resulting from the cluster analysis.

Species	**A1**	**A3**
Acer negundo	0.04	
Callicarpa americana	0.08	
Campsis radicans	0.07	
Celtis laevigata	0.30	
Cocculus carolinus	0.02	
Cornus drummondii	0.11	
Diospyros texana	0.13	
Forestiera pubescens	0.08	
Ilex decidua	0.02	
Ilex vomitoria	0.39	0.87
Juniperus virginiana		0.68
Opuntia engelmannii		0.03
Prunus mexicana	0.05	
Quercus marilandica		0.06
Quercus sinuata var. *sinuata*	0.03	
Quercus stellata		0.13
Sapindus saponaria	0.06	
Sideroxylon lanuginosum	0.04	
Smilax bona-nox	0.19	0.03
Toxicodendron radicans	0.05	
Ulmus crassifolia	0.21	0.17
Vaccinium arboreum	0.01	
Viburnum rufidulum	0.09	0.04
Vitis mustangensis	0.01	

Table 18. The seven associations delimited by linear coverage and cluster analysis of the qualitative data collected from the least disturbed stands at MR.

Name of Association	Stands
Ulmus americana-Celtis laevigata-Salix nigra Forest	FT1
Ulmus crassifolia-Celtis laevigata-Juniperus virginiana Forest	A1
Quercus stellata-Juniperus virginiana-Fraxinus texensis Forest	RNP
Pinus taeda-Quercus stellata-Quercus marilandica Forest	RPG
Juniperus virginiana-Quercus stellata-Ulmus crassifolia Forest	URS
Juniperus virginiana-Quercus stellata-Quercus marilandica Woodland	UBN
Quercus stellata-Juniperus virginiana-Carya texana Forest	A3

DISCUSSION

The fluctuation of boundaries at MR complicated comparisons among the plant lists that have been generated for the site. During the growing seasons of 1999 and 2000, I collected 372 species on 648 ha. My collections include 75% of the 136 species that Schumann (1996) observed on 524 ha in the fall of 1995 and 68% of the 354 species that Carr observed on 809 ha in the spring of 1996. The Digital Flora of Texas (2000) lists 128 families, 472 genera and 984 species for Bastrop County as of November 4, 2002. My collections contributed an additional ten families, 52 genera, and 115 species. It is probable that some of these taxa have been collected from Bastrop County and stored in herbaria whose collections are not yet available on-line.

The limited number of Texas endemic species collected at MR (1.9% of the total) was anticipated because the flora of the Oak Woods & Prairies region has affinities with four of the thirteen major floristic provinces in North America (Thorne 1993). The common grasses in the woodland openings at MR represent the North American Prairie Province. The thorny shrubs pioneering disturbed areas are components of the Tamaulipan Subprovince of the Sonoran Province. The woody species dominating the relatively-undisturbed forests represent both the Appalachian Province and the Atlantic and Gulf Coast Plain Province. Furthermore, MR is not situated in one of the 27 regions of the Atlantic and Gulf Coast Plain Floristic Province delineated for high endemicism (Sorrie and Weakley 2001).

The majority of introduced species occurred near old home sites (e.g. *Prunus persica* and *Lonicera japonica*), along the riparian corridor (e.g. *A. philoxeroides* and *Melia azedarach*) or on abandoned pastures (e.g. *Cynodon dactylon* and *Medicago sativa*). In fact, grasses represented 33% percent of the introduced species. Only one introduced species, *M. azedarach*, appeared to be invasive at the time of this investigation. Unfortunately, the distribution of introduced species will increase as more equestrian trails and foot paths are constructed into previously inaccessible sections of the tract (Drayton and Primack 1996).

My research provided quantitative data for five of the nine communities delineated by Schumann (1996) and for three of the four communities described by Carr (1996). Stand FT1 corresponded to Schumann's *C. laevigata-Ulmus* spp. forest. Stand FT2 approached the *C. illinoinensis*-dominated forests described by both Schumann and Carr. Placement of all intervals up-slope from the second riser, rather than alternating between up-slope and down-slope, underestimated the importance of *C. illinoinensis*. Stand RWR was not part of MR when Schumann completed the initial biological survey and Windmill Ranch was not mentioned in Carr's botanical inventory. Stand RNP and all three of the upland stands (URS, A3, and UBN) appeared to be dominated by *Q. stellata*. Schumann recognized two similar forests, *Q. stellata-Q. marilandica* and *Q. stellata-C. texana*, while Carr included *Q. marilandica* in the *Q. stellata-C. texana* and associated grasslands community. Stand data from RPG supplemented the descriptions by Schumann and Carr of the *P. taeda-Quercus* spp. forest. I did not survey the other four communities (*P. occidentalis-S. nigra* forest, abandoned gravel quarry, grassland, or

wetland) that Schumann delineated nor the "weed invested" *P. glandulosa-C. laevigata* woodland and associated grasslands that Carr disparaged.

