

COMPARISON OF BARE ROOT VS POTTED PLANTS, SPECIES SELECTION, AND
CAGING TYPES FOR RESTORATION OF A PRAIRIE WETLAND, AND
QUANTITATIVE ANALYSIS AND DESCRIPTIVE SURVEY OF PLANT
COMMUNITIES AND ASSOCIATIONS AT LEWISVILLE LAKE
ENVIRONMENTAL LEARNING AREA (LLELA),
LEWISVILLE, TX

Robin R. Buckallew, B.A., B.S., M.S.

Dissertation Prepared for the Degree of
DOCTOR OF PHILOSOPHY

UNIVERSITY OF NORTH TEXAS

May 2007

APPROVED:

Kenneth L. Dickson, Major Professor
Gary O. Dick, Committee Member
Paul F. Hudak, Committee Member
Thomas W. La Point, Committee Member and
Director of the Institute of Applied
Sciences
Kenneth L. Steigman, Committee Member
Art J. Goven, Chair of the Department of
Biological Sciences
Sandra L. Terrell, Dean of the Robert B.
Toulouse School of Graduate Studies

Buckallew, Robin R. *Comparison of Bare Root vs. Potted Plants, Species Selection, and Caging Types for Restoration of a Prairie Wetland, and Quantitative Analysis and Descriptive Survey of Plant Communities and Associations at Lewisville Lake Environmental Learning Area (LLELA), Lewisville, TX.* Doctor of Philosophy (Environmental Science), May 2007, 164 pp., 14 tables, 13 illustrations, references, 127 titles.

Lewisville Lake Environmental Learning Area (LLELA) is an 809-hectare property in Denton County, TX. A study of the vegetation community identified 466 species in 104 families, with 25% of the species from only two families, Asteraceae and Poaceae. The property demonstrates the characteristics of an early successional community, dominated by weedy species. Prairie communities are dominated by Johnson grass and ragweed, with climax tall grass prairie communities only in areas that have been planted with native grass seed. Forest communities are similarly in an early successional stage, dominated by the hackberry-elm-ash alliance, with small remnants of native Cross Timbers found in isolated patches. Species richness and diversity were highest in the forests and lowest in the wetlands; evenness, though not different across ecosystems, demonstrated a strong seasonal component. The species list was compared with previously reported lists for Denton County, and 256 species identified had not been previously reported for the county.

A wetland restoration study was conducted to determine if there was a difference in survival and growth between potted transplants with intact root systems and bare-root transplants. Two different mesh sizes were used for protection, and the success of the different caging was evaluated. Of eight species, only four survived through the second

growing season. There was no significant difference in the success of the propagule types for *Sagittaria latifolia*. The treatments planted with intact root systems showed significantly higher growth and reproduction than the bare-root treatments for *Eleocharis quadrangulata*, *Heteranthera dubia*, and *Vallisneria americana*. There was no survival recorded in the coarse mesh cages, likely due to the presence of crayfish that are able to get through the coarser mesh and feed on the transplants.

Copyright 2007

by

Robin R. Buckallew

ACKNOWLEDGEMENTS

Any study this ambitious could not have been undertaken without assistance. I would like to acknowledge the many colleagues and friends who have contributed to this project. Assistance in the wetland restoration was provided by Brian Boe, Patricia Brady, Dilcia Figuera, Kelly Finch, Marie King, Yasu Kitamura, Maria Moreno, Jill Nugent, Theron Palmer, Donna Snow, and Adam Way.

People who assisted with the biological survey, and whose help was appreciated more than I can ever express included Brian Boe, Stephanie Britton, Gloria Caddell, Chris David, Elm Fork Master Naturalists, Marie King, George Maxey, Regina Southworth, Rudi Thompson, Tommy Turner, and Gina Woodling.

Additional assistance in all phases of the project was provided by UNT students in the Environmental Science and Ecology classes.

I would also like to acknowledge the tireless assistance of John Coffman, Joshua Sales, and especially Joaquin Torrans who donated hours to assisting with the GPS mapping of the property. Special thanks are also due to Thomas Beitingner, who gave me valuable advice regarding statistical analyses, and Mike Stockstill at the SAS Institute, who patiently guided me through difficult analyses.

Special notice should be given to the Botanical Research Institute of Texas (BRIT), who assisted me with particularly difficult plant identifications, and verified questionable IDs. I would particularly like to acknowledge the assistance of Lee Luckeydoo, who generously assisted me at BRIT, and answered many questions for me.

I would like to acknowledge the staff of the Lewisville Lake Aquatic Ecosystem Research Facility (LAERF) who have assisted me countless times and in countless ways. I would also like to thank the University of North Texas librarians, who have been dedicated and efficient at assuring that I received the literature I needed in a timely fashion. I would also like to take time to give special notice to all the many technicians out there who struggled to keep my equipment in shape and functioning throughout the entire process.

Special thanks are extended for services unwittingly rendered by William Carlos Williams and MAD Magazine.

Other people have been with me every step of the way, and have assisted in more ways than can be counted, and I want to especially thank Cara Cobos, Richard Freiheit, Bruce Hunter, Tina Tucker, and Sarah Whyman, who have given selflessly and graciously of their time and deserve special mention. Special thanks are also due to Candy King and Bob Killam, who always manage to solve problems no one else could possibly have solved.

I would also like to acknowledge my graduate committee, without whom none of this would have been possible. They have been solid supporters, and have given me advice and assistance in every way possible, and have been a source of strength and inspiration to me. Thank you very much Dwight Barry, Gary Dick, Paul Hudak, Tom La Point, Ken Steigman, and especially Ken Dickson.

Last, but by no means least, special acknowledgement is due to two special individuals, David Ford and Fritz Buckallew, truly deserve most of the credit for this project for their endurance, their patience, and their special way of helping me through.

TABLE OF CONTENTS

ACKNOWLEDGMENTS.....	iii
LIST OF TABLES.....	vi
LIST OF ILLUSTRATIONS.....	vii
CHAPTER I: WETLAND RESTORATION.....	1
Introduction.....	1
Description of Site	3
Design, Materials and Methods	5
Results	7
Conclusions.....	13
CHAPTER II: FLORISTIC SURVEY.....	15
Introduction.....	15
Description of Site	17
Design, Materials and Methods	22
Results	30
Conclusions.....	82
CHAPTER III: RECOMMENDATIONS	86
APPENDIX A: SPECIES DISTRIBUTIONS PER FAMILY	103
APPENDIX B: QUADRAT SPECIES INFORMATION.....	106
LITERATURE CITED	155

LIST OF TABLES

Table 1: Average number of stems per species per cage	9
Table 2: Average estimated percent cover per species per cage.....	11
Table 3: Cover classes of the Daubenmire method.....	25
Table 4: List of species at LLELA.....	33
Table 5: Coefficient of conservation for native species found at LLELA.....	46
Table 6: Descriptive statistics for species distribution by ecosystem, Origin and Habit	54
Table 7: Descriptive statistics for species distribution by ecosystem, Functional Group.....	55
Table 8: Quadrat information for LLELA.....	58
Table 9: Descriptive statistics for biodiversity parameters by ecosystem	62
Table 10: Successional stages and alliances of the quadrats sampled at LLELA.....	64
Table 11: Species that demonstrate associations	66
Table 12: Communities that can be predicted to occur together	77
Table 13: Tree species present on LLELA	78
Table 14: Tree species in sample quadrats.....	81

LIST OF ILLUSTRATIONS

Figure 1: Location of target wetland below Lewisville Lake dam.....	4
Figure 2: Average monthly temperature for LLELA	20
Figure 3: Average monthly precipitation for LLELA	21
Figure 4: Location of sample quadrats on LLELA	27
Figure 5: Plant species composition at LLELA, Origin and Habit	31
Figure 6: Plant species composition at LLELA, Functional Group.....	32
Figure 7: Average species per plot by ecosystem, origin and habit.....	55
Figure 8: Average species per plot by ecosystem, functional group.....	56
Figure 9: Average richness by ecosystem.....	57
Figure 10: Average diversity by ecosystem.....	60
Figure 11: Average evenness by ecosystem.....	61
Figure 12: Average evenness by season	61
Figure 13: Dendrogram for cluster analysis of sample quadrats, summer 2005	62

CHAPTER I

WETLAND RESTORATION

Introduction

Throughout the past two decades, ecologists have become very aware of the importance of wetlands in healthy ecosystems. Wetlands are transitional areas between flooded deepwater and drained uplands (United States Geological Survey, 2001). Although initial emphasis was on draining wetlands for agricultural or urban uses, in recent years society has begun to recognize the value of intact wetlands. Although for a long time wetland protection was regarded as a luxury, it has come to be recognized as an important capital investment (Odum, 1969). The most productive ecosystems on earth, wetlands provide significant resources for economic uses, as well as food supply and water supply. They are significant factors in protection of water quality, and also in erosion and flood control. In addition, the aesthetic values of wetlands have come to be recognized, as well as their uses as habitat for plants, fish and other wildlife (United States Fish and Wildlife service, 1989; United States Geological Survey, 2001; Wentz, 1981; Wilen & Bates, 1995; Tiner, 1984).

Wetland loss has become an issue of international concern. It is estimated that at the time of European settlement, the United States had 215 million acres, of which less than 95 million acres remain. This represents a loss of 56 percent (United States Fish and Wildlife Service, 1989). Texas had lost approximately 52% of its wetlands by the mid-1980s (Dahl and Johnson, 1991). Small wetlands, especially those of only regional importance, have been particularly vulnerable. They often are the only land in an area remaining undeveloped, and are attractive to those wishing to convert wetlands

for economic gain (Ewel, 1990). If wetlands are degraded or drained, many of the benefits are reduced or eliminated (United States Fish and Wildlife Service, 1989).

A great deal of emphasis has been placed on wetland restoration, in an attempt to return degraded wetlands to a more healthy level of functioning. Many of these restorations are done by reintroducing native vegetation into the system to reestablish a healthy community (Smart, Dick and Snow, 2005). There is some controversy over the proper role and definition of restoration; however, many experts now agree that restoration involves returning a wetland to its original or previous state of functioning (Mitsch and Gosselink, 2000). The first step in wetland restoration is often the reintroduction of native aquatic vegetation. Though many wetlands contain a seed bank that can allow natural revegetation over time, planting may provide results that are more reliable, and that allow for a more rapid recovery (Willard, et al., 1990).

In spite of advances made in the state of ecological science, studies have shown that about 50-60% of wetland restoration projects fail to meet the criteria established for success (Mitsch and Wilson, 1996). In the process of revegetation, many *a priori* assumptions have been made about the best methods of planting. Although a vast body of literature exists on wetland planting techniques, a review of this literature indicates that many of these assumptions have not been tested quantitatively. Most restoration specialists have adopted a preferred method of planting based on empirical observations or simply on the word of other wetland scientists who have been planting using a particular method (G. Dick, 2003, personal communication; Mitsch and Wilson, 1996). Without backing by scientific studies, many attempts to restore ecosystems have demonstrated that theory and practice are not always in line (Mitsch et al., 1998).

Research is still needed to determine what techniques work best for restoring and managing degraded wetlands (United States Geological Survey, 2001).

Planting methods can include seeding, planting roots and tubers, or releasing fragments. These may be obtained from nursery stocks or from cuttings (Smart, Dick and Snow, 2005; Smart and Dick, 1999; Willard, et al., 1990). In addition, protection by caging must be considered, as aquatic plant communities often incur substantial losses from herbivory (Smart, Dick and Snow, 2005; Smart and Dick, 1999; Smart, Dick, and Doyle, 1998; Smart et al., 1996; Lodge, 1991). This study attempted to quantitatively assess the success of planting methods using various propagule types and various caging regimes.

This study compared different planting methods to determine optimal methods of establishing wetland species. The research attempts to answer two questions.

- Which planting method, potted vs. bare root or fragment, yields the best rate of survival, growth and reproduction?
- Which species have the best chance for survival and reproduction?

Description of Site

The Lewisville Lake Environmental Learning Area (LLELA) is an 809-hectare (2000-acre) property located beneath the Lewisville Dam in north central Texas, at the northern edge of the Dallas-Fort Worth metroplex. The surrounding community of Lewisville is a growing urban community with a population of 77,737 (Texas Department of Transportation, 2002). The property is managed by a consortium of partners that includes the University of North Texas, Texas Women's University, Texas A&M University, the City of Lewisville, and the Lewisville Independent School District. The

LLELA mandate calls for preservation and restoration of native habitat and biodiversity, environmental education, and environmental research. The principal goals are to preserve and protect native biodiversity and to restore degraded ecosystems, communities and native biodiversity (Barry, Forbes and Dickson, 2001).

The target wetland for the restoration planting project is a four-hectare pond located at 743883 easting, 2155708 northing (B. Hunter, 2005, personal communication), as indicated on the map in Figure 1. It is a palustrine emergent wetland (Tiner, 1984; Cowardin et al., 1979), and is permanently flooded, receiving water from the Elm Fork of the Trinity River. The shoreline is vegetated with emergent riparian species, and infrequent *Salix nigra* individuals. The wetland itself is populated with *Nelumbo lutea* (American water lotus), *Polygonum amphibium* (water knotweed), and *Azolla caroliniana* (water fern).



Figure 1. Location of target wetland below Lewisville Lake Dam.

Design, Materials and Methods

At the beginning of the study, vegetation consisted predominantly of *Polygonum amphibium* (smartweed) and *Nelumbo lutea* (American water lotus). A floating invasive, *Azolla caroliniana* (water fern), was also present in small amounts, as well as some scattered sedges. *Typha domingensis* (southern cattail) was present in small amounts at the edge of the pond, and a large community of cattail was present nearby. Because the target wetland had been invaded by *Nelumbo lutea* (American water lotus), it was necessary to disc the wetland to prepare for planting. This was done by staff from Lewisville Lake Aquatic Ecosystem Research Facility (LAERF) in the fall of 2003. It was also necessary to remove beaver dams that blocked the water flow into the wetland, and to maintain this area free of beaver dams throughout the study period. Staff from LLELA and LAERF managed this aspect.

To evaluate propagule type, I compared bare root plantings or fragments for submersed species with mature potted plants. Literature reported that *Heteranthera* is able to be established from stem fragments; however, transplants of actively growing potted plants were believed to provide a better opportunity for short-term survival. Empirical observations had shown that bare-root transplants had a higher mortality than those that had the root system intact at time of transplanting, and that plants with bare-roots were more likely to get uprooted and float away (Smart et al., 1996). I further compared the use of herbivore protection in the form of cages with unprotected plantings, and I also compared the mesh size of the protective cages. I evaluated a total of eight common, native wetland species: *Eleocharis quadrangulata* (Squarestem spikerush), *Heteranthera dubia* (Water stargrass), *Justicia americana* (American water

willow), *Potamogeton illinoensis* (Illinois pondweed), *Potamogeton nodosus* (American pondweed), *Sagittaria latifolia* (Arrowhead), *Schoenoplectus tabernaemontani* (Softstem bulrush), and *Vallisneria americana* (Water celery). These species were selected based on ready availability of appropriate propagules from a local source (Smart et al., 1996). They were also selected based on a preliminary survey that determined what plants were already present in the area. The selected species did not already exist nearby, so this enabled me to better evaluate establishment from plantings free of contamination from propagule dispersion. All plantings were done in May, 2004, with the assistance of volunteers from the University of North Texas.

For each species, an appropriate planting depth was determined from the existing literature. Submersed species (*Vallisneria americana* and *Heteranthera dubia*) were planted at depths between 0.5 and 1.0 m, floating-leaved species (*Potamogeton illinoensis* and *Potamogeton nodosus*) were planted at depths from 25 to 75 cm, and emergent species (*Eleocharis quadrangulata*, *Sagittaria graminea*, *Justicia americana*, and *Schoenoplectus tabernaemontani*) were planted at a depth from 0 to 25 cm (Smart, Dick and Snow, 2005; Smart and Dick, 1999). All species were planted with mature, established potted species obtained from the nursery at LAERF. The emergent and floating-leaved species (plus *Vallisneria*) were planted with bare root plantings; *Heteranthera* was planted using vegetative fragments. Controls were set up where no planting was done. Each of the three treatments had six replicates. A review of the literature in the Journal of Aquatic Plant Management for the past four years (2001-2004) shows that similar studies have typically used three to four replicates, and I used six because of the lack of controls in field studies (G. Dick, 2005, personal

communication). Planting was done in late May in order to allow establishment before winter (Smart, Dick and Snow, 2005; Smart and Dick 1999).

To evaluate effectiveness of protection methods, three treatment types were used: controls with no protection; protection with modified tomato cages made of 2" by 4" wire mesh; and additional protection with .25" mesh wrapped around the wire mesh (Smart, Dick and Snow, 2005; Smart and Dick, 1999). Emergent species were protected in 3'x2' cages, and submersed species in 3' x 2.5' cages. Each treatment had six replicates. In order to prevent invasion by aggressive species present in the area, cages were weeded regularly to remove any water lotus that has invaded the cages.

The project was evaluated for success of establishment based on survival rate, surface area measurements using estimates of percent cover, and measurement of spread beyond the cage. Data were evaluated using T-test with the SAS 9.1 software package.

Results

The plantings were counted four times, once in the fall of 2004, and one time per season in the spring, summer and fall of 2005. Summer counts were not obtained in 2004 because unseasonably heavy rainfalls increased the water level in the wetland, and all the cages were underwater. Stem counts were done, percent cover was estimated, and growth outside the cages was noted.

Of the eight species planted, only five species (*E. quadrangulata*, *H. dubia*, *S. latifolia*, *S. tabernaemontani*, and *V. americana*) showed any survival and growth at the end of the first season. In the second season, *S. tabernaemontani* had essentially no

regrowth, with only one dwarf individual showing up in the early spring. This individual did not survive the growing season. *P. illinoensis*, *P. nodosus*, and *J. americana* did not survive the first growing season, and no individuals were present in 2005. All survivors among the four remaining species were in the fine mesh cages. No survivors were noted for any species in the uncaged treatments. No individuals of any of the planted species were found in the control cages; the control cages contained only *Nelumbo lutea* and *Polygonum amphibium*, which were present in the wetland prior to planting. Rapid growth and spread of *N. lutea* necessitated frequent weeding of the planted area.

Statistical analysis was performed between potted and bare root/fragment plantings in the fine mesh cages for the four surviving species. When comparing stem counts (Table 1), there was no significant difference between treatments for *S. latifolia*, except for the spring of 2005, when the potted plantings were significantly higher ($p=0.009$) than the bare root. There was no statistically significant difference between the treatments for *H. dubia* in the first 3 sample periods; however, in the fall of 2005 no survivors were found in the bare root treatments. *V. americana* had no survivors in the fragment treatments for the first three counting periods, though there was significant survivorship in the potted treatments; t-test was not done for these samples. In the final sample, in the fall of 2005, the fragment treatments showed survivors in two of the six cages; t-test was significant at $p=0.03$. *E. quadrangulata* showed significance for all four samples, with the potted treatments having significantly higher stem counts than the bare root. The only growth outside the cage was seen in *E. quadrangulata*, where spread was noted outside the cages in both the summer and fall samples in 2005. No outside the cage growth was observed for the coarse mesh cages.

Table 1. Average number of stems per species per cage, with *p* value, *t*-test

Species	Season	Rep	Bare Root	Potted	<i>P</i>
<i>Eleocharis quadrangulata</i>	Fall 04	1	11	35	0.0008
		2	29	42	
		3	0	63	
		4	0	66	
		5	8	73	
		6	3	26	
	Spring 05	1	62	39	0.01
		2	82	104	
		3	0	143	
		4	0	281	
		5	0	162	
		6	0	104	
	Sum 05	1	160	150	0.004
		2	208	207	
		3	4	353	
		4	0	239	
		5	0	220	
		6	37	315	
<i>Heteranthera dubia</i>	Fall 05	1	467	615	0.006
		2	560	506	
		3	33	593	
		4	0	784	
		5	3	463	
		6	62	522	
	Fall 04	1	0	54	0.28*
		2	16	0	
		3	0	6	
		4	0	37	
		5	9	0	
		6	1	0	
	Spring 05	1	0	47	0.75
		2	0	0	
		3	43	0	
		4	0	0	
		5	25	0	
		6	0	0	
	Sum 05	1	0	92	0.56
		2	0	0	
		3	0	0	
		4	0	0	
		5	103	112	
		6	0	0	
<i>Sagittaria latifolia</i>	Fall 05	1	0	36	N/A
		2	0	0	
		3	0	0	
		4	0	43	
		5	0	41	
		6	0	0	
	Fall 04	1	2	4	N/A
		2	2	2	
		3	1	2	
		4	2	4	

(Table continues)

Table 1 (cont.)

Species	Season	Rep	Bare Root	Potted	<i>P</i>
<i>Vallisneria americana</i>	Spring 05	5	5	2	0.83
		6	2	1	
		1	4	6	0.009
		2	4	7	
		3	1	7	
		4	1	6	
		5	1	1	
		6	1	8	
	Sum 05	1	1	3	0.56
		2	3	5	
		3	5	5	
		4	4	3	
		5	3	2	
		6	8	2	
	Fall 05	1	5	6	0.82
		2	8	9	
		3	4	5	
		4	4	5	
		5	2	2	
		6	8	2	
	Fall 04	1	0	7	0.82
		2	0	1	
		3	0	8	
		4	0	3	
		5	0	2	
		6	0	2	
	Spring 05	1	0	42	0.02
		2	0	55	
		3	0	38	
		4	0	48	
		5	0	51	
		6	0	31	
	Sum 05	1	0	0	0.02
		2	0	1	
		3	0	8	
		4	0	22	
		5	0	0	
		6	0	33	
	Fall 05	1	0	37	0.02
		2	0	42	
		3	34	11	
		4	24	25	
		5	0	45	
		6	0	27	

Statistical analysis using percent cover data revealed similar findings. The only exception was *S. latifolia*, which was significant in both the spring and summer of 2005, with higher percent cover in the potted treatments. See Table 2 for details.

Table 2. Average estimated percent cover per species per cage, with *P* value, t-test. * indicates that non-parametric testing was used because of unequal variances; however, in no instance did the non-parametric alternative yield a decisional difference than parametric analysis

Species	Season	Rep	Bare Root	Potted	<i>P</i>
<i>Eleocharis quadrangulata</i>	Fall 04	1	10	20	0.0002
		2	15	30	
		3	0	30	
		4	0	35	
		5	10	35	
		6	8	20	
	Spring 05	1	20	20	0.002
		2	25	35	
		3	0	35	
		4	0	55	
		5	0	45	
		6	0	30	
	Sum 05	1	70	70	0.02*
		2	80	75	
		3	2	80	
		4	0	80	
		5	0	75	
		6	30	85	
<i>Heteranthera dubia</i>	Fall 05	1	85	90	0.03*
		2	90	90	
		3	20	90	
		4	0	99	
		5	5	85	
		6	45	90	
	Fall 04	1	0	75	0.26*
		2	15	0	
		3	0	10	
		4	0	50	
		5	15	0	
		6	5	0	
	Spring 05	1	0	50	0.78
		2	0	0	
		3	50	0	
		4	0	0	
		5	20	0	
		6	0	0	
	Sum 05	1	0	75	0.58
		2	0	0	
		3	0	0	
		4	0	0	
		5	85	85	
		6	0	0	

(Table continues)

Table 2 (cont.)

Species	Season	Rep	Bare Root	Potted	P
<i>Sagittaria latifolia</i>	Fall 05	1	0	50	0.82
		2	0	0	
		3	0	0	
		4	0*	75	
		5	0	70	
		6	0	0	
	Fall 04	1	5	10	0.03
		2	5	5	
		3	3	5	
		4	5	5	
		5	10	3	
		6	5	3	
	Spring 05	1	10	25	0.08*
		2	16	15	
		3	2	20	
		4	1	10	
		5	2	2	
		6	1	30	
<i>Vallisneria americana</i>	Sum 05	1	3	15	0.94
		2	5	20	
		3	10	25	
		4	5	10	
		5	5	5	
		6	8	5	
	Fall 05	1	10	5	0.94
		2	5	5	
		3	8	10	
		4	6	10	
		5	15	15	
		6	10	10	
	Fall 04	1	0	5	0.94
		2	0	15	
		3	0	10	
		4	0	5	
		5	0	5	
		6	0	5	
<i>Vallisneria americana</i>	Spring 05	1	0	75	0.94
		2	0	70	
		3	0	40	
		4	0	50	
		5	0	55	
		6	0	25	
	Sum 05	1	0	0	0.94
		2	0	5	
		3	0	10	
		4	0	20	
		5	0	0	

(Table continues)

Table 2 (cont.)

Species	Season	Rep	Bare Root	Potted	<i>P</i>
		6	0	25	
	Fall 05	1	0	50	
		2	0	85	
		3	50	40	
		4	45	25	
		5	0	50	
		6	0	50	0.03

Conclusions

Five of the eight species originally planted were able to establish and overwinter the first year; however, *Schoenoplectus tabernaemontani* did not survive the second season. The heavy flooding in 2004 covered the cages, and would have allowed swimming herbivores access to the plants. Reasons for high mortality of the other species are not clear, but could include high water levels from unseasonably heavy rains immediately following the planting, or shading from the heavy growth of water lotus that continually re-established after being cleared, in spite of regular weeding. Studies have indicated that light intensity has a significant influence on the establishment of aquatic plants, including *Potamogeton* spp. (Carter and Rybicki, 1985; Barko, Hardin and Matthews, 1981; Spence and Chrystal, 1970). According to Gary Dick of LAERF, there have been problems with long-term survival of pondweed in other projects in the past in areas where water lotus infestations reduce light availability to photosynthetic tissue (G. Dick, 2007, personal communication; Ott, 2005).

Justicia americana, although it was planted in shallow water close to the shore, was submersed by heavy rains and flooding two days after planting, and remained underwater for a period of two approximately two months through June and July of

2004. A few stragglers showed up at a later sampling date that fall, but failed to survive until the second season.

There was no survival within the coarse mesh cages. This is consistent with several studies (Chambers et al., 1990; Ott, 2005) that have demonstrated problems from herbivory by crayfish even in exclosures, if the mesh was large enough for the crayfish to pass through. Crayfish are present at LLELA, and would have been able to pass through the coarse mesh, but not through the fine mesh.

There was no difference between the bare root and the potted treatments for *Sagittaria latifolia*; however, both *Vallisneria americana* and *Eleocharis quadrangulata* had significantly higher stem counts, as well as percent cover, in the potted treatments. *Heteranthera dubia* had no significant difference between treatments for the first three sampling events; however, the bare root transplants failed to survive through the second growing season, suggesting that long-term survival can be enhanced by use of mature potted transplants. The only species to demonstrate spread outside the cage was *E. quadrangulata*.

This study has shown that there is no demonstrably preferable planting method for *Sagittaria latifolia*. Mature transplants with intact root systems would be the preferred planting method for *Vallisneria americana*, *Eleocharis quadrangulata*, and *Heteranthera dubia*. Additional caging with fine mesh resulted in a substantial difference in growth and survival, and should be considered a wise investment where small herbivores are present.

CHAPTER II

FLORISTIC SURVEY

Introduction

Biodiversity around the world has been significantly threatened by human activities, particularly by conversion to other uses (Wilcove et al., 1998; Dobson, Bradshaw, and Baker, 1997). Cultivation, grazing, and urban encroachment have destroyed much of the native vegetation of the prairies of central Texas (Diamond and Smeins, 1985).

There are numerous post-oak/black-jack oak forest remnants persisting throughout Oklahoma and Texas, forming the western edge of the eastern deciduous forest, and bounded to the west by the Blackland Prairie. Although these forest remnants are one of the largest unaltered forest vegetation types in the eastern United States, these forests have been reduced by alteration of the system for agricultural and urban uses (Stahle and Hehr, 1984).

Prairies once accounted for 300 million hectares of land in the United States. These native systems have been extensively converted to cropland, and now cover only about 125 million hectares (Barbour and Billings, 1988). The prairies of north central Texas developed in the Pliocene, during a period of increased aridity that gave rise to the expansive prairies of the Great Plains by favoring grasses and forbs at the expense of woody species; the prairie biome is a young, relatively unstable system, with few endemic species and a tendency to invasion by woody vegetation (Axelrod, 1985; Branson, 1985). The Blackland Prairie in Texas was considered prime rangeland in the 19th century, but quickly proved insufficient to sustain production of cattle, and the land

was converted from rangeland to cropland. High levels of migration into the urban areas during the 1930s led to a population growth trend. Only small remnants of the original Blackland Prairie remain; most of the remnants are small, existing within or on the edge of the large population centers of a heavily urbanized region (Riskind and Collins, 1975).

The importance of preserving and restoring the remaining remnants of Cross Timbers forest and Blackland Prairie cannot be overemphasized. In order to accomplish this goal successfully, it is crucial to compile an inventory of the current species complement.

The Lewisville Lake Environmental Learning Area (LLELA) is a US Army Corps of Engineers property currently leased to a consortium of state and local agencies for purposes of preservation, restoration, and education (Barry, Forbes and Dickson, 2001). A biological survey was undertaken to quantify the plant communities, both aquatic and terrestrial, currently present on the property for management purposes. This research addressed the following questions.

- What plant species and associations are present at LLELA, what is the distribution within the various communities, and what is the diversity as measured by commonly accepted diversity indices?
- What is the proportion of invasive species, which species need to be top priority for control measures, and what are some of the best management methods to attempt to control these priority invasive species?
- What management plans would be most appropriate to attempt to meet LLELA's mandate for restoration?

Description of Site

The Lewisville Lake Environmental Learning Area (LLELA) is an 809-hectare property located beneath the Lewisville Dam in north central Texas. The area is characterized by a diversity of habitats, including a bottomland hardwood forest, wetlands, prairies, and transitional shrublands. The property is managed by a consortium of partners that includes the University of North Texas, Texas Women's University, Texas A&M University, the City of Lewisville, and the Lewisville Independent School District. The LLELA mandate calls for preservation and restoration of native habitat and biodiversity, environmental education, and environmental research. The principal goals are to preserve and protect native biodiversity and to restore degraded ecosystems, communities and native biodiversity (Barry, Forbes and Dickson, 2001).

LLELA is located just beneath the Lewisville Reservoir, which was created in 1954 when the US Army Corps of Engineers impounded Clear Creek, Little Elm Creek, Stewart Creek, Pecan Creek, and Hickory Creek, as well as the Elm Fork of the Trinity River behind a 125-foot high, 33,000-foot long earthen dam (Handbook of Texas Online, 2006). Prior to the impoundment of the dam, the area now known as LLELA had been used for agricultural purposes for approximately a century, farmed for about 50 years, and grazed for about 50 years (D. Barry, 2004, personal communication).

LLELA is located in the mid-latitudes, with tropical and polar masses governing the domain. It lies in the transition zone between the forests to the east and the deserts to the west. Evapotranspiration offsets precipitation, and the climate is subhumid (Fralish and Franklin, 2002; Bailey, 1998).

LLELA is in the humid temperate domain (Fralish and Franklin, 2002; McNab and Avers, 1994). It is in the Texan biotic province, which extends from northern Oklahoma south across Texas. The Texan biotic province is characterized by gently rolling hills, with short mild winters and long hot summers. There are natural perennial streams at a low to moderate density, which usually form a dendritic drainage pattern (McNab and Avers, 1994; Shimer, 1972; Dice, 1943). The study area lies in the Cross Timbers region, a cold-deciduous broadleaf forest interspersed by extensive expanses of grassland which extends from the southern edge of the bluestem prairie in Kansas down through eastern Texas (McNab and Avers, 1994; Barbour and Billings, 1988; Risser et al., 1981; Dyksterhuis, 1948). The Cross Timbers have been described in historical literature as a continuous series of forests, an “immense wall of woods stretching from south to north in a straight line”, and in the days of the pioneers was considered a great landmark of the endless western prairies (Dyksterhuis, 1948; Foreman, 1947). The natural vegetation does not form a homogenous vegetation formation, but instead is a mosaic of oak-hickory forest and tall grass prairies characterized as bluestem sod (Bailey, 1998; United States Department of Agriculture, 1936). The most important tree species in the natural vegetation are post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*) and Texas hickory (*Carya illinoensis*). Natural prairie vegetation would include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), indiagrass (*Sorghastrum nutans*), and common sunflower (*Helianthus annuus*) (Fralish and Franklin, 2002; McNab and Avers, 1994; Risser et al., 1981; Dice, 1943). The Blackland prairie is also intermingled with the Cross Timbers at the southern edge, and is classified as True Prairie, with little

bluestem as the dominant in climax prairie communities (Barbour and Billings, 1988; Collins, Smiens, and Riskind, 1975; Launchbaugh, 1972; Carpenter, 1940).

Soils in the area are predominantly mollisols; however, the Blackland prairie is characterized by vertisols (Barbour and Billings, 1988; Risser et al., 1981). According to the Soil Survey for Denton County, the soils on the east end of the property are Altoga-Vertel-Ferris, which are moderately deep soils of upland prairies, well drained clay soils with low potential for urban development because of the high shrink-swell potential. Permeability is moderate and very slow. On the west end, soils are Frio-Ovan, which are deep soils on bottomlands, well drained to moderately well drained, with low potential for urban development because of flooding, shrinking and swelling. Permeability is moderately slow to very slow (United States Department of Agriculture, 1980). The bedrock in the area is Paleozoic in origin (Shimer, 1972).

The normal growing season is 190-240 days, with the last killing frost of the spring occurring between March 1st and March 31st, and the first killing frost of winter occurring between November 1st and November 30th (McNab and Avers, 1994; United States Department of Agriculture, 1936). Normal weather patterns show that there are typically 126 days per year when the maximum temperature exceeds 32°C, and 38 days per year when the temperature drops below 0°C (National Oceanic and Atmospheric Administration, 2006; Atwood, 1940). The yearly average temperature is 8-17°C (Fralish and Franklin, 2002; McNab and Avers, 1994). Figure 2 shows the normal average monthly temperatures for the area, and also indicates the average monthly temperatures throughout the sampling period of 2004-2005. Average wind velocity is 12-14 mph (United States Department of Agriculture, 1936).

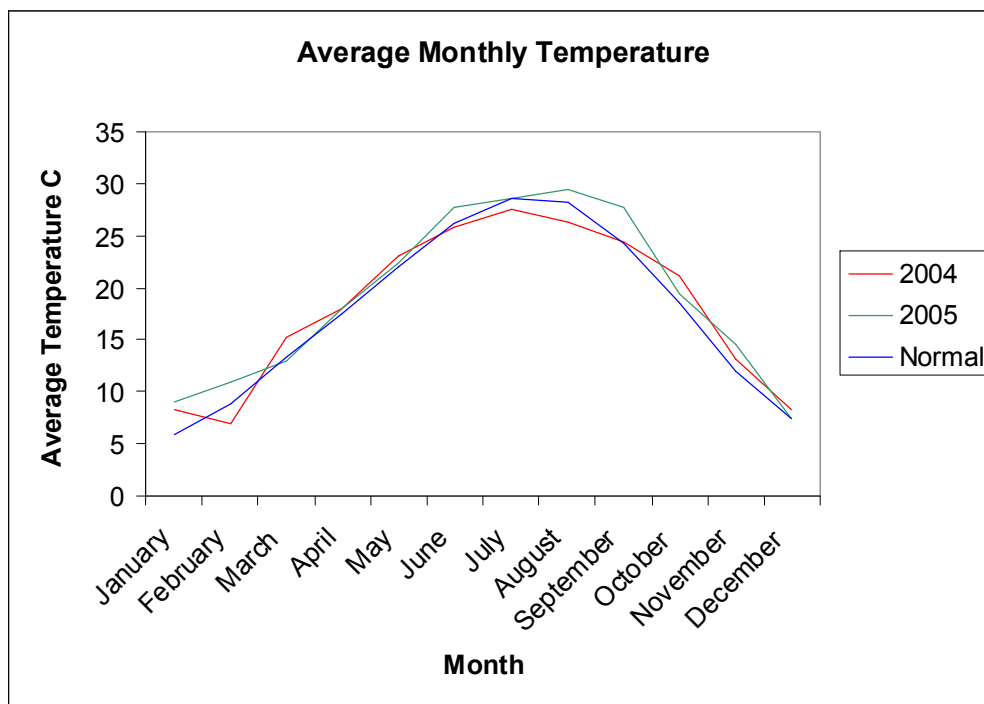


Figure 2. Average monthly temperature for LLELA, showing normal temperatures, and temperatures during the 2004-2005 sampling period, according to NOAA (2006).

According to the National Oceanic and Atmospheric Administration (NOAA), normal precipitation for the area is 95.99 cm annually. Total precipitation in 2004 was 132.18 cm, which was 36.2 cm above normal; in 2005, it was 39.55 cm, which was 56.44 cm below normal (National Oceanic and Atmospheric Administration, 2006). Figure 3 shows the normal monthly precipitation for LLELA, and also the monthly precipitation during the sampling period of 2004-2005.

