INTRODUCTION
Review of data in the Oklahoma Vascular Plant database (OVPD; Hoagland et al 2005) indicates that the flora of Major County is under-documented. Prior to 2004, the year collecting began for this study, 417 species were reported from Major County. G. W. Stevens made the first plant collections in Major County from May and July of 1913. During that time, he collected 74 species. Additional peak years for plant collecting in Major County were 1947 (22 specimens) and 1985 (39 specimens; Hoagland et al 2005). The objective of this study was to document the flora of a specific site thereby adding to the comprehensive species list for Major County.

STUDY AREA
The site encompasses over 80 hectares in Major County (Fig. 1). Latitudinal extent ranges from 36.42°N to 36.41°N and longitudinal extent from 98.94°W to 96.95°W, and is located within the Subtropical Humid (Cf) climate zone (Trewartha 1968). Summers are warm (mean July temperature = 28.5°C) and humid, and winters are relatively short and mild (mean January temperature = 1.4°C). Mean annual precipitation is 70 cm, with periodic severe droughts (Oklahoma Climatological Survey 2005). The study area is located in the Osage Plains section of the Central Lowlands province (Hunt 1974) and within the Cimarron Gypsum Hills province of Oklahoma (Curtis and Ham 1979). Elevation ranges from 457 m to 508 m. The surface geology consists of Permian age gypsum outcrops and red sandstone and shale (Branson and Johnson 1979). Soils are of the Weymouth-Vernon-gypsum outcrop association, which are shallow, moderately sloping, loamy soils (Allgood et al 1968). Mixedgrass prairie is the predominant potential vegetation type (Duck and Fletcher 1943).

METHODS
Three collection sites were established for intensive floristic sampling. Sites were visited once a month from March through October 2004. Sites were selected following a review of US Geological Survey 1:24,000 topographic maps and field reconnaissance.

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Figure 1: Location of Major County study area.

The predominant vegetation associations at these sites were classified according to Hoagland (2000). However, collecting was not restricted to these sites, and previously uncollected species were gathered wherever they were encountered. Vouchers for exotic species were made from naturalized populations only, thus excluding cultivated and ornamental plants. Specimens were processed at the Robert Bebb Herbarium of the University of Oklahoma (OKL) following standard procedures. Manuals we used for specimen identification included those by Waterfall (1973) and Barkley (1986). Origin, either native or introduced, was determined by using Taylor and Taylor (1991) and USDA-NRCS (2005). Nomenclature follows the US Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS 2005). Voucher specimens were deposited at OKL.

RESULTS AND DISCUSSION

A total of 233 taxa of vascular plants in 61 families and 173 genera were collected (Table 1). Among the angiosperms, 50 were monocots and 179 were dicots. In addition, there were three species of pteridophytes and one gymnosperm. The families with the greatest number of species were Asteraceae (44), Poaceae (40), Fabaceae (14), and Euphorbiaceae (13). The largest genera were Chamaesyce (6 species) and Asclepias (5 species). Seventy-seven species were annuals, two biennials, and 152 perennials. Twenty woody plant species were present. A complete listing of plants is found in the Appendix.

Twenty-two species (10.6%) from 11 families were exotic. The Poaceae had nine

<table>
<thead>
<tr>
<th>Taxonomic group</th>
<th>Species</th>
<th>Native spp.</th>
<th>Exotic spp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pteridophyta</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Coniferophyta</td>
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<td>1</td>
<td>0</td>
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<tr>
<td>Magnoliophyta</td>
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<tr>
<td>Magnoliopsida</td>
<td>179</td>
<td>167</td>
<td>12</td>
</tr>
<tr>
<td>Liliopsida</td>
<td>50</td>
<td>41</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>233</td>
<td>212</td>
<td>21</td>
</tr>
</tbody>
</table>

* Table format follows Palmer et al (1995).
exotic species and the genus *Bromus* had two. At the Selman Living Laboratory (SLL), in adjacent Woodward County, 21 introduced species were recorded constituting 9% of the flora (Buckallew and Caddell 2003). These values are consistent with other floristic studies from Oklahoma, in which exotic species constitute 9-15% of the flora (Hoagland and Johnson 2001, 2004a, 2004b; Hoagland and Buthod 2003, 2004; Hoagland and Wallack 2003, Hoagland, Buthod, and Elisen 2004, Hoagland, Crawford-Callahan et al. 2004). However, at two sites in McCurtain County, only 6.6% of the flora were exotic species (Hoagland and Johnson 2004c).