The surveyed stands at McKinney Roughs represented three of the five forest/ woodland types reported in the Oak Woodlands subregion (Diamond et al. 1987). Stands FT1 and A1 exemplified the *C. laevigata-Ulmus* spp. forest type. If *J. virginiana* were an understory species, stand A3 (UBS and UBW) approached the *Q. stellata-C. texana* forest/woodland type. Likewise, stands RNP, URS, and UBN approximated the *Q. stellata-Q. marilandica* forest/woodland type. Stand RPG exemplified the *P. taeda-Quercus* spp. forest type, which Diamond et al. (1987) reported from the Mixed Pine-Hardwood subregion of eastern Texas. The TNHP (1993) categorized all four of these community types as "apparently secure" at both the global and state levels. However, the quantitative data collected at MR indicate that neither *Q. stellata*-dominated community was secure at the local level and supported earlier reports of the invasiveness of *J. virginiana* (Rykiel and Cook 1986, Smeins and Diamond 1987) in oak woodlands. The Mann-Whitney U-test indicated no statistical difference between the LCIs of *Q. stellata* and *J. virginiana* in all four of these stands (α=0.05).

The high importance values of *J. virginiana* distinguished the upland stands and the nature preserve stand from other *Q. stellata*-dominated stands previously described in the Oak Woodlands (Tharp 1926, McBryde 1933, McCaleb 1954, Allen 1974, MacRoberts 2002). Moreover, it set these stands apart from most other oak-dominated communities throughout the eastern United States. In a study of 707 forest stands from 32 eastern states, *J. virginiana* was ranked as the first, second, or third most dominant species in only nine stands (Monk et al. 1990). Subsequently, Gibson (1996) determined that *J.*

virginiana had the second highest IV after *Q. stellata* in seven of fifteen upland stands at Fairfield Lake State Recreational Area. Additionally, ecologists from The Nature Conservancy created a "placeholder for the development of a *J. virginiana-Quercus (stellata, velutina, marilandica)* Forest" from eastern Texas. The absence of both *Ulmus alata* and *Quercus nigra* also distinguished the upland stands at MR from those at Fairfield Lake State Recreational Area (Gibson 1996) and from those in the uplands along the Lower Navasota River (Allen 1974).

The species composition of the riparian forests at MR were more similar to those along the rivers in the Edwards Plateau (Ford and Van Auken 1982, Van Auken and Bush 1985) than they were to riparian forests in the Blackland Priaires (Nixon et al. 1991) or in the Oak Woodlands (Allen 1974, Gibson 1996). The riparian forests along the Guadalupe River (Ford and Van Auken 1982) and along the San Antonio River (Van Auken and Bush 1985) exemplified a *C. illinoinensis-C. laevigata-T. distichum* forest and a *C. laevigata-U. crassifolia-C. illinoinensis* forest, respectively (TNHP 1993). These communities were ranked as "apparently secure" at both the global and state levels (TNHP 1993). More recently, these floodplain communities were ranked as globally "rare and local throughout their ranges" due to the impacts of artificial impoundments, forestry, and agriculture (NatureServe 2000). In addition to being downstream of a series of flood-control structures, the floodplain communities at MR are threatened by resort development (*Bastrop Advertiser*, 16 November 2000) and by invasion of *Melia azedarach*.

This investigation provided a snapshot of the flora and least-disturbed plant communities two years after management of the tract changed from ranching to

recreation and education. As of 1986, only 18 managed natural areas were located in the Oak Woodlands and only 56% of the 14,852 ha in these natural areas were considered to be of fair or better quality (Smeins and Diamond 1986). Even with the additions of Lick Creek Park south of College Station and MR, less that 1% of the total area in the Oak Woodlands is managed as a natural area. As a natural area with an emphasis on environmental education, MR provides numerous research opportunities for botanists and plant ecologists in one of Texas' least-studied natural regions.

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