In an area where the traditional land uses are farming and ranching, about 75% of the area has been cleared for agriculture, with only a small percentage of the former forest cover remaining (McNab and Avers, 1994; Atwood, 1940; USDA, 1936). The

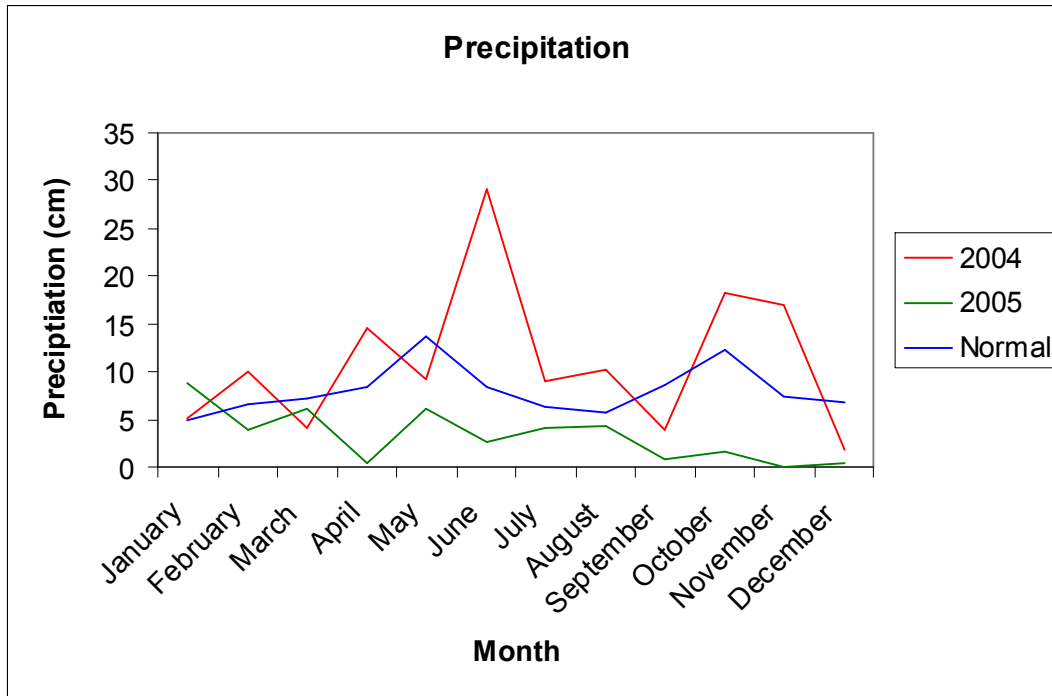


Figure 3. Average monthly precipitation for LLELA, showing normal rainfall in cm, and rainfall during the 2004-2005 sampling period, according to NOAA (2006).

principal disturbance in the area prior to human settlement was fire and drought; however, a long history of fire suppression practices has led to woody encroachment of the surrounding prairies (McNab and Avers, 1994; Barbour and Billings, 1988). The ecoregion has been rated as regionally outstanding in terms of the extraordinary biodiversity features, including more than 1500 species of plants native to the region. It has been assessed to have a conservation status of critical in terms of biodiversity loss and threats to ecological integrity. The region has been placed in a Class IV conservation class, which encompasses “biologically and nationally important ecoregions requiring protection of remaining habitat and extensive restoration” (Ricketts et al., 1999).

Design, Materials and Methods

I began the floral survey by compiling a list of plant species present on the property. I visited the property at least once per month during the growing season 2003-2005, February through November, noting what species were present and collecting voucher specimens, which were deposited in the University of North Texas herbarium. Plant identifications were done according to the Illustrated Flora of North Central Texas (Diggs, Lipscomb and O'Kennon, 1999), the Keys and Descriptions for the Vascular Plants of Oklahoma (Tyrl et al., 2005) and the Flora of the Great Plains (Great Plains Flora Association, 1986). Difficult identifications were verified by the Botanical Research Institute of Texas (BRIT). Plant names and authorities are according to the PLANTS Database (United States Department of Agriculture, 2006); family allocations were according to Diggs, et al. (1999), with the exception of the legumes, where I followed the Oklahoma keys (Tyrl et al., 2005).

Species were also recorded as very common, common, infrequent, rare, accidental, or historical. A species was considered very common if it was widely dispersed on the property, and occurred in all representative communities in large stands. A common species was one that was found in most of the representative areas of a community where that species could reasonably be expected to occur, given its ecological requirements. If it was scattered sparsely throughout a community, or found in only a few patches, it was listed as infrequent. A species that was represented by only one or a few specimens was recorded as rare. A species that appeared to be an anomalous occurrence, such as one species seen only in the compost heap, was recorded as accidental. A few species had been identified on the property in the past,

and the verification was able to be verified through reliable sources, but appeared to have disappeared from the property; these species were recorded as historical. These categories were subjectively determined in the field, and have no definitive boundaries; therefore, these values should not be taken as quantitative. Species that were present only under cultivation at the Lewisville Aquatic Ecosystem Research Facility (LAERF) were so noted.

Origin (native or introduced) and habit (annual or perennial) were also determined, using the Illustrated Flora of North Central Texas (Diggs, Lipscomb and O'Kennon, 1999) and the PLANTS National Database (United States Department of Agriculture, 2006). I used Chi-Square analysis to determine if there were more introduced species than could be expected by random chance alone (Gotelli and Ellison, 2004; Mueller-Dombois and Ellenberg, 2002; Cook and Hurst, 1963). I compared the species list with the distribution maps in Atlas of the Vascular Plants of Texas (Turner et al., 2003) and the Illustrated Flora of North Central Texas (Diggs, Lipscomb and O'Kennon, 1999), and compiled a list of those plant species not previously reported for Denton County.

I noted wetland indicator status for those species where one was available. These were obtained from the PLANTS National Database, using the status assigned for Region 6, which includes the states of Oklahoma and Texas (United States Department of Agriculture, 2006). Wetland indicators are those plants that occur in wetlands under natural conditions; the categories are defined as Obligate (OBL), which are species that occur in wetlands greater than 99% of the time; Facultative Wetland (FACW), which occur in wetlands between 67-99% of the time; Facultative (FAC), which

occur approximately 34-66% of the time in wetlands; Facultative Upland (UPL), which occur in wetlands 1-33% of the time; and Upland (UPL), which occur less than 1% of the time in wetlands. Species which are not known to occur in wetlands have not been assigned a wetland indicator status (Tiner, 1996).

I began quantitative sampling in the spring of 2004. Permanent quadrats were placed and their GPS coordinates recorded during the spring and summer of 2004. Quadrats were sampled once per month throughout the growing seasons of 2004 and 2005. Because of unseasonably heavy rainfalls causing frequent flooding, several quadrats were not sampled during the months of June, July, or November in 2004; one quadrat was bulldozed by the City of Lewisville, and was not sampled anymore. Because the data set from 2004 was incomplete, only the 2005 data were used in the statistical analyses.

Before placing quadrats, I consulted with the management team at LLELA to determine appropriate quadrat placement to achieve management goals of identifying target areas for restoration, and assessing potential wildlife habitat. Management identified the key habitats of interest, and quadrats were then sited within the area identified. Because of the heterogeneous nature of the community at LLELA, strictly random placement was not used; however, stratified random placement is a common feature of many vegetation studies in similar communities, and the statistical analyses utilized are robust enough to withstand this violation of the assumptions (Mueller-Dumbois and Ellenberg, 2002). A total of 32 quadrats were placed initially. Quadrat size was 20 m X 20 m. Reconnaissance of the area indicated that this size of quadrat would capture essentially all the species in the community (Biondi, Feoli, and

Zuccarello, 2004); test sampling of a larger area failed to add any new species to the list in all but one of the quadrats. Specific coordinates were obtained for each quadrat using a hand-held Global Positioning System (GPS) unit with submeter accuracy, assisted by UNT student volunteers.

Because of a change in management during the summer of 2004, management goals shifted, and quadrat placement needed to be adjusted in order to obtain adequate sampling data. An additional twelve quadrats were placed during the spring of 2005; seven quadrats were determined to be redundant, and were retired from sampling. All adjustments to quadrat placement were made before the beginning of sampling in March, 2005, and GPS coordinates had been obtained for the additional quadrats by May. Figure 4 shows the location of all the quadrats. Quadrats were classified by ecosystem as forest, prairie, savannah, or wetland.

To begin sampling, I first listed all species present in the quadrat (Mueller-Dumbois, 1974; Hahs et al., 1999). Each species was assigned a cover class value based on the Daubenmire Cover Class Scale (See Table 3) (Anonymous, 1999).

Table 3. Cover classes of the Daubenmire method (Mueller-Dumbois and Ellenberg, 2002).

Cover Class	Range of Coverage	Midpoint of Range
1	<5%	2.5%
2	5-25%	15.0%
3	25-50%	37.5%
4	50-75%	62.5%
5	75-95%	85.0%
6	95-100%	97.5%

To use the Daubenmire method, canopy cover was estimated for each species by placing a 20 x 20 m quadrat, and estimating the canopy cover for each species. Because the Daubenmire method is an estimate of percent cover, overlapping canopy cover was included in the estimates, even if a plant was not rooted in the quadrat. Data

were recorded by quadrat, species and cover class (Anonymous, 1999). Dominant species for each quadrat were determined using the Corps of Engineers 50/20 rule. Each quadrat was also evaluated to determine if it met the COE criteria for hydrophytic vegetation (Tiner, 1999; Tiner, 1996; Federal Interagency Committee for Wetland Delineation, 1989).

Diversity (H') was calculated for each quadrat using the Shannon-Wiener diversity index. Evenness (J') was calculated using Shannon evenness index (Gotelli and Ellison, 2004; Gurevitch, Scheiner and Fox, 2002; Barbour et al., 1999). Because diversity was calculated using cover instead of density, the value of H' is only an approximate value (Hahs, Enright and Thomas, 1999); however, testing has indicated that diversity calculated using cover showed a highly significant correlation with that calculated from biomass. Correlation to calculations using biomass was highest using the Shannon-Wiener index (Chairucci et al., 1999). Non-parametric Analysis of variance (ANOVA) was used on ranked data to determine if there are any significant differences among diversity and evenness values within the identified communities, and also between seasons (Beitinger, pers. comm.; Gotelli and Ellison, 2004; Zar, 1999). In addition, each community was classified according to its successional phase according to the stages described in Oliver and Larson (1996). Where possible, species were identified as increaser, decreaser or invader under razing pressure, based on criteria established for judging rangeland quality in Oklahoma (Rommann et al., 1979; Voigt and Weaver, 1951), which is believed to be broadly applicable within the north Texas community.

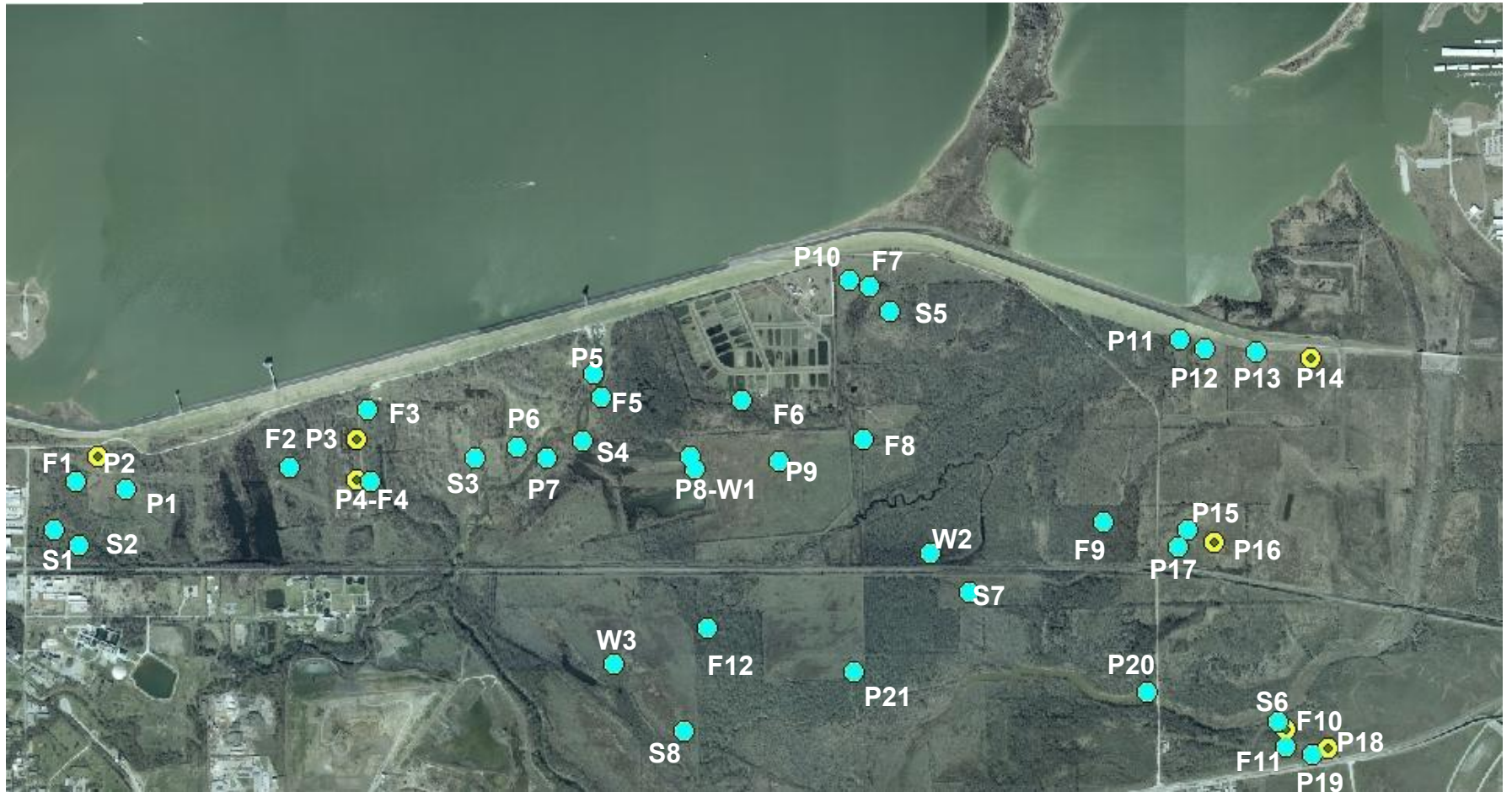


Figure 4: Location of sample quadrats on LLELA. Quadrats in yellow indicate those quadrats sampled in 2004, but not in 2005. Map created by Robin Buckallew, Bruce Hunter, Joaquin Torrans, Joshua Sales, and John Coffman.

In order to determine how many associations are present, I evaluated the data using cluster analysis based on percent dissimilarity, or Euclidean distance. Cluster analysis was done using the SAS software package, and similarity was determined by species presence/absence, weighted by percent cover. A dendrogram was constructed, and utilized to define associations present (Gotelli and Ellison, 2004; Mueller-Dumbois and Ellenberg, 2002; Barbour et al., 1999). Associations identified were compared with the Vegetation Classification Standard (Fralish and Franklin, 2002; Federal Geographic Data Committee, 1997). In addition, Poisson analysis was used to determine if groups of species occurred together more often than would be indicated by random chance alone in order to determine if there were any associations present that had not previously been identified (Mueller-Dumbois and Ellenberg, 2002).

Within the forested quadrats, each tree rooted in the quadrat was identified and measured with a diameter tape at diameter breast height (DBH) to calculate the basal area, using the calculation: basal area = $\pi(1/2 \text{ DBH})^2$ (Barbour et al., 1999). An individual was recorded as a tree if the DBH was greater than 5 cm, individuals between 1 cm and 5 cm were recorded as saplings, and individuals less than 1 cm DBH were recorded as seedlings (United States Department of Agriculture, United States Forestry Service, 1987). Dead trees were also counted and measured, and recorded as snags (Barry and Kroll, 1999). These data were used to determine community composition, dominant species, frequency and importance of each tree species based on both number of individuals of each species and total basal area. I also used these data to establish an estimate of overall woody biomass.

After determining the three most commonly occurring tree species at LLELA, representative specimens of each species were randomly selected using GIS coordinates. With the help of UNT volunteers, the DBH of each tree was obtained, and an increment borer used to obtain core samples to determine the age. The cores were carefully labeled, and taken back to the laboratory, where the rings were carefully counted using a dissecting microscope. The rings on each core were independently counted by two separate investigators to double check accuracy. Regression analysis was performed to determine the relationship of age to DBH (Gotelli and Ellison, 2004; Barry and Kroll, 1999; Zar, 1999).

In order to determine the state of the prairie, and to assist management with decisions on restoration priorities, a Floristic Quality Index (FQI) was calculated for each quadrat (Packard and Mutel, 1997). Because no FQI coefficients of conservatism have been published for Texas, I used the guidelines provided by Packard and Mutel (1997) to assign coefficients for the native species at LLELA, in consultation with Kenneth Steigman, Director of LLELA. The coefficient of conservation (C) assigned to a particular species is based on the degree to which a given species is restricted to high quality prairie remnants; the coefficients range from 0-10, with ten being found primarily in pristine prairie habitat. The FQI for each quadrat was then calculated by dividing the mean C by the square root of the total number of native species recorded in the quadrat. It is recommended that only native species be included in the FQI, because they have been present in the area through several millennia of natural selection, and represent the natural fluctuations that would be expected in a healthy ecosystem (Packard and Mutel, 1997).

Upon completion of the survey, I created a field guide for plant identification of LLELA vegetation. This guide has been placed on file with the LLELA management for printing and disseminating to the general public. I produced an interactive GIS map of the sample quadrats to be made available to the public on the LLELA website. In addition, I prepared management recommendations for restoration or preservation, based on species present, and a proposal for control of invasive and native weedy species.

Raw data have been stored in an Excel spreadsheet, and can be requested from the management of LLELA, (<http://www.ias.unt.edu/llela/>).

Results

The study identified a total of 466 species in 104 families. There were a total of 330 genera. These are listed in Table 4, along with the ecological data for each species. The four most common families at LLELA are the Asteraceae (Sunflower family) with 64 species, the Poaceae (Grass family) with 52 species, the Cyperaceae (Sedge family) with 27 species, and the Fabaceae (Bean family) with 22 species. All other families contributed fewer than 15 species, with 44 families represented by only a single species. The family information is shown in Appendix 1.

Of the 466 species found at LLELA, two (*Chara* sp. and *Nitella* sp.) are non-vascular, and were not able to be identified to species because of a lack of reliable resources for the region. One species, *Spiranthes* sp. (family Orchidaceae), was not able to be classified to species because of rarity and the inability to collect a voucher specimen. These species were not able to be classified as native or introduced, annual

or perennial. Of the 463 species able to be categorized, 378 were native and 85 introduced; 302 were perennial, and 161 were annual. See Figure 5. The species composition is predominantly native, at 80%, with 57% of the species being native perennial species. A total of 34 species were present only at the Lewisville Lake Aquatic Ecosystem Research Facility (LAERF), in their cultivated ponds, and one species was found only in their compost heap, apparently an accidental introduction from meal waste.

The plant community at LLELA includes 43 species of trees, 15 shrubs, and 17 vines, for a total of 75 woody species. There are 52 species of grasses, 27 sedges and 4 rushes, for a total

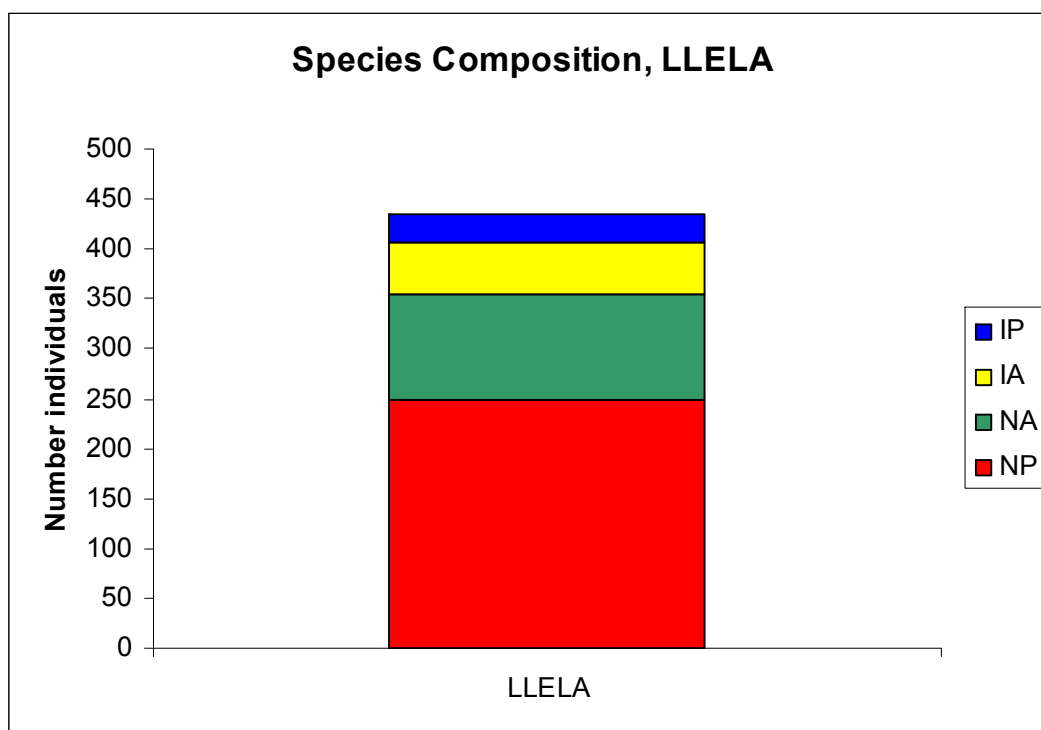


Figure 5: Plant species Composition at LLELA, Origin and Habit - Introduced Perennials (IP), Introduced Annuals (IA), Native Perennials (NP), and Native Annuals (NA).

of 83 graminoids. There were 2 species of non-vascular plants, three ferns, and one fern ally. Forbs accounted for the remaining 302 species. See Figure 6. Wetland indicator status was able to be determined for 280 species, and of these, 120 were characterized as either obligate or facultative wet (see Table 4).

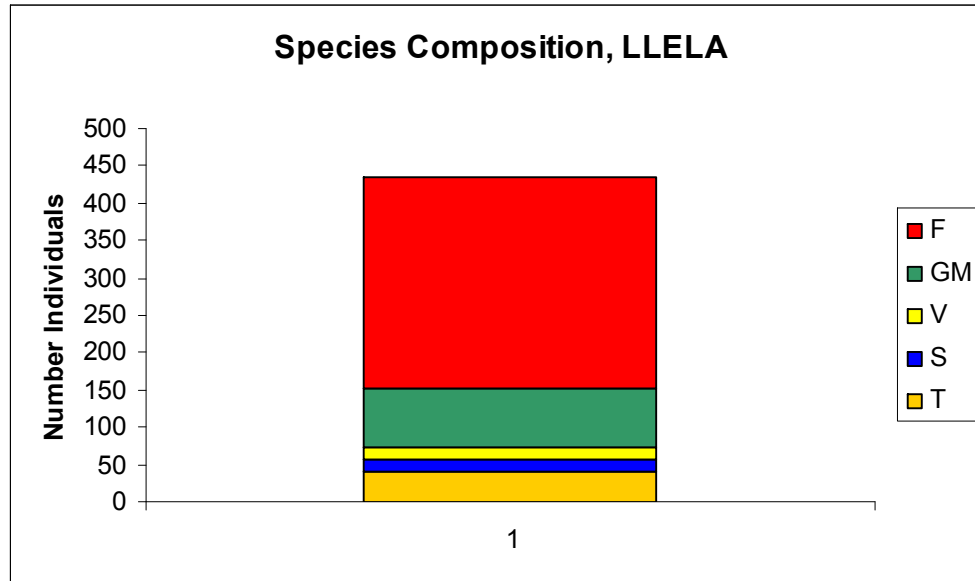


Figure 6: Plant species Composition at LLELA, Functional Group - Forbs (F), Graminoids (GM), Vines (V), Shrubs (S), and Trees (T).

The species were further characterized by their response to grazing pressure, based on the Pasture and Range judging guide (Rommann et al., 1979). Species were characterized as to whether they tend to be increasers, decreasers, or invaders under grazing, and also whether they are considered good, fair or poor quality for grazing. I was able to characterize a total of 89 species under this system (see Table 4). In responses to grazing, 30 species were classified as increasers, 19 as decreasers, and 40 as invaders. For grazing quality, 24 were listed as good, 10 as fair, and 55 as poor.

Table 4. List of species identified at LLELA, including functional group (FG), Origin (O), Habit (HO), Wetland Indicator Status (WI), response to grazing pressure (G), estimated frequency of occurrence (F) and number of sample quadrats in which it was found (Quad). Species with ** have not previously been reported in Denton County.

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Acanthaceae	<i>Dicliptera brachiata</i>	False mint	F	N	P	FACW		I	2
	<i>Justicia americana</i>	American water willow	F	N	P	OBL		I	1
	<i>Ruellia strepens</i>	Smooth wild petunia	F	N	P	FAC		I	5
Aceraceae	<i>Acer negundo</i>	Box elder	T	N	P	FACW-		R	0
Agavaceae	<i>Yucca pallida</i> **	Pale yucca	F	N	P		I	R	0
Alismataceae	<i>Alisma subcordatum</i> **	American water plantain	F	N	P	OBL		L	0
	<i>Echinodorus berteroi</i>	Erect burhead	F	N	P	OBL		I	3
	<i>Echinodorus cordifolius</i>	Creeping burhead	F	N	P	OBL		L	0
	<i>Sagittaria graminea</i> **	Bulltongue arrowhead	F	N	P	OBL		I	0
	<i>Sagittaria latifolia</i>	Arrowhead	F	N	P	OBL		I	0
	<i>Sagittaria subulata</i> **	Awl leaf arrowhead	F	N	P			L	0
	<i>Amaranthus tuberculatus</i>	Water hemp	F	N	A	FAC		C	2
Amaranthaceae	<i>Froelichia gracilis</i>	Slender snake cotton	F	N	A			I	0
	<i>Rhus copallinum</i> **	Winged sumac	S	N	P	NI	I	I	5
Anacardiaceae	<i>Rhus glabra</i>	Smooth sumac	S	N	P		I	I	2
	<i>Toxicodendron radicans</i> **	Poison ivy	V	N	P	FAC		VC	23
Apiaceae	<i>Daucus carota</i>	Queen Anne's lace	F	I	B			I	1
	<i>Eryngium hookeri</i>	Hooker's eryngo	F	N	A	FACW		I	3
	<i>Eryngium leavenworthii</i>	Leavenworth's eryngo	F	N	A			I	4
	<i>Hydrocotyle umbellata</i>	Umbrella water pennywort	F	N	P	OBL		I	1
	<i>Limnoscium pinnatum</i> **	Tansy dogshade	F	N	A	FACW		I	2
	<i>Polytaenia nuttallii</i>	Nuttall's prairie parsley	F	N	P			VC	16
	<i>Ptilimnium nuttallii</i>	Nuttall's mock bishop's weed	F	N	A	FACW		C	14
	<i>Scandix ectin-veneris</i> **	Shepherd's needles	F	I	A			C	19
	<i>Torilis arvensis</i>	Hedge parsley	F	I	A			C	25
	<i>Torilis nodosa</i>	Knotted hedge parsley	F	I	A			I	0
	<i>Amsonia tabernaemontana</i>	Eastern blue star	F	N	P	FACW-		I	0
	<i>Apocynum cannabinum</i>	Prairie dog bane	F	N	P	FAC		I	0
Aquifoliaceae	<i>Ilex decidua</i>	Yaupon	S	N	P	FACW-		I	4
Araceae	<i>Peltandra virginica</i> **	Arrow arum	F	N	P	OBL		L	0
Asclepiadaceae	<i>Asclepias asperula</i> ssp. <i>capricornu</i>	Spider milkweed	F	N	P		I	R	0
	<i>Asclepias stenophylla</i> **	Narrow leaf milkweed	F	N	P		I	R	1
	<i>Asclepias tuberosa</i>	Butterfly milkweed	F	N	P		I	R	0
	<i>Asclepias viridiflora</i>	Green antelope horns	F	N	P		I	R	0

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Asclepiadaceae	<i>Asclepias viridis</i>	Antelope horns	F	N	P		I	C	15
	<i>Matelea gonocarpus</i> **	Anglepod	V	N	P	NI		I	2
Asteraceae	<i>Achillea millefolium</i> **	Yarrow	F	N	P	FACU	I	I	3
	<i>Ageratina altissima</i> **	White snake root	F	N	P	UPL		C	8
	<i>Ambrosia psilostachya</i>	Common ragweed	F	N	A	FAC-	V	VC	20
	<i>Ambrosia trifida</i> **	Giant ragweed	F	N	A	FAC	V	VC	27
	<i>Amphiachyris dracunculoides</i>	Broomweed	F	N	A		V	C	16
	<i>Arnoglossum plantagineum</i>	Indian plantain	F	N	P	FAC		R	0
	<i>Artemisia ludoviciana</i> **	Louisiana sage	F	N	P	UPL	I	R	1
	<i>Astranthium integrifolium</i>	Western daisy	F	N	A			R	0
	<i>Baccharis neglecta</i>	Roosevelt weed	S	N	P	FAC		I	1
	<i>Bidens frondosa</i> **	Devil's beggartick	F	N	P	FACW		R	1
	<i>Brickellia eupatorioides</i> var. <i>corymbulosa</i>	False boneset	F	N	P			I	8
	<i>Carduus nutans</i> **	Nodding musk thistle	F	I	A			I	2
	<i>Centaurea americana</i> **	Basket flower	F	N	A		V	I	3
	<i>Chrysopsis pilosa</i> **	Soft golden aster	F	N	A			C	6
	<i>Cirsium horridulum</i>	Bull thistle	F	N	A	FAC		I	1
	<i>Cirsium texanum</i>	Texas thistle	F	N	P			C	18
	<i>Conyza canadensis</i> **	Canada horseweed	F	N	A	UPL		C	13
	<i>Conyza ramosissima</i> **	Dwarf horseweed	F	N	A			R	0
	<i>Coreopsis tinctoria</i> **	Plains coreopsis	F	N	A	FAC	V	R	1
	<i>Crepis pulchra</i> **	Showy hawk's beard	F	I	A			R	2
	<i>Dracopis amplexicaulis</i> **	Clasping cone flower	F	N	A	FAC+		C	22
	<i>Eclipta prostrata</i> **	False daisy	F	N	A	FACW		I	2
	<i>Engelmannia peristenia</i>	Engelmann's daisy	F	N	P		D	I	1
	<i>Erigeron philadelphicus</i> **	Philadelphia fleabane	F	N	P	FAC		I	3
	<i>Erigeron strigosus</i>	Daisy fleabane	F	N	A	FAC-	V	C	13
	<i>Evax prolifera</i> **	Rabbit tobacco	F	N	A			R	1
	<i>Fleischmannia incarnata</i> **	Pink boneset	F	N	A	FAC		I	3
	<i>Gaillardia pulchella</i>	Indian blanket	F	N	A			C	8
	<i>Grindelia adenodonta</i>	Lonestar gumweed	F	N	A			I	0
	<i>Grindelia papposa</i>	Wax goldenweed	F	N	A	FAC	V	C	8
	<i>Helenium amarum</i> var. <i>amarum</i>	Bitter sneezeweed	F	N	A	FACU	V	I	1
	<i>Helianthus annuus</i>	Common sunflower	F	N	A	FAC	V	C	19
	<i>Helianthus hirtus</i>	Hairy sunflower	F	N	P		D	R	1
	<i>Helianthus maximiliani</i> **	Maximilian's sunflower	F	N	P	FACU-	D	I	3
	<i>Heterotheca subaxillaris</i>	Camphor daisy	F	N	A	UPL		I	3

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Asteraceae	<i>Hymenopappus scabiosaeus</i>	Old plainsman	F	N	B			I	1
	<i>Iva annua</i>	Annual marsh elder	F	N	A	FAC		VC	19
	<i>Lactuca floridana</i> **	Blue lettuce	F	N	A	FAC+		R	2
	<i>Lactuca serriola</i> **	Prickly lettuce	F	I	A	FAC		C	12
	<i>Liatris mucronata</i>	Narrow leaf gay feather	F	N	P			C	4
	<i>Lindheimera texana</i>	Texas star	F	N	A			I	5
	<i>Mikania scandens</i> **	Climbing hemp vine	V	N	P	FACW+		C	6
	<i>Packera tampicana</i> **	Great Plains ragwort	F	N	A	NI		C	18
	<i>Parthenium hysterophorus</i> **	Santa Maria feverfew	F	I	A			I	0
	<i>Pluchea odorata</i>	Sweetscent	F	N	A	OBL		I	2
	<i>Pyrrhopappus pauciflorus</i>	Texas dandelion	F	N	A			C	14
	<i>Ratibida columnifera</i> **	Mexican hat	F	N	P		I	C	6
	<i>Rudbeckia hirta</i> **	Black-eyed Susan	F	N	A	FACU	V	I	4
	<i>Senecio vulgaris</i> **	Old-man-in-the-spring	F	I	A	NI		C	0
	<i>Silphium radula</i> **	Roughstem rosinweed	F	N	P			R	1
	<i>Solidago canadensis</i>	Canada goldenrod	F	N	P	FACU+	I	C	11
	<i>Solidago petiolaris</i>	Downy ragged goldenrod	F	N	P		I	C	16
	<i>Solidago ulmifolia</i>	Elm-leaf goldenrod	F	N	P		I	R	1
	<i>Sonchus asper</i>	Spiny sow thistle	F	I	A	FAC-		C	15
	<i>Sonchus oleraceus</i>	Common sow thistle	F	I	A	UPL		R	0
	<i>Symphotrichum divaricatum</i> **	Slim aster	F	N	A			C	18
	<i>Symphotrichum ericoides</i> **	Heath aster	F	N	P	FACU-	I	C	25
	<i>Symphotrichum lanceolatum</i> **	White panicle aster	F	N	P	NI		C	10
	<i>Taraxacum officinale</i> **	Common dandelion	F	I	P	FACU+		I	2
	<i>Thelesperma filifolium</i>	Stiff greenthread	F	N	A			I	3
	<i>Tragopogon dubius</i> **	Goat's beard	F	I	A			I	0
	<i>Verbesina virginica</i>	Frostweed	F	N	P	FACU		I	1
	<i>Vernonia baldwinii</i> ssp. <i>interior</i> **	Baldwin's ironweed	F	N	P	NI	V	C	5
	<i>Xanthium strumarium</i> var. <i>canadense</i>	Canada cocklebur	F	N	A	FAC-	V	C	3
Azollaceae	<i>Azolla caroliniana</i> **	Water fern	Fern	N	A	OBL		C	3
Bignoniaceae	<i>Campsis radicans</i> **	Trumpet vine	V	N	P	FAC		C	1
Boraginaceae	<i>Buglossoides arvensis</i> **	Corn gromwell	F	I	A			I	0
	<i>Heliotropium indicum</i>	India heliotrope	F	I	A	FACW		R	0
	<i>Lithospermum incisum</i> **	Fringed puccoon	F	N	P			R	0
	<i>Myosotis macrosperma</i>	Spring forget-me-not	F	N	A	FAC		C	14
Brassicaceae	<i>Brassica juncea</i> **	India mustard	F	I	A			C	0
	<i>Capsella bursa-pastoris</i> **	Shepherd's purse	F	I	A	FAC		C	0