No federally listed threatened or endangered species were encountered. However, three species tracked by the ONHI (2005) were present: *Chamaesyce carunculata* (G5S1), *Echinocereus reichenbachii* (G5S2), and *Escobaria vivipara* (G5S2S3). This represents only the third population of *C. carunculata* found in Oklahoma; the other two are located in Woods County (Hoagland et al 2005). Species conservation ranks, presented parenthetically, are assigned according to the level of imperilment at the state (S) and global (G) levels on a scale of 1-5, with 1 representing a species that is imperiled and 5 a species that is secure (Groves et al 1995).

A study of the SLL, a 129.5 ha site in Woodward County, recorded 229 species in 61 families (Buckallew and Caddell 2003). A comparison of the two floras seems warranted because they share gypsum grasslands. There were 142 species found at both sites. Ninety-one species recorded at this site were not reported at SLL, and 91 species were reported from SLL that were not encountered in this study. The differences in species composition may be a result of differences in habitats. For example, sandsage grassland, floodplain, and cave entrance habitats were reported from SLL but not here.

Prior to this research, the OVPD listed 417 taxa of vascular plants from Major County. Of the 233 species reported in this study, 144 had been previously reported (Hoagland et al 2005), but 83 species reported in this study had not. As a result of this study, 500 species are now known to occur in Major County.

The three collection sites were located in three vegetation associations. A brief description of each follows:

1. **Schizachyrium scoparium-Castilleja purpurea var. citrina-Lesquerella gordonii herbaceous association**

   This vegetation type, which is typical of grasslands growing on gypsum substrates in western Oklahoma, was predominant in upland areas. Common associated species included *Bouteloua curtipendula, Chaetopappa ericoides, Comandra umbellata, Erioneuron pilosum, Hedysotis nigricans, Lithospermum incisum, Machaeranthera pinnatifida, Opuntia phaeacantha, Paronychia jamesii, Phacelia integrifolia, Psilostrophe tagetina, Symphyotrichum fendleri, and Yucca glauca*. Most of the woody plant species were found at the bottom of steep-sided ravines in the gypsum. These sites were dominated by *Quercus macrocarpa* and *Q. muehlenbergii*, with *Ribes aureum, Sideroxylon lanuginosum, and Symphoricarpos orbiculatus*. *Echinocereus reichenbachii* and *Escobaria vivipara*, both tracked by ONHI, occurred in this habitat.

2. **Wetland and riparian vegetation**

   This vegetation type was restricted to the margins of the creek and a large pond on the property. Common associates included *Amorpha fruticosa, Baccharis salicina, Eleocharis palustris, Juncus torreyi, Panicum virgatum, Phyla lanceolata, Pluchea odorata, Polypogon monspeliensis, Populus deltoides, Ranunculus sceleratus, Salix nigra, Samolus valerandi, and Schoenoplectus pungens.*

3. **Disturbed areas and old-field vegetation**

   Disturbed areas were designated as sites exhibiting signs of physical disruption, such as oil well pads, roadsides, and heavily grazed pastures along the creek. Common plants in disturbed areas included *Bothrio-
and a species tracked by ONHI, was found in this habitat.

ACKNOWLEDGMENTS

We thank Todd Fagin and Kim Shannon for field assistance and an anonymous reviewer for constructive comments.