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Brassicaceae	<i>Cardamine hirsuta</i> **	Hairy bittercress	F	I	A	FAC		C	5
	<i>Draba cuneifolia</i>	Wedge leaf draba	F	N	A			R	0
	<i>Lepidium virginicum</i>	Poor man's pepper	F	N	A	FAC-		C	2
	<i>Lesquerella gracilis</i>	Cloth-of-gold	F	N	A	FACW		I	6
	<i>Nasturtium officinale</i> **	Water cress	F	I	P	OBL		I	0
	<i>Rapistrum rugosum</i> **	Annual bastard cabbage	F	I	A			I	0
	<i>Sinapis arvensis</i> **	Wild mustard	F	I	A			R	1
Cactaceae	<i>Opuntia phaeacantha</i>	Prickly pear	F	N	P		V	C	8
Caesalpiniaceae	<i>Cercis canadensis</i> **	Eastern redbud	T	N	P	UPL		I	5
	<i>Chamaecrista fasciculata</i> **	Partridge pea	F	N	A	FACU-	V	C	10
	<i>Prosopis glandulosa</i> **	Honey mesquite	T	N	P		V	VC	13
	<i>Senna marilandica</i> **	Maryland senna	F	N	P	FAC		R	0
Campanulaceae	<i>Lobelia appendiculata</i> **	Pale lobelia	F	N	A	FAC-		I	0
	<i>Lobelia cardinalis</i>	Cardinal flower	F	N	P	FACW+		H	0
	<i>Triodanis perfoliata</i>	Clasping Venus' looking glass	F	N	A	FAC-		C	15
Caprifoliaceae	<i>Lonicera japonica</i> **	Japanese honeysuckle	V	I	P	FAC		C	1
	<i>Lonicera sempervirens</i>	Coral honeysuckle	V	N	P	FAC-		I	1
	<i>Sambucus nigra</i> ssp. <i>canadensis</i> **	Common elderberry	S	N	P	FAC+		R	0
	<i>Symphoricarpos orbiculatus</i> **	Buckbush	S	N	P	FACU	V	C	15
	<i>Viburnum rufidulum</i>	Rusty blackhaw	T	N	P	FACU-		I	2
Caryophyllaceae	<i>Cerastium brachypodum</i>	Shortstalk chickweed	F	N	P	FACU		R	0
	<i>Cerastium glomeratum</i> **	Sticky chickweed	F	I	A	FACU		C	7
	<i>Petrorhagia dubia</i> **	Hairy pink	F	I	A			R	0
	<i>Stellaria media</i> **	Chickweed	F	I	A	FACU-		C	4
Ceratophyllaceae	<i>Ceratophyllum demersum</i> **	Coontail	F	N	P	OBL		I	1
Characeae	<i>Chara</i> sp.	Muskgrass	NV					C	2
	<i>Nitella</i> sp.		NV					I	1
Cistaceae	<i>Lechea tenuifolia</i>	Narrow leaf pinweed	F	N	P			I	1
Clusiaceae	<i>Hypericum perforatum</i> **	Common St. John's wort	F	I	P			I	0
Commelinaceae	<i>Commelina erecta</i>	Erect dayflower	F	N	P			I	0
	<i>Tradescantia ohiensis</i>	Ohio spiderwort	F	N	P	FACW		R	0
Convolvulaceae	<i>Convolvulus arvensis</i> **	Bindweed	F	I	P			H	0
	<i>Convolvulus equitans</i>	Texas bindweed	F	N	P			I	1
	<i>Dichondra carolinensis</i>	Carolina pony's foot	F	N	P	FAC+		I	0
	<i>Ipomoea cordatotriloba</i> **	Wild morning glory	F	N	P	FAC		C	0
	<i>Ipomoea lacunosa</i> **	White morning glory	F	N	A	FACW		C	4
	<i>Ipomoea purpurea</i> **	Common morning glory	F	N	A	UPL		L	0

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Convolvulaceae	<i>Ipomoea quamoclit</i> **	Cypress vine	F	I	A	NI		L	0
Cornaceae	<i>Cornus drummondii</i>	Roughleaf dogwood	T	N	P	FAC		C	4
Cucurbitaceae	<i>Cucurbita pepo</i> **	Marrow	V	I	A	FAC		X	0
Cupressaceae	<i>Juniperus virginiana</i> **	Eastern redcedar	T	N	P	FACW	V	C	9
	<i>Taxodium distichum</i> **	Bald cypress	T	N	P	OBL		I	0
Cuscutaceae	<i>Cuscuta cuspidata</i>	Cuspidate dodder	F	N	P			C	1
	<i>Cuscuta indecora</i> **	Showy dodder	F	N	P			C	3
	<i>Cuscuta pentagona</i>	Five angled dodder	F	N	P			C	1
Cyperaceae	<i>Carex albicans</i> var. <i>australis</i> **	Stellate sedge	G	N	P	FACU		I	0
	<i>Carex arkansana</i> **	Arkansas sedge	G	N	P			C	10
	<i>Carex blanda</i>	Eastern woodland sedge	G	N	P	FAC		I	0
	<i>Carex cherokeensis</i> **	Cherokee sedge	G	N	P	FACW-		C	11
	<i>Carex crus-corvi</i> **	Raven foot sedge	G	N	P	OBL		C	8
	<i>Carex festucacea</i> **	Fescue sedge	G	N	P	NI		I	0
	<i>Carex frankii</i> **	Frank's sedge	G	N	P	OBL		C	2
	<i>Carex grvida</i>	Heavy sedge	G	N	P			I	0
	<i>Carex grisea</i> **	Inflated narrow-leaf sedge	G	N	P			I	0
	<i>Carex leavenworthii</i>	Leavenworth's sedge	G	N	P			VC	15
	<i>Carex retroflexa</i>	Reflexed fruit sedge	G	N	P			I	1
	<i>Cyperus acuminatus</i>	Tapertip flat sedge	G	N	P	OBL		I	1
	<i>Cyperus echinatus</i>	Globe flatsedge	G	N	P	FAC+		C	2
	<i>Cyperus erythrorhizos</i> **	Red root flatsedge	G	N	A	OBL		C	2
	<i>Cyperus esculentus</i>	Chufa	G	I	P	FACW		I	1
	<i>Cyperus odoratus</i>	Fragrant flatsedge	G	N	P	FACW		I	0
	<i>Cyperus polystachyos</i> **	Field sedge	G	N	P	FACW		C	1
	<i>Cyperus squarrosus</i> **	Bearded flat sedge	G	N	A	OBL		I	1
	<i>Eleocharis acicularis</i> **	Needle spike rush	G	N	P	OBL		C	0
	<i>Eleocharis montevidensis</i>	Sand spikerush	G	N	P	FACW+		C	0
	<i>Eleocharis palustris</i>	Common spikerush	G	N	P	OBL		I	2
	<i>Eleocharis parvula</i> **	Dwarf spikerush	G	N	P	OBL		I	4
	<i>Eleocharis quadrangulata</i>	Square-stem spikerush	G	N	P	OBL		I	0
	<i>Rhynchospora corniculata</i> **	Horned beak rush	G	N	P	OBL		L	0
	<i>Schoenoplectus americanus</i> **	Charimaker's bulrush	G	N	P	OBL		L	0
	<i>Schoenoplectus fluviatilis</i> **	River bulrush	G	N	P	OBL		L	0
	<i>Schoenoplectus tabernaemontani</i> **	Softstem bulrush	G	N	P	OBL		I	1
Dipsacaceae	<i>Scabiosa atropurpurea</i> **	Mourning bride	F	I	A			I	0
Ebenaceae	<i>Diospyros virginiana</i>	Persimmon	T	N	P	FAC	V	I	2

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Equisetaceae	<i>Equisetum hyemale</i> **	Scouring horsetail	FA	N	P	FACW		I	0
Euphorbiaceae	<i>Acalypha virginica</i> **	Virginia three-seed mercury	F	N	A	UPL		R	0
	<i>Chamaesyce maculata</i>	Spotted sandmat	F	N	A	NI		C	3
	<i>Chamaesyce serpens</i>	Matted sandmat	F	N	A	UPL		C	2
	<i>Cnidoscolus texanus</i> **	Texas bullnettle	F	N	P			I	0
	<i>Croton capitatus</i>	Woolly croton	F	N	A			I	0
	<i>Croton monanthogynus</i>	One-seed croton	F	N	A			C	23
	<i>Croton texensis</i> **	Texas croton	F	N	A		V	I	3
	<i>Euphorbia bicolor</i>	Snow-on-the-prairie	F	N	A		V	C	19
	<i>Euphorbia dentata</i> **	Toothed spurge	F	N	A			C	3
	<i>Euphorbia hexagona</i> **	Five-angle spurge	F	N	A			C	4
Fabaceae	<i>Tragia betonicifolia</i>	Betony noseburn	F	N	P			C	11
	<i>Amorpha fruticosa</i>	Bastard indigo	F	N	P	FACW+		R	0
	<i>Dalea purpurea</i> **	Purple prairie clover	F	N	P		D	R	0
	<i>Desmodium obtusum</i>	Stiff tickclover	F	N	P		D	R	1
	<i>Desmodium tweedyi</i> **	Tweedy's tickclover	F	N	P		D	R	0
	<i>Indigofera miniata</i> **	Coastal indigo	F	N	P			R	0
	<i>Lablab purpureus</i> **	Hyacinth bean	F	I	P			L	0
	<i>Lathyrus hirsutus</i>	Caley pea	F	I	A			VC	6
	<i>Lespedeza virginica</i>	Slender bush clover	F	N	P		D	I	1
	<i>Lotus unifoliolatus</i>	Prairie trefoil	F	N	A			I	3
	<i>Lupinus texensis</i> **	Texas bluebonnet	F	N	A			R	0
	<i>Medicago rabica</i> **	Spotted medic	F	I	A			C	0
	<i>Medicago orbicularis</i> **	Button medick	F	I	A			C	1
	<i>Melilotus albus</i>	White sweetclover	F	I	A	FACU		C	9
	<i>Melilotus officinalis</i>	Yellow sweetclover	F	I	A	FACU		C	2
	<i>Sesbania herbacea</i>	Big-pod sesbania	F	N	A	FACW-		I	1
	<i>Sesbania vesicaria</i>	Bagpod	F	N	A	FAC+		R	1
	<i>Strophostyles helvola</i>	Trailing wild bean	F	N	A	FACU		C	4
	<i>Styphnolobium affine</i> **	Eve's necklace pod	T	N	P			C	6
	<i>Trifolium campestre</i> **	Large hop clover	F	I	A			C	4
	<i>Vicia minutiflora</i>	Small flower vetch	F	N	A	UPL	V	I	1
	<i>Vicia sativa</i> ssp. <i>sativa</i>	Common vetch	F	I	A	FAC	V	C	25
	<i>Vicia villosa</i> ssp. <i>varia</i> **	Winter vetch	F	I	A		V	I	0
Fagaceae	<i>Quercus macrocarpa</i>	Bur oak	T	N	P	FAC-		I	5
	<i>Quercus marilandica</i>	Blackjack oak	T	N	P		I	R	0
	<i>Quercus nigra</i>	Water oak	T	N	P	FAC+		R	2

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Fagaceae	<i>Quercus shumardii</i>	Shumard oak	T	N	P	FAC		I	3
	<i>Quercus stellata</i>	Post oak	T	N	P	NA	I	R	3
Gentianaceae	<i>Centaurium texense</i>	Lady Bird centaury	F	N	A			C	10
	<i>Eustoma exaltatum</i> ssp. <i>russellianum</i> **	Showy gentian	F	N	A	FACW		R	0
	<i>Sabatia campestris</i>	Prairie gentian	F	N	A	FACU		C	4
Geraniaceae	<i>Erodium cicutarium</i> **	Redstem stork's bill	F	I	A			I	1
	<i>Geranium carolinianum</i>	Carolina crane's bill	F	N	A			C	15
	<i>Geranium dissectum</i> **	Cutleaf crane's bill	F	I	A			I	2
Haloragaceae	<i>Myriophyllum aquaticum</i>	Parrot feather water milfoil	F	I	P	OBL		I	0
	<i>Myriophyllum spicatum</i> **	Eurasian water milfoil	F	I	P	OBL		I	0
Hamamelidaceae	<i>Liquidambar styraciflua</i> **	Sweet gum	T	N	P	FAC		I	0
Hydrocharitaceae	<i>Egeria densa</i> **	Brazilian waterweed	F	I	P	OBL		L	0
	<i>Elodea canadensis</i> **	Canadian waterweed	F	N	P	OBL		L	0
	<i>Hydrilla verticillata</i>	Waterthyme	F	I	P	OBL		L	0
	<i>Limnobium spongia</i> **	Frog bit	F	N	P	OBL		L	0
	<i>Najas guadalupensis</i>	Water nymph		N	A	OBL		L	0
	<i>Vallisneria americana</i> **	Water celery	F	N	P	OBL		I	0
Hydrophyllaceae	<i>Nemophila phacelioides</i> **	Baby blue eyes	F	N	A			R	0
Iridaceae	<i>Iris pseudacorus</i> **	Dixie iris	F	N	P	OBL		L	0
	<i>Sisyrinchium angustifolium</i> **	Bermuda blue-eyed-grass	F	N	P	FACW-		C	7
Juglandaceae	<i>Carya illinoensis</i> **	Pecan	T	N	P	FAC+		I	7
	<i>Carya texana</i>	Texas hickory	T	N	P			R	0
	<i>Juglans nigra</i> **	Black walnut	T	N	P	FACU		R	1
Juncaceae	<i>Juncus bufonius</i> **	Toad rush	G	N	A	OBL		I	0
	<i>Juncus dudleyi</i>	Dudley's rush	G	N	P			C	6
	<i>Juncus effusus</i>	Common rush	G	N	P	OBL		I	0
	<i>Juncus torreyi</i> **	Torrey's rush	G	N	P	FACW		C	3
Krameriaceae	<i>Krameria lanceolata</i>	Ratany	F	N	P			R	0
Lamiaceae	<i>Hedeoma drummondii</i>	Drummond's false pennyroyal	F	N	P			H	0
	<i>Lamium amplexicaule</i>	Henbit	F	I	A			C	8
	<i>Lycopus americanus</i> **	Water horehound	F	N	P	OBL		I	0
	<i>Monarda citriodora</i> **	Lemon beebalm	F	N	A		V	C	17
	<i>Monarda punctata</i>	Spotted beebalm	F	N	A	UPL	V	I	0
	<i>Physostegia pulchella</i>	Obedient plant	F	N	P	FACW		R	0
	<i>Salvia azurea</i>	Blue sage	F	N	P			I	0
	<i>Salvia coccinea</i> **	Texas sage	F	N	P			L	0
	<i>Stachys crenata</i>	Mousesear	F	N	A	FAC		C	5

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Lamiaceae	<i>Teucrium canadense</i>	Canada germander	F	N	P	FACW-		C	8
Lemnaceae	<i>Lemna obscura</i> **	Duckweed	F	N	P	OBL		C	2
	<i>Spirodela polyrrhiza</i>	Duckmeat	F	N	P	OBL		C	2
	<i>Wolffia columbiana</i> **	Watermeal	F	N	P	OBL		I	1
Lentibulariaceae	<i>Utricularia gibba</i> **	Humped bladderwort	F	N	P	OBL		I	0
Liliaceae	<i>Allium canadense</i> var. <i>canadense</i>	Meadow garlic	F	N	P	FACU-		C	10
	<i>Allium drummondii</i>	Drummond's onion	F	N	P			I	2
	<i>Androstaphyrum caeruleum</i>	Blue funnel lily	F	N	P			R	0
	<i>Camassia scilloides</i>	Meadow hyacinth	F	N	P	FAC		R	0
	<i>Cooperia drummondii</i> **	Rain lily	F	N	P	FAC-		I	0
	<i>Hymenocallis liriosme</i> **	White spider lily	F	N	P	OBL		L	0
	<i>Lycoris radiata</i> **	Red spider lily	F	I	P			L	0
	<i>Nothoscordum bivalve</i>	Crow poison	F	N	P	FACU-		C	6
Linaceae	<i>Linum sulcatum</i> **	Grooved flax	F	N	A			R	1
Loganiaceae	<i>Mitreola petiolata</i> **	Lax hornpod	F	N	A	FACW-		R	0
Lythraceae	<i>Ammannia coccinea</i> **	Purple toothcup	F	N	A	OBL		C	0
	<i>Lythrum alatum</i> var. <i>lanceolatum</i> **	Winged loosestrife	F	N	P	OBL		VC	17
Malvaceae	<i>Callirhoe involucrata</i>	Wine cup	F	N	P			C	3
	<i>Hibiscus syriacus</i> **	Rose of Sharon	S?	I	P			I	0
	<i>Sida abutilifolia</i> **	Spreading fanpetals	F	I	P			I	0
	<i>Sphaeralcea hastulata</i> **	Spear globemallow	F	N	P			I	0
Meliaceae	<i>Melia azedarach</i>	Chinaberry tree	T	I	P			I	1
Menispermaceae	<i>Cocculus carolinus</i>	Carolina snailseed	V	N	P	FACU		C	10
	<i>Menispermum canadense</i> **	Common moonseed	V	N	P	NI		R	0
Menyanthaceae	<i>Nymphoides aquatica</i> **	Floating heart	F	N	P	OBL		L	0
Mimosaceae	<i>Desmanthus illinoensis</i> **	Illinois bundleflower	F	N	P	FACU	D	C	17
	<i>Desmanthus leptolobus</i>	Slender lobe bundleflower	F	N	P			VC	23
	<i>Gleditsia triacanthos</i>	Honey locust	T	N	P			C	13
	<i>Mimosa roemeriana</i> **	Roemer's sensitive briar	F	N	P			C	5
	<i>Neptunia lutea</i> **	Yellow puff	F	N	P	FACU		I	5
Molluginaceae	<i>Mollugo verticillata</i>	Green carpetweed	F	I	A	FAC-		I	0
Moraceae	<i>Maclura pomifera</i>	Osage orange	T	N	P	UPL		C	8
	<i>Morus rubra</i> **	Red mulberry	T	N	P	FACU		C	6
Nelumbonaceae	<i>Nelumbo lutea</i> **	American water lotus	F	N	P	OBL		I	1
Nyctaginaceae	<i>Mirabilis linearis</i> **	Narrow leaf four-o'clock	F	N	P			I	1
	<i>Mirabilis nyctaginea</i> **	Heart leaf four-o'clock	F	N	P	UPL		I	2
Nymphaeaceae	<i>Nuphar lutea</i> ssp. <i>advena</i> **	Spatterdock	F	N	P	OBL		L	0

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Nymphaeaceae	<i>Nymphaea mexicana</i> **	Mexican water lily	F	N	P	OBL		L	0
	<i>Nymphaea odorata</i> **	White water lily	F	N	P	OBL		L	0
Oleaceae	<i>Forestiera acuminata</i> **	Swamp privet	S	N	P	OBL		I	1
	<i>Forestiera pubescens</i> **	Stretchberry	T	N	P	FACU		R	1
	<i>Fraxinus americana</i>	White ash	T	N	P	FACU		I	1
	<i>Fraxinus pennsylvanica</i>	Green ash	T	N	P	FACW-		C	14
	<i>Fraxinus texensis</i>	Texas ash	T	N	P			R	1
	<i>Ligustrum sinense</i> **	Chinese privet	S	I	P	UPL		C	1
Onagraceae	<i>Calylophus hartwegii</i> **	Hartweg's sundrops	F	N	P			R	0
	<i>Calylophus serrulatus</i> **	Yellow sundrops	F	N	P		D	R	0
	<i>Gaura mollis</i> **	Velvety gaura	F	N	A	NI		C	4
	<i>Gaura suffulta</i>	Kisses	F	N	A			C	4
	<i>Ludwigia leptocarpa</i> **	Angle-stem primrose willow	F	N	P	OBL		I	1
	<i>Ludwigia peploides</i> **	Floating primrose willow	F	N	P	OBL		I	2
	<i>Oenothera biennis</i> **	Common evening primrose	F	N	B	FACU+		I	0
	<i>Oenothera laciniata</i>	Cut leaf evening primrose	F	N	A	FACU		I	6
	<i>Oenothera speciosa</i>	Showy evening primrose	F	N	P			C	9
	<i>Stenosiphon linifolius</i> **	False gaura	F	N	P			I	1
Orchidaceae	<i>Spiranthes</i> sp.	Ladies tresses	F					R	0
Oxalidaceae	<i>Oxalis stricta</i>	Yellow wood sorrel	F	N	P	FACU		C	17
Papaveraceae	<i>Argemone polyanthemus</i> **	Prickly poppy	F	N	A			I	0
Passifloraceae	<i>Passiflora incarnata</i>	Maypop passion flower	V	N	P			I	4
	<i>Passiflora lutea</i>	Yellow passion flower	V	N	P			I	4
Phytolaccaceae	<i>Rivina humilis</i>	Rougeplant	F	N	P			C	4
Plantaginaceae	<i>Plantago aristata</i> **	Bracted plantain	F	N	A			I	1
	<i>Plantago patagonica</i> **	Woolly plantain	F	N	A	FACU-		I	2
	<i>Plantago rhodosperma</i>	Redseed plantain	F	N	A	FACU		C	8
Platanaceae	<i>Platanus occidentalis</i>	Sycamore	T	N	P	FAC+		I	1
Poaceae	<i>Andropogon gerardii</i> **	Big bluestem	G	N	P	FACU	D	I	1
	<i>Andropogon glomeratus</i>	Bushy bluestem	G	N	P	FACW+		C	4
	<i>Andropogon ternarius</i>	Split-beard bluestem	G	N	P	FACU	V	I	0
	<i>Andropogon virginicus</i>	Broomsedge bluestem	G	N	P	FACU+	V	I	4
	<i>Aristida longespica</i> var. <i>geniculata</i> **	Slim-spike three-awn	G	N	A	FACU	V	I	1
	<i>Aristida purpurea</i>	Purple threeawn	G	N	P		V	I	0
	<i>Avena sativa</i> **	Wild oat	G	I	A			C	0
	<i>Bothriochloa ischaemum</i> **	King Ranch bluestem	G	I	P			VC	12
	<i>Bothriochloa laguroides</i> ssp. <i>torreyana</i> **	Silver bluestem	G	N	P		V	VC	14

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Poaceae	<i>Bouteloua curtipendula</i>	Side oats grama	G	N	P		I	C	5
	<i>Bouteloua dactyloides</i> **	Buffalo grass	G	N	P	FACU-	I	I	1
	<i>Briza minor</i> **	Little quaking grass	G	I	A	FAC+		I	1
	<i>Bromus arvensis</i>	Japanese brome	G	I	A	FACU	V	VC	26
	<i>Bromus catharticus</i> **	Rescue grass	G	I	A		V	C	0
	<i>Cenchrus spinifex</i>	Coastal sandbur	G	N	P			I	0
	<i>Chasmanthium latifolium</i>	Fish on a pole grass	G	N	P	FAC		I	1
	<i>Chloris virgata</i> **	Feather fingergrass	G	N	A			C	1
	<i>Coelorachis cylindrica</i>	Carolina joint tail	G	N	P	FAC-		I	3
	<i>Cynodon dactylon</i> **	Bermuda grass	G	I	P	FACU+	V	VC	7
	<i>Dichanthelium oligosanthes</i> var. <i>scribnerianum</i>	Scribner's rosette grass	G	N	P	FAC	I	C	16
	<i>Digitaria ciliaris</i>	Eastern crabgrass	G	N	A	FAC		I	0
	<i>Echinochloa crus-gallii</i>	Barnyard grass	G	I	A	FACW-		I	1
	<i>Eleusine indica</i>	Indian Goose Grass	G	I				I	0
	<i>Elymus canadensis</i> **	Canada wild rye	G	N	P	FAC	D	I	6
	<i>Elymus virginicus</i> **	Virginia wild rye	G	N	P	FAC	D	VC	25
	<i>Eragrostis barrelieri</i>	Mediterranean love grass	G	I	A			C	0
	<i>Hordeum pusillum</i>	Little barley	G	N	A	FACU	V	C	9
	<i>Koeleria macrantha</i>	June grass	G	N	P			I	1
	<i>Leptochloa panicea</i> ssp. <i>mucronata</i> **	Mucronate sprangletop	G	N	A			C	1
	<i>Lolium perenne</i>	English rye grass	G	I	P	FACU		C	1
	<i>Muhlenbergia sobolifera</i> **	Rock muhly	G	N	P			R	1
	<i>Nassella leucotricha</i>	Texas tussock grass	G	N	P			C	4
	<i>Panicum capillare</i> **	Witch grass	G	N	A	FAC	I	C	9
	<i>Panicum coloratum</i> **	Klein grass	G	I	P			C	6
	<i>Panicum obtusum</i> **	Vine mesquite	G	N	P	FAC+	I	I	0
	<i>Panicum virgatum</i> **	Switch grass	G	N	P	FACW	D	I	3
	<i>Pascopyrum smithii</i>	Western wheat grass	G	N	P	FAC-	D	C	7
	<i>Paspalum dilatatum</i> **	Dallis grass	G	I	P	FAC		C	3
	<i>Paspalum floridanum</i>	Big paspalum	G	N	P	FACW-	D	I	1
	<i>Paspalum urvillei</i>	Urville's paspalum	G	I	P	FAC		I	0
	<i>Phalaris caroliniana</i> **	Carolina canary grass	G	N	A	FACW		C	9
	<i>Polypogon monspeliensis</i> **	Rabbit's foot grass	G	I	A	FACW-		I	2
	<i>Schizachyrium scoparium</i> **	Little bluestem	G	N	P	FACU+	D	I	4
	<i>Setaria parviflora</i>	Marsh bristle grass	G	N	P	FAC	I	I	0
	<i>Setaria pumila</i> **	Yellow bristle grass	G	I	A	FAC		C	8

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Poaceae	<i>Sorghastrum nutans</i> **	Yellow Indian grass	G	N	P	FACU	D	I	4
	<i>Sorghum halepense</i>	Johnson grass	G	I	P	FACU	V	VC	25
	<i>Sporobolus compositus</i> var. <i>macer</i>	Mississippi dropseed	G	N	P		I	VC	27
	<i>Tridens albescens</i>	White tridens	G	N	P	FAC-		C	9
	<i>Tripsacum dactyloides</i>	Eastern gama grass	G	N	P	FAC+	D	I	5
	<i>Urochloa fuscata</i> **	Browntop signal grass	G	N	A	FAC-		I	3
Polemoniaceae	<i>Ipomopsis rubra</i> **	Standing cypress	F	N	A			H	0
Polygonaceae	<i>Polygonum amphibium</i> **	Water knotweed	F	N	P	OBL		C	3
	<i>Polygonum aviculare</i> **	Prostrate knotweed	F	I	A	FAC+		C	0
	<i>Rumex crispus</i> **	Curly dock	F	I	P	FACW		I	4
Pontederiaceae	<i>Eichhornia crassipes</i>	Water hyacinth	F	I	P	OBL		L	0
	<i>Heteranthera dubia</i> **	Water stargrass	F	N	P	OBL		I	0
	<i>Heteranthera limosa</i> **	Blue mud plantain	F	N	A	OBL		L	0
	<i>Pontederia cordata</i> **	Pickrelweed	F	N	P	OBL		I	0
Portulacaceae	<i>Portulaca oleracea</i> **	Common purslane	F	I	A	FAC		R	0
	<i>Portulaca pilosa</i> **	Kiss me quick	F	N	A	FACU		I	0
Potamogetonaceae	<i>Potamogeton crispus</i> **	Curly pondweed	F	I	P	OBL		I	0
	<i>Potamogeton illinoensis</i> **	Illinois pondweed	F	N	P	OBL		I	0
	<i>Potamogeton nodosus</i>	American pondweed	F	N	P	OBL		I	0
	<i>Potamogeton pusillus</i>	Baby pondweed	F	N	P	OBL		L	0
	<i>Stuckenia pectinata</i> **	Saga pondweed	F	N	P	OBL		L	0
Ranunculaceae	<i>Anemone berlandieri</i>	Windflower	F	N	P			C	8
	<i>Aquilegia caerulea</i> **	Blue columbine	F	N	P	NO		L	0
	<i>Aquilegia canadensis</i> **	Red columbine	F	N	P	FACW		L	0
	<i>Clematis pitcheri</i>	Leather flower	F	N	P	FACU		R	1
	<i>Delphinium carolinianum</i> ssp. <i>virescens</i>	Prairie larkspur	F	N	P			R	1
	<i>Myosurus minimus</i>	Little mousetail	F	N	A	FACW+		R	1
	<i>Ranunculus abortivus</i> **	Early woods buttercup	F	N	P	FAC+	P	C	1
Rhamnaceae	<i>Berchemia scandens</i> **	Alabama supplejack	V	N	P	FAC+		I	4
Rosaceae	<i>Crataegus mollis</i> **	Arnold hawthorn	T	N	P	FAC	V	R	0
	<i>Crataegus spathulata</i> **	Littlehip hawthorn	T	N	P	FAC+	V	C	9
	<i>Geum canadense</i>	White avens	F	N	P	FAC		C	13
	<i>Prunus angustifolia</i> **	Chickasaw plum	S	N	P		I	I	2
	<i>Prunus mexicana</i> **	Mexican plum	T	N	P		I	I	1
	<i>Prunus persica</i> **	Peach	T	I	P			L	0
	<i>Prunus rivularis</i> **	Creek plum	S	N	P		I	C	1
	<i>Pyrus communis</i> **	Pear	T	I	P			I	0

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Rosaceae	<i>Rosa setigera</i> var. <i>tomentosum</i> **	Prairie rose	F	N	P	FACU-	D	I	0
	<i>Rubus aboriginum</i>	Garden dewberry	S	N	P		1	VC	11
	<i>Rubus oklahomus</i> **	Oklahoma blackberry	S	N	P	FAC	1	I	0
	<i>Spiraea prunifolia</i> **	Bridal wreath spirea	S	I	P			L	0
Rubiaceae	<i>Cephalanthus occidentalis</i> **	Buttonbush	S	N	P	OBL		I	0
	<i>Diodia virginiana</i> **	Virginia button weed	F	N	P	OBL		I	1
	<i>Galium aparine</i> **	Sticky willy	F	N	A	FAC-		C	18
	<i>Galium circaezens</i>	Licorice bedstraw	F	N	P	NI		R	1
	<i>Houstonia pusilla</i>	Tiny bluet	F	N	A	UPL		I	1
	<i>Sherardia arvensis</i> **	Field madder	F	I	A			C	0
	<i>Stenaria nigricans</i> var. <i>nigricans</i>	Prairie bluet	F	N	P			I	6
Rutaceae	<i>Zanthoxylum clava-herculis</i>	Prickly ash	T	N	P	FAC-		C	5
Salicaceae	<i>Populus deltoides</i> **	Cottonwood	T	N	P	FAC		C	7
	<i>Salix nigra</i>	Black willow	T	N	P	FACW+		C	3
Salviniaceae	<i>Salvinia minima</i> **	Water spangles	Fern	I	P	OBL		L	0
	<i>Salvinia molesta</i> **	Giant salvinia	Fern	I	A	OBL		I	1
Sapindaceae	<i>Cardiospermum halicacabum</i> **	Love in a puff	F	N	A	FAC		VC	15
	<i>Sapindus saponaria</i> var. <i>drummondii</i>	Western soapberry	T	N	P	FACU-		C	9
Sapotaceae	<i>Sideroxylon lanuginosum</i> **	Chittamwood	T	N	P			C	17
Saururaceae	<i>Saururus cernuus</i> **	Lizard's tail	F	N	P	OBL		I	0
Scrophulariaceae	<i>Agalinis fasciculata</i> **	Pink foxglove	F	N	A	FAC		VC	17
	<i>Bacopa monnieri</i>	Water hyssop	F	N	P	OBL		I	0
	<i>Castilleja indivisa</i> **	Entire leaf Indian paintbrush	F	N	A	FAC-		C	10
	<i>Leucophyllum frutescens</i> **	Texas barometer bush	S	N	P			L	0
	<i>Veronica arvensis</i>	Common speedwell	F	I	A	NI		I	0
	<i>Veronica peregrina</i>	American speedwell	F	N	A	OBL		C	12
	<i>Veronica persica</i> **	Bird's eye speedwell	F	I	A			I	0
	<i>Smilax bona-nox</i>	Greenbrier	V	N	P	FAC		C	20
	<i>Physalis angulata</i> **	Southwest ground cherry	F	N	A	FAC-		I	1
	<i>Physalis longifolia</i> var. <i>longifolia</i> **	Common ground cherry	F	N	P			C	3
Smilicaceae	<i>Physalis mollis</i> **	Field ground cherry	F	N	P			I	2
	<i>Solanum dimidiatum</i> **	Western horsenettle	F	N	P			C	7
	<i>Solanum elaeagnifolium</i> **	Silver leaf nightshade	F	N	P		I	C	0
	<i>Solanum rostratum</i> **	Buffalo bur	F	N	A		V	I	0
	<i>Tamarix chinensis</i> **	Salt cedar	T	I	P	FACW	V	I	0
Typhaceae	<i>Typha domingensis</i> **	Southern cattail	F	N	P	OBL		C	3
	<i>Typha latifolia</i> **	Broadleaf cattail	F	N	P	OBL		C	0

(Table continues)

Table 4 (cont.)

Family	Species	Common name	FG	O	H	WI	G	F	Quad
Ulmaceae	<i>Celtis laevigata</i> var. <i>laevigata</i>	Hackberry	T	N	P	FAC		VC	24
	<i>Ulmus alata</i> **	Winged elm	T	N	P	FACU		I	2
	<i>Ulmus americana</i> **	American elm	T	N	P	FAC		C	12
	<i>Ulmus crassifolia</i>	Cedar elm	T	N	P	FAC		VC	19
Urticaceae	<i>Urtica chamaedryoides</i> **	Stinging nettle	F	N	A	FACU		R	1
Valerianaceae	<i>Valerianella radiata</i>	Beaked corn salad	F	N	A	NA		C	24
Verbenaceae	<i>Glandularia bipinnatifida</i>	Dakota mock vervain	F	N	P			C	5
	<i>Lantana camara</i> **	Lantana	F	I	P	FACU		L	0
	<i>Phyla nodiflora</i> **	Frog fruit	F	N	P	FACW		C	6
	<i>Verbena bracteata</i>	Big bract vervain	F	N	P	FAC		I	0
	<i>Verbena brasiliensis</i> **	Brazilian vervain	F	I	A	NA		R	0
	<i>Verbena halei</i>	Texas vervain	F	N	P			C	2
	<i>Verbena stricta</i> **	Woolly vervain	F	N	P			I	1
	<i>Verbena urticifolia</i>	White vervain	F	N	P	FAC		I	0
	<i>Viola bicolor</i>	Johnny jump up	F	N	A	FAC		R	0
	<i>Phoradendron tomentosum</i> **	Christmas mistletoe	F	N	P			I	2
Viscaceae	<i>Ampelopsis arborea</i> **	Peppervine	S	N	P	FAC		C	8
Vitaceae	<i>Ampelopsis cordata</i> **	Heartleaf peppervine	V	N	P	FAC-		I	1
	<i>Cissus trifoliata</i> **	Sorrel vine	V	N	P	FACU-		C	5
	<i>Parthenocissus quinquefolia</i>	Virginia creeper	V	N	P	FAC		C	10
	<i>Vitis mustangensis</i> **	Mustang grape	V	N	P			C	11
	<i>Vitis rotundifolia</i> **	Muscadine grape	V	N	P	FAC-		C	7
Zannichelliaceae	<i>Zannichellia palustris</i>	Horned pondweed	F	N	P	OBL		I	1
Zygophyllaceae	<i>Kallstroemia parviflora</i> **	Warty caltrop	F	N	A			I	0
	<i>Tribulus terrestris</i>	Goat head	F	I	A			C	0

Functional groups are: Tree (T), Shrub (S), Vine (V), Graminoid (G), Forb (F), Non-vascular (NV), or Fern Ally (FA)

Origin is categorized as either Native (N) or Introduced (I).

Habit is either Annual (A) or Perennial (P).

Wetland indicator status is as explained in the text.

Response to grazing is indicated as an Increaser (I), Decreaser (D) or Invader (V).

Species distributions were compared with reported species for Denton County. Although many of the species had not previously been reported for Denton County, the species are mostly common species which have been reported in surrounding counties, and many of the species not reported for Denton County in the Atlas of the Vascular Plants of Texas (2003) or in Shinner's and Mahler's Illustrated Flora of North Central Texas (1999) are known in general to occur there; the lack of appearance in the literature is likely simply due to a lack of collected specimens for the county. There were a total of 207 species found at LLELA that had previously been reported to occur in Denton County, and 256 species that were not reported (see Table 4). Three species were not categorized as they were not identified to the species level.

Chi-Square contingency analysis was performed to determine if the species distribution was what could be expected by random chance alone. For the purposes of X^2 , biennials were counted as perennials (Buckallew and Caddell, 2003). Statistical analysis revealed that there was a significantly higher number of introduced annuals than expected, with a $p < 0.0001$.

In order to calculate a Floristic Quality Index (FQI), it was necessary to assign coefficients of conservation (C) to the native species found at LLELA. This was done in consultation with Ken Steigman, Director of LLELA, and also involved a review of the available literature on the species. See Table 5 for a listing of the assigned C values.

Table 5. Coefficient of conservation (C) for native species found at LLELA.

Family	Species	Coefficient
Acanthaceae	<i>Dicliptera brachiata</i>	5
	<i>Justicia americana</i>	5
	<i>Ruellia strepens</i>	3
Aceraceae	<i>Acer negundo</i>	2
Agavaceae	<i>Yucca pallida</i>	5
Alismataceae	<i>Echinodorus berteroi</i>	5

(Table continues)

Table 5 (cont.)

Family	Species	Coefficient
Amaranthaceae	<i>Amaranthus tuberculatus</i>	0
	<i>Froelichia gracilis</i>	3
Anacardiaceae	<i>Rhus copallinum</i>	2
	<i>Rhus glabra</i>	1
Apiaceae	<i>Toxicodendron radicans</i>	1
	<i>Eryngium hookeri</i>	2
	<i>Eryngium leavenworthii</i>	2
	<i>Limnoscium pinnatum</i>	3
	<i>Polytaenia nuttallii</i>	5
	<i>Ptilimnium nuttallii</i>	4
Apocynaceae	<i>Amsonia tabernaemontana</i>	8
	<i>Apocynum cannabinum</i>	3
Aquifoliaceae	<i>Ilex decidua</i>	3
Asclepiadaceae	<i>Asclepias asperula</i> ssp. <i>capricornu</i>	4
	<i>Asclepias stenophylla</i>	6
	<i>Asclepias tuberosa</i>	5
	<i>Asclepias viridiflora</i>	8
	<i>Asclepias viridis</i>	3
	<i>Matelea gonocarpus</i>	5
	<i>Achillea millefolium</i>	0
	<i>Ageratina altissima</i>	3
	<i>Ambrosia psilostachya</i>	0
	<i>Ambrosia trifida</i>	0
Asteraceae	<i>Amphiachyris dracunculoides</i>	3
	<i>Arnoglossum plantagineum</i>	10
	<i>Artemisia ludoviciana</i>	8
	<i>Astranthium integrifolium</i>	6
	<i>Baccharis neglecta</i>	1
	<i>Bidens frondosa</i>	2
	<i>Brickellia eupatorioides</i>	5
	<i>Centaurea americana</i>	3
	<i>Chrysopsis pilosa</i>	3
	<i>Cirsium horridulum</i>	0
	<i>Cirsium texanum</i>	3
	<i>Conyza canadensis</i>	0
	<i>Conyza ramosissima</i>	1
	<i>Coreopsis tinctoria</i>	2
	<i>Dracopis amplexicaulis</i>	3
	<i>Eclipta prostrata</i>	2
	<i>Engelmannia peristenia</i>	7
	<i>Erigeron philadelphicus</i>	3
	<i>Erigeron strigosus</i>	3
	<i>Evax prolifera</i>	3
	<i>Fleischmannia incarnatum</i>	5
	<i>Gaillardia pulchella</i>	3
	<i>Grindelia adenodonta</i>	3
	<i>Grindelia papposa</i>	2
	<i>Helenium amarum</i>	1

(Table continues)

Table 5 (cont.)

Family	Species	Coefficient
Asteraceae	<i>Helianthus annuus</i>	0
	<i>Helianthus hirsutus</i>	4
	<i>Helianthus maximiliani</i>	5
	<i>Heterotheca subaxillaris</i>	1
	<i>Hymenopappus scabiosaeus</i>	7
	<i>Iva annua</i>	0
	<i>Lactuca floridana</i>	3
	<i>Liatris mucronata</i>	8
	<i>Lindheimera texana</i>	5
	<i>Mikania scandens</i>	4
	<i>Packera tampicana</i>	1
	<i>Pluchea odorata</i>	3
	<i>Pyrrhopappus pauciflorus</i>	2
	<i>Ratibida columnifera</i>	3
	<i>Rudbeckia hirta</i>	1
	<i>Silphium radula</i>	2
	<i>Solidago canadensis</i>	0
	<i>Solidago petiolaris</i>	3
	<i>Solidago ulmifolia</i>	4
	<i>Symphotrichum divaricatum</i>	0
	<i>Symphotrichum ericoides</i>	3
	<i>Symphotrichum lanceolatum</i>	4
	<i>Thelesperma filifolium</i>	8
	<i>Verbesina virginica</i>	3
	<i>Vernonia baldwinii</i>	3
	<i>Xanthium strumarium</i>	0
Azollaceae	<i>Azolla caroliniana</i>	0
Bignoniaceae	<i>Campsis radicans</i>	2
Boraginaceae	<i>Lithospermum incisum</i>	7
	<i>Myosotis macrosperma</i>	2
Brassicaceae	<i>Draba cuneifolia</i>	3
	<i>Lepidium virginicum</i>	0
	<i>Lesquerella gracilis</i>	4
Cactaceae	<i>Opuntia phaeacantha</i>	2
Campanulaceae	<i>Lobelia appendiculata</i>	5
	<i>Lobelia cardinalis</i>	8
	<i>Triodanis perfoliata</i>	2
Caesalpiniaceae	<i>Cercis canadensis</i>	3
	<i>Chamaecrista fasciculata</i>	1
	<i>Prosopis glandulosa</i>	0
Campanulaceae	<i>Senna marilandica</i>	4
	<i>Lobelia appendiculata</i>	5
	<i>Lobelia cardinalis</i>	8
Caprifoliaceae	<i>Triodanis perfoliata</i>	2
	<i>Lonicera sempervirens</i>	6
	<i>Sambucus nigra</i> ssp. <i>canadensis</i>	5
	<i>Symphoricarpos orbiculatus</i>	1
	<i>Viburnum rufidulum</i>	2

(Table continues)

Table 5 (cont.)

Family	Species	Coefficient
Cistaceae	<i>Lechea tenuifolia</i>	4
Commelinaceae	<i>Commelina erecta</i>	4
	<i>Tradescantia ohiensis</i>	4
Convolvulaceae	<i>Convolvulus equitans</i>	0
	<i>Dichondra carolinensis</i>	1
	<i>Ipomoea cordatotriloba</i>	2
	<i>Ipomoea lacunosa</i>	1
Cornaceae	<i>Cornus drummondii</i>	1
Cupressaceae	<i>Juniperus virginiana</i>	2
Cuscutaceae	<i>Cuscuta cuspidata</i>	2
	<i>Cuscuta indecora</i>	2
	<i>Cuscuta pentagona</i>	2
Cyperaceae	<i>Carex albicans</i>	8
	<i>Carex arkansana</i>	10
	<i>Carex cherokeensis</i>	3
	<i>Carex crus-corvi</i>	5
	<i>Carex frankii</i>	5
	<i>Carex leavenworthii</i>	3
	<i>Carex retroflexa</i>	5
	<i>Cyperus acuminatus</i>	3
	<i>Cyperus echinatus</i>	3
	<i>Cyperus erythrorhizos</i>	2
	<i>Cyperus odoratus</i>	1
	<i>Cyperus polystachyos</i>	1
	<i>Cyperus squarrosus</i>	2
	<i>Eleocharis montevidensis</i>	2
	<i>Eleocharis palustris</i>	8
	<i>Eleocharis parvula</i>	2
	<i>Schoenoplectus tabernaemontana</i>	5
Ebenaceae	<i>Diospyros virginiana</i>	3
Equisetaceae	<i>Equisetum hyemale</i>	3
Euphorbiaceae	<i>Acalypha virginica</i>	2
	<i>Chamaesyce maculata</i>	2
	<i>Chamaesyce serpens</i>	2
	<i>Cnidoscolus texanus</i>	3
	<i>Croton capitatus</i>	0
	<i>Croton monanthogynus</i>	2
	<i>Croton texensis</i>	2
	<i>Euphorbia bicolor</i>	3
	<i>Euphorbia dentata</i>	0
	<i>Euphorbia hexagona</i>	0
	<i>Tragia betonicifolia</i>	4
Fabaceae	<i>Amorpha fruticosa</i>	5
	<i>Dalea purpurea</i>	8
	<i>Desmodium obtusum</i>	5
	<i>Indigofera miniata</i>	6
	<i>Lespedeza virginica</i>	5
	<i>Lotus unifoliolatus</i>	4

(Table continues)

Table 5 (cont.)

Family	Species	Coefficient
Fabaceae	<i>Lupinus texensis</i>	5
	<i>Sesbania herbacea</i>	3
	<i>Sesbania vesicaria</i>	3
	<i>Strophostyles helvola</i>	2
	<i>Styphnolobium affine</i>	5
	<i>Vicia minutiflora</i>	2
Fagaceae	<i>Quercus macrocarpa</i>	5
	<i>Quercus marilandica</i>	4
	<i>Quercus nigra</i>	5
	<i>Quercus shumardii</i>	3
	<i>Quercus stellata</i>	4
Gentianaceae	<i>Centaurium texense</i>	2
	<i>Eustoma exaltatum</i>	3
	<i>Sabatia campestris</i>	4
Geraniaceae	<i>Geranium carolinense</i>	0
Hydrophyllaceae	<i>Nemophila phacelioides</i>	5
Iridaceae	<i>Sisyrinchium angustifolium</i>	5
Juglandaceae	<i>Carya illinoensis</i>	2
	<i>Carya texana</i>	3
	<i>Juglans nigra</i>	3
Juncaceae	<i>Juncus bufonius</i>	3
	<i>Juncus dudleyi</i>	4
	<i>Juncus effusus</i>	5
	<i>Juncus torreyi</i>	4
Krameriaceae	<i>Krameria lanceolata</i>	3
Lamiaceae	<i>Hedeoma drummondii</i>	3
	<i>Lycopus americanus</i>	4
	<i>Monarda citriodora</i>	5
	<i>Monarda punctata</i>	5
	<i>Physostegia pulchella</i>	3
	<i>Salvia azurea</i>	4
	<i>Salvia coccinea</i>	5
	<i>Stachys crenata</i>	2
	<i>Teucrium canadense</i>	2
	<i>Lemna obscura</i>	2
Lemnaceae	<i>Spirodela polyrrhiza</i>	2
	<i>Wolffia columbiana</i>	2
	<i>Allium canadense</i>	1
Liliaceae	<i>Allium drummondii</i>	3
	<i>Androstephium caeruleum</i>	8
	<i>Camassia scillioides</i>	8
	<i>Cooperia drummondii</i>	3
	<i>Nothoscordum bivalve</i>	4
Linaceae	<i>Linum sulcatum</i>	5
Loganiaceae	<i>Mitreola petiolata</i>	5
Lythraceae	<i>Ammannia coccinea</i>	3
	<i>Lythrum alatum</i>	3
Malvaceae	<i>Callirhoe involucrata</i>	5

(Table continues)

Table 5 (cont.)

Family	Species	Coefficient
Malvaceae	<i>Sphaeralcea hastulata</i>	3
Menispermaceae	<i>Cocculus carolinus</i>	2
	<i>Menispermum canadense</i>	4
Mimosaceae	<i>Desmanthus illinoensis</i>	3
	<i>Desmanthus leptolobus</i>	3
	<i>Gleditsia triacanthos</i>	2
	<i>Mimosa roemeriana</i>	2
	<i>Neptunia lutea</i>	3
Moraceae	<i>Maclura pomifera</i>	2
	<i>Morus rubra</i>	3
Nyctaginaceae	<i>Mirabilis linearis</i>	8
	<i>Mirabilis nyctaginea</i>	0
Oleaceae	<i>Forestiera acuminata</i>	5
	<i>Forestiera pubescens</i>	5
	<i>Fraxinus americanus</i>	5
	<i>Fraxinus pennsylvanica</i>	5
	<i>Fraxinus texensis</i>	5
Onagraceae	<i>Calylophus hartwegii</i>	5
	<i>Calylophus serrulatus</i>	4
	<i>Gaura mollis</i>	2
	<i>Gaura suffulta</i>	2
	<i>Ludwigia leptocarpa</i>	3
	<i>Ludwigia peploides</i>	3
	<i>Oenothera biennis</i>	0
	<i>Oenothera laciniata</i>	1
	<i>Oenothera speciosa</i>	2
	<i>Stenosiphon linifolius</i>	3
Oxalidaceae	<i>Oxalis stricta</i>	0
Papaveraceae	<i>Argemone polyanthemus</i>	0
Passifloraceae	<i>Passiflora incarnata</i>	5
	<i>Passiflora lutea</i>	5
Phytolaccaceae	<i>Rivina humilis</i>	3
Plantaginaceae	<i>Plantago aristata</i>	1
	<i>Plantago patagonica</i>	0
	<i>Plantago rhodosperma</i>	2
Platanaceae	<i>Platanus occidentalis</i>	3
Poaceae	<i>Andropogon gerardii</i>	8
	<i>Andropogon glomeratus</i>	3
	<i>Andropogon temarius</i>	5
	<i>Andropogon virginicus</i>	2
	<i>Aristida longespica</i>	2
	<i>Aristida purpurea</i>	0
	<i>Bothriochloa laguroides</i>	2
	<i>Bouteloua curtipendula</i>	7
	<i>Bouteloua dactyloides</i>	5
	<i>Cenchrus spinifex</i>	0
	<i>Chasmanthium latifolium</i>	5
	<i>Chloris virgata</i>	1

(Table continues)

Table 5 (cont.)

Family	Species	Coefficient
Poaceae	<i>Coelorachis cylindrica</i>	10
	<i>Dichanthelium oligosanthes</i>	3
	<i>Elymus canadensis</i>	5
	<i>Elymus virginicus</i>	4
	<i>Eragrostis secundiflora</i>	2
	<i>Hordeum pusillum</i>	0
	<i>Koeleria macrantha</i>	4
	<i>Leptochloa mucronata</i>	2
	<i>Muhlenbergia sobolifera</i>	4
	<i>Nassella leucotricha</i>	3
	<i>Panicum capillare</i>	2
	<i>Panicum obtusum</i>	2
	<i>Panicum virgatum</i>	6
	<i>Pascopyrum smithii</i>	0
	<i>Paspalum floridanum</i>	5
	<i>Phalaris caroliniana</i>	1
	<i>Schizachyrium scoparium</i>	8
	<i>Setaria parviflora</i>	6
	<i>Sorghastrum nutans</i>	8
	<i>Sporobolus compositus</i>	4
	<i>Tridens albescens</i>	2
	<i>Tripsacum dactyloides</i>	5
	<i>Urochloa fuscata</i>	3
Polemoniaceae	<i>Ipomopsis rubra</i>	8
Polygonaceae	<i>Polygonum amphibium</i>	1
Portulacaceae	<i>Portulaca pilosa</i>	2
Ranunculaceae	<i>Anemone berlandieri</i>	2
	<i>Clematis pitcheri</i>	6
	<i>Delphinium virescens</i>	6
	<i>Myosurus minimus</i>	5
	<i>Ranunculus abortivus</i>	3
Rhamnaceae	<i>Berchemia scandens</i>	3
Rosaceae	<i>Crataegus mollis</i>	1
	<i>Crataegus spathulata</i>	1
	<i>Geum canadense</i>	2
	<i>Prunus angustifolia</i>	4
	<i>Prunus mexicana</i>	3
	<i>Prunus rivularis</i>	2
	<i>Rosa setigera</i>	4
	<i>Rubus aboriginum</i>	0
	<i>Rubus oklahomus</i>	0
Rubiaceae	<i>Cephalanthus occidentalis</i>	3
	<i>Diodia virginiana</i>	3
	<i>Galium aparine</i>	0
	<i>Galium circaezens</i>	4
	<i>Houstonia pusillum</i>	3
	<i>Stenaria nigricans</i>	5
Rutaceae	<i>Zanthoxylum clava-herculis</i>	4

(Table continues)

Table 5 (cont.)

Family	Species	Coefficient
Salicaceae	<i>Populus deltoides</i>	2
	<i>Salix nigra</i>	3
Sapindaceae	<i>Cardiospermum halicacabum</i>	2
	<i>Sapindus saponaria</i>	3
Sapotaceae	<i>Sideroxylon lanuginosum</i>	2
Scrophulariaceae	<i>Agalinis fasciculata</i>	2
	<i>Bacopa monnieri</i>	3
	<i>Castilleja indivisa</i>	3
	<i>Veronica peregrine</i>	0
Smilicaceae	<i>Smilax bona-nox</i>	1
Solanaceae	<i>Physalis angulata</i>	2
	<i>Physalis longifolia</i>	2
	<i>Physalis mollis</i>	2
	<i>Solanum dimidiatum</i>	0
	<i>Solanum elaeagnifolium</i>	0
	<i>Solanum rostratum</i>	0
Typhaceae	<i>Typha domingensis</i>	0
	<i>Typha latifolia</i>	0
Ulmaceae	<i>Celtis laevigata</i>	2
	<i>Ulmus alata</i>	5
	<i>Ulmus americana</i>	4
	<i>Ulmus crassifolia</i>	2
Urticaceae	<i>Urtica chamaedryoides</i>	5
Valerianaceae	<i>Valerianella radiata</i>	0
Verbenaceae	<i>Glandularia bipinnatifida</i>	5
	<i>Phyla nodiflora</i>	2
	<i>Verbena bracteata</i>	0
	<i>Verbena halei</i>	0
	<i>Verbena stricta</i>	2
	<i>Verbena urticifolia</i>	0
Violaceae	<i>Viola bicolor</i>	0
Viscaceae	<i>Phoradendron tomentosum</i>	0
Vitaceae	<i>Ampelopsis arborea</i>	2
	<i>Ampelopsis cordata</i>	2
	<i>Cissus trifoliata</i>	2
	<i>Parthenocissus quinquefolia</i>	2
	<i>Vitis mustangensis</i>	0
	<i>Vitis rotundifolia</i>	3
Zannichelliaceae	<i>Zannichellia palustris</i>	5
Zygophyllaceae	<i>Kallstroemia parviflora</i>	2

A total of 44 quadrats were placed over the two year sampling period; 32 in 2004, and an additional 12 in 2005. Seven quadrats were retired in 2005, and the statistical data listed below use only the data collected from 37 quadrats in 2005. See Figure 4 for a map of the locations of these quadrats. A total of 297 species were found in the quadrats over the two year sampling period. This represents 69% of all the species present on LLELA. See Appendix 3 for a complete list of all species found in each quadrat. Table 8 provides a summary of the quadrat information by ecosystem.

Analysis of the species found in the quadrats reveals that 86 species were found in the forest quadrats, 128 species in the prairies, 102 in the savannahs, and 27 in the wetlands. There were 259 native species, and 30 introduced; 108 of the species in the quadrats were annual, and 188 were perennial (See Table 6). Figure 7 shows the average number of species per quadrat by ecosystem, by origin and habit.

Table 6. Descriptive statistics for species distribution by ecosystem, Origin and Habit. Mean number of species per quadrat by origin: Native (N) or Introduced (I) and habit: Annual (A) or Perennial (P). The probability of normal distribution by Shapiro-Wilk (*W*) is given.

ECOSYS	O/H	MEAN	SD	S ²	W	Five Number Summary				
						MIN	Q ₁	Q ₂	Q ₃	MAX
Forest <i>n</i> =99	N	22.77	6.25	39.06	0.17	5	18	24	27	35
	I	1.49	1.95	3.80	<0.0001	0	0	1	2	10
	A	3.27	3.42	11.70	<0.0001	0	1	3	4	15
	P	20.77	6.83	46.65	0.14	2	16	22	25	30
Grassland <i>n</i> =135	N	17.39	8.25	68.06	0.02	0	12	17	22	44
	I	2.67	2.07	4.28	<0.0001	0	1	2	4	9
	A	7.90	4.42	19.54	0.002	0	4	7	11	20
	P	12.20	6.03	36.36	0.11	0	8	12	16	27
Savannah <i>n</i> =72	N	20.92	6.63	43.96	0.32	5	16	20	26	36
	I	1.76	1.47	2.16	<0.0001	0	1	2	2	6
	A	6.26	3.05	9.30	0.04	0	4	6	8	16
	P	16.43	6.23	38.81	0.006	5	11	15	20.5	21
Wetland <i>n</i> =27	N	12.0	3.71	13.76	0.41	2	10	13	14	18
	I	0.11	0.32	0.10	<0.0001	0	0	0	0	1
	A	2.07	1.44	2.07	0.007	0	1	2	3	5
	P	10.0	3.29	10.82	0.32	2	8	10	13	16

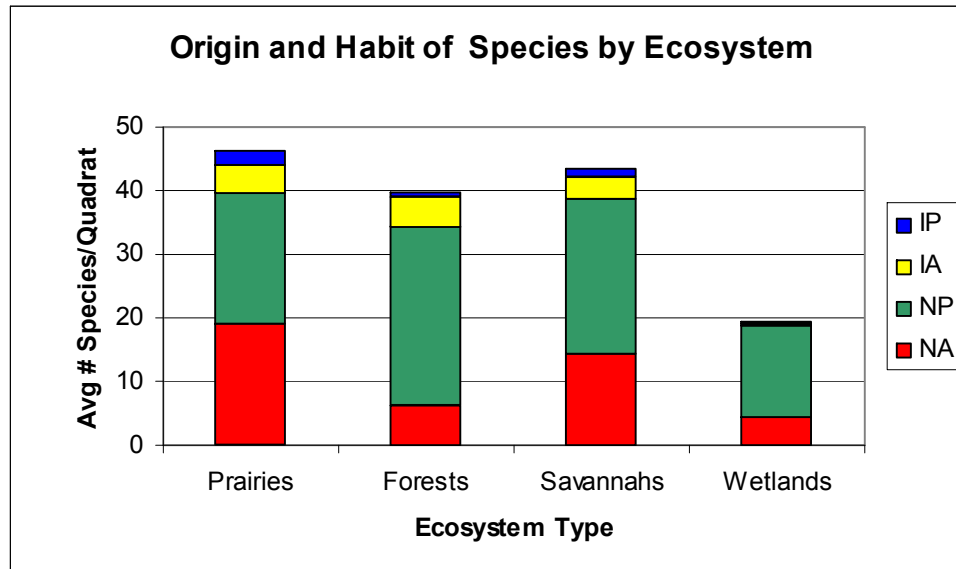


Figure 7. Average species per quadrat by ecosystem, origin and habit: Introduced Perennial (IP), Introduced annual (IA), Native Perennial (NP), and Native Annual (NA).

Of the species found in the quadrat, 33 were trees, 11 were shrubs, 16 were vines, 56 were graminoids, 177 were forbs, and 4 were non-vascular. There were more species of trees, shrubs and vines found in the forested quadrats, with a higher number of species of

graminoids and forbs found in the prairies (See Table 7). See Figure 8 for a breakdown of average number of species per quadrat in each ecosystem by functional group.

Table 7. Descriptive statistics for species distribution by ecosystem, Functional Group. Mean number of species per quadrat by functional group: Woody (W), Graminoid (G), or Forb (F). The probability of normal distribution by Shapiro-Wilk (*W*) is given.

ECOSYS	O/H	MEAN	SD	S ²	W	Five Number Summary				
						MIN	Q ₁	Q ₂	Q ₃	MAX
Forest <i>n</i> =99	W	14.92	5.85	34.22	0.003	3	11	15	20	25
	G	2.44	1.61	2.59	0.0001	0	1	2	4	6
	F	6.91	4.87	23.72	<0.0001	0	3	6	9	21
Grassland <i>n</i> =135	W	4.14	3.56	12.67	<0.0001	0	1	3	8	13
	G	4.73	2.97	8.82	0.0004	0	3	5	7	12
	F	10.98	5.99	35.88	0.01	0	6	10	15	28
Savannah <i>n</i> =72	W	8.93	3.22	10.37	<0.0001	4	6	8	11	16
	G	4.03	2.49	5.98	0.002	0	2	3	5.5	11
	F	9.85	4.72	22.28	0.02	0	6.5	10	12	24
Wetland <i>n</i> =27	W	3.74	2.36	5.57	0.0009	0	1	4	6	7
	G	1.56	0.58	0.34	<0.0001	1	1	2	2	3
	F	6.30	2.95	8.70	0.04	0	5	6	9	10

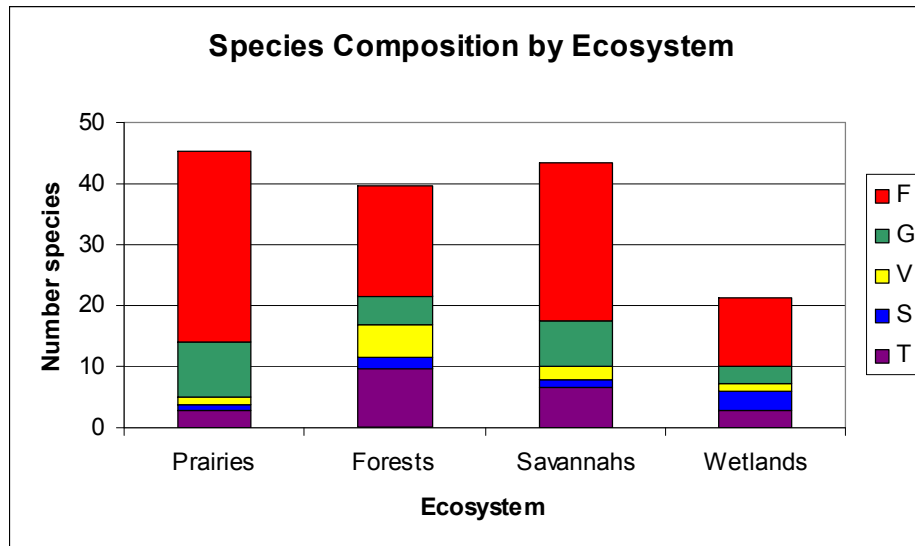


Figure 8. Average number of species per quadrat by ecosystem, functional group: Forbs (F), Graminoids (G), Vines (V), Shrubs (S), and Trees (T).

Species richness was calculated for each month (see Figure 9). Richness was higher on average in the forested quadrats. ANOVA shows that there is a significant difference in richness between ecosystems ($p < 0.0001$) and between seasons ($p < 0.001$), with no significant interaction between the parameters. SNK showed that the forest and savannah were not significantly different, and had the highest richness; the wetlands had the lowest species richness per quadrat. Richness was highest in the early summer, with lowest richness in the fall.

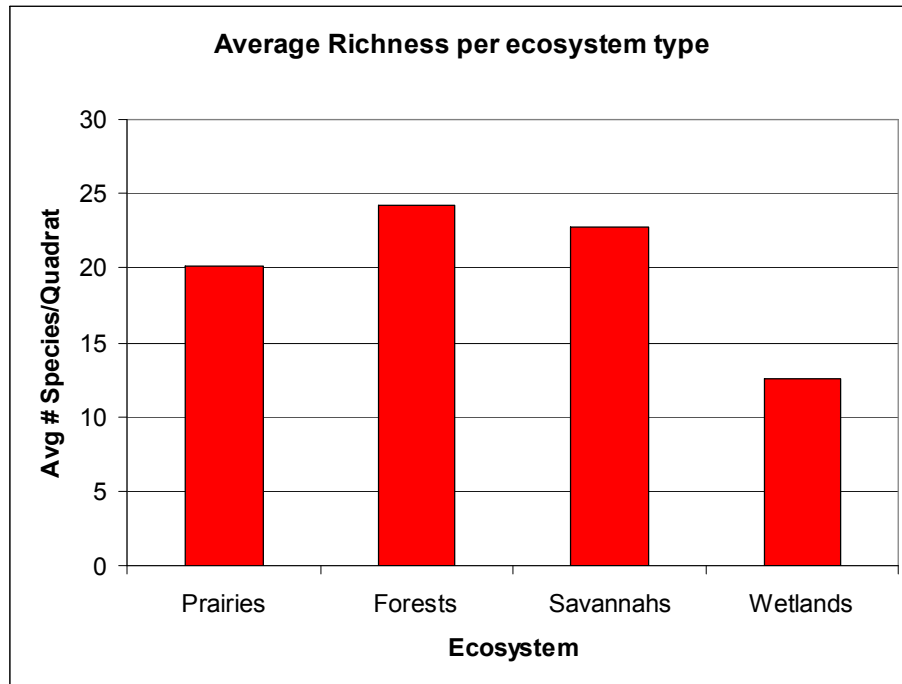


Figure 9. Average richness by ecosystem.

Diversity was calculated for each quadrat at each sampling event, using Shannon-Wiener diversity index. ANOVA was performed on the derived variable, and demonstrated a significant difference between ecosystems ($p < 0.0001$) and season ($p < 0.0001$). There was no significant interaction between the variables. SNK demonstrated that there was no significant difference between the forests and savannas, which had significantly higher diversity than the prairies. The lowest diversity was in the wetlands. See Figure 10 for average diversity values.

Table 8. Quadrat information for LLELA. Dominant species were determined using the Corps of Engineers 50/20 method. Years indicates which year(s) the quadrat was sampled. Total species includes species found in all sampling periods. Floristic Quality Index (FQI) was calculated using values given above. Wetland Indicator (WI) indicates whether the quadrat meets the official Corps of Engineers wetland criteria for hydrophytic vegetation.

#	Dominant Species	Years	FQI	Total	Origin		Habit		Woody			Graminoids			F	WI
					N	I	A	P	T	S	V	G	S	R		
Forests																
F1	<i>F. Pennsylvania/Q. macrocarpa/U. crassifolia</i>	05	18.01	39	38	1	3	36	16	2	6	1	3	0	11	Y
F2	<i>U. americana</i>	04/05	15.91	37	32	5	8	29	13	2	7	1	2	0	12	Y
F3	<i>U. crassifolia/A. trifida/C. laevigata</i>	04/05	15.94	47	37	10	15	32	8	2	6	3	1	0	27	Y
F4	<i>C. laevigata/U. crassifolia/T. radicans</i>	04/05	15.78	37	34	3	7	30	9	3	6	0	3	1	15	Y
F5	<i>S. saponaria</i>	04/05	13.69	32	30	2	2	30	14	4	8	1	1	0	4	Y
F6	<i>F. pennsylvanica</i>	04/05	16.82	44	42	2	7	37	11	2	9	2	2	0	18	Y
F7	<i>C. laevigata</i>	04/05	10.91	27	21	6	9	18	8	2	3	3	1	0	10	Y
F8	<i>C. laevigata/T. radicans</i>	04/05	13.27	53	42	11	19	34	8	3	6	5	2	1	28	N
F9	<i>C. laevigata/M. pomifera</i>	05	14.80	42	37	5	14	28	7	2	4	4	1	0	24	N
F10	<i>C. laevigata/G. triacanthos/P. glandulosa</i>	04	10.39	29	26	3	12	17	5	1	1	3	0	0	19	N
F11	<i>P. glandulosa/S. compositus/G. triacanthos</i>	04/05	14.18	48	43	5	24	24	3	0	3	7	0	0	35	N
F12	<i>U. crassifolia/E. virginicus/S. affine</i>	05	15.37	47	39	8	21	26	8	1	4	3	3	0	28	N
Prairies																
P1	<i>R. aboriginum</i>	04/05	16.01	71	59	12	34	37	5	2	6	12	1	0	45	N
P2	<i>S. halepense</i>	04	17.46	64	49	15	35	39	3	1	0	13	3	1	43	N
P3	<i>I. annua/L. alatum</i>	04	9.00	29	25	4	19	10	1	0	0	5	1	0	22	Y
P4	<i>P. virgatum</i>	04	15.01	30	27	3	12	18	0	0	1	9	1	0	19	Y
P5	<i>C. dactylon</i>	04/05	14.97	66	54	12	35	31	2	1	4	18	1	0	40	Y
P6	<i>A. arborea/A. trifida/C. dactylon/T. radicans</i>	04/05	11.33	43	35	8	24	19	2	1	2	5	2	0	31	Y
P7	<i>S. helvola/P. deltoides/D. virginiana</i>	04/05	10.21	34	28	6	16	18	4	2	5	2	0	0	21	Y
P8	<i>I. annua/S. compositus/C. leavenworthii</i>	04/05	12.67	43	37	6	27	16	1	0	0	10	4	2	26	Y
P9	<i>I. annua/C. leavenworthii/S. canadense</i>	05	10.03	34	29	5	16	18	3	0	0	6	3	0	22	Y
P10	<i>S. halepense/A. trifida/B. arvensis</i>	04/05	13.14	50	38	12	33	17	0	0	0	9	1	0	40	N
P11	<i>S. halepense/T. radicans</i>	04/05	15.98	51	44	7	24	27	4	4	2	5	0	0	36	N
P12	<i>S. halepense/B. ischaemum</i>	04/05	19.75	48	42	6	21	27	2	1	0	9	0	0	6	N
P13	<i>S. halepense/ S. compositus/B. laguroides</i>	04/05	18.90	51	42	9	26	25	2	0	0	8	0	0	41	N
P14	<i>S. halepense/B. laguroides</i>	04	17.20	31	28	3	14	17	0	0	0	5	0	0	26	N
P15	<i>H. maximiliani/B. ischaemum/S. compositus/S. scoparium</i>	04/05	20.46	46	41	5	23	23	1	0	0	12	0	0	33	N

(Table continues)

Table 8 (cont.)

#	Dominant Species	Years	FQI	Total	Origin		Habit		Woody			Graminoid			F	WI
					N	I	A	P	T	S	V	G	S	R		
P16	<i>H. maximiliani</i> / <i>S. halepense</i> / <i>B. ischaemum</i> / <i>S. scoparium</i>	04	15.43	26	23	3	9	17	0	0	0	9	0	0	17	N
P17	<i>H. maximiliani</i> / <i>S. compositus</i>	05	20.28	41	38	3	18	23	2	1	0	11	0	0	27	N
P18	<i>A. dracunculoides</i>	04	8.26	18	15	3	11	7	0	0	0	4	0	0	14	N
P19	<i>S. compositus</i> / <i>A. dracunculoides</i>	04/05	14.86	44	41	3	24	20	0	0	0	11	0	1	32	N
P20	<i>U. crassifolia</i>	05	17.65	70	62	8	36	34	8	3	1	6	3	1	48	Y
P21	<i>S. halepense</i> / <i>A. trifida</i> / <i>U. crassifolia</i>	04/05	11.50	52	46	6	28	24	6	1	1	7	4	0	33	Y
Savannahs																
S1	<i>B. ischaemum</i> / <i>Q. stellata</i>	05	19.14	53	49	4	18	35	9	2	2	10	1	1	28	N
S2	<i>B. ischaemum</i> / <i>S. bona-nox</i>	05	17.93	42	39	3	11	31	10	4	2	4	0	0	22	Y
S3	<i>T. radicans</i> / <i>P. deltoides</i>	04/05	8.62	38	31	7	20	18	4	1	4	4	2	0	23	Y
S4	<i>V. mustangensis</i> / <i>S. helvola</i> / <i>A. trifida</i>	04/05	13.32	46	37	9	16	30	6	2	5	7	1	0	24	Y
S5	<i>S. halepense</i> / <i>P. glandulosa</i> / <i>C. dactylon</i>	04/05	17.42	63	54	9	27	36	6	0	5	9	1	0	42	N
S6	<i>S. compositus</i> / <i>P. glandulosa</i> / <i>P. angustifolia</i>	04/05	16.92	58	52	6	30	28	5	1	0	10	0	0	42	N
S7	<i>C. leavenworthii</i> / <i>I. annua</i> / <i>P. glandulosa</i> / <i>U. crassifolia</i>	05	13.15	42	37	5	18	24	6	1	0	7	4	2	22	Y
S8	<i>C. crus-corvi</i> / <i>I. annua</i>	05	10.77	32	29	3	14	18	6	0	1	4	3	0	18	Y
Wetlands																
W1	<i>Chara</i> sp./ <i>C. demersum</i>	04/05	12.00	18	17	1	3	15	0	0	1	0	3	0	12	Y
W2	<i>C. laevigata</i> / <i>U. crassifolia</i> / <i>C. crus-corvi</i> / <i>M. scandens</i>	05	10.23	26	25	1	6	20	5	0	2	1	2	0	15	Y
W3	<i>F. acuminata</i> / <i>C. crus-corvi</i>	05	8.29	16	16	0	6	10	3	1	1	0	2	0	8	Y

Origin: N=Native, I=Introduced

Habit: A=Annual, P=Perennial

Woody species include Trees (T), Shrubs (S), and Vines (V)

Graminoids includes Grasses (G), Sedges (S), and Rushes (F)

F=Forbs

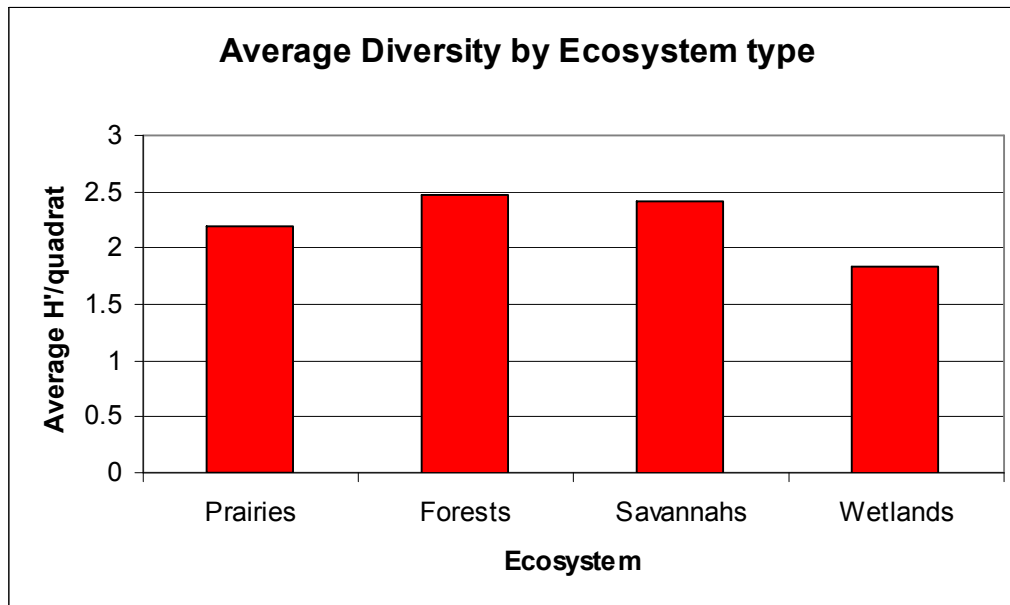


Figure 10. Average diversity by ecosystem.

Evenness was also calculated, using the Shannon evenness index. Statistical analysis revealed no significant difference between ecosystems in evenness, but did reveal a significant difference between seasons ($p < 0.0002$). Evenness was highest in the spring, declined through the summer, and was lowest in the fall. See Figure 11 for average evenness values for the ecosystems, and Figure 12 for average evenness values by season.

Table 9 gives the statistical breakdown for richness, diversity, and evenness by ecosystem. Evaluation of these parameters suggests an ecological system in a dynamic state of non-equilibrium, a community subjected to frequent disturbance, and characterized as early successional, in a state of flux with low stability and low resilience.