REFERENCES

Annotated species list for a site predominated by gypsum outcrops in Major County. The first entry is the life history (A = annual, B = biennial, P = perennial), followed by the collection number, and habitat (MGP = *Schizachyrium scoparium*-Castilleja purpurea var. *citrina*-Lesquerella gordonii* herbaceous association, WETL = wetland and aquatic vegetation, DAOF = disturbed areas and old-field vegetation). Exotic species are denoted with an asterisk. Voucher specimens were deposited at the Robert Bebb Herbarium at the University of Oklahoma (OKL).

**PTERIDOPHYTA**

Ophioglossaceae  
*Ophioglossum engelmannii* Prantl - P; AB-4550; MGP

Pteridaceae  
*Cheilanthes fexi* T. Moore - P; AB-6118; MGP  
*Pellaea atropurpurea* (L.) Link - P; AB-6136; MGP

**CONIFEROPHYTA**

Cupressaceae  
*Juniperus virginiana* L. - P; AB-4752; MGP, DAOF

**MAGNOLIOPHYTA**

**MAGNOLIOPSISDA**

Anacardiaceae  
*Rhus aromatica* Ait - P; AB-6457; MGP

Apocynaceae  
*Apocynum cannabinum* L. - P; AB-4747; MGP

Asclepiadaceae  
*Asclepias asperula* (Dcne.) Woods. - P; AB-5073; MGP  
*A. engelmanniana* Woods. - P; AB-5189; MGP  
*A. latifolia* (Torr.) Raf. - P; AB-5190; MGP  
*A. pumila* (Gray) Vail - P; AB-5181; MGP

Asteraceae  
*Ambrosia psilostachya* DC. - P; AB-6008; DAOF  
*A. trifida* L. - A; AB-6139; DAOF  
*Amphiachyris dracunculoides* (DC.) Nutt. - A; AB-6127; DAOF  
*Aphanostephus skirrhobasis* (DC.) Trel. - A; AB-4781; DAOF, MGP  
*Artemisia fi lifolia* Torr. - P; AB-6439; MGP  
*A. ludoviciana* Nutt. - P; AB-6129; MGP  
*Coreopsis grandifl ora* Hogg ex Sweet - P; AB-5165; MGP  
*Cirsium undulatum* (Nutt.) Sprng. - P; AB-5077; DAOF, MGP  
*Coryza canadensis* (L.) Cronq. - A; AB-5179; OF  
*Coropris grandifl ora* Hogg ex Sweet - P; AB-4757; MGP  
*Cuspia canadensis* (L.) Cronq. - A; AB-5179; OF  
*Coreopsis grandifl ora* Hogg ex Sweet - P; AB-4757; MGP