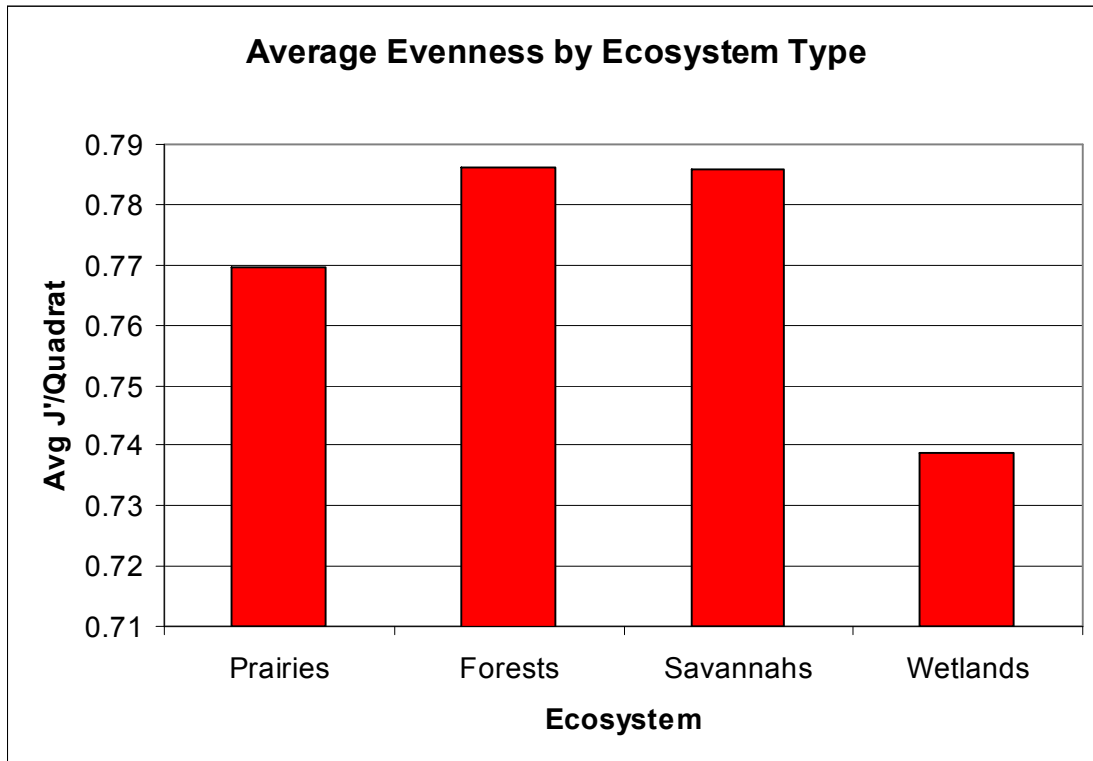


Figure 11. Average evenness by ecosystem.

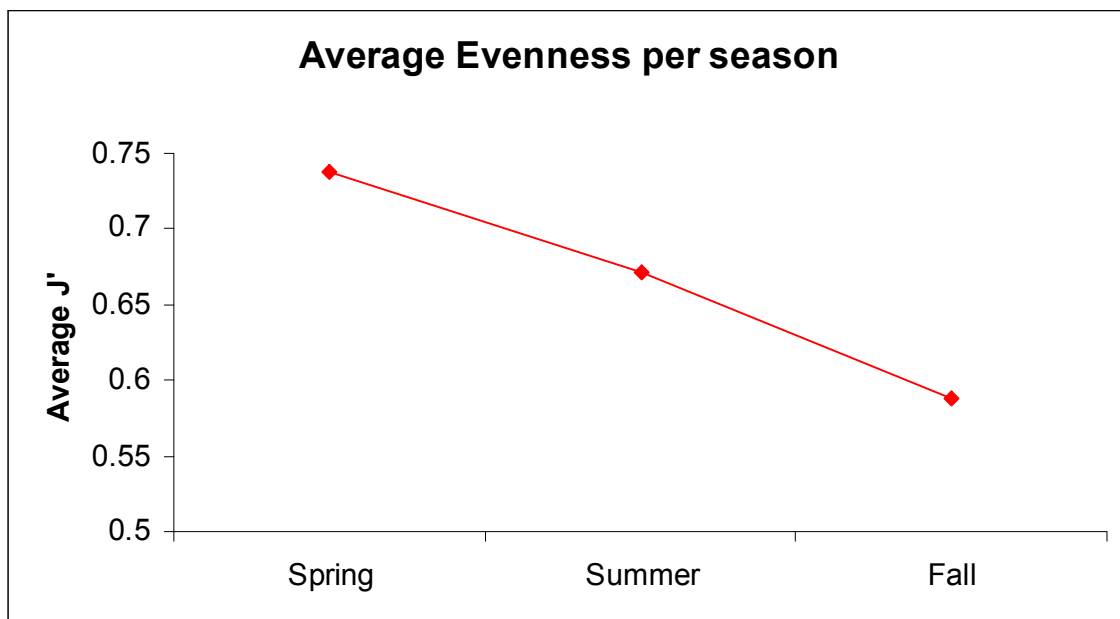


Figure 12. Average evenness by season.

Table 9. Descriptive statistics for biodiversity parameters by ecosystem. Richness, Diversity (H') and Evenness (J') are given. The probability of normal distribution by Shapiro-Wilk (W) is given.

ECOSYS	O/H	MEAN	SD	S^2	W	Five Number Summary				
						MIN	Q_1	Q_2	Q_3	MAX
Forest $n=99$	Rich	24.27	6.65	44.22	0.10	6	20	24	29	3
	H'	2.48	0.37	0.14	0.003	1.16	2.33	2.55	2.74	3.07
	J'	0.79	0.05	0.003	0.0008	0.64	0.75	0.80	0.82	0.87
Grassland $n=135$	Rich	20.09	9.37	87.80	0.12	0	13	20	26	47
	H'	2.20	0.56	0.31	0.02	0.00	1.93	2.20	2.58	3.50
	J'	0.76	0.13	0.02	<0.0001	0.00	0.70	0.76	0.83	1.0
Savannah $n=72$	Rich	22.72	7.39	54.61	0.33	5	17	22	29	40
	H'	2.42	0.42	0.18	0.05	0.81	2.14	2.47	2.70	3.38
	J'	0.79	0.8	0.64	0.04	0.50	0.74	0.79	0.84	1.0
Wetland $n=27$	Rich	12.56	3.79	14.36	0.21	2	10	13	15	18
	H'	1.84	0.48	0.23	0.001	0.41	1.63	1.99	2.23	2.35
	J'	0.74	0.11	0.01	0.002	0.33	0.69	0.76	0.81	0.86

Cluster analysis was performed on the quadrat data, using Jaccard weighted by cover. Cluster analysis reveals that there are a total of 22 associations (See Figure 13), using the standard of a CC of 50 or greater.

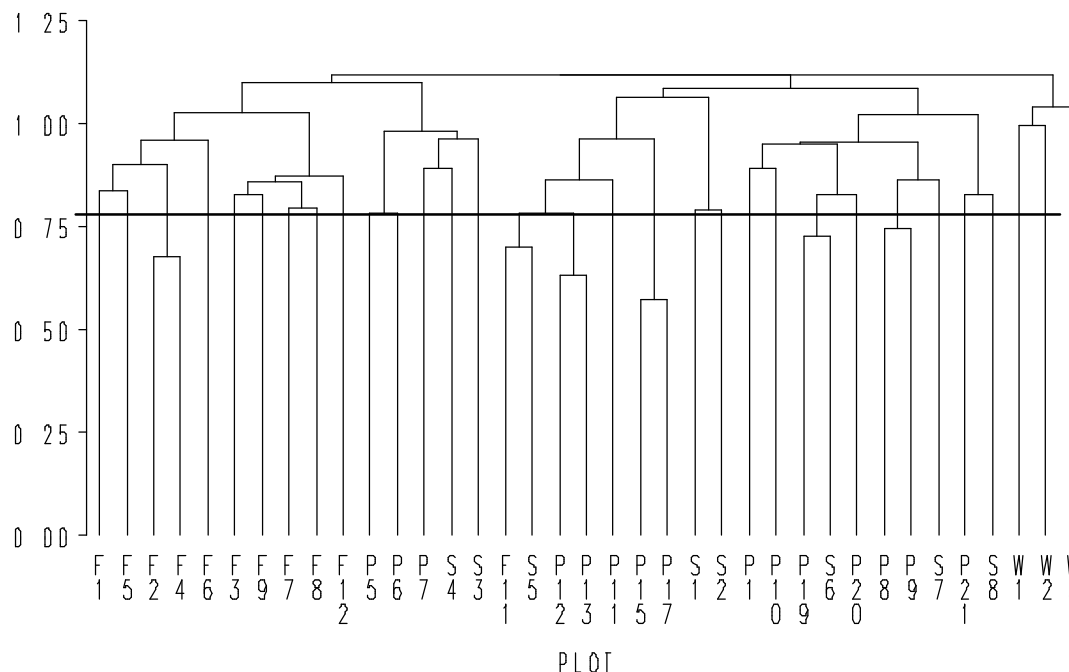


Figure 13. Dendrogram for cluster analysis of sample quadrats, LLELA, summer 2005.

Alliances present were determined using the National Vegetation Classification Standard (Federal Geographic Data Committee, 1997). Eight alliances listed in the standard were identified as present within the sampled quadrats; in addition, it appeared that *Prosopis/Gleditsia* were present in association with each other frequently enough to be considered a potential alliance.

Successional stages for the forested quadrats were determined according to Oliver and Larson (1996), and these are also listed in Table 10. The forests are mostly in early stages of succession following disturbance, dominated by fast-growing, short-lived species. The trees range from 10-25 years of age. There was only one forested quadrat (F1) that demonstrated the level of stratification expected in a mature, old-growth forest. This forest was on the west end of the property, and was surrounded by remnants of the native Cross Timbers. One of the savannahs (S1), also on the west end of the property, had a woody community characteristic of native Cross Timbers, though there was some encroachment locally by eastern redcedar and Chittamwood. Prairies appeared to be predominantly in the early stages of succession, dominated by *r*-strategists, with high productivity and low stability, with the exception of four grassland quadrats which were in the late stages, having achieved a climax prairie stage (Barbour et al., 1999); however, these four quadrats had all been planted with native tall grasses within the past few years. Because of the infestation of *Tamarix chinensis* (salt cedar) that was discovered early in the course sampling, one quadrat was placed along the banks of McWhorter Creek to determine the composition of the community that had been invaded. This quadrat (P20) demonstrated that the community was composed of mostly weedy species. Wetland 1 (W1) is a well-established, permanently flooded

Table 10. Successional stages and alliances of the quadrats sampled at LLELA.

#	Successional Stage	Associations Present
F1	Transitional Old Growth	
F2	Stem Exclusion	<i>Fraxinus pennsylvanica/Celtis</i> spp.
F3	Stem Exclusion	
F4	Stem Exclusion	<i>Fraxinus pennsylvanica/Celtis</i> spp.
F5	Understory Reinitiation	
F6	Understory Reinitiation	<i>Fraxinus pennsylvanica/Celtis</i> spp.
F7	Understory Reinitiation	
F8	Understory Reinitiation	
F9	Understory Reinitiation	
F10	Stem Exclusion	<i>Prosopis/Gleditsia</i> Woodland Alliance**
F11	Stem Exclusion	<i>Prosopis/Gleditsia</i> Woodland Alliance**
F12	Stem Exclusion	
P1	Pioneer Weedy	
P2	Pioneer Weedy	
P3	Pioneer Weedy	Annual Low Forb Vegetation
P4	Climax Prairie	<i>Tripsacum/Panicum</i> Herbaceous Alliance
P5	Pioneer Weedy	Annual Low Forb Vegetation
P6	Pioneer Weedy	Annual Low Forb Vegetation
P7	Pioneer Weedy	Annual Low Forb Vegetation
P8	Pioneer Weedy	Annual Low Forb Vegetation
P9	Pioneer Weedy	Annual Low Forb Vegetation
P10	Pioneer Weedy	
P11	Pioneer Weedy	
P12	Pioneer Weedy	
P13	Pioneer Weedy	
P14	Pioneer Weedy	
P15	Climax Prairie	<i>Schizachyrium/Sorghastrum</i> Herbaceous Alliance
P16	Climax Prairie	<i>Schizachyrium/Sorghastrum</i> Herbaceous Alliance
P17	Climax Prairie	<i>Schizachyrium/Sporobolus</i> Herbaceous Alliance
P18	Pioneer Weedy	Annual Low Forb Vegetation
P19	Pioneer Weedy	Annual Low Forb Vegetation
P20	Pioneer Weedy	
P21	Pioneer Weedy	
S1	Remnant Cross Timbers	<i>Juniperus/Fraxinus/Quercus</i> Forest Alliance
S2	Remnant Cross Timbers	<i>Juniperus/Fraxinus/Quercus</i> Forest Alliance
S3	Stem Exclusion	<i>Populus/Tall Grass</i> Woodland Alliance
S4	Pioneer Weedy	Annual Tall Forb Vegetation
S5	Pioneer Weedy	<i>Juniperus virginiana</i> Shrubland Alliance
S6	Pioneer Weedy	
S7	Pioneer Weedy	<i>Prosopis/Gleditsia</i> Woodland Alliance**
S8	Pioneer Weedy	<i>Fraxinus pennsylvanica/Celtis</i> spp.
W1	Permanently flooded freshwater marsh	
W2	Transitional wetland	
W3	Temporarily flooded wetland	

freshwater marsh. Wetland 2 (W2) is an intermittently flooded wetland in the transitional state from a lowland forest, and contains a mixture of wetland plants that have recently established, and upland plants that are remnants of the system prior to flooding.

Wetland 3 (W3) is a seasonal sedge marsh that is dominated by swamp privet

(*Forestiera acuminata*), and surrounded by grasslands dominated by giant ragweed; the community is a mixture of wetland species and upland annual weeds.

Chi-Square contingency analysis reveals that some species have a positive association with each other, occurring more frequently together in quadrats than would be expected by random chance alone. A number of species are also negatively associated, occurring together less frequently than would be expected by random chance alone. Table 11 lists those associations for species that occur in at least 30% of the total quadrats (Goodall, 1969).

The plant species at LLELA can be divided into five separate communities, based on the analysis of species that occur together more frequently than expected. There are two commonly occurring prairie communities, and three commonly occurring forest communities that can be predicted from the dominant species. Table 12 lists those plant groupings that can be expected to occur in some combination with the listed dominant species. Only those species occurring with a frequency of 30% or greater are listed (Cook and Hurst, 1963). Community composition in the three forested quadrats indicate that slightly over 80% of the expected species are native in the quadrats dominated by *Ulmus crassifolia* and *Celtis laevigata*; in the community dominated by *Fraxinus pennsylvanica*, 100% of the commonly occurring species are natives. In the prairie communities, native species account for less than 75% of the commonly occurring species in communities dominated by *Sorghum halepense*, but approximately 96% of the commonly occurring species in communities dominated by *Sporobolus compositus*. Annual species account for approximately half the species frequently present in both prairie communities.

Table 11. Species that demonstrate associations using Chi-Square contingency analysis, and the probabilities.

Positive		Negative		P
<i>Agalinis fasciculata</i>	<i>Ambrosia psilostachya</i>			<0.0001
<i>Agalinis fasciculata</i>	<i>Amphiachyris dracunculoides</i>			0.01
<i>Agalinis fasciculata</i>	<i>Bothriochloa laguroides</i>			0.02
<i>Agalinis fasciculata</i>	<i>Bromus arvensis</i>			0.009
<i>Agalinis fasciculata</i>	<i>Croton monanthogynus</i>			0.05
<i>Agalinis fasciculata</i>	<i>Desmanthus leptolobus</i>			0.05
<i>Agalinis fasciculata</i>	<i>Dracopis amplexicaulis</i>			0.03
<i>Agalinis fasciculata</i>	<i>Erigeron strigosus</i>			0.0007
		<i>Agalinis fasciculata</i>	<i>Fraxinus pennsylvanica</i>	0.009
<i>Agalinis fasciculata</i>	<i>Helianthus annuus</i>			0.02
<i>Agalinis fasciculata</i>	<i>Iva annua</i>			0.02
<i>Agalinis fasciculata</i>	<i>Lythrum alatum</i>			0.005
<i>Agalinis fasciculata</i>	<i>Monarda citriodora</i>			0.03
<i>Agalinis fasciculata</i>	<i>Packera tampicana</i>			0.05
<i>Agalinis fasciculata</i>	<i>Polytaenia nuttallii</i>			0.01
<i>Agalinis fasciculata</i>	<i>Pyrrhopappus pauciflorus</i>			0.002
<i>Agalinis fasciculata</i>	<i>Sporobolus compositus</i>			0.02
<i>Agalinis fasciculata</i>	<i>Symphotrichum divaricatum</i>			0.05
<i>Agalinis fasciculata</i>	<i>Symphotrichum ericoides</i>			0.0005
<i>Agalinis fasciculata</i>	<i>Valerianella radiata</i>			0.002
		<i>Ambrosia psilostachya</i>	<i>Ambrosia trifida</i>	0.04
<i>Ambrosia psilostachya</i>	<i>Amphiachyris dracunculoides</i>			<0.0001
<i>Ambrosia psilostachya</i>	<i>Asclepias viridis</i>			0.05
<i>Ambrosia psilostachya</i>	<i>Bothriochloa laguroides</i>			0.0002
<i>Ambrosia psilostachya</i>	<i>Bromus arvensis</i>			0.009
		<i>Ambrosia psilostachya</i>	<i>Celtis laevigata</i>	0.02
<i>Ambrosia psilostachya</i>	<i>Croton monanthogynus</i>			0.0006
<i>Ambrosia psilostachya</i>	<i>Desmanthus leptolobus</i>			0.0008
<i>Ambrosia psilostachya</i>	<i>Desmanthus illinoensis</i>			<0.0001
<i>Ambrosia psilostachya</i>	<i>Dichanthelium oligosanthes</i>			0.003
<i>Ambrosia psilostachya</i>	<i>Erigeron strigosus</i>			0.0005
<i>Ambrosia psilostachya</i>	<i>Euphorbia bicolor</i>			0.0008
<i>Ambrosia psilostachya</i>	<i>Geranium carolinianum</i>			0.04
<i>Ambrosia psilostachya</i>	<i>Helianthus annuus</i>			0.04
<i>Ambrosia psilostachya</i>	<i>Lythrum alatum</i>			0.04
<i>Ambrosia psilostachya</i>	<i>Monarda citriodora</i>			0.0008
<i>Ambrosia psilostachya</i>	<i>Polytaenia nuttallii</i>			0.0002

(Table continues)

Table 11 (cont.)

Positive		Negative		P
<i>Ambrosia psilostachya</i>	<i>Prosopis glandulosa</i>			0.04
<i>Ambrosia psilostachya</i>	<i>Ptilimnium nuttallii</i>			0.002
<i>Ambrosia psilostachya</i>	<i>Pyrrhopappus pauciflorus</i>			0.02
<i>Ambrosia psilostachya</i>	<i>Sporobolus compositus</i>			0.02
<i>Ambrosia psilostachya</i>	<i>Symphotrichum ericoides</i>			0.004
<i>Ambrosia psilostachya</i>	<i>Valerianella radiata</i>			0.01
<i>Ambrosia psilostachya</i>	<i>Vicia sativa</i>			0.02
		<i>Ambrosia trifida</i>	<i>Amphiachyris dracunculoides</i>	0.01
		<i>Ambrosia trifida</i>	<i>Asclepias viridis</i>	0.04
<i>Ambrosia trifida</i>	<i>Carex leavenworthii</i>			0.0007
<i>Ambrosia trifida</i>	<i>Celtis laevigata</i>			0.007
		<i>Ambrosia trifida</i>	<i>Desmanthus leptolobus</i>	0.05
<i>Ambrosia trifida</i>	<i>Galium aparine</i>			0.001
<i>Ambrosia trifida</i>	<i>Gleditsia triacanthos</i>			0.03
<i>Ambrosia trifida</i>	<i>Iva annua</i>			0.03
<i>Amphiachyris dracunculoides</i>	<i>Asclepias viridis</i>			0.0002
<i>Amphiachyris dracunculoides</i>	<i>Bothriochloa laguroides</i>			<0.0001
<i>Amphiachyris dracunculoides</i>	<i>Bromus arvensis</i>			0.02
<i>Amphiachyris dracunculoides</i>	<i>Cirsium texanum</i>			0.004
<i>Amphiachyris dracunculoides</i>	<i>Croton monanthogynus</i>			0.003
<i>Amphiachyris dracunculoides</i>	<i>Desmanthus illinoensis</i>			0.002
<i>Amphiachyris dracunculoides</i>	<i>Desmanthus leptolobus</i>			<0.0001
<i>Amphiachyris dracunculoides</i>	<i>Dichanthelium oligosanthes</i>			0.007
		<i>Amphiachyris dracunculoides</i>	<i>Elymus virginicus</i>	0.05
<i>Amphiachyris dracunculoides</i>	<i>Erigeron strigosus</i>			0.0003
<i>Amphiachyris dracunculoides</i>	<i>Euphorbia bicolor</i>			<0.0001
<i>Amphiachyris dracunculoides</i>	<i>Helianthus annuus</i>			0.009
<i>Amphiachyris dracunculoides</i>	<i>Monarda citriodora</i>			0.002
<i>Amphiachyris dracunculoides</i>	<i>Polytaenia nuttallii</i>			0.0002
<i>Amphiachyris dracunculoides</i>	<i>Prosopis glandulosa</i>			0.0003
<i>Amphiachyris dracunculoides</i>	<i>Ptilimnium nuttallii</i>			0.009
<i>Amphiachyris dracunculoides</i>	<i>Pyrrhopappus pauciflorus</i>			0.05
<i>Amphiachyris dracunculoides</i>	<i>Solidago petiolaris</i>			0.04
<i>Amphiachyris dracunculoides</i>	<i>Sonchus asper</i>			0.02
<i>Amphiachyris dracunculoides</i>	<i>Sporobolus compositus</i>			0.005
<i>Amphiachyris dracunculoides</i>	<i>Symphotrichum ericoides</i>			<0.0001
		<i>Amphiachyris dracunculoides</i>	<i>Toxicodendron radicans</i>	0.005

(Table continues)

Table 11 (cont.)

Positive		Negative		P
<i>Asclepias viridis</i>	<i>Bothriochloa laguroides</i>			<0.0001
<i>Asclepias viridis</i>	<i>Bromus arvensis</i>			0.005
<i>Asclepias viridis</i>	<i>Cirsium texanum</i>			0.01
<i>Asclepias viridis</i>	<i>Croton monanthogynus</i>			0.04
<i>Asclepias viridis</i>	<i>Desmanthus illinoensis</i>			0.04
<i>Asclepias viridis</i>	<i>Desmanthus leptolobus</i>			0.0006
<i>Asclepias viridis</i>	<i>Euphorbia bicolor</i>			<0.0001
<i>Asclepias viridis</i>	<i>Helianthus annuus</i>			0.0003
<i>Asclepias viridis</i>	<i>Monarda citriodora</i>			0.006
<i>Asclepias viridis</i>	<i>Packera tampicana</i>			0.01
<i>Asclepias viridis</i>	<i>Polytaenia nuttallii</i>			<0.0001
<i>Asclepias viridis</i>	<i>Ptilimnium nuttallii</i>			0.03
<i>Asclepias viridis</i>	<i>Solidago petiolaris</i>			0.0002
<i>Asclepias viridis</i>	<i>Sporobolus compositus</i>			0.0007
<i>Asclepias viridis</i>	<i>Symphyotrichum ericoides</i>			<0.0001
<i>Bothriochloa laguroides</i>	<i>Cirsium texanum</i>			0.0004
<i>Bothriochloa laguroides</i>	<i>Croton monanthogynus</i>			0.002
<i>Bothriochloa laguroides</i>	<i>Desmanthus illinoensis</i>			0.02
<i>Bothriochloa laguroides</i>	<i>Desmanthus leptolobus</i>			<0.0001
<i>Bothriochloa laguroides</i>	<i>Dichanthelium oligosanthes</i>			0.009
		<i>Bothriochloa laguroides</i>	<i>Elymus virginicus</i>	0.05
<i>Bothriochloa laguroides</i>	<i>Erigeron strigosus</i>			0.0007
<i>Bothriochloa laguroides</i>	<i>Euphorbia bicolor</i>			<0.0001
<i>Bothriochloa laguroides</i>	<i>Helianthus annuus</i>			0.05
<i>Bothriochloa laguroides</i>	<i>Monarda citriodora</i>			0.0002
<i>Bothriochloa laguroides</i>	<i>Polytaenia nuttallii</i>			<0.0001
<i>Bothriochloa laguroides</i>	<i>Prosopis glandulosa</i>			0.05
<i>Bothriochloa laguroides</i>	<i>Ptilimnium nuttallii</i>			0.002
<i>Bothriochloa laguroides</i>	<i>Solidago petiolaris</i>			0.009
<i>Bothriochloa laguroides</i>	<i>Sporobolus compositus</i>			0.02
<i>Bothriochloa laguroides</i>	<i>Symphyotrichum ericoides</i>			0.0004
<i>Bromus arvensis</i>	<i>Cardiospermum halicacabum</i>			0.04
<i>Bromus arvensis</i>	<i>Cirsium texanum</i>			0.005
<i>Bromus arvensis</i>	<i>Croton monanthogynus</i>			0.006
<i>Bromus arvensis</i>	<i>Desmanthus illinoensis</i>			0.01
<i>Bromus arvensis</i>	<i>Desmanthus leptolobus</i>			0.0007
<i>Bromus arvensis</i>	<i>Dichanthelium oligosanthes</i>			0.002

(Table continues)

Table 11 (cont.)

Positive		Negative		P
<i>Bromus arvensis</i>	<i>Dracopis amplexicaulis</i>			0.01
<i>Bromus arvensis</i>	<i>Erigeron strigosus</i>			0.002
<i>Bromus arvensis</i>	<i>Euphorbia bicolor</i>			0.002
		<i>Bromus arvensis</i>	<i>Fraxinus pennsylvanica</i>	0.005
<i>Bromus arvensis</i>	<i>Geranium carolinianum</i>			0.04
<i>Bromus arvensis</i>	<i>Helianthus annuus</i>			0.0002
<i>Bromus arvensis</i>	<i>Monarda citriodora</i>			0.001
<i>Bromus arvensis</i>	<i>Oxalis stricta</i>			0.01
<i>Bromus arvensis</i>	<i>Packera tampicana</i>			0.03
<i>Bromus arvensis</i>	<i>Polytaenia nuttallii</i>			0.002
<i>Bromus arvensis</i>	<i>Ptilimnium nuttallii</i>			0.0008
<i>Bromus arvensis</i>	<i>Solidago petiolaris</i>			0.02
<i>Bromus arvensis</i>	<i>Sorghum halepense</i>			0.04
<i>Bromus arvensis</i>	<i>Sporobolus compositus</i>			0.0001
<i>Bromus arvensis</i>	<i>Symphyotrichum divaricatum</i>			0.03
<i>Bromus arvensis</i>	<i>Symphyotrichum ericoides</i>			0.001
		<i>Bromus arvensis</i>	<i>Toxicodendron radicans</i>	0.03
<i>Bromus arvensis</i>	<i>Valerianella radiata</i>			0.02
<i>Cardiospermum halicacabum</i>	<i>Gleditsia triacanthos</i>			0.01
<i>Cardiospermum halicacabum</i>	<i>Iva annua</i>			0.02
<i>Cardiospermum halicacabum</i>	<i>Symphyotrichum divaricatum</i>			0.01
		<i>Carex leavenworthii</i>	<i>Croton monanthogynus</i>	0.01
<i>Carex leavenworthii</i>	<i>Dracopis amplexicaulis</i>			0.02
<i>Carex leavenworthii</i>	<i>Iva annua</i>			0.003
<i>Carex leavenworthii</i>	<i>Lythrum alatum</i>			0.0006
<i>Carex leavenworthii</i>	<i>Symphyotrichum divaricatum</i>			0.002
<i>Celtis laevigata</i>	<i>Cocculus caroliniana</i>			0.006
		<i>Celtis laevigata</i>	<i>Desmanthus illinoensis</i>	0.007
<i>Celtis laevigata</i>	<i>Elymus virginicus</i>			0.04
<i>Celtis laevigata</i>	<i>Geum canadense</i>			0.0005
<i>Celtis laevigata</i>	<i>Gleditsia triacanthos</i>			0.007
<i>Celtis laevigata</i>	<i>Lactuca serriola</i>			0.01
<i>Celtis laevigata</i>	<i>Myosotis macrosperma</i>			0.02
<i>Celtis laevigata</i>	<i>Scandix pecten-veneris</i>			0.02
<i>Celtis laevigata</i>	<i>Torilis arvensis</i>			0.007
<i>Celtis laevigata</i>	<i>Toxicodendron radicans</i>			0.03
<i>Cirsium texanum</i>	<i>Croton monanthogynus</i>			<0.0001

(Table continues)

Table 11 (cont.)

Positive		Negative		P
<i>Cirsium texanum</i>	<i>Desmanthus leptolobus</i>			0.03
<i>Cirsium texanum</i>	<i>Dichanthelium oligosanthes</i>			0.03
<i>Cirsium texanum</i>	<i>Euphorbia bicolor</i>			0.008
		<i>Cirsium texanum</i>	<i>Iva annua</i>	0.02
<i>Cirsium texanum</i>	<i>Monarda citriodora</i>			0.05
<i>Cirsium texanum</i>	<i>Polytaenia nuttallii</i>			0.03
<i>Cirsium texanum</i>	<i>Prosopis glandulosa</i>			0.01
<i>Cirsium texanum</i>	<i>Ptilimnium nuttallii</i>			0.03
<i>Cirsium texanum</i>	<i>Scandix pecten-veneris</i>			0.001
<i>Cirsium texanum</i>	<i>Sporobolus compositus</i>			0.001
<i>Cirsium texanum</i>	<i>Symphyotrichum ericoides</i>			0.02
<i>Cirsium texanum</i>	<i>Sporobolus compositus</i>			0.02
<i>Conyza canadensis</i>	<i>Dichanthelium oligosanthes</i>			0.03
<i>Conyza canadensis</i>	<i>Dracopis amplexicaulis</i>			0.002
<i>Conyza canadensis</i>	<i>Pyrrhopappus pauciflorus</i>			0.007
<i>Conyza canadensis</i>	<i>Triodanis perfoliata</i>			0.002
<i>Croton monanthogynus</i>	<i>Desmanthus leptolobus</i>			0.002
<i>Croton monanthogynus</i>	<i>Dichanthelium oligosanthes</i>			0.0002
<i>Croton monanthogynus</i>	<i>Erigeron strigosus</i>			0.004
<i>Croton monanthogynus</i>	<i>Euphorbia bicolor</i>			0.01
		<i>Croton monanthogynus</i>	<i>Fraxinus pennsylvanica</i>	0.004
<i>Croton monanthogynus</i>	<i>Geranium carolinianum</i>			0.0006
<i>Croton monanthogynus</i>	<i>Monarda citriodora</i>			<0.0001
<i>Croton monanthogynus</i>	<i>Oxalis stricta</i>			0.009
<i>Croton monanthogynus</i>	<i>Polytaenia nuttallii</i>			0.02
<i>Croton monanthogynus</i>	<i>Prosopis glandulosa</i>			0.03
<i>Croton monanthogynus</i>	<i>Ptilimnium nuttallii</i>			0.002
<i>Croton monanthogynus</i>	<i>Symphyotrichum ericoides</i>			0.02
<i>Desmanthus illinoensis</i>	<i>Desmanthus leptolobus</i>			<0.0001
<i>Desmanthus illinoensis</i>	<i>Dichanthelium oligosanthes</i>			0.002
<i>Desmanthus illinoensis</i>	<i>Erigeron strigosus</i>			0.007
<i>Desmanthus illinoensis</i>	<i>Euphorbia bicolor</i>			0.01
		<i>Desmanthus illinoensis</i>	<i>Galium aparine</i>	0.01
<i>Desmanthus illinoensis</i>	<i>Monarda citriodora</i>			0.002
<i>Desmanthus illinoensis</i>	<i>Packera tampicana</i>			0.05
<i>Desmanthus illinoensis</i>	<i>Polytaenia nuttallii</i>			0.01
<i>Desmanthus illinoensis</i>	<i>Ptilimnium nuttallii</i>			0.002

(Table continues)

Table 11 (cont.)

Positive		Negative		P
<i>Desmanthus illinoensis</i>	<i>Sorghum halepense</i>	<i>Desmanthus illinoensis</i>	<i>Scandix pecten-veneris</i>	0.03
<i>Desmanthus illinoensis</i>	<i>Sporobolus compositus</i>			0.03
<i>Desmanthus illinoensis</i>	<i>Symphyotrichum ericoides</i>			0.02
				0.0005
<i>Desmanthus illinoensis</i>	<i>Vicia sativa</i>	<i>Desmanthus illinoensis</i>	<i>Torilis arvensis</i>	0.02
<i>Desmanthus leptolobus</i>	<i>Dichanthelium oligosanthes</i>	<i>Desmanthus illinoensis</i>	<i>Toxicodendron radicans</i>	0.002
<i>Desmanthus leptolobus</i>	<i>Dracopis amplexicaulis</i>	<i>Desmanthus illinoensis</i>	<i>Ulmus crassifolia</i>	0.03
				0.005
<i>Desmanthus leptolobus</i>	<i>Erigeron strigosus</i>			0.02
<i>Desmanthus leptolobus</i>	<i>Euphorbia bicolor</i>	<i>Desmanthus leptolobus</i>	<i>Elymus virginicus</i>	0.01
<i>Desmanthus leptolobus</i>	<i>Helianthus annuus</i>			0.004
<i>Desmanthus leptolobus</i>	<i>Monarda citriodora</i>			<0.0001
				0.002
<i>Desmanthus leptolobus</i>	<i>Packera tampicana</i>	<i>Desmanthus leptolobus</i>	<i>Myosotis macrosperma</i>	<0.0001
<i>Desmanthus leptolobus</i>	<i>Polytaenia nuttallii</i>			0.03
<i>Desmanthus leptolobus</i>	<i>Prosopis glandulosa</i>			0.004
<i>Desmanthus leptolobus</i>	<i>Ptilimnium nuttallii</i>			<0.0001
				0.03
<i>Desmanthus leptolobus</i>	<i>Sporobolus compositus</i>	<i>Desmanthus leptolobus</i>	<i>Smilax bona-nox</i>	0.002
<i>Desmanthus leptolobus</i>	<i>Symphyotrichum divaricatum</i>	<i>Desmanthus leptolobus</i>	<i>Symphoricarpos orbiculatus</i>	<0.0001
<i>Desmanthus leptolobus</i>	<i>Symphyotrichum ericoides</i>			0.01
				0.0002
<i>Desmanthus leptolobus</i>	<i>Valerianella radiata</i>	<i>Desmanthus leptolobus</i>	<i>Toxicodendron radicans</i>	0.004
<i>Desmanthus leptolobus</i>	<i>Vicia sativa</i>			<0.0001
<i>Dichanthelium oligosanthes</i>	<i>Erigeron strigosus</i>			0.03
<i>Dichanthelium oligosanthes</i>	<i>Euphorbia bicolor</i>			0.002
<i>Dichanthelium oligosanthes</i>	<i>Monarda citriodora</i>			0.0003
<i>Dichanthelium oligosanthes</i>	<i>Oxalis stricta</i>			0.05
<i>Dichanthelium oligosanthes</i>	<i>Polytaenia nuttallii</i>			0.0001
<i>Dichanthelium oligosanthes</i>	<i>Prosopis glandulosa</i>			0.01
<i>Dichanthelium oligosanthes</i>	<i>Ptilimnium nuttallii</i>			0.007
<i>Dichanthelium oligosanthes</i>	<i>Pyrropappus pauciflorus</i>			0.03
<i>Dichanthelium oligosanthes</i>	<i>Sporobolus compositus</i>			0.009
				0.05
				0.005

(Table continues)

Table 11 (cont.)