**Boraginaceae**

*Lithospermum incisum* Lehm. - P; AB-4761; MGP

**Brassicaceae**

*Capsella bursa-pastoris* (L.) Medik.* - A; AB-4567; DAOF

Descurainia pinnata (Walt.) Britt. - A; AB-4569; DAOF, MGP
Draba brachycarpa Nutt. ex Torr. & Gray - A; AB-4567; MGP
D. reptans (Lam.) Fern. - A; AB-4566; MGP
Lepidium densiflorum Schrad.* - A; AB-5193; DAOF
L. oblongum Small - P; AB-4564; DAOF
Lesquerella gordonii (Gray) S. Wats. - A; AB-4562; DAOF
Lepidium densiflorum - A; AB-5193; DAOF
L. oblongum Small - P; AB-4564; DAOF
Lesquerella gordonii (Gray) S. Wats. - A; AB-4562; DAOF
Rorippa nasturtium-aquaticum (L.) Hayek* - P; AB-5114; WETL
Cactaceae
Echinocereus reichenbachii (Terscheck ex Walp.) Haage f. - P; AB-4550a; MGP
Escobaria vivipara (Nutt.) Buxbaum - P; AB-4821; MGP
Opuntia humifusa (Raf.) Raf. - P; AB-4567; MGP
O. lindheimeri Engelm. - P; AB-6019; MGP
O. phaeacantha Engelm. - P; AB-5195; MGP
Capparaceae
Cleome serrulata Pursh - A; AB-4827; MGP
Polanisia dodecandra (L.) DC. - A; AB-5091; MGP
Caprifoliaceae
Symphoricarpos orbiculatus Moench - P; AB-5177; MGP
Caryophyllaceae
Arenaria serpyllifolia L.* - A; AB-4562; OF
Cerastium pumilum W. Curtis* - A; AB-4563; OF
Paronychia jamesii Torr. & Gray - P; AB-5092; MGP
Chenopodiaceae
Chenopodium album L. - A; AB-6011; DAOF
C. pratericola Rydb. - A; AB-4829; DAOF
Salsola tragus L.* - A; AB-6450; DAOF
Convolvulaceae
Evolvulus nuttallianus J.A. Schultes - P; AB-4778; MGP
Ipomoea leptophylla Torr. - P; AB-5109; MGP
Cucurbitaceae
Cucurbita foetidissima Kunth - P; AB-5108; DAOF, MGP
Cyclanthera dissecta (Torr. & Gray) Arn. - A; AB-6131; MGP
Euphorbiaceae
Acalypha ostryifolia Riddell - A; AB-5175; DAOF
Indigofera miniata Ortega - P; AB-5106; MGP
Melilotus officinalis (L.) Lam.* - B; AB-5103; DAOF
Mimosa nutallii (DC.) B.L. Turner - P; AB-4739; MGP
Pelionema cuspidatum (Pursh) Ryd. - P; AB-4755; MGP
P. linearifolium (Torr. & Gray) J. Grimes - P; AB-4822; DAOF
Prospis glandulosa Torr. - P; AB-5169; DAOF: MGP
Vicia americana Muhl. ex Willd. - P; AB-4572; DAOF, MGP
Fagaceae
Quercus macrocarpa Michx. - P; AB-4551; DAOF, MGP
Q. muehlenbergii Engelm. - P; AB-4551a; MGP
Fumariaceae
Corydalis curvisiliqua Engelm. - A; AB-4573; MGP
Grossulariaceae
Ribes aureum Pursh - P; AB-4770; MGP
Hydrophyllaceae
Nama stevensii C. L. Hitchc. - A; AB-4575; MGP
Phacelia integrifolia Torr. - A; AB-5090; MGP
Juglandaceae
Juglans microcarpa Berl. - P; AB-4560; DAOF, MGP
Krameriacae
Krameria lanceolata Torr. - P; AB-5119; MGP
Lamiaceae
Lamium purpureum L.* - A; AB-4557; DAOF
Monarda clinopodioides Gray - A; AB-4828; MGP
Linaceae
Linum pratense (J.B.S. Norton) Small - A; AB-4577; MGP
L. rigidum Pursh - A; AB-4578; MGP
Loasaceae
Mentzelia nuda (Pursh) Torr. & Gray - P; AB-5100; MGP
M. oligosperma Nutt. ex Sims - P; AB-5172; MGP
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Malvaceae
Callihoe involucrata (Torr. & Gray) Gray - P; AB-4561; MGP
C. leiocarpa R.F. Martin - P; AB-6121; MGP
Sphaeralcea coccinea (Nutt.) Rydb. - P; AB-4570; MGP

Molluginaceae
Mollugo verticillata L. - A; AB-6141; DAOF

Moraceae
Morus alba L.* - P; AB-5089; DAOF

Nyctaginaceae
Mirabilis linearis (Pursh) Heimerl - P; AB-6444; MGP

Onagraceae
Calylophus hartwegii (Bent.) Raven - P; AB-6006; MGP
C. serrulatus (Nutt.) Raven - P; AB-6124; MGP
Gaura coccinea (Nutt.) Rydb. - P; AB-4573; DAOF
G. mollis James - A; AB-5186; DAOF
Oenothera biennis H. L. - A; AB-4759; MGP
O. laciniata Hill - P; AB-4743; DAOF, MGP
Stenosiphon linifolius (Nutt. ex James) Heynh. - P; AB-6440; MGP