Positive		Negative		P
<i>Dichanthelium oligosanthes</i>	<i>Symphyotrichum ericoides</i>			0.01
<i>Dichanthelium oligosanthes</i>	<i>Valerianella radiata</i>			0.04
<i>Dichanthelium oligosanthes</i>	<i>Vicia sativa</i>			0.01
		<i>Dracopis amplexicaulis</i>	<i>Fraxinus pennsylvanica</i>	0.01
<i>Dracopis amplexicaulis</i>	<i>Helianthus annuus</i>			0.0006
<i>Dracopis amplexicaulis</i>	<i>Iva annua</i>			0.03
<i>Dracopis amplexicaulis</i>	<i>Lythrum alatum</i>			0.005
<i>Dracopis amplexicaulis</i>	<i>Monarda citriodora</i>			0.03
<i>Dracopis amplexicaulis</i>	<i>Packera tampicana</i>			0.002
<i>Dracopis amplexicaulis</i>	<i>Pyrrhopappus pauciflorus</i>			0.05
<i>Dracopis amplexicaulis</i>	<i>Sporobolus compositus</i>			0.0004
		<i>Dracopis amplexicaulis</i>	<i>Symphoricarpos orbiculatus</i>	0.02
<i>Dracopis amplexicaulis</i>	<i>Symphyotrichum divaricatum</i>			<0.0001
<i>Dracopis amplexicaulis</i>	<i>Symphyotrichum ericoides</i>			0.005
		<i>Dracopis amplexicaulis</i>	<i>Toxicodendron radicans</i>	0.03
<i>Dracopis amplexicaulis</i>	<i>Triodanis perfoliata</i>			0.003
<i>Dracopis amplexicaulis</i>	<i>Vicia sativa</i>			0.005
		<i>Elymus virginicus</i>	<i>Euphorbia bicolor</i>	0.02
<i>Elymus virginicus</i>	<i>Galium aparine</i>			0.002
<i>Elymus virginicus</i>	<i>Geum canadense</i>			0.0009
<i>Elymus virginicus</i>	<i>Myosotis macrosperma</i>			0.006
<i>Elymus virginicus</i>	<i>Smilax bona-nox</i>			0.0004
<i>Elymus virginicus</i>	<i>Torilis arvensis</i>			0.02
<i>Elymus virginicus</i>	<i>Toxicodendron radicans</i>			0.02
<i>Elymus virginicus</i>	<i>Triodanis perfoliata</i>			0.02
<i>Erigeron strigosus</i>	<i>Euphorbia bicolor</i>			0.0002
<i>Erigeron strigosus</i>	<i>Helianthus annuus</i>			0.02
<i>Erigeron strigosus</i>	<i>Monarda citriodora</i>			<0.0001
<i>Erigeron strigosus</i>	<i>Oxalis stricta</i>			0.04
<i>Erigeron strigosus</i>	<i>Polytaenia nuttallii</i>			0.03
<i>Erigeron strigosus</i>	<i>Ptilimnium nuttallii</i>			0.007
<i>Erigeron strigosus</i>	<i>Pyrrhopappus pauciflorus</i>			0.05
<i>Erigeron strigosus</i>	<i>Sonchus asper</i>			0.01
<i>Erigeron strigosus</i>	<i>Symphyotrichum ericoides</i>			0.01
<i>Erigeron strigosus</i>	<i>Valerianella radiata</i>			0.007
<i>Euphorbia bicolor</i>	<i>Helianthus annuus</i>			0.003
<i>Euphorbia bicolor</i>	<i>Monarda citriodora</i>			0.0003

(Table continues)

Table 11 (cont.)

Positive		Negative		P
<i>Euphorbia bicolor</i>	<i>Polytaenia nuttallii</i>	<i>Euphorbia bicolor</i>	<i>Myosotis macrosperma</i>	0.05
<i>Euphorbia bicolor</i>	<i>Prosopis glandulosa</i>			<0.0001
<i>Euphorbia bicolor</i>	<i>Ptilimnium nuttallii</i>			0.003
				0.001
<i>Euphorbia bicolor</i>	<i>Solidago petiolaris</i>	<i>Euphorbia bicolor</i>	<i>Smilax bona-nox</i>	0.004
<i>Euphorbia bicolor</i>	<i>Sorghum halepense</i>			0.001
<i>Euphorbia bicolor</i>	<i>Sporobolus compositus</i>			0.05
<i>Euphorbia bicolor</i>	<i>Symphotrichum ericoides</i>			0.0005
<i>Fraxinus pennsylvanica</i>	<i>Geum canadense</i>			<0.0001
<i>Fraxinus pennsylvanica</i>	<i>Sideroxylon lanuginosum</i>			0.007
<i>Fraxinus pennsylvanica</i>	<i>Smilax bona-nox</i>			0.02
				0.002
		<i>Fraxinus pennsylvanica</i>	<i>Sorghum halepense</i>	0.05
		<i>Fraxinus pennsylvanica</i>	<i>Sporobolus compositus</i>	0.0002
<i>Fraxinus pennsylvanica</i>	<i>Symphoricarpos orbiculatus</i>			
<i>Fraxinus pennsylvanica</i>	<i>Toxicodendron radicans</i>	<i>Fraxinus pennsylvanica</i>	<i>Symphotrichum ericoides</i>	0.001
<i>Fraxinus pennsylvanica</i>	<i>Ulmus crassifolia</i>			0.002
				0.05
		<i>Fraxinus pennsylvanica</i>	<i>Vicia sativa</i>	0.009
<i>Galium aparine</i>	<i>Geum canadense</i>			0.01
<i>Galium aparine</i>	<i>Gleditsia triacanthos</i>			0.002
<i>Galium aparine</i>	<i>Scandix pecten-veneris</i>			0.04
<i>Galium aparine</i>	<i>Solidago canadensis</i>			0.001
<i>Galium aparine</i>	<i>Symphotrichum divaricatum</i>			0.01
<i>Galium aparine</i>	<i>Torilis arvensis</i>			0.0002
<i>Geranium carolinianum</i>	<i>Monarda citriodora</i>			0.04
<i>Geranium carolinianum</i>	<i>Oxalis stricta</i>			0.04
<i>Geranium carolinianum</i>	<i>Sporobolus compositus</i>			0.04
<i>Geranium carolinianum</i>	<i>Vicia sativa</i>			0.0002
<i>Geum canadense</i>	<i>Myosotis macrosperma</i>			0.0007
<i>Geum canadense</i>	<i>Scandix pecten-veneris</i>			0.02
<i>Geum canadense</i>	<i>Sideroxylon lanuginosum</i>			0.007
<i>Geum canadense</i>	<i>Smilax bona-nox</i>			0.0005
<i>Geum canadense</i>	<i>Symphoricarpos orbiculatus</i>			0.0001
<i>Geum canadense</i>	<i>Torilis arvensis</i>			0.01
<i>Geum canadense</i>	<i>Toxicodendron radicans</i>			0.0002
<i>Geum canadense</i>	<i>Ulmus crassifolia</i>			0.003

(Table continues)

Table 11 (cont.)

Positive		Negative		P
<i>Gleditsia triacanthos</i>	<i>Oxalis stricta</i>			0.04
<i>Gleditsia triacanthos</i>	<i>Prosopis glandulosa</i>			0.0002
<i>Gleditsia triacanthos</i>	<i>Scandix pecten-veneris</i>			0.003
<i>Gleditsia triacanthos</i>	<i>Symphyotrichum divaricatum</i>			0.01
<i>Gleditsia triacanthos</i>	<i>Torilis arvensis</i>			0.0009
<i>Helianthus annuus</i>	<i>Iva annua</i>			0.003
<i>Helianthus annuus</i>	<i>Monarda citriodora</i>			0.02
<i>Helianthus annuus</i>	<i>Polytaenia nuttallii</i>			0.009
<i>Helianthus annuus</i>	<i>Ptilimnium nuttallii</i>			0.009
		<i>Helianthus annuus</i>	<i>Smilax bona-nox</i>	0.0004
<i>Helianthus annuus</i>	<i>Solidago canadensis</i>			0.001
<i>Helianthus annuus</i>	<i>Sporobolus compositus</i>			0.03
<i>Helianthus annuus</i>	<i>Symphyotrichum divaricatum</i>			0.001
<i>Helianthus annuus</i>	<i>Symphyotrichum ericoides</i>			0.008
		<i>Helianthus annuus</i>	<i>Toxicodendron radicans</i>	0.02
<i>Iva annua</i>	<i>Lythrum alatum</i>			0.003
<i>Iva annua</i>	<i>Packera tampicana</i>			0.008
		<i>Iva annua</i>	<i>Smilax bona-nox</i>	0.004
<i>Iva annua</i>	<i>Symphyotrichum divaricatum</i>			<0.0001
<i>Iva annua</i>	<i>Valerianella radiata</i>			0.02
<i>Lythrum alatum</i>	<i>Pyrhopappus pauciflorus</i>			0.02
		<i>Lythrum alatum</i>	<i>Scandix pecten-veneris</i>	0.005
<i>Lythrum alatum</i>	<i>Symphyotrichum divaricatum</i>			0.01
<i>Lythrum alatum</i>	<i>Triodanis perfoliata</i>			0.04
<i>Lythrum alatum</i>	<i>Valerianella radiata</i>			0.02
<i>Lythrum alatum</i>	<i>Vicia sativa</i>			0.03
<i>Monarda citriodora</i>	<i>Oxalis stricta</i>			0.03
<i>Monarda citriodora</i>	<i>Packera tampicana</i>			0.05
<i>Monarda citriodora</i>	<i>Polytaenia nuttallii</i>			<0.0001
<i>Monarda citriodora</i>	<i>Prosopis glandulosa</i>			0.04
<i>Monarda citriodora</i>	<i>Ptilimnium nuttallii</i>			<0.0001
<i>Monarda citriodora</i>	<i>Pyrhopappus pauciflorus</i>			0.002
<i>Monarda citriodora</i>	<i>Solidago petiolaris</i>			0.01
<i>Monarda citriodora</i>	<i>Sorghum halepense</i>			0.0005
<i>Monarda citriodora</i>	<i>Sporobolus compositus</i>			0.02
<i>Monarda citriodora</i>	<i>Symphyotrichum ericoides</i>			0.0005
		<i>Monarda citriodora</i>	<i>Ulmus crassifolia</i>	0.03

(Table continues)

Table 11 (cont.)

Positive		Negative		P
<i>Monarda citriodora</i>	<i>Vicia sativa</i>			<0.0001
<i>Myosotis macrosperma</i>	<i>Sonchus asper</i>			0.03
<i>Myosotis macrosperma</i>	<i>Symphoricarpos orbiculatus</i>			0.03
<i>Myosotis macrosperma</i>	<i>Ulmus crassifolia</i>			0.009
<i>Oxalis stricta</i>	<i>Sonchus asper</i>			0.04
<i>Oxalis stricta</i>	<i>Triodanis perfoliata</i>			0.04
<i>Oxalis stricta</i>	<i>Ulmus crassifolia</i>			0.004
<i>Packera tampicana</i>	<i>Polytaenia nuttallii</i>			0.004
<i>Packera tampicana</i>	<i>Solidago petiolaris</i>	<i>Packera tampicana</i>	<i>Smilax bona-nox</i>	0.001
<i>Packera tampicana</i>	<i>Symphyotrichum divaricatum</i>			0.03
<i>Packera tampicana</i>	<i>Symphyotrichum ericoides</i>			0.004
				0.002
<i>Packera tampicana</i>	<i>Valerianella radiata</i>	<i>Packera tampicana</i>	<i>Toxicodendron radicans</i>	0.0007
<i>Polytaenia nuttallii</i>	<i>Prosopis glandulosa</i>			0.001
<i>Polytaenia nuttallii</i>	<i>Ptilimnium nuttallii</i>			0.03
<i>Polytaenia nuttallii</i>	<i>Pyrhopappus pauciflorus</i>			<0.0001
				0.009
<i>Polytaenia nuttallii</i>	<i>Solidago petiolaris</i>	<i>Polytaenia nuttallii</i>	<i>Smilax bona-nox</i>	0.006
<i>Polytaenia nuttallii</i>	<i>Sporobolus compositus</i>			0.007
<i>Polytaenia nuttallii</i>	<i>Symphyotrichum ericoides</i>			0.0003
				<0.0001
<i>Polytaenia nuttallii</i>	<i>Valerianella radiata</i>	<i>Polytaenia nuttallii</i>	<i>Toxicodendron radicans</i>	0.0005
<i>Polytaenia nuttallii</i>	<i>Vicia sativa</i>			0.04
<i>Prosopis glandulosa</i>	<i>Scandix pecten-veneris</i>			0.01
<i>Prosopis glandulosa</i>	<i>Sporobolus compositus</i>			0.02
<i>Prosopis glandulosa</i>	<i>Symphyotrichum ericoides</i>			0.03
<i>Ptilimnium nuttallii</i>	<i>Sorghum halepense</i>			0.01
<i>Ptilimnium nuttallii</i>	<i>Sporobolus compositus</i>			0.006
<i>Ptilimnium nuttallii</i>	<i>Symphyotrichum ericoides</i>			0.02
<i>Ptilimnium nuttallii</i>	<i>Vicia sativa</i>			0.0004
<i>Pyrhopappus pauciflorus</i>	<i>Sorghum halepense</i>			0.006
<i>Pyrhopappus pauciflorus</i>	<i>Symphyotrichum ericoides</i>			0.04
<i>Pyrhopappus pauciflorus</i>	<i>Triodanis perfoliata</i>			0.006
<i>Pyrhopappus pauciflorus</i>	<i>Vicia sativa</i>			0.0004
<i>Rubus aboriginum</i>	<i>Scandix pecten-veneris</i>			0.04
<i>Rubus aboriginum</i>	<i>Sideroxylon lanuginosum</i>			0.02
				0.008

(Table continues)

Table 11 (cont.)

Positive		Negative		P
<i>Scandix pecten-veneris</i>	<i>Sideroxylon lanuginosum</i>			0.02
<i>Scandix pecten-veneris</i>	<i>Smilax bona-nox</i>			0.04
<i>Scandix pecten-veneris</i>	<i>Symphoricarpos orbiculatus</i>			0.003
<i>Scandix pecten-veneris</i>	<i>Torilis arvensis</i>			<0.0001
<i>Scandix pecten-veneris</i>	<i>Ulmus crassifolia</i>			0.003
<i>Sideroxylon lanuginosum</i>	<i>Smilax bona-nox</i>			0.04
<i>Sideroxylon lanuginosum</i>	<i>Sorghum halepense</i>			0.03
<i>Sideroxylon lanuginosum</i>	<i>Torilis arvensis</i>			0.03
<i>Sideroxylon lanuginosum</i>	<i>Toxicodendron radicans</i>			0.05
<i>Sideroxylon lanuginosum</i>	<i>Ulmus crassifolia</i>			0.003
		<i>Smilax bona-nox</i>	<i>Solidago petiolaris</i>	0.006
<i>Smilax bona-nox</i>	<i>Symphoricarpos orbiculatus</i>			<0.0001
		<i>Smilax bona-nox</i>	<i>Symphyotrichum ericoides</i>	0.0008
<i>Smilax bona-nox</i>	<i>Torilis arvensis</i>			0.02
<i>Smilax bona-nox</i>	<i>Toxicodendron radicans</i>			<0.0001
<i>Solidago canadensis</i>	<i>Torilis arvensis</i>			0.005
<i>Solidago canadensis</i>	<i>Vicia sativa</i>			0.04
<i>Solidago petiolaris</i>	<i>Sporobolus compositus</i>			0.005
<i>Solidago petiolaris</i>	<i>Triodanis perfoliata</i>			0.02
<i>Solidago petiolaris</i>	<i>Vicia sativa</i>			0.02
<i>Sorghum halepense</i>	<i>Stenaria nigricans</i>			0.006
		<i>Sorghum halepense</i>	<i>Symphoricarpos orbiculatus</i>	0.02
<i>Sorghum halepense</i>	<i>Symphyotrichum ericoides</i>			0.02
		<i>Sorghum halepense</i>	<i>Ulmus crassifolia</i>	0.02
<i>Sorghum halepense</i>	<i>Vicia sativa</i>			0.0003
<i>Sporobolus compositus</i>	<i>Symphyotrichum divaricatum</i>			0.01
<i>Sporobolus compositus</i>	<i>Symphyotrichum ericoides</i>			<0.0001
		<i>Sporobolus compositus</i>	<i>Toxicodendron radicans</i>	0.001
<i>Sporobolus compositus</i>	<i>Valerianella radiata</i>			0.0008
		<i>Symphoricarpos orbiculatus</i>	<i>Symphyotrichum ericoides</i>	0.02
<i>Symphoricarpos orbiculatus</i>	<i>Torilis arvensis</i>			0.003
<i>Symphoricarpos orbiculatus</i>	<i>Toxicodendron radicans</i>			0.007
		<i>Symphoricarpos orbiculatus</i>	<i>Valerianella radiata</i>	0.04
		<i>Symphoricarpos orbiculatus</i>	<i>Vicia sativa</i>	0.003
				0.02
<i>Symphyotrichum divaricatum</i>	<i>Symphyotrichum ericoides</i>	<i>Symphyotrichum divaricatum</i>	<i>Toxicodendron radicans</i>	0.0007
		<i>Symphyotrichum ericoides</i>	<i>Toxicodendron radicans</i>	0.002

(Table continues)

Table 11 (cont.)

Positive		Negative	P
<i>Symphyotrichum ericoides</i>	<i>Valerianella radiata</i>		0.007
<i>Symphyotrichum ericoides</i>	<i>Vicia sativa</i>		0.003
<i>Valerianella radiata</i>	<i>Vicia sativa</i>		0.04

Table 12. Communities that can be predicted to occur together, classified by dominant species, as indicated by Chi-Square contingency analysis.

Prairies		Forests		
<i>Sorghum halepense</i>	<i>Sporobolus compositus</i>	<i>Ulmus crassifolia</i>	<i>Celtis laevigata</i>	<i>Fraxinus pennsylvanica</i>
<i>Bromus arvensis</i>	<i>Agalinis fasciculata</i>	<i>Fraxinus pennsylvanica</i>	<i>Elymus virginicus</i>	<i>Elymus virginicus</i>
<i>Celtis laevigata</i>	<i>Ambrosia psilostachya</i>	<i>Geum canadense</i>	<i>Geum canadense</i>	<i>Geum canadense</i>
<i>Desmanthus illinoensis</i>	<i>Amphiachyris dracunculoides</i>	<i>Myosotis macrosperma</i>	<i>Gleditsia triacanthos</i>	<i>Sideroxylon lanuginosum</i>
<i>Euphorbia bicolor</i>	<i>Asclepias viridis</i>	<i>Scandix pecten-veneris</i>	<i>Myosotis macrosperma</i>	<i>Smilax bona-nox</i>
<i>Monarda citriodora</i>	<i>Bothriochloa laguroides</i>	<i>Sideroxylon lanuginosum</i>	<i>Scandix pecten-veneris</i>	<i>Toxicodendron radicans</i>
<i>Ptilimnium nuttallii</i>	<i>Bromus arvensis</i>		<i>Toxicodendron radicans</i>	<i>Ulmus crassifolia</i>
<i>Pyrrhopappus pauciflorus</i>	<i>Desmanthus illinoensis</i>			
<i>Sideroxylon lanuginosum</i>	<i>Desmanthus leptolobus</i>			
<i>Stenaria nigricans</i>	<i>Dichanthelium oligosanthes</i>			
<i>Symphoricarpos orbiculatus</i>	<i>Euphorbia bicolor</i>			
<i>Symphyotrichum ericoides</i>	<i>Geranium carolinianum</i>			
<i>Vicia sativa</i>	<i>Helianthus annuus</i>			
	<i>Monarda citriodora</i>			
	<i>Polytaenia nuttallii</i>			
	<i>Prosopis glandulosa</i>			
	<i>Ptilimnium nuttallii</i>			
	<i>Solidago petiolaris</i>			
	<i>Symphyotrichum divaricatum</i>			
	<i>Symphyotrichum ericoides</i>			
	<i>Valerianella radiata</i>			

LLELA contains at least 43 tree species (see Table 13). The most common tree is hackberry, followed by cedar elm and green ash.

Table 13. Tree species present on LLELA.

Scientific name	Common name
<i>Acer negundo</i>	Box elder
<i>Carya illinoensis</i>	Pecan
<i>Carya texana</i>	Texas hickory
<i>Celtis laevigata</i>	Hackberry
<i>Cercis canadensis</i>	Eastern red bud
<i>Cornus drummondii</i>	Roughleaf dogwood
<i>Crataegus mollis</i>	Arnold hawthorn
<i>Crataegus spathulata</i>	Hawthorne
<i>Diospyros virginiana</i>	Persimmon
<i>Forestiera pubescens</i>	Stretchberry
<i>Fraxinus americanus</i>	White ash
<i>Fraxinus pennsylvanica</i>	Green ash
<i>Fraxinus texensis</i>	Texas ash
<i>Gleditsia triacanthos</i>	Honey locust
<i>Juglans nigra</i>	Black walnut
<i>Juniperus virginiana</i>	Eastern red cedar
<i>Liquidambar styraciflua</i>	Sweet gum
<i>Maclura pomifera</i>	Osage orange
<i>Melia azedarach</i>	Chinaberry tree
<i>Morus rubra</i>	Red mulberry
<i>Platanus occidentalis</i>	Sycamore
<i>Populus deltoides</i>	Cottonwood
<i>Prosopis glandulosa</i>	Honey mesquite
<i>Prunus mexicana</i>	Mexican plum
<i>Prunus persica</i>	Peach
<i>Pyrus communis</i>	Pear
<i>Quercus macrocarpa</i>	Bur oak
<i>Quercus marilandica</i>	Blackjack oak
<i>Quercus nigra</i>	Water oak
<i>Quercus shumardii</i>	Shumard oak
<i>Quercus stellata</i>	Post oak
<i>Salix nigra</i>	Black willow
<i>Sambucus nigra</i> ssp. <i>canadensis</i>	Common elderberry
<i>Sapindus saponaria</i>	Western soapberry
<i>Sideroxylon lanuginosum</i>	Chittamwood
<i>Styphnolobium affine</i>	Eve's necklace
<i>Tamarix chinensis</i>	Salt cedar
<i>Taxodium distichum</i>	Bald cypress
<i>Ulmus alata</i>	Winged elm
<i>Ulmus americana</i>	American elm
<i>Ulmus crassifolia</i>	Cedar elm
<i>Viburnum rufidulum</i>	Rusty blackhaw
<i>Zanthoxylum clava-herculis</i>	Prickly ash

Table 14 lists the tree species found in the sample quadrats, and the total basal area, total number of trees, and the frequency of occurrence for each species. There

were 24 species in the sample quadrats large enough to be counted as part of the overstory. They are listed in decreasing order of their importance value. The forest is dominated by hackberry and cedar elm with respect to basal area, density, and frequency. Hackberry has an importance value of 32.39%, while cedar elm has an importance value of 25.24%. Green ash has the third highest importance value, at 21.08%, and is also third highest in relative density and relative frequency. Other species that had importance values over 10% were *Prosopis glandulosa* (honey mesquite), 14.46%; *Populus deltoides* (cottonwood), 13.03%; *Gleditsia triacanthos* (honey locust), 11.34%; *Sapindus saponaria* (western soapberry), 11.25%; and *Ulmus americana* (American elm), 10.96%. In addition, dead snags had an importance value of 10.26%. Table 14 gives the total basal area, number of trees, and frequency of occurrence in the sample quadrats for each tree.

Evaluation of the understory reveals a similar pattern in the saplings and seedlings. A total of 30 species were found in the understory, and are also listed in Table 14, along with their frequency of occurrence. Table 14 also lists the total number of saplings and the total number of seedlings of each species. The most common species in the understory is hackberry, followed by cedar elm and *Sideroxylon lanuginosum* (Chittamwood). The understory is dominated by hackberry and cedar elm in both density and frequency. Hackberry has an importance value of 41.63%, and cedar elm has an importance value of 32.05%. Chittamwood has the third highest importance value at 24.29%, and also the third highest frequency. Other species that have importance values over 10% are green ash, 21.30%; honey locust, 20.48%; *Crataegus spathulata* (hawthorn), 17.43%; American elm, 15.29%; western soapberry,

14.07%; honey mesquite, 12.58%; *Juniperus virginiana* (eastern red cedar), 12.15%; and *Cornus drummondii* (roughleaf dogwood), 11.53%. Although both Roughleaf dogwood and eastern redbud appear are very common in the sapling and seedling layer, neither species is present in any great numbers in the overstory.

Regression analysis for age to dbh relationship demonstrated a positive linear relationship between age and size for both hackberry and green ash. For hackberry, $\text{age} = 0.453 (\text{dbh}/\text{cm}^3) + 7.706$ ($R^2=0.61$, $p=0.04$) and for green ash, $\text{age} = 0.642(\text{dbh}/\text{cm}^3) + 7.898$ ($R^2=0.84$, $p=0.002$). Regression analysis was not done for cedar elm because it was not possible to get an accurate count on the rings.

An interactive GIS map of the property has been prepared, and will be available on the LLELA website at <http://www.ias.unt.edu/llela>. The map will include information about each quadrat, including the ecosystem, the dominant species, the FQI, and the successional stage. In addition, each sampling point will be linked to photographs of the quadrat, and photographs of the dominant species.

Table 14. Tree species in sample quadrats, including frequency of occurrence, absolute number of trees, saplings and seedlings.

Species	FreqTrees	FreqUnderstory	#T	#SP	#SD	BA	Do	D	F	IV
<i>Celtis laevigata</i>	16	23	176	262	74	27021.61	17.34	26.26	53.57	32.39
<i>Ulmus crassifolia</i>	13	18	98	145	95	21656.28	3.89	15.41	46.43	25.24
<i>Fraxinus pennsylvanica</i>	12	12	75	120	37	13885.28	8.91	11.48	42.86	21.08
<i>Prosopis glandulosa</i>	9	8	40	24	11	7731.13	4.96	6.29	32.14	14.46
<i>Populus deltoides</i>	5	1	16	2	0	29187.58	18.73	2.52	17.86	13.03
<i>Gleditsia triacanthos</i>	7	11	45	87	98	3050.14	1.96	7.08	25.0	11.34
<i>Sapindus saponaria</i>	8	8	29	51	48	6787.40	4.35	4.40	25.0	11.25
<i>Ulmus americana</i>	6	10	24	14	11	12225.79	7.84	3.62	21.43	10.96
Snags	6	2	32	26	0	6747.62	4.33	5.03	21.43	9.28
<i>Maclura pomifera</i>	6	3	15	8	16	6305.14	4.05	2.36	21.43	9.28
<i>Sideroxylon lanuginosum</i>	6	15	17	62	34	1361.39	0.87	2.67	21.43	8.32
<i>Quercus macrocarpa</i>	3	4	15	21	29	6144.94	3.94	2.36	10.71	5.67
<i>Crataegus spathulata</i>	3	11	13	34	20	1156.4	0.74	2.04	10.71	4.50
<i>Morus rubra</i>	3	5	7	17	12	2588.1	1.66	1.10	10.71	4.49
<i>Ulmus alata</i>	3	1	10	35	0	1325.19	0.85	1.57	10.71	4.38
<i>Juniperus virginiana</i>	3	8	7	10	7	601.68	0.39	1.10	10.71	4.07
<i>Quercus stellata</i>	2	3	14	40	162	944.01	0.61	2.20	7.14	3.32
<i>Carya illinoensis</i>	3	5	4	3	2	2696.87	1.73	0.47	7.14	3.11
<i>Quercus shumardii</i>	2	3	3	8	1	1279.02	0.82	0.47	7.14	2.81
<i>Styphnolobium affine</i>	2	5	4	28	8	963.97	0.62	0.63	7.14	2.80
<i>Cercis canadensis</i>	2	4	2	37	130	131.35	0.08	0.32	7.14	2.51
<i>Salix nigra</i>	1	1	1	7	0	1028.73	0.66	0.16	3.57	1.46
<i>Juglans nigra</i>	1	0	1	0	0	850.12	0.55	0.16	3.57	1.42
<i>Fraxinus americanus</i>	1	1	1	0	2	130.70	0.08	0.16	3.57	1.27
<i>Melia azedarach</i>	1	0	1	0	0	70.88	0.05	0.16	3.57	1.26
<i>Cornus drummondii</i>	0	4	0	133	110	0	0	0	0	0
<i>Zanthoxylum clava-herculis</i>	0	6	0	7	1	0	0	0	0	0
<i>Viburnum rufidulum</i>	0	2	0	5	3	0	0	0	0	0
<i>Quercus nigra</i>	0	2	0	2	4	0	0	0	0	0
<i>Diospyros virginiana</i>	0	2	0	4	0	0	0	0	0	0
<i>Prunus mexicana</i>	0	1	0	6	20	0	0	0	0	0
<i>Forestiera pubescens</i>	0	1	0	1	11	0	0	0	0	0
<i>Fraxinus texensis</i>	0	1	0	6	0	0	0	0	0	0

Conclusions

This two-year study has established a plant list for LLELA, consisting of 466 species in 330 genera and 104 families. The property is dominated by two families, Asteraceae and Poaceae. The mixture of grasses, forbs, and trees currently present is typical of a disturbed system in the early stages of succession expected at a site following agricultural abandonment and profound ecological disruption from dam-building activities. The property does not demonstrate the stability and resilience expected in a healthy, fully-functional ecosystem.

The species are predominantly native; however, introduced annuals are more abundant than would be predicted by the expected distribution. This is indicative of system that has been subjected to frequent disturbances, and has undergone colonization by invading species. It is also surrounded by a large urban area which could serve as a source of propagules for many weedy species. In addition, there are a high number of species classified as increasers or invaders (70), compared to only 19 species of decreasers, most of which were present in only small populations. This is typical of a disturbed rangeland in degraded condition.

Many of the species identified at LLELA have not previously been reported for Denton County. Many of these are common and well-known species that are known to be present in the surrounding counties, so it is likely that this is simply attributable to a lack of systematic studies for the area.

In order to calculate the floristic quality index (FQI) for the quadrats, it was necessary to assign regionally appropriate coefficients of conservation for the species present. This was accomplished, and the calculated FQI values can now be used to

reflect any improvements in species composition that result from future restoration efforts (Packard and Mutel, 1997).

Systematic quadrat sampling revealed that species richness was highest in the prairie and lowest in the wetlands. The wooded areas at LLELA were dominated by a complex of *Celtis-Fraxinus-Ulmus*. The trees are mostly young, ranging in age from 10-25 years, consistent with a system that began to regenerate following impoundment of the dam 52 years ago. Because these are long-lived communities that tend to readily replace themselves and be self-sustaining for long periods of time, this forest dynamic can be expected to remain dominant for a long period into the future in the absence of restoration efforts by management (Hodges, 1997). There are some small remnants of native Cross Timbers remaining, and these can serve as a ready source of propagules to attempt restoration of the original native ecosystem.

The prairies are mostly dominated by tall grasses and forbs, in particular aggressive introduced perennial grasses such as Johnson grass and king ranch bluestem. These two species are ubiquitous on the property, and account for a large percentage of the total vegetation biomass. Other native aggressive species, particularly ragweed and marsh elder, have colonized disturbed areas, and become major contributors to the overall productivity. Because these species are annuals, however, they should respond well to management techniques such as mowing or burning. The only prairie areas that are typical of a native climax tall grass prairie are those areas where restoration efforts have been undertaken and planting has been done, suggesting a paucity of native grass seed in the seed bank.

Diversity was highest in the forested quadrats and lowest in the wetlands. Diversity of the savannahs most closely resembled that of the forests, and these communities appear to be in transition from prairie to forest, as woody species encroach on the prairies in the absence of fire. Species evenness demonstrated a seasonal component, with overall evenness starting out high, and declining throughout the growing season.

There were 22 associations present. Eight alliances were identified that matched the NVCS. Most of the property was dominated by early successional species, and the system overall appears to be in the early stages of secondary succession, with patches of remnant prairie and Cross Timbers intermingled. The community that has been invaded by salt cedar is primarily weedy, with no particularly unique or ecologically valuable characteristics; therefore, salt cedar control can be safely undertaken without substantial threat to the riparian system.

A total of 24 quadrats met the Corps of Engineers criteria for hydrophytic vegetation as outlined in the wetland delineation manual (Federal Interagency Committee for Wetland Delineation, 1989). One of these (W1) is a permanently flooded freshwater marsh, and two of them (W2 and W3) are intermittently flooded wetlands. W2 appears to be a newly created wetland, and is in a transitional state from upland forest dominated by hackberry and cedar elm to a lowland swamp dominated by obligate hydrophytes. W3 is a seasonally wet sedge meadow that undergoes encroachment by weedy plant species, especially ragweed, during the fall dry period. These three areas all meet the USACEOE criteria for wetland hydrology, as well as hydrophytic vegetation, and should be sustained as wetland resources.

A number of species occur together more frequently than expected by chance alone, and it appears there are five distinct communities that can be identified at LLELA. Two of them are prairie communities, and are dominated by Johnson grass and Mississippi dropseed respectively. The other three are forest communities, and are dominated by hackberry, cedar elm, and green ash respectively.

Tree counts revealed that woody populations on the property are dominated by hackberry, with cedar elm and green ash also making important contributions. Evaluation of the understory reveals that hackberry and cedar elm also dominate there, indicating that the future composition of the forest will not likely change significantly in the absence of an intervening disturbance. Although large numbers of dogwood and eastern redbud are present in the understory, these are not strong competitors and will not likely contribute largely to the future canopy cover, though they will likely remain important components of the understory community.

Regression analysis was done to obtain an equation that could be used to determine the age of trees from the dbh. Hackberry and green ash had a positive linear relationship between these two parameters, and the equations are presented in the results section.

This study has demonstrated that LLELA supports a dynamic and diverse plant community that is currently early in the process of secondary succession. This study has attempted to quantify the community as an integrated mosaic of ecosystem types, in contrast to most ecological studies which focus primarily on one ecosystem type exclusively.

CHAPTER III

RECOMMENDATIONS

The LLELA mandate calls for preservation and restoration of native habitat and biodiversity, environmental education, and environmental research. The principal goals are to preserve and protect native biodiversity and to restore degraded ecosystems, communities and native biodiversity (Barry, Forbes and Dickson, 2001). Vegetation communities are really just assemblages of plant communities that live together in seeming functional entities because they utilize the same or complementary environmental resources. The assemblages we see are the results of complex interactions between species in a dynamic system (Biondi, Feoli and Zuccarello, 2004). Spatial heterogeneity of plant communities is typically maintained by disturbance (Trager, Wilson, and Hartnett, 2004; Hobbs and Huenneke, 1992; Sprugel, 1991; Gibson, 1989; Sousa, 1984). Natural systems typically experience a variety of disturbances, and the actual condition of the ecosystem may reflect a variety of forces that shaped it (Hobbs and Hunneke, 1992). The communities that are present at LLELA are the result of 150 years of human impact, including a century of agricultural activities, followed by large-scale disturbance from dam-building. If long-term restoration goals include restoring the community to some semblance of what existed there prior to settlement, it is necessary to restore a disturbance regime that closely approximates that of the original system; however, given the long history of impact and the ongoing disturbances in the surrounding urban area, it may not be realistic or practical to return the community to its pre-settlement state. Although restoration will occur if left alone, this process can take decades or even centuries to occur; therefore, it might be

necessary to enhance the natural processes through artificial reintroduction of desired species (Dobson, Bradshaw, and Baker, 1997). Once a dominant species or group of species has suffered decline through a disturbance, they will not become dominant again in the absence of subsequent changes in the environment (Huston and Smith, 1987).

Disturbance in natural communities may result in invasions by non-native species. If a community is invaded by a large, long-lived species that experiences rapid growth, the relative abundance of early and mid-successional species will be reduced (Huston, 1987). Controlling invasive species can be a very expensive aspect of managing the park, (Hobbs and Huenneke, 1992; Huston and Smith, 1987) and as such, it should be planned carefully, with an eye to prioritizing target species. Because many invasions are well-established and cover large areas, control might be the ultimate goal, rather than total exclusion of invasive species (Berger, 1992).

The primary disturbances historically have been fire and grazing by large mammals such as bison (Trager, Wilson and Hartnett, 2004; Hobbs and Huenneke, 1992). Although total species richness has been demonstrated to increase under a fire suppression regime (Baker, 1992), if fire is eliminated, the forest can spread and invade the prairie, and become dominant at the expense of the native grasses. Throughout the early 20th century, a policy of aggressive fire suppression led to just such a result, with an increase in many weedy tree species, such as *Juniperus virginiana* and *Prosopis glandulosa* (Axelrod, 1985; Branson, 1985). Studies have repeatedly demonstrated that fire is an effective tool for maintaining a prairie, and it can have a stimulatory effect on

primary productivity and diversity. It can lead to an increase in warm-season tall grasses and a decrease in the abundance of forbs (Hobbs and Huenneke, 1992).

Fire should be used carefully, however, because it results in an opening of a niche through removal of the existing canopy cover. If the native species are highly susceptible to fire, the open niche can favor invasion by invasive, fire-tolerant species (Berger, 1992; Hobbs and Hunneke, 1992). In addition, adjacent ecosystems can provide propagules that arrive on the newly opened site, and become a new source of non-indigenous species (Büssenschütt and Pahl-Wostl, 1999). Since LLELA is surrounded by a large urban environment, it provides a rich source of potential species, and management will need to be diligent to protect against arrival of unwanted species. In the long run, one fire alone won't determine the direction the ecosystem takes; rather, an overall fire regime needs to be maintained to achieve the desired ecosystem response (Hobbs and Huenneke, 1992). LLELA management has already implemented a fire regime, and has begun a regular series of prescribed burns; it is expected that this practice will continue in the future.

Another way in which the early prairies were maintained was through the grazing of large ungulates. This helped to maintain the prairie by removal of young shrubs and trees that were beginning to encroach on the grasslands. It also helped maintain spatial heterogeneity, by creating numerous microsites where a variety of species could establish. Early settlement removal of bison and confinement of large populations of grazing animals in small areas behind fences caused destabilization of the ecosystem, and resulted in a deterioration of the native grass cover (West, 1993; Hobbs and Hunneke, 1992; Voigt and Weaver, 1951). Reintroduction of grazing in a manner that is

similar to a wild system can help to maintain prairie conditions, and restore conditions favorable for the growth of native grasses. LLELA management has already introduced *Bison* spp. to the property, and grazing management plans are being implemented to follow up on the overall success of this reintroduction.

Invasive species do present a challenge for LLELA management, as well as encroachment and increasing abundance of a wide variety of native species that are aggressive competitors, and that have increased in abundance from the natural, pre-disturbance state. Although there are a total of 82 non-native species on LLELA, not all of these species pose a management problem. Some of them, such as *Ipomoea quamoclit* and *Lablab purpureus*, are ornamental species that exist only in the LAERF gardens, and are unlikely to become problematic invaders. Other species do not exist in large amounts at LLELA, and do not appear poised to become serious, problematic invaders; however, it should be noted that a close watch should be maintained on those species to ensure that they don't become a more serious problem. Many of the invasive and aggressive species are annual weedy species, and can be controlled by prescribed burns or mowing before seed set, though some of these, such as *Ambrosia* sp. or *Iva annua*, may be very problematic to control simply because of the extent of their spread. Some species, however, because of the nature of their ecology or the extent of the invasion, are going to require large-scale, sustained maintenance in order to achieve and maintain control over the populations. In the following pages, I will discuss several high priority species and the management practices that are the best for their control on LLELA.

Tamarix chinensis. Salt cedar is a shrub to small tree that is not native to the United States. Eight species of *Tamarix* were introduced into the United States in the 1800s, most of them from Asia (DiTomaso, 1998). Since then, it has spread rapidly, and colonized approximately 470,000 to 650,000 ha in the western United States. Colonization has been particularly rapid in areas where extensive dam building has substantially altered natural river flows (Bailey, Schweitzer, and Whitham, 2001; Zavaleta, 2000; Everitt, 1998; Stromberg, 1998; Duncan, 1994; Sisneros, 1991). Salt cedar grows rapidly, tolerates a wide variety of environmental conditions, and has an extensive root system that can reach deep into the water table, allowing it to survive even in drought conditions (Pearce and Smith, 2003; Zavaleta, 2000; Carpenter, 1998; DiTomaso, 1998; Duncan, 1994; Howard et al., 1983). Because it is self-compatible, it can readily self-pollinate in the absence of other individuals. It can produce as many as a half million seeds a year from a single plant, and it produces seeds throughout the growing season, giving it a competitive edge over other species (DeLoach et al, 2003; Pearce and Smith, 2003; Zavaleta, 2000; Carpenter, 1998; DiTomaso, 1998; Friederici, 1995; Duncan, 1994; Crins, 1989).

Because it has such a competitive advantage, and lacks natural predators in the United States, it outcompetes many of the native species, especially cottonwood, which thrives in the same sort of ecological system (Sisneros, 1991). It lacks palatable fruits and seeds, and has been demonstrated to contain lower numbers of insect species than native trees; this in turn has a negative effect on higher trophic levels. It is also structurally unsuitable habitat for most wildlife (DeLoach et al., 2003; Bailey, Schweitzer, and Whitham, 2001; Zavaleta, 2000; DiTomaso, 1998). In addition, it has been reported

to have extremely high evapotranspiration rates, and is a heavy user of water. There have been reports of declines in the water table in areas where it has become established, as well as desiccation of surface water bodies (Carpenter, 1998; DiTomaso, 1998; Duncan, 1994; Sisneros, 1991; Horton, Mounts and Kraft, 1960). For these reasons, eradication of salt cedar is placed at a high priority for LLELA management.

Control of salt cedar has been difficult and costly. Because it propagates vegetatively from underground buds, it has usually resisted efforts at mechanical control. In addition, it sprouts vigorously from stems buried in the soil, and may take root again from debris left over from a mechanical removal (Duncan, 1994; Crins, 1989). Fire has usually been unsuccessful, because of its ability to resprout, and it often responds to fire by increasing in numbers, usually at the expense of native tree species (Zavaleta, 2000; DiTomaso, 1998; Duncan, 1994). Biological controls do exist, and have been undergoing tests in the United States. The leaf beetle, *Diorhabda elongata*, feeds exclusively on salt cedar, and was approved as a biological control for salt cedar in 1999. Biological control in the case of the LLELA infestation would be impractical, because at this time, the infestation is small, and it requires a relatively large, stable community to maintain a population of beetles long enough for control to be achieved (DeLoach et al., 2003; Quimby et al., 2003; Stelljes and Wood, 2000).

In general, it is usually necessary to use a combination of treatment methods to control both the mature trees and the offspring (Duncan and McDaniel, 1998). Although using mechanical methods in combination with herbicides is expensive and labor intensive, the best control is achieved when salt cedar is removed mechanically and the

stumps are treated with herbicide (DeLoach et al, 2003; Carpenter, 1998; Friederici, 1995; Duncan 1994; Sisneros, 1991). In addition, although burning alone has proven ineffective at controlling salt cedar infestations, burning followed by herbicide application has given satisfactory results. A prescribed burn in late July, followed by spraying a month later, resulted in a 99 percent mortality rate. Burning in the fall was ineffective in controlling the invasion, even when followed by spraying (Sisneros, 1991; Howard et al., 1983).

A number of herbicides have been tested for effectiveness against salt cedar; however, many of these herbicides have been restricted for use by the US Environmental Protection Agency (EPA), or cannot be used close to water because of toxicity. Both glyphosate and imazapyr have proven effective against salt cedar when applied to cut stumps; imazapyr has a much higher success rate, and depending on the concentration, can achieve up to 99% mortality. Glyphosate does not bioaccumulate, and has very little leaching and a short half-life. Imazapyr has low toxicity to mammals, little to no mobility in soil, and a short half-life. It does have the downside of being quite expensive to use (Sisneros, 1991). Control is most effective during periods of active growth, and late summer has been shown to be the time of year where treatment methods yield the highest mortality (Carpenter, 1998).

Because the infestation of salt cedar is currently small and contained, it is possible that complete eradication might be able to be achieved. I would recommend a program of mechanical removal, followed by treatment of the cut stumps with a broad-spectrum herbicide to prevent the stump from resprouting. Imazapyr would be the best herbicide for this; however, if expense is prohibitive, glyphosate can achieve effective

control. This program will need follow up for a couple of years afterward, with follow up applications of herbicide to any living tissue, in order to ensure complete eradication.

Sorghum halepense. Johnson grass is a perennial grass that is not native to the United States. It was introduced for forage early in the 19th century, and since that time has spread rapidly. It is now cosmopolitan in its distribution, and is listed as one of the “world’s worst weeds” (Simberloff, 1996; Newman, 1993; Oyer, Gries and Rogers, 1959). Because it grows quickly, produces prolific numbers of seeds, and has an extensive system of rhizomes, it is able to compete aggressively with other species. It is also self-compatible, and the seeds are long-lived, remaining viable through long periods of dormancy (McKinley et al., 1999; Newman, 1993; Oyer, Gries and Rogers, 1959).

Although burning has demonstrated some effectiveness of control, it has not been demonstrated to be of long-term utility in controlling invasions, because Johnson grass is a perennial grass, and burning only slows its growth. Frequent mowing over several seasons has been shown to have some success in controlling Johnson grass by weakening the plants and reducing the growth of the rhizomes. Repeated tilling and plowing has also had some success; however, carelessness in tilling can result in spreading the rhizomes and increasing the extent of the invasion. One method that has been highly successful is deep plowing to break up the rhizomes, and leave them on the surface to desiccate. This needs to be repeated six to eight times throughout the season at two weeks intervals (Newman, 1993). On a property the size of LLELA, with the extent of the Johnson grass infestation, this would probably prove impractical, but the technique might be used in small areas where full eradication is desired.

Johnson grass cannot be eradicated with herbicides alone; however, glyphosate has been shown to reduce Johnson grass by 85% in a single application, and has been shown to be one of the most economical of tested pesticides. Because it can also control broad-leaved dicot weeds, it generates the highest rates of return. Application rates required to achieve control are extremely high if no mechanical removal techniques are utilized (Newman, 1993). Best results are obtained from application during periods of active growth when plants have achieved medium-to-full growth stage (Kintzios et al., 1999).

In general, a combination of methods produces the best results for controlling Johnson grass invasions (Newman, 1993). I would recommend application of glyphosate for large infestations, followed by deep plowing and leaving the rhizomes to desiccate where full eradication is desired. Because the sampling data indicated that native prairie had established only in those areas where seeding had occurred, and because Johnson grass is so predominant in the surrounding communities, as soon as adequate control has been achieved the site should be seeded with native grasses to establish a thriving community of perennial grasses which can compete with Johnson grass and help protect the ecosystem from future invasions. Also in order to avoid future invasions, it is essential to avoid disturbances of the soil and vegetation. Where possible, disturbance should be avoided in the adjacent land to prevent further spread of the infestation (Newman, 1993).

Juniperus virginiana. Eastern redcedar is a native woody shrub that has historically existed in the eastern United States. The early 20th century policies of fire suppression, coupled with overgrazing, have allowed it to spread rapidly beyond its

historical range and encroach on the native prairie. Many Texas prairies are now dominated by eastern redcedar. Increased dominance by *Juniperus* typically leads to a decline in native herbaceous species, particularly in perennial grasses (Ansley and Rasmussen, 2005). *Juniperus* is a slow-growing, long-lived species. Individual trees have been reported to live as long as 300 years (Converse, 1993).

Herbicides are only erratically effective against red cedar, and are not usually recommended as the treatment of choice (Converse, 1993). The most effective treatment for *Juniperus* is fire. Because redcedar does not resprout after burning, a surface fire will usually destroy even the mature trees. Young trees can be treated effectively with a prescribed spring burn, but the fuel load may not be sufficient to carry a fire in a dense, mature stand. Once redcedar has become established, fire alone may not be enough to control an invasion, and mechanical methods such as chaining may need to be utilized (Ansley and Rasmussen, 2005; Converse, 1983; Kucera, Ehrenreich and Brown, 1963; Arend, 1950). Where the infestation is not extensive, mechanical removal can be effective by a single cut at ground level that removes all the green foliage (Converse, 1993).

Because the *Juniperus* at LLELA are mostly widespread and not clustered in single communities, fire might not be the most effective means of control. In this situation, I would recommend continuing the system of mechanical removal that has already been undertaken; however, in many areas where *Juniperus* has begun to encroach on the prairie, burns undertaken for control of other species may well result in significant mortality to redcedar.

***Melia azedarach* and *Ligustrum sinense*.** Chinaberry tree and Chinese privet are both invasive woody species that were introduced from the orient. Both of them produce prolific seeds that are dispersed widely by birds, and frequently escape cultivation to become problematic invaders of native habitats (Batcher, 2000a; Batcher, 2000b). Mechanical removal is not recommended for *Melia* because it spreads vegetatively by root and stem suckers (Batcher, 2000a). Effective control of *Ligustrum* can be obtained by mowing or cutting; however, stems need to be cut close to the ground at least once every growing season (Batcher, 2000b).

Both *Ligustrum* and *Melia* can be effectively controlled by cutting, followed by stump-treatment with ticlopyr (Batcher, 2000a; Batcher, 2000b). Because only a few individuals of each species are currently present at LLELA, and are in areas that are not easily accessible for mowing, I feel that this is probably the most economical and effective way of preventing spread, and achieving good control.

***Xanthium strumarium*.** Cocklebur is a native annual species. It is an aggressive competitor, and can spread rapidly and outcompete other, more ecologically desirable species. It usually self-pollinates, and in open conditions can produce as many as 500-5400 burs per plant, with more than 80% of the seeds being viable. It is listed as one of the “world’s worst weeds” (Pitcher, 1989).

Cocklebur regenerates easily following injury, and for this reason mowing has not proven to be effective at achieving control. They can be effectively controlled by hand pulling or by hoeing, if they have not yet flowered. Herbicides have also been demonstrated to be effective (Pitcher, 1989).

Although *Xanthium* has not yet established an extensive population on LLELA, the species is present and does appear to be spreading, based on personal observations. Because it is such an aggressive competitor, and can form large monocultures if allowed to establish a foothold, it has been listed as a priority for control.

***Melilotus albus* and *Melilotus officinalis*.** Sweetclover is native to the Mediterranean and throughout central Europe. It is able to withstand a wide variety of environmental conditions, and has long-lived seeds that remain viable through long periods of dormancy. Germination can be triggered by early spring burns, which may lead to an increase in abundance (Eckhardt, 1987a; Kline, 1986).

The best control method is to initiate a dormant season burn, followed by a burn in late spring the following season in order to prevent new seed production. Studies have indicated that the proper fire schedule for elimination of *Melilotus* is to burn on this two-year burning schedule twice in six years, with a two year period in between burns (Eckhardt, 1987a; Kline, 1986).

Although some authors have suggested that control of *Melilotus* is not a priority on natural prairies because it is primarily an aesthetic problem in non-cropland (Eckhardt, 1987a), the spread of *Melilotus* on LLELA has been rapid and extensive. It is now widespread on the roadsides, and occurs with a high frequency in the prairies. In order to prevent the further spread of this aggressive species, it should certainly be considered as a target for management.

Other species. Although the species listed above have been listed as high priority species to target for management, there are other species that could be expected to respond well to management programs. Species that might be expected to

respond well to mowing would include the sowthistles, *Sonchus asper* and *Sonchus oleraceus* (Zollinger and Parker, 1999), Queen Anne's lace, *Daucus carota* (Eckhardt, 1987b) musk thistle, *Carduus nutans* (Heidel, 1987; Beck, 1999), the annual ragweeds, *Ambrosia trifida* and *Ambrosia psilostachya* and marsh elder, *Iva annua*. Plants that would be expected to respond well to herbicides would include St. John's wort, *Hypericum perforatum* (Piper, 1999) and the sowthistles, *Sonchus asper* and *Sonchus oleraceus* (Zollinger and Parker, 1999).

In addition, because a thriving community of native climax grasses can help a system resist invasion (Allred, 1949), it is recommended that any treatments that open up a niche for colonization be followed immediately by planting native grasses and forbs to assist the system return to a healthy, functional state. It has been a century and a half since the site has been a native prairie (Barry, 2004), and it is likely that the seed bank will be insufficiently stocked in viable seed to restore a native system without substantial management. A soil seed bank study should be considered as a preliminary approach to setting restoration priorities.

Long-term management strategy for LLELA should take into consideration the dynamic flux of natural systems even in the absence of human intervention. While it might seem tempting to establish a wish-list of native forbs, grasses, and trees that have been identified as being present in the region pre-European settlement, management goals should focus less on particular species and assemblages, and more on restoring the natural stability and resilience of a healthy, functional native ecosystem that can support a wide variety of wildlife. It is important to emphasize that, in the absence of human-induced changes that have occurred in the past 200 years, the

species assemblage in this region would likely have undergone substantial natural fluctuation as a result of intermittent disturbance caused by normal seasonal and temporal variations, as well as extreme climatic events. The best approach for management is to operate under an assumption of non-equilibrium vegetation dynamics, assuming that there is no one pre-determined climax community for the area, and that as environmental shifts occur, the equilibrium of the vegetative community will shift, as well (Pickett and Cadenasso, 2005; Huston and Smith, 1987).

This survey has demonstrated that certain species planted in earlier test plantings at LLELA (Winhager, 1999) have managed to establish and thrive in the area. These species include *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indian grass), *Tripsacum dactyloides* (Eastern gamagrass), and *Helianthus maximiliani* (Maximilian sunflower). Two of these species, *S. scoparium* and *H. maximiliani*, have been able to establish dominance in their communities. These species appear to be the most likely candidates to form the framework of a healthy native community, and can be introduced through a native seed mix obtained from a local nursery, or from live mature transplants harvested from elsewhere on the property. Other native wildflower and grass species, such as *Desmanthus illinoensis*, *Neptunia lutea*, and *Bouteloua curtipendula*, are present in small numbers in many of the communities on the property, and seeds of these could be harvested and included in the plantings to ensure that they get an opportunity to establish and spread locally. Initial restoration attempts should be small and localized, so the communities can be easily maintained and protected from invasion while the native communities are establishing.

In the forested community, it will be necessary to undertake some aggressive management in order to affect an eventual shift from the current early successional, weedy tree species that currently dominate the property. In order to allow establishment and growth of desirable woody species, a few older, larger trees should be selectively removed to open gaps in the canopy allowing light penetration to the forest floor. Because the understory is predominantly *Celtis laevigata* and *Ulmus crassifolia*, it will be necessary to plant individuals of the desired species. *Quercus stellata* and *Q. marilandica* saplings should be introduced into the forested gaps that are created, in order to give the forest an opportunity to shift back toward Cross Timbers community that was historically present in this region. Care should be taken to keep soil compaction to a minimum during the clearing and planting process in order to give the transplants a good chance for survival.

Another goal for management needs to be stabilization of the river banks to prevent erosion. Serious erosion is occurring along the banks of the Elm Fork. This could be slowed or halted by planting native aquatic vegetation or riparian tree species to help hold the soil in place. *Populus deltoides* or *Salix nigra* could be valuable species for this purpose. Introduction of aquatic herbaceous vegetation such as *Justicia americana*, *Pontederia cordata*, or *Schoenoplectus tabernaemontani* would also be useful in helping prevent shoreline erosion. This project could benefit from establishing cooperative partnerships with local civil services groups, such as the Boy Scouts, who could provide volunteer labor for the transplanting process.

Protection of the soil is also important to the overall success of the restoration. Although it will likely be necessary to utilize synthetic fertilizers at times to restore the

nutrient balance, LLELA has a readily available supply of native legume species, and these could also be encouraged in areas of soil depletion to help restore the soil nitrogen. In addition, soil compaction can be a serious problem with reestablishment of vegetation. Care should be taken in undertaking restoration activities to ensure that heavy equipment usage is kept to a minimum, and all users of LLELA should be discouraged wherever possible from driving off the provided roads over the vegetation.

In addition, because the property is being used by the public as a recreation area, education is crucial to prevent the spread of undesirable species through accidental dissemination of weed seed. A visitor's guide should address the issue of invasive species, and provide information about how to recognize undesirable seeds and avoid their spread. Regular nature classes would also be beneficial to enlisting the public as an ally in the restoration process. Frequent public work and fun days should be held to bring the public out to LLELA to establish a relationship with the property and feel a sense of personal accomplishment and pride as the restoration efforts accelerate and begin to demonstrate success. LLELA is a unique oasis in a rapidly growing urban community, and few large metropolitan areas have such an area where citizens can work and play together in a natural laboratory. Although such a property being surrounded on all sides by a densely populated metroplex can be a detriment to restoration efforts, it is possible through innovative public relations to turn this deficit into an asset by tapping into the enormous energy and talent of the Dallas/Ft. Worth region as a volunteer work force and as advocates for continued restoration and preservation efforts.

Further studies of the vegetation community at LLELA should be done to follow up on this preliminary survey. This should by no means be considered to be a complete, definitive characterization of the vegetation communities present, but only a beginning, a snapshot of a single moment in time. Future studies that should be considered are a comprehensive soil seed bank survey, and an analysis of the possible *Prosopis/Gleditsia* alliance. In addition, vegetation data should be compared with studies that have been done on the wildlife corridors and also ongoing studies of the insect and bird communities, in order to determine wildlife preferences and requirements. I would also recommend that studies be undertaken of the fungal communities, as casual observation revealed numerous species of fungus. A study of fungal mycorrhizal communities would be invaluable, as it could demonstrate potential tools that could be used to maximize the success of restoration, particularly among the woody species. In addition, there were several species of bryophytes that should be identified and mapped.

APPENDIX A
SPECIES DISTRIBUTION PER FAMILY

Family	Total	N	I	A	P	W	H
Acanthaceae (Wild Petunia)	3	3	0	0	2	0	3
Aceraceae (Maple)	1	1	0	0	1	1	0
Agavaceae (Yucca)	1	1	0	0	1	0	1
Alismataceae (Mud Plantain)	6	6	0	0	6	0	6
Amaranthaceae (Pigweed)	2	2	0	2	0	0	2
Anacardiaceae (Sumac)	3	3	0	0	3	3	0
Apiaceae (Carrot)	10	6	4	7	3	0	10
Apocynaceae (Dogbane)	2	2	0	0	2	0	2
Aquifoliaceae (Holly)	1	1	0	0	1	1	0
Araceae (Arum)	1	1	0	0	1	0	1
Asclepiadaceae (Milkweed)	6	6	0	0	6	1	5
Asteraceae (Sunflower)	64	55	9	39	25	2	62
Azollaceae (Water Fern)	1	1	0	1	0	0	1
Bignoniaceae (Catalpa)	1	1	0	0	1	1	0
Boraginaceae (Forget-Me-Not)	4	2	2	3	1	0	4
Brassicaceae (Mustard)	9	3	6	8	1	0	9
Cactaceae (Cactus)	1	1	0	0	1	0	1
Caesalpiniaceae (Caesalpinia)	4	4	0	1	3	2	2
Campanulaceae (Bellflower)	3	3	0	2	1	0	3
Caprifoliaceae (Honeysuckle)	5	4	1	0	5	5	0
Caryophyllaceae (Pink)	4	0	4	0	4	0	4
Ceratophyllaceae (Coontail)	1	1	0	0	1	0	1
Characeae (Muskgrass)	2						
Cistaceae (Sun-Rose)	1	1	0	0	1	0	1
Clusiaceae (Gardinia)	1	0	1	0	1	0	1
Commelinaceae (Spiderwort)	2	2	0	0	2	0	2
Convolvulaceae (Morning Glory)	7	5	2	3	4	0	7
Cornaceae (Dogwood)	1	1	0	0	1	1	0
Cucurbitaceae (Gourd)	1	0	1	1	0	0	1
Cupressaceae (Juniper)	2	2	0	0	2	2	0
Cuscutaceae (Dodder)	3	3	0	0	3	0	3
Cyperaceae (Sedge)	25	24	1	2	23	0	25
Dipsacaceae (Teasel)	1	0	1	1	0	0	1
Ebenaceae (Persimmon)	1	1	0	0	1	1	0
Equisetaceae (Horsetail)	1	1	0	0	1	0	1
Euphorbiaceae (Spurge)	11	11	0	9	2	0	11
Fabaceae (Bean)	22	13	9	14	8	2	20
Fagaceae (Beech)	5	5	0	0	5	5	0
Gentianaceae (Gentian)	3	3	0	3	0	0	3
Geraniaceae (Geranium)	3	1	2	3	0	0	3
Haloragaceae (Water-Milfoil)	2	0	2	0	2	0	2
Hamamelidaceae (Witch-Hazel)	1	1	0	0	1	1	0
Hydrocharitaceae (Waterweed)	6	4	2	1	5	0	6
Hydrophyllaceae (Waterleaf)	1	1	0	1	0	0	1
Iridaceae (Iris)	2	2	0	0	2	0	2
Juglandaceae (Hickory)	3	3	0	0	3	3	0
Juncaceae (Rush)	4	4	0	1	3	0	4
Krameriaceae (Ratany)	1	1	0	0	1	0	1
Lamiaceae (Mint)	10	9	1	4	6	0	10
Lemnaceae (Duckweed)	3	3	0	0	3	0	3
Lentibulariaceae (Bladderwort)	1	1	0	0	1	0	1

Liliaceae (Lily)	8	7	1	0	8	0	8
Linaceae (Flax)	1	1	0	1	0	0	1
Loganiaceae (Strychnine)	1	1	0	0	1	0	1
Lythraceae (Loosestrife)	2	2	0	1	1	0	1
Malvaceae (Mallow)	4	2	2	0	4	0	4
Meliaceae (Mahogany)	1	0	1	0	1	1	0
Menispermaceae (Moonseed)	2	2	0	0	2	1	1
Menyanthaceae (Bogbean)	1	1	0	0	1	0	1
Mimosaceae (Mimosa)	5	5	0	0	5	1	4
Molluginaceae (Carpetweed)	1	0	1	1	0	0	1
Moraceae (Mulberry)	2	2	0	0	2	2	0
Nelumbonaceae (Lotus)	1	1	0	0	1	0	1
Nyctaginaceae (Four-o'clock)	2	2	0	0	2	0	2
Nymphaeaceae (Water-Lily)	3	3	0	0	3	0	3
Oleaceae (Olive)	6	5	1	0	6	6	0
Onagraceae (Evening Primrose)	10	10	0	3	7	0	10
Orchidaceae (Orchid)	1						1
Oxalidaceae (Woodsorrel)	1	1	0	0	1	0	1
Papaveraceae (Poppy)	1	1	0	1	0	0	1
Passifloraceae (Passionflower)	2	2	0	0	2	2	0
Phytolaccaceae (Pokeweed)	1	1	0	0	1	0	1
Plantaginaceae (Plantain)	3	3	0	3	0	0	3
Platanaceae (Sycamore)	1	1	0	0	1	1	0
Poaceae (Grass)	52	36	16	17	25	0	52
Polemoniaceae (Phlox)	1	1	0	1	0	0	1
Polygonaceae (Smartweed)	3	1	2	1	2	0	3
Pontederiaceae (Pickerelweed)	4	3	1	1	3	0	4
Portulacaceae (Purslane)	2	1	1	2	0	0	2
Potamogetonaceae (Pondweed)	5	4	1	0	5	0	5
Ranunculaceae (Buttercup)	7	7	0	1	6	0	7
Rhamnaceae (Buckthorn)	1	1	0	0	1	1	0
Rosaceae (Rose)	12	9	3	0	12	10	2
Rubiaceae (Coffee)	7	6	1	3	4	1	6
Rutaceae (Citrus)	1	1	0	0	1	1	0
Salicaceae (Willow)	2	2	0	0	2	2	0
Salvinaceae (Water Spangles)	2	0	2	1	1	0	2
Sapindaceae (Soapberry)	2	2	0	1	1	1	1
Sapotaceae (Chicle)	1	1	0	0	1	1	0
Saururaceae (Lizard's Tail)	1	1	0	0	1	0	1
Scrophulariaceae (Figwort)	7	5	2	5	2	1	6
Smilicaceae (Catbriar)	1	1	0	0	1	1	0
Solanaceae (Potato)	6	6	0	2	4	0	6
Tamaricaceae (Salt Cedar)	1	0	1	0	1	1	0
Typhaceae (Cattail)	2	2	0	0	2	0	2
Ulmaceae (Elm)	4	4	0	0	4	4	0
Urticaceae (Nettle)	1	1	0	1	0	0	1
Valerianaceae (Valerian)	1	1	0	1	0	0	1
Verbenaceae (Vervain)	8	6	2	1	7	0	8
Violaceae (Violet)	1	1	0	1	0	0	1
Viscaceae (Poinsettia)	1	1	0	0	1	0	1
Vitaceae (Grape)	6	6	0	0	6	6	0
Zannichelliaceae (Horned Pondweed)	1	1	0	0	1	0	1
Zygophyllaceae (Caltrop)	2	1	1	2	0	0	2
Total	464	373	87	162	298	75	386

N=Native; I=Introduced; A=Annual; P=Perennial; W=Woody; H=Herbaceous

APPENDIX B
QUADRAT SPECIES INFORMATION

F1

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Carex cherokeensis</i>	Native	Perennial	Sedge	FACW-
<i>Carex frankii</i>	Native	Perennial	Sedge	OBL
<i>Carex retroflexa</i>	Native	Perennial	Sedge	N/A
<i>Carya illinoensis</i>	Native	Perennial	Tree	FAC+
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cercis canadensis</i>	Native	Perennial	Tree	UPL
<i>Cornus drummondii</i>	Native	Perennial	Tree	FAC
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Galium circaezens</i>	Native	Perennial	Forb	FAC-
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Helianthus hirsutus</i>	Native	Perennial	Forb	N/A
<i>Ilex decidua</i>	Native	Perennial	Shrub	FACW-
<i>Juniperus virginiana</i>	Native	Perennial	Tree	FACU-
<i>Lonicera sempervirens</i>	Native	Perennial	Vine	FAC-
<i>Morus rubra</i>	Native	Perennial	Tree	FACU
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Neptunia lutea</i>	Native	Perennial	Forb	FACU
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Parthenocissus quinquefolia</i>	Native	Perennial	Vine	FAC
<i>Passiflora lutea</i>	Native	Perennial	Vine	N/A
<i>Phoradendron tomentosum</i>	Native	Perennial	Forb	N/A
<i>Prunus mexicana</i>	Native	Perennial	Tree	N/A
<i>Quercus macrocarpa</i>	Native	Perennial	Tree	FAC-
<i>Quercus shumardii</i>	Native	Perennial	Tree	FAC
<i>Quercus stellata</i>	Native	Perennial	Tree	UPL**
<i>Ruellia strepens</i>	Native	Perennial	Forb	FAC
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Solidago ulmifolia</i>	Native	Perennial	Forb	N/A
<i>Styphnolobium affine</i>	Native	Perennial	Tree	N/A
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Ulmus americana</i>	Native	Perennial	Tree	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Verbesina virginica</i>	Native	Perennial	Forb	FACU
<i>Viburnum rufidulum</i>	Native	Perennial	Tree	FACU-
Total Species	39			
Total Native	38			
Total Introduced	1			
Total Annual	3			
Total Perennial	36			
Trees	16			
Shrubs	2			
Vines	6			
Grasses	1			
Sedges	3			

Rushes 0
Forbs 11

Quadrat F2

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Allium canadense</i>	Native	Perennial	Forb	FACU-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Carex arkansana</i>	Native	Perennial	Sedge	N/A
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cercis canadensis</i>	Native	Perennial	Tree	UPL
<i>Cocculus carolinus</i>	Native	Perennial	Vine	FACU
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Fleischmannia incarnata</i>	Native	Annual	Forb	FAC
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Fraxinus texensis</i>	Native	Perennial	Tree	N/A
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Ilex decidua</i>	Native	Perennial	Shrub	FACW-
<i>Juglans nigra</i>	Native	Perennial	Tree	FACU
<i>Juniperus virginiana</i>	Native	Perennial	Tree	FACU-
<i>Lactuca floridana</i>	Native	Annual	Forb	FAC+
<i>Lactuca serriola</i>	Introduced	Annual	Forb	FAC
<i>Lonicera japonica</i>	Introduced	Perennial	Vine	FAC
<i>Morus rubra</i>	Native	Perennial	Tree	FACU
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Parthenocissus quinquefolia</i>	Native	Perennial	Vine	FAC
<i>Passiflora incarnata</i>	Native	Perennial	Vine	N/A
<i>Quercus macrocarpa</i>	Native	Perennial	Tree	FAC-
<i>Ruellia strepens</i>	Native	Perennial	Forb	FAC
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Solidago canadensis</i>	Native	Perennial	Forb	FACU+
<i>Styphnolobium affine</i>	Native	Perennial	Tree	N/A
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Ulmus americana</i>	Native	Perennial	Tree	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Viburnum rufidulum</i>	Native	Perennial	Tree	FACU-
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
<i>Vitis rotundifolia</i>	Native	Perennial	Vine	FAC-

Total Species	37
Total Native	32
Total Introduced	5
Total Annual	8
Total Perennial	29
Trees	13
Shrubs	2
Vines	7
Grasses	1
Sedges	2

Rushes 0
Forbs 12

Quadrat F3

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Allium canadense</i>	Native	Perennial	Forb	FACU-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cardamine hirsuta</i>	Introduced	Annual	Forb	FAC
<i>Carex arkansana</i>	Native	Perennial	Sedge	N/A
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cerastium glomeratum</i>	Introduced	Annual	Forb	FACU
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Cissus trifoliata</i>	Native	Perennial	Vine	FACU-
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Matelea gonocarpus</i>	Native	Perennial	Vine	NI
<i>Dicliptera brachiata</i>	Native	Perennial	Forb	FACW
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Fleischmannia incarnata</i>	Native	Annual	Forb	FAC
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Lactuca serriola</i>	Introduced	Annual	Forb	FAC
<i>Lamium amplexicaule</i>	Introduced	Annual	Forb	N/A
<i>Ligustrum sinense</i>	Introduced	Perennial	Shrub	UPL
<i>Melia azedarach</i>	Introduced	Perennial	Tree	N/A
<i>Mirabilis nyctaginea</i>	Native	Perennial	Forb	UPL
<i>Morus rubra</i>	Native	Perennial	Tree	FACU
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Nothoscordum bivalve</i>	Native	Perennial	Forb	FACU-
<i>Opuntia phaeacantha</i>	Native	Perennial	Forb	N/A
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Parthenocissus quinquefolia</i>	Native	Perennial	Vine	FAC
<i>Passiflora lutea</i>	Native	Perennial	Vine	N/A
<i>Rivina humilis</i>	Native	Perennial	Forb	N/A
<i>Ruellia strepens</i>	Native	Perennial	Forb	FAC
<i>Sapindus saponaria</i>	Native	Perennial	Tree	FACU-
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Solidago canadensis</i>	Native	Perennial	Forb	FACU+
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stellaria media</i>	Introduced	Annual	Forb	FACU-
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Tragia betonicifolia</i>	Native	Perennial	Forb	N/A
<i>Ulmus alata</i>	Native	Perennial	Tree	FACU
<i>Ulmus americana</i>	Native	Perennial	Tree	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Vernonia baldwinii</i>	Native	Perennial	Forb	UPL **
<i>Veronica peregrina</i>	Native	Annual	Forb	OBL
<i>Zanthoxylum clava-herculis</i>	Native	Perennial	Tree	FAC-
Total Species	47			

Total Native	37
Total Introduced	10
Total Annual	15
Total Perennial	32
Trees	8
Shrubs	2
Vines	6
Grasses	3
Sedges	1
Rushes	0
Forbs	27

Quadrat F4

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Allium canadense</i>	Native	Perennial	Forb	FACU-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Carex cherokeensis</i>	Native	Perennial	Sedge	FACW-
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Carex frankii</i>	Native	Perennial	Sedge	OBL
<i>Carya illinoensis</i>	Native	Perennial	Tree	FAC+
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cercis canadensis</i>	Native	Perennial	Tree	UPL
<i>Cocculus carolinus</i>	Native	Perennial	Vine	FACU
<i>Dicliptera brachiata</i>	Native	Perennial	Forb	FACW
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Fleischmannia incarnata</i>	Native	Annual	Forb	FAC
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Ilex decidua</i>	Native	Perennial	Shrub	FACW-
<i>Lactuca floridana</i>	Native	Annual	Forb	FAC+
<i>Lactuca serriola</i>	Introduced	Annual	Forb	FAC
<i>Mirabilis nyctaginea</i>	Native	Perennial	Forb	UPL
<i>Morus rubra</i>	Native	Perennial	Tree	FACU
<i>Nothoscordum bivalve</i>	Native	Perennial	Forb	FACU-
<i>Parthenocissus quinquefolia</i>	Native	Perennial	Vine	FAC
<i>Passiflora lutea</i>	Native	Perennial	Vine	N/A
<i>Rhus copallinum</i>	Native	Perennial	Shrub	UPL **
<i>Rivina humilis</i>	Native	Perennial	Forb	N/A
<i>Ruellia strepens</i>	Native	Perennial	Forb	FAC
<i>Sapindus saponaria</i>	Native	Perennial	Tree	FACU-
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Styphnolobium affine</i>	Native	Perennial	Tree	N/A
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Tragia betonicifolia</i>	Native	Perennial	Forb	N/A
<i>Ulmus americana</i>	Native	Perennial	Tree	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Vitis rotundifolia</i>	Native	Perennial	Vine	FAC-
Total Species	37			
Total Native	34			

Total Introduced	3
Total Annual	7
Total Perennial	30
Trees	9
Shrubs	3
Vines	6
Grasses	1
Sedges	3
Rushes	0
Forbs	15

Quadrat F5

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Allium canadense</i>	Native	Perennial	Forb	FACU-
<i>Ampelopsis arborea</i>	Native	Perennial	Shrub	FAC
<i>Berchemia scandens</i>	Native	Perennial	Vine	FAC+
<i>Carex cherokeensis</i>	Native	Perennial	Sedge	FACW-
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cercis canadensis</i>	Native	Perennial	Tree	UPL
<i>Cocculus carolinus</i>	Native	Perennial	Vine	FACU
<i>Cornus drummondii</i>	Native	Perennial	Tree	FAC
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Juniperus virginiana</i>	Native	Perennial	Tree	FACU-
<i>Morus rubra</i>	Native	Perennial	Tree	FACU
<i>Parthenocissus quinquefolia</i>	Native	Perennial	Vine	FAC
<i>Passiflora lutea</i>	Native	Perennial	Vine	N/A
<i>Prunus rivularis</i>	Native	Perennial	Shrub	N/A
<i>Quercus macrocarpa</i>	Native	Perennial	Tree	FAC-
<i>Quercus nigra</i>	Native	Perennial	Tree	FAC+
<i>Quercus shumardii</i>	Native	Perennial	Tree	FAC
<i>Rubus aboriginum</i>	Native	Perennial	Shrub	N/A
<i>Sapindus saponaria</i>	Native	Perennial	Tree	FACU-
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Styphnolobium affine</i>	Native	Perennial	Tree	N/A
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Ulmus americana</i>	Native	Perennial	Tree	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Vitis mustangensis</i>	Native	Perennial	Vine	N/A
<i>Vitis rotundifolia</i>	Native	Perennial	Vine	FAC-
Total Species	32			
Total Native	30			
Total Introduced	2			
Total Annual	2			
Total Perennial	30			
Trees	14			
Shrubs	4			
Vines	8			