Oxalidaceae
Oxalis stricta L. - P; AB-4559; DAOF, MGP
O. violacea L. - P; AB-4566; MGP

Papaveraceae
Argemone polyanthemos (Fedde) G.B. Ownbey - A; AB-6448; DAOF, MGP

Plantaginaceae
Plantago patagonica Jacq. - A; AB-4766; DAOF, MGP
P. rhodosperma Dcne. - A; AB-4762; DAOF, MGP
P. virginica L. - A; AB-4568; DAOF

Polygalaceae
Polygala alba Nutt. - P; AB-5163; MGP

Polygonaceae
Eriogonum annuum Nutt. - A; AB-5178; MGP
Polygonum lapathifolium L. - A; AB-6298; WETL
P. tenne Michx. - P; AB-5068; DAOF
Rumex crispus L.* - P; AB-5080; WETL

Portulacaceae
Portulaca oleracea L. - A; AB-6300; DAOF
P. pilosa L. - A; AB-6299; DAOF

Primulaceae
Samolus valerandi L. - P; AB-5081; WETL

Ranunculaceae
Delphinium carolinianum Walt, ssp. virescens (Nutt.) Brooks - P; AB-4760; MGP
Ranunculus abortivus L. - P; AB-5086; WETL
R. scleratus L. - A; AB-6442; WETL

Rosaceae
Prunus angustifolia Marsh. - P; AB-4744; DAOF

Rubiaceae
Hedyotis nigricans (Lam.) Fosberg - P; AB-5105; MGP

Salicaceae
Populus deltoides Bartr. ex Marsh. - P; AB-5112; WETL
Salix nigra Marsh - P; AB-5079; WETL

Santalaceae
Comandra umbellata (L.) Nutt. - P; AB-4573; MGP

Sapindaceae
Sapindus saponaria L. - P; AB-4746; DAOF, MGP

Scrophulariaceae
Castilleja purpurea (Nutt.) G.Don var. citrina (Penneill) Shinniers - P; AB-4571; MGP
Penstemon coloba Nutt - P; AB-4740; MGP
Veronica arvensis L.* - A; AB-4558; DAOF, MGP

Solanaceae
Physalis cerasascens (Dunal) A.S. Hitchc. - P; AB-4767; MGP
Quinqua lobata (Torr.) Raf. - P; AB-4573; DAOF, MGP
Solanum dimidiatum Raf. - A; AB-5082; DAOF, MGP
S. elaeagnifolium Cav. - P; AB-6120; DAOF, MGP
S. rostratum Dunal - P; AB-6134; DAOF

Tamaricaceae
Tamarix chinensis Lour.* - P; AB-4818; WETL

Ulmaceae
Celtis laevigata Willd. var. reticulata (Torr.) L. - P; AB-6132; DAOF, MGP
Ulmus americana L. - P; AB-4820; DAOF, MGP
U. pumila L.* - P; AB-6452; DAOF, MGP

Urticaceae
Parietaria pensylvanica Muhl. ex Willd. - A; AB-4563; DAOF

Verbenaceae
Glandularia bipinnatifida (Nutt.) Nutt. - A; AB-4763; MGP
G. pumila (Rydb.) Umber - A; AB-4763; DAOF
Phyla lanceolata (Michx.) Greene - P; AB-5084; WETL
Verbena bracteata; Lag. & Rodr. - P; AB-5071; MGP

Violaceae
Hybanthus verticillatus (Ortega) Baill. - P; AB-4579; MGP
Viola bicolor Pursh - A; AB-4556; DAOF, MGP

Vitaceae
Cissus trifoliata (L.) - P; AB-4754; MGP
Vitis acerifolia Raf. - P; AB-4775; DAO, MGP
V. riparia Michx. - P; AB-6116; WETL