Grasses	1
Sedges	1
Rushes	0
Forbs	4

Quadrat F6

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ageratina altissima</i>	Native	Perennial	Forb	UPL
<i>Allium canadense</i>	Native	Perennial	Forb	FACU-
<i>Ampelopsis arborea</i>	Native	Perennial	Shrub	FAC
<i>Ampelopsis cordata</i>	Native	Perennial	Vine	FAC-
<i>Berchemia scandens</i>	Native	Perennial	Vine	FAC+
<i>Carex arkansana</i>	Native	Perennial	Sedge	N/A
<i>Carex cherokeensis</i>	Native	Perennial	Sedge	FACW-
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cercis canadensis</i>	Native	Perennial	Tree	UPL
<i>Chasmanthium latifolium</i>	Native	Perennial	Grass	FAC
<i>Cirsium horridulum</i>	Native	Annual **	Forb	FAC
<i>Clematis pitcheri</i>	Native	Perennial	Forb	FACU
<i>Cocculus carolinus</i>	Native	Perennial	Vine	FACU
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Cornus drummondii</i>	Native	Perennial	Tree	FAC
<i>Crataegus spathulata</i>	Native	Perennial	Tree	FAC+
<i>Echinodorus berteroi</i>	Native	Perennial	Forb	OBL
<i>Eclipta prostrata</i>	Native	Annual	Forb	FACW
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Lactuca serriola</i>	Introduced	Annual	Forb	FAC
<i>Ludwigia leptocarpa</i>	Native	Perennial	Forb	OBL
<i>Maclura pomifera</i>	Native	Perennial	Tree	UPL
<i>Mikania scandens</i>	Native	Perennial	Vine	FACW+
<i>Morus rubra</i>	Native	Perennial	Tree	FACU
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Parthenocissus quinquefolia</i>	Native	Perennial	Vine	FAC
<i>Passiflora incarnata</i>	Native	Perennial	Vine	N/A
<i>Polygonum amphibium</i>	Native	Perennial	Forb	OBL
<i>Populus deltoides</i>	Native	Perennial	Tree	FAC
<i>Quercus nigra</i>	Native	Perennial	Tree	FAC+
<i>Ruellia strepens</i>	Native	Perennial	Forb	FAC
<i>Sapindus saponaria</i>	Native	Perennial	Tree	FACU-
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Solidago canadensis</i>	Native	Perennial	Forb	FACU+
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Symphyotrichum lanceolatum</i>	Native	Perennial	Forb	OBL **
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Typha domingensis</i>	Native	Perennial	Forb	OBL
<i>Ulmus americana</i>	Native	Perennial	Tree	FAC
<i>Vitis rotundifolia</i>	Native	Perennial	Vine	FAC-
Total Species	44			
Total Native	42			

Total Introduced	2
Total Annual	7
Total Perennial	37
Trees	11
Shrubs	2
Vines	9
Grasses	2
Sedges	2
Rushes	0
Forbs	18

Quadrat F7

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Carex arkansana</i>	Native	Perennial	Sedge	N/A
<i>Carya illinoensis</i>	Native	Perennial	Tree	FAC+
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Lactuca serriola</i>	Introduced	Annual	Forb	FAC
<i>Lamium amplexicaule</i>	Introduced	Annual	Forb	N/A
<i>Maclura pomifera</i>	Native	Perennial	Tree	UPL
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Rhus copallinum</i>	Native	Perennial	Shrub	UPL**
<i>Sapindus saponaria</i>	Native	Perennial	Tree	FACU-
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Styphnolobium affine</i>	Native	Perennial	Tree	N/A
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Vitis rotundifolia</i>	Native	Perennial	Vine	FAC-
Total Species	27			
Total Native	21			
Total Introduced	6			
Total Annual	9			
Total Perennial	18			

Trees	8
Shrubs	2
Vines	3
Grasses	3
Sedges	1
Rushes	0
Forbs	10

Quadrat F8

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ageratina altissima</i>	Native	Perennial	Forb	UPL
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Artemisia ludoviciana</i>	Native	Perennial	Forb	UPL
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Campsis radicans</i>	Native	Perennial	Vine	FAC
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carduus nutans</i>	Introduced	Annual	Forb	N/A
<i>Carex arkansana</i>	Native	Perennial	Sedge	N/A
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cerastium glomeratum</i>	Introduced	Annual	Forb	FACU
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Cissus trifoliata</i>	Native	Perennial	Vine	FACU-
<i>Cocculus carolinus</i>	Native	Perennial	Vine	FACU
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Crataegus spathulata</i>	Native	Perennial	Tree	FAC+
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Cyperus echinatus</i>	Native	Perennial	Sedge	FAC+
<i>Dichanthelium oligosanthes</i>	Native	Perennial	Grass	FACU
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Juncus dudleyi</i>	Native	Perennial	Rush	N/A
<i>Lamium amplexicaule</i>	Introduced	Annual	Forb	N/A
<i>Lathyrus hirsutus</i>	Introduced	Annual	Forb	N/A
<i>Lepidium virginicum</i>	Native	Annual	Forb	FAC-
<i>Maclura pomifera</i>	Native	Perennial	Tree	UPL
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Phoradendron tomentosum</i>	Native	Perennial	Forb	N/A
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Rhus copallinum</i>	Native	Perennial	Shrub	UPL **
<i>Rivina humilis</i>	Native	Perennial	Forb	N/A
<i>Rubus aboriginum</i>	Native	Perennial	Shrub	N/A
<i>Sapindus saponaria</i>	Native	Perennial	Tree	FACU-
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A

<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Solanum dimidiatum</i>	Native	Perennial	Forb	N/A
<i>Solidago canadensis</i>	Native	Perennial	Forb	FACU+
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stellaria media</i>	Introduced	Annual	Forb	FACU-
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
<i>Vitis mustangensis</i>	Native	Perennial	Vine	N/A
<i>Zanthoxylum clava-herculis</i>	Native	Perennial	Tree	FAC-
Total Species	52			
Total Native	41			
Total Introduced	11			
Total Annual	19			
Total Perennial	33			
Trees	8			
Shrubs	3			
Vines	6			
Grasses	5			
Sedges	2			
Rushes	1			
Forbs	28			

Quadrat F9

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Anemone berlandieri</i>	Native	Perennial	Forb	N/A
<i>Carex arkansana</i>	Native	Perennial	Sedge	N/A
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Cocculus carolinus</i>	Native	Perennial	Vine	FACU
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Dichanthelium oligosanthes</i>	Native	Perennial	Grass	FACU
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Forestiera pubescens</i>	Native	Perennial	Tree	FACU
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Lactuca serriola</i>	Introduced	Annual	Forb	FAC
<i>Lamium amplexicaule</i>	Introduced	Annual	Forb	N/A
<i>Lindheimera texana</i>	Native	Annual	Forb	N/A
<i>Maclura pomifera</i>	Native	Perennial	Tree	UPL
<i>Muhlenbergia sobolifera</i>	Native	Perennial	Grass	N/A
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Opuntia phaeacantha</i>	Native	Perennial	Forb	N/A
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Parthenocissus quinquefolia</i>	Native	Perennial	Vine	FAC
<i>Plantago patagonica</i>	Native	Annual	Forb	FACU-

<i>Plantago rhodosperma</i>	Native	Annual	Forb	FACU
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Rhus copallinum</i>	Native	Perennial	Shrub	UPL**
<i>Rivina humilis</i>	Native	Perennial	Forb	N/A
<i>Sapindus saponaria</i>	Native	Perennial	Tree	FACU-
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sisyrinchium angustifolium</i>	Native	Perennial	Forb	FACW-
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Tragia betonicifolia</i>	Native	Perennial	Forb	N/A
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Vernonia baldwinii</i>	Native	Perennial	Forb	UPL**
Total Species	42			
Total Native	37			
Total Introduced	5			
Total Annual	14			
Total Perennial	28			
Trees	7			
Shrubs	2			
Vines	4			
Grasses	4			
Sedges	1			
Rushes	0			
Forbs	24			

Quadrat F10

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Crataegus spathulata</i>	Native	Perennial	Forb	FAC+
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Euphorbia dentata</i>	Native	Annual	Forb	N/A
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Lactuca serriola</i>	Introduced	Annual	Forb	FAC
<i>Lindheimera texana</i>	Native	Annual	Forb	N/A
<i>Maclura pomifera</i>	Native	Perennial	Tree	UPL
<i>Mimosa roemeriana</i>	Native	Perennial	Forb	N/A
<i>Opuntia phaeacantha</i>	Native	Perennial	Forb	N/A
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU

<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Teucrium canadense</i>	Native	Perennial	Forb	FACW-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Tragia betonicifolia</i>	Native	Perennial	Forb	N/A
<i>Urochloa fuscata</i>	Native	Annual	Grass	FAC-
<i>Vitis mustangensis</i>	Native	Perennial	Vine	N/A
Total Species	29			
Total Native	26			
Total Introduced	3			
Total Annual	12			
Total Perennial	17			
Trees	5			
Shrubs	1			
Vines	1			
Grasses	3			
Sedges	0			
Rushes	0			
Forbs	19			

Quadrat F11

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Anemone berlandieri</i>	Native	Perennial	Forb	N/A
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Centaurium texense</i>	Native	Annual	Forb	N/A
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Cocculus carolinianus</i>	Native	Perennial	Vine	FACU
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Croton texense</i>	Native	Annual	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dichanthelium oligosanthes</i>	Native	Perennial	Grass	FACU
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Gaura suffulta</i>	Native	Annual	Forb	N/A
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Lesquerella gracilis</i>	Native	Annual	Forb	FACW
<i>Mimosa roemeriana</i>	Native	Perennial	Forb	N/A
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Nassella leucotricha</i>	Native	Perennial	Grass	N/A
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU

<i>Physalis longifolia</i>	Native	Perennial	Forb	N/A
<i>Plantago rhodosperma</i>	Native	Annual	Forb	FACU
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Solanum dimidiatum</i>	Native	Perennial	Forb	N/A
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Tragia betonicifolia</i>	Native	Perennial	Forb	N/A
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Urochloa fuscata</i>	Native	Annual	Grass	FAC-
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
<i>Vitis mustangensis</i>	Native	Perennial	Vine	N/A
Total Species	48			
Total Native	43			
Total Introduced	5			
Total Annual	24			
Total Perennial	24			
Trees	3			
Shrubs	0			
Vines	3			
Grasses	7			
Sedges	0			
Rushes	0			
Forbs	35			

Quadrat F12

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Allium canadense</i>	Native	Perennial	Forb	FACU-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carex arkansana</i>	Native	Perennial	Sedge	N/A
<i>Carex crus-corvi</i>	Native	Perennial	Sedge	OBL
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Chrysopsis pilosa</i>	Native	Annual	Forb	N/A
<i>Cissus trifoliata</i>	Native	Perennial	Vine	FACU-
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Crataegus spathulata</i>	Native	Perennial	Tree	FAC+

<i>Matelea gonocarpus</i>	Native	Perennial	Vine	NI
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Juniperus virginiana</i>	Native	Perennial	Tree	FACU-
<i>Lactuca serriola</i>	Introduced	Annual	Forb	FAC
<i>Lamium amplexicaule</i>	Introduced	Annual	Forb	N/A
<i>Lathyrus hirsutus</i>	Introduced	Annual	Forb	OBL
<i>Maclura pomifera</i>	Native	Perennial	Tree	UPL
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Nothoscordum bivalve</i>	Native	Perennial	Forb	FACU-
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Parthenocissus quinquefolia</i>	Native	Perennial	Vine	FAC
<i>Plantago rhodosperma</i>	Native	Annual	Forb	FACU
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Styphnolobium affine</i>	Native	Perennial	Tree	N/A
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stachys crenata</i>	Native	Annual	Forb	FAC
<i>Stellaria media</i>	Introduced	Annual	Forb	FACU-
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum lanceolatum</i>	Native	Perennial	Forb	OBL**
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Tragia betonicifolia</i>	Native	Perennial	Forb	N/A
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Urtica chamaedryoides</i>	Native	Annual	Forb	FACU
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
Total Species	47			
Total Native	39			
Total Introduced	8			
Total Annual	21			
Total Perennial	26			
Trees	8			
Shrubs	1			
Vines	4			
Grasses	3			
Sedges	3			
Rushes	0			
Forbs	28			

Quadrat P1

Wetland

Species	Origin	Habit	Functional Group	Indicator Status
<i>Achillea millefolium</i>	Native	Perennial	Forb	FACU
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Ampelopsis arborea</i>	Native	Perennial	Shrub	FAC
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Bothriochloa ischaemum</i>	Introduced	Perennial	Grass	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Brickellia eupatorioides</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Castilleja indivisa</i>	Native	Annual	Forb	FAC-
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Centaurium texense</i>	Native	Annual	Forb	N/A
<i>Chamaecrista fasciculata</i>	Native	Annual	Forb	FACU-
<i>Chrysopsis pilosa</i>	Native	Annual	Forb	N/A
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Cissus trifoliata</i>	Native	Perennial	Vine	FACU-
<i>Cocculus carolinus</i>	Native	Perennial	Vine	FACU
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Daucus carota</i>	Introduced	Perennial	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dichanthelium oligosanthes</i>	Native	Perennial	Grass	FACU
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Euphorbia dentata</i>	Native	Annual	Forb	N/A
<i>Euphorbia hexagona</i>	Native	Annual	Forb	N/A
<i>Gaillardia pulchella</i>	Native	Annual	Forb	N/A
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Gaura mollis</i>	Native	Annual	Forb	FACU**
<i>Glandularia bipinnatifida</i>	Native	Perennial	Forb	N/A
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Hordeum pusillum</i>	Native	Annual	Grass	FACU
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Lolium perenne</i>	Introduced	Perennial	Grass	FACU
<i>Lotus unifoliolatus</i>	Native	Annual	Forb	N/A
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Melilotus albus</i>	Introduced	Annual	Forb	FACU
<i>Melilotus officinalis</i>	Introduced	Annual	Forb	FACU
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Oenothera speciosa</i>	Native	Perennial	Forb	N/A
<i>Panicum coloratum</i>	Introduced	Perennial	Grass	N/A
<i>Parthenocissus quinquefolia</i>	Native	Perennial	Vine	FAC
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Quercus shumardii</i>	Native	Perennial	Tree	FAC
<i>Rubus aboriginum</i>	Native	Perennial	Shrub	N/A
<i>Sapindus saponaria</i>	Native	Perennial	Tree	FACU-
<i>Setaria pumila</i>	Introduced	Annual	Grass	FAC
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Sisyrinchium angustifolium</i>	Native	Perennial	Forb	FACW-

<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Solidago canadensis</i>	Native	Perennial	Forb	FACU+
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stenosiphon linifolius</i>	Native	Perennial	Forb	N/A
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Tridens albescens</i>	Native	Perennial	Grass	FAC
<i>Trifolium campestre</i>	Introduced	Annual	Forb	N/A
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Verbena halei</i>	Native	Perennial	Forb	N/A
<i>Vicia minutiflora</i>	Native	Annual	Forb	UPL
<i>Vitis sativa</i>	Introduced	Annual	Forb	FAC
<i>Vitis mustangensis</i>	Native	Perennial	Vine	N/A
<i>Zanthoxylum clava-herculis</i>	Native	Perennial	Tree	FAC-
Total Species	71			
Total Native	59			
Total Introduced	12			
Total Annual	34			
Total Perennial	37			
Trees	5			
Shrubs	2			
Vines	6			
Grasses	12			
Sedges	1			
Rushes	0			
Forbs	45			

Quadrat P2

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Amaranthus tuberculatus</i>	Native	Annual	Forb	FACW**
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Ampelopsis arborea</i>	Native	Perennial	Shrub	FAC
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Bothriochloa ischaemum</i>	Introduced	Perennial	Grass	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Castilleja indivisa</i>	Native	Annual	Forb	FAC-
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Centaurea texense</i>	Native	Annual	Forb	N/A
<i>Cerastium glomeratum</i>	Introduced	Annual	Forb	FACU
<i>Chamaecrista fasciculata</i>	Native	Annual	Forb	FACU-
<i>Chamaesyce serpens</i>	Native	Annual	Forb	N/A
<i>Coelorachis cylindrica</i>	Native	Perennial	Grass	FAC-
<i>Coreopsis tinctoria</i>	Native	Annual	Forb	FAC
<i>Cynodon dactylon</i>	Introduced	Perennial	Grass	FACU+
<i>Cyperus echinatus</i>	Native	Perennial	Sedge	FAC+
<i>Cyperus squarrosus</i>	Native	Annual	Sedge	OBL
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU

<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dichanthelium oligosanthes</i>	Native	Perennial	Grass	FACU
<i>Echinochloa crus-galli</i>	Introduced	Annual	Grass	FACW-
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Gaura mollis</i>	Native	Annual	Forb	FACU**
<i>Grindelia papposa</i>	Native	Annual	Forb	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Hordeum pusillum</i>	Native	Annual	Grass	FACU
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Juncus dudleyi</i>	Native	Annual	Rush	N/A
<i>Lamium amplexicaule</i>	Introduced	Annual	Forb	N/A
<i>Lotus unifoliolatus</i>	Native	Annual	Forb	N/A
<i>Medicago orbicularis</i>	Introduced	Annual	Forb	N/A
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Neptunia lutea</i>	Native	Perennial	Forb	FACU
<i>Oenothera speciosa</i>	Native	Perennial	Forb	N/A
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Panicum coloratum</i>	Introduced	Perennial	Grass	N/A
<i>Paspalum dilatatum</i>	Introduced	Perennial	Grass	FAC
<i>Paspalum floridanum</i>	Native	Perennial	Grass	FACW-
<i>Physalis angulata</i>	Native	Annual	Forb	FAC-
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Ratibida columnifera</i>	Native	Perennial	Forb	N/A
<i>Rumex crispus</i>	Introduced	Perennial	Forb	FACW
<i>Sesbania herbacea</i>	Native	Annual	Forb	FACW-
<i>Setaria pumila</i>	Introduced	Annual	Grass	FAC
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Sisyrinchium angustifolium</i>	Native	Perennial	Forb	FACW-
<i>Solidago canadensis</i>	Native	Perennial	Forb	FACU+
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Sorghum halepense</i>	Introduced	Annual	Grass	FACU
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Symphyotrichum lanceolatum</i>	Native	Perennial	Forb	OBL**
<i>Thelesperma filifolium</i>	Native	Annual	Forb	N/A
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Trifolium campestre</i>	Introduced	Annual	Forb	N/A
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	64			
Total Native	48			
Total Introduced	16			
Total Annual	35			
Total Perennial	29			
Trees	3			
Shrubs	1			
Vines	0			
Grasses	13			
Sedges	3			
Rushes	1			
Forbs	43			

Quadrat P3

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Andropogon glomeratus</i>	Native	Perennial	Grass	FACW+
<i>Briza minor</i>	Introduced	Annual	Grass	FAC+
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Crepis pulchra</i>	Introduced	Annual	Forb	N/A
<i>Cuscuta cuspidata</i>	Native	Perennial	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Erigeron philadelphicus</i>	Native	Perennial	Forb	FAC
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Grindelia papposa</i>	Native	Annual	Forb	FAC
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Oenothera laciniata</i>	Native	Annual	Forb	FACU
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Panicum capillare</i>	Native	Annual	Grass	FAC
<i>Phalaris caroliniana</i>	Native	Annual	Grass	FACW
<i>Plantago rhodosperma</i>	Native	Annual	Forb	FACU
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stachys crenata</i>	Native	Annual	Forb	FAC
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Veronica peregrina</i>	Native	Annual	Forb	OBL
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	29			
Total Native	25			
Total Introduced	4			
Total Annual	19			
Total Perennial	20			
Trees	1			
Shrubs	0			
Vines	0			
Grasses	5			
Sedges	1			
Rushes	0			
Forbs	22			

Quadrat P4

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ageratina altissima</i>	Native	Perennial	Forb	UPL
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Andropogon gerardii</i>	Native	Perennial	Grass	FACU
<i>Andropogon glomeratus</i>	Native	Perennial	Grass	FACW+

<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carex cherokeensis</i>	Native	Perennial	Sedge	FACW-
<i>Chamaecrista fasciculata</i>	Native	Annual	Forb	FACU-
<i>Chrysopsis pilosa</i>	Native	Annual	Forb	N/A
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dichanthelium oligosanthos</i>	Native	Perennial	Grass	FACU
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/S
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Neptunia lutea</i>	Native	Perennial	Forb	FACU
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Panicum virgatum</i>	Native	Perennial	Grass	FACW
<i>Schizachyrium scoparium</i>	Native	Perennial	Grass	FACU+
<i>Solidago canadensis</i>	Native	Annual	Forb	FACU+
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Strophostyles helvola</i>	Native	Annual	Forb	FACU
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Tripsacum dactyloides</i>	Native	Perennial	Grass	FAC+
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Verbena stricta</i>	Native	Perennial	Forb	N/A
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	30			
Total Native	27			
Total Introduced	3			
Total Annual	12			
Total Perennial	18			
Trees	0			
Shrubs	0			
Vines	1			
Grasses	9			
Sedges	1			
Rushes	0			
Forbs	19			

Quadrat P5

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Ampelopsis arborea</i>	Native	Perennial	Shrub	FAC
<i>Bothriochloa ischaemum</i>	Introduced	Perennial	Grass	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	N/A
<i>Bouteloua dactyloides</i>	Native	Perennial	Grass	FACU-
<i>Callirhoe involucrata</i>	Native	Perennial	Forb	N/A
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Castilleja indivisa</i>	Native	Annual	Forb	FAC-
<i>Cerastium glomeratum</i>	Introduced	Annual	Forb	FACU
<i>Chamaecrista fasciculata</i>	Native	Annual	Forb	FACU-
<i>Chloris virgata</i>	Native	Annual	Grass	N/A

<i>Chrysopsis pilosa</i>	Native	Annual	Forb	N/A
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Cynodon dactylon</i>	Introduced	Perennial	Grass	FACU+
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Dichanthelium oligosanthos</i>	Native	Perennial	Grass	FACU
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-
<i>Euphorbia hexagona</i>	Native	Annual	Forb	N/A
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Grindelia papposa</i>	Native	Annual	Forb	FAC
<i>Hordeum pusillum</i>	Native	Annual	Grass	FACU
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Koeleria macrantha</i>	Native	Perennial	Grass	N/A
<i>Lepidium virginicum</i>	Native	Annual	Forb	FAC-
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Melilotus albus</i>	Introduced	Annual	Forb	FACU
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Nothoscordum bivalve</i>	Native	Perennial	Forb	FACU-
<i>Oenothera laciniata</i>	Native	Annual	Forb	FACU
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Panicum capillare</i>	Native	Annual	Grass	FAC
<i>Pascopyrum smithii</i>	Native	Perennial	Grass	FAC-
<i>Paspalum dilatatum</i>	Introduced	Perennial	Grass	FAC
<i>Passiflora incarnata</i>	Native	Perennial	Vine	N/A
<i>Phalaris caroliniana</i>	Native	Annual	Grass	FACW
<i>Phyla nodiflora</i>	Native	Perennial	Forb	FACW
<i>Platanus occidentalis</i>	Native	Perennial	Tree	FAC+
<i>Populus deltoides</i>	Native	Perennial	Tree	FAC
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Ratibida columnifera</i>	Native	Perennial	Forb	N/A
<i>Setaria pumila</i>	Introduced	Annual	Grass	FAC
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Symphyotrichum lanceolatum</i>	Native	Perennial	Forb	OBL**
<i>Taraxacum officinale</i>	Introduced	Perennial	Forb	FACU+
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Tridens albescens</i>	Native	Perennial	Grass	FAC-
<i>Trifolium campestre</i>	Introduced	Annual	Forb	N/A
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Tripsacum dactyloides</i>	Native	Perennial	Grass	FAC+
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Verbena halei</i>	Native	Perennial	Forb	N/A
<i>Veronica peregrina</i>	Native	Annual	Forb	OBL
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
<i>Vitis mustangensis</i>	Native	Perennial	Vine	N/A

Total Species 66
Total Native 54

Total Introduced	12
Total Annual	35
Total Perennial	31
Trees	2
Shrubs	1
Vines	4
Grasses	18
Sedges	1
Rushes	0
Forbs	40

Quadrat P6

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ageratina altissima</i>	Native	Perennial	Forb	UPL
<i>Allium canadense</i>	Native	Perennial	Forb	FACU-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Ampelopsis arborea</i>	Native	Perennial	Shrub	FAC
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Cerastium glomeratum</i>	Introduced	Annual	Forb	FACU
<i>Chamaecrista fasciculata</i>	Native	Annual	Forb	FACU-
<i>Chrysopsis pilosa</i>	Native	Annual	Forb	N/A
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Cuscuta indecora</i>	Native	Perennial	Forb	N/A
<i>Cynodon dactylon</i>	Introduced	Perennial	Grass	FACU+
<i>Cyperus acuminatus</i>	Native	Perennial	Sedge	OBL
<i>Diospyros virginiana</i>	Native	Perennial	Tree	FAC
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Euphorbia hexagona</i>	Native	Annual	Forb	N/A
<i>Evax prolifera</i>	Native	Annual	Forb	N/A
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Grindelia papposa</i>	Native	Annual	Forb	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Ipomoea lacunosa</i>	Native	Annual	Forb	FACW
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Melilotus albus</i>	Introduced	Annual	Forb	FACU
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Nothoscordum bivalve</i>	Native	Perennial	Forb	FACU-
<i>Oenothera laciniata</i>	Native	Annual	Forb	FACU
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Paspalum dilatatum</i>	Introduced	Perennial	Grass	FAC
<i>Phyla nodiflora</i>	Native	Perennial	Forb	FACW
<i>Populus deltoides</i>	Native	Perennial	Tree	FAC
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Setaria pumila</i>	Introduced	Annual	Grass	FAC
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Symphyotrichum lanceolatum</i>	Native	Perennial	Forb	OBL**
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Trifolium campestre</i>	Introduced	Annual	Forb	N/A

<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Veronica peregrina</i>	Native	Annual	Forb	OBL
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	43			
Total Native	35			
Total Introduced	8			
Total Annual	24			
Total Perennial	19			
Trees	2			
Shrubs	1			
Vines	2			
Grasses	5			
Sedges	2			
Rushes	0			
Forbs	31			

Quadrat P7

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Ampelopsis arborea</i>	Native	Perennial	Shrub	FAC
<i>Berchemia scandens</i>	Native	Perennial	Vine	FAC+
<i>Carya illinoensis</i>	Native	Perennial	Tree	FAC+
<i>Cerastium glomeratum</i>	Introduced	Annual	Forb	FACU
<i>Chamaecrista fasciculata</i>	Native	Annual	Forb	FACU-
<i>Chamaesyce maculata</i>	Native	Annual	Forb	N/A
<i>Cynodon dactylon</i>	Introduced	Perennial	Grass	FACU+
<i>Diodia virginiana</i>	Native	Perennial	Forb	OBL
<i>Diospyros virginiana</i>	Native	Perennial	Tree	FAC
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Geranium dissectum</i>	Introduced	Annual	Forb	N/A
<i>Heterotheca subaxillaris</i>	Native	Annual	Forb	UPL
<i>Ipomoea lacunosa</i>	Native	Annual	Forb	FACW
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Melilotus albus</i>	Introduced	Annual	Forb	FACU
<i>Nothoscordum bivalve</i>	Native	Perennial	Forb	FACU-
<i>Oenothera laciniata</i>	Native	Annual	Forb	FACU
<i>Passiflora incarnata</i>	Native	Perennial	Vine	N/A
<i>Phyla nodiflora</i>	Native	Perennial	Forb	FACW
<i>Populus deltoides</i>	Native	Perennial	Tree	FAC
<i>Rubus aboriginum</i>	Native	Perennial	Shrub	N/A
<i>Salix nigra</i>	Native	Perennial	Tree	FACW+
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Strophostyles helvola</i>	Native	Annual	Forb	FACU
<i>Symphotrichum lanceolatum</i>	Native	Perennial	Forb	OBL**
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Veronica peregrina</i>	Native	Annual	Forb	OBL
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
<i>Vitis mustangensis</i>	Native	Perennial	Vine	N/A
<i>Xanthium strumarium</i>	Native	Annual	Forb	FAC-
Total Species	34			
Total Native	28			

Total Introduced	6
Total Annual	16
Total Perennial	18
Trees	4
Shrubs	2
Vines	5
Grasses	2
Sedges	0
Rushes	0
Forbs	21

Quadrat P8

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carex crus-corvi</i>	Native	Perennial	Sedge	OBL
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Centaureum texense</i>	Native	Annual	Forb	N/A
<i>Cuscuta indecora</i>	Native	Perennial	Forb	N/A
<i>Cyperus erythrorhizos</i>	Native	Annual	Sedge	OBL
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dichanthelium oligosanthes</i>	Native	Perennial	Grass	FACU
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Eleocharis palustris</i>	Native	Perennial	Sedge	OBL
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Eryngium hookeri</i>	Native	Annual	Forb	FACW
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Hordeum pusillum</i>	Native	Annual	Forb	FACU
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Juncus dudleyi</i>	Native	Perennial	Rush	N/A
<i>Juncus torreyi</i>	Native	Perennial	Rush	FACW
<i>Lathyrus hirsutus</i>	Introduced	Annual	Forb	N/A
<i>Lotus unifoliolatus</i>	Native	Annual	Forb	N/A
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Melilotus albus</i>	Introduced	Annual	Forb	FACU
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Oenothera speciosa</i>	Native	Perennial	Forb	N/A
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Panicum capillare</i>	Native	Annual	Grass	FAC
<i>Phalaris caroliniana</i>	Native	Annual	Grass	FACW
<i>Polypogon monspeliensis</i>	Introduced	Annual	Grass	FACW+
<i>Ratibida columnifera</i>	Native	Perennial	Forb	N/A
<i>Rudbeckia hirta</i>	Native	Annual	Forb	FACU
<i>Setaria pumila</i>	Introduced	Annual	Grass	FAC
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stachys crenata</i>	Native	Annual	Forb	FAC
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Tridens albescens</i>	Native	Perennial	Grass	FAC-
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC

<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Veronica peregrina</i>	Native	Annual	Forb	OBL
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	43			
Total Native	37			
Total Introduced	6			
Total Annual	27			
Total Perennial	16			
Trees	1			
Shrubs	0			
Vines	0			
Grasses	10			
Sedges	4			
Rushes	2			
Forbs	26			

Quadrat P9

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carex cherokeensis</i>	Native	Perennial	Sedge	FACW-
<i>Carex crus-corvi</i>	Native	Perennial	Sedge	OBL
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Forb	FACW-
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Hordeum pusillum</i>	Native	Annual	Grass	FACU
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Lathyrus hirsutus</i>	Introduced	Annual	Forb	N/A
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Oenothera speciosa</i>	Native	Perennial	Forb	N/A
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Pascopyrum smithii</i>	Native	Perennial	Grass	FAC-
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Rumex crispus</i>	Introduced	Perennial	Forb	FACW
<i>Solidago canadensis</i>	Native	Perennial	Forb	FACU+
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Tridens albescens</i>	Native	Perennial	Forb	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	34			

Total Native	29
Total Introduced	5
Total Annual	16
Total Perennial	18
Trees	3
Shrubs	0
Vines	0
Grasses	6
Sedges	3
Rushes	0
Forbs	22

Quadrat P10

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Anemone berlandieri</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Callirhoe involucrata</i>	Native	Perennial	Forb	N/A
<i>Carex cherokeensis</i>	Native	Perennial	Sedge	FACW-
<i>Castilleja indivisa</i>	Native	Annual	Forb	FAC-
<i>Centaurium texense</i>	Native	Annual	Forb	N/A
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Gaillardia pulchella</i>	Native	Annual	Forb	N/A
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Glandularia bipinnatifida</i>	Native	Perennial	Forb	N/A
<i>Grindelia papposa</i>	Native	Annual	Forb	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Hordeum pusillum</i>	Native	Annual	Grass	FACU
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Lactuca serriola</i>	Introduced	Annual	Forb	FAC
<i>Lamium amplexicaule</i>	Introduced	Annual	Forb	N/A
<i>Lathyrus hirsutus</i>	Introduced	Annual	Forb	N/A
<i>Melilotus officinalis</i>	Introduced	Annual	Forb	FACU
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Panicum capillare</i>	Native	Annual	Grass	FAC
<i>Panicum coloratum</i>	Introduced	Perennial	Grass	N/A
<i>Pascopyrum smithii</i>	Native	Perennial	Grass	FAC-
<i>Phalaris caroliniana</i>	Native	Annual	Grass	FACW
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Rumex crispus</i>	Introduced	Perennial	Forb	FACW
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sisyrinchium angustifolium</i>	Native	Perennial	Forb	FACW-
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-

<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stachys crenata</i>	Native	Annual	Forb	FAC
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Teucrium canadense</i>	Native	Perennial	Forb	FACW-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Veronica peregrina</i>	Native	Perennial	Forb	OBL
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	50			
Total Native	38			
Total Introduced	12			
Total Annual	33			
Total Perennial	17			
Trees	0			
Shrubs	0			
Vines	0			
Grasses	9			
Sedges	1			
Rushes	0			
Forbs	40			

Quadrat P11

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Anemone berlandieri</i>	Native	Perennial	Forb	N/A
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Bouteloua curtipendula</i>	Native	Perennial	Grass	N/A
<i>Brickellia eupatorioides</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cardamine hirsuta</i>	Introduced	Annual	Forb	FAC
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Castilleja indivisa</i>	Native	Annual	Forb	FAC-
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Centaurea americana</i>	Native	Annual	Forb	N/A
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Cissus trifoliata</i>	Native	Perennial	Vine	FACU-
<i>Convolvulus equitans</i>	Native	Perennial	Forb	N/A
<i>Crataegus spathulata</i>	Native	Perennial	Tree	FAC+
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Eryngium leavenworthii</i>	Native	Annual	Forb	N/A
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Gaura mollis</i>	Native	Annual	Forb	FACU**
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Grindelia papposa</i>	Native	Annual	Forb	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Lactuca serriola</i>	Introduced	Annual	Forb	FAC
<i>Lesquerella gracilis</i>	Native	Annual	Forb	FACW

<i>Lindheimera texana</i>	Native	Annual	Forb	N/A
<i>Mirabilis linearis</i>	Native	Perennial	Forb	N/A
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Rhus copallinum</i>	Native	Perennial	Shrub	UPL**
<i>Rhus glabra</i>	Native	Perennial	Shrub	N/A
<i>Rubus aboriginum</i>	Native	Perennial	Shrub	N/A
<i>Sapindus saponaria</i>	Native	Perennial	Tree	FACU-
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Solanum dimidiatum</i>	Native	Perennial	Forb	N/A
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Vernonia baldwinii</i>	Native	Perennial	Forb	UPL**
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	51			
Total Native	44			
Total Introduced	7			
Total Annual	24			
Total Perennial	27			
Trees	4			
Shrubs	4			
Vines	2			
Grasses	5			
Sedges	0			
Rushes	0			
Forbs	36			

Quadrat P12

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ageratina altissima</i>	Native	Perennial	Forb	UPL
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bothriochloa ischaemum</i>	Introduced	Perennial	Grass	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Bouteloua curtipendula</i>	Native	Perennial	Grass	N/A
<i>Brickellia eupatorioides</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Castilleja indivisa</i>	Native	Annual	Forb	FAC-
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL

<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dichanthelium oligosanthes</i>	Native	Perennial	Grass	FACU
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Erigeron philadelphicus</i>	Native	Perennial	Forb	FAC
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-
<i>Eryngium leavenworthii</i>	Native	Annual	Forb	N/A
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Gaillardia pulchella</i>	Native	Annual	Forb	N/A
<i>Glandularia bipinnatifida</i>	Native	Perennial	Forb	N/A
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Hymenopappus scabiosaeus</i>	Native	Perennial	Forb	N/A
<i>Lesquerella gracilis</i>	Native	Annual	Forb	FACW
<i>Limnoscium pinnatum</i>	Native	Annual	Forb	FACW
<i>Mimosa roemeriana</i>	Native	Perennial	Forb	N/A
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Nassella leucotricha</i>	Native	Perennial	Grass	N/A
<i>Panicum coloratum</i>	Introduced	Perennial	Grass	N/A
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Rubus aboriginum</i>	Native	Perennial	Shrub	N/A
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Sisyrinchium angustifolium</i>	Native	Perennial	Forb	FACW-
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stenaria nigricans</i>	Native	Perennial	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Tragia betonicifolia</i>	Native	Perennial	Forb	N/A
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
<hr/>				
Total Species	48			
Total Native	42			
Total Introduced	6			
Total Annual	21			
Total Perennial	27			
Trees	2			
Shrubs	1			
Vines	0			
Grasses	9			
Sedges	0			
Rushes	0			
Forbs