LILIOPSIDA
Agavaceae
Yucca glauca Nutt. - P; AB-4769; MGP, DAO

Commelinaceae
Commelina erecta L. - P; AB-4826; MGP, DAO
Tradescantia occidentalis (Britt.) Smyth - P; AB-4576; MGP

Cyperaceae
Carex gravis Bailey - P; AB-4524; MGP
Cyperus schweinitzii Torr. - P; AB-5196; MGP
Eleocharis palustris (L.) Roemer & J.A. Schultes - P; AB-5078; WETL
Schoenoplectus pungens (Vahl) Palla - P; AB-5075; WETL

Juncaceae
Juncus torreyi Coville - P; AB-5074; WETL

Lemnaceae
Lemma minor (L.) - A; AB-4552a; WETL

Lilaceae
Allium drummondii Regel - P; AB-4568; MGP, DAO

Poaceae
Andropogon gerardii Vitman - P; AB-6142; MGP
Aristida purpurea Nutt. - P; AB-5087, AB-6001; MGP
Bothriochloa ischaemum (L.) Keng* - P; AB-6000; MGP
B. laguroides (DC.) Herter - P; AB-5076; MGP
Bouteloua curtipendula (Michx.) Torr. - P; AB-5102; MGP
B. gracilis (Willd. ex Kunth) Lag, ex Griffiths - P; AB-6002; MGP
Bromus catharticus Vahl* - A; AB-4553; DAO
B. tectorum L.* - A; AB-4555; DAO
Buchloe dactyloides (Nutt.) Engelm. - P; AB-4564; MGP
Cenchrus spinifex Cav. - P; AB-5197; WETL
Chloris verticillata Nutt. - P; AB-5168; DAO
Cynodon dactylon (L.) Pers.* - P; AB-5180; DAO
Dichanthelium oligosanthes (J.A. Schultes) Gould - P; AB-4758; MGP
Digitaria ciliaris (Retz.) Koel. - A; AB-6126; DAO
Echinochaia muricata (Beauv.) Fern.* - A; AB-5199; WETL
Eleusine indica (L.) Gaertn.* - A; AB-6113; DAO
Elymus canadensis L. - P; AB-5170; DAO, WETL
E. virginicus L. - P; AB-5093; WETL
Eragrostis cilium (A.) Vign. ex Janchen* - A; AB-6445; DAO
Eriochloa contracta A.S. Hitchc.- A; AB-6138; WETL
Erioneuron pilosum (Buckl.) Nash - P; AB-5164; MGP
Hordeum pusillum Nutt. - A; AB-4554; MGP, OF
Panicum capillare L. - A; AB-6130; MGP
P. obtusum Kunth - P; AB-5083; WETL
P. virgatum L. - P; AB-6013; MGP, WETL
Paspalum smithii (Rydb.) A. Love - P; AB-5117; DAO
Phalaris caroliniana Walt. - A; AB-5085; WETL
Poa arachnifera Torr - P; AB-4573; DAO
P. arida Vasey - P; AB-6461; DAO, MGP
Polygong monspeliensis (L.) Desf.* - A; AB-5118; WETL
Schizachyrium scoparium (Michx.) Nash - P; AB-6128; MGP
Setaria parviflora (Poir.) Kerguelen - P; AB-5198; DAO
S. pumila (Poir.) Roemer & J. A. Schultes* - A; AB-5094; DAO
Sorghastrum nutans (L.) Nash - P; AB-6140; MGP
Sphenopholis obtusata (Michx.) Scribn. - P; AB-6462; WETL
Sporobolus compositus (Poir.) (Merr.) - P; AB-6119; DAO, MGP
S. cryptandrus (Torr.) Gray - P; AB-6014; DAO, MGP
Tridens albescens (Vasey) Woot. & Standl. - P; AB-6137; DAO
T. flavus (L.) A.S. Hitchc. - P; AB-6015; MGP
Vulpia bromoides (L.) S.F. Gray* - A; AB-4817; DAO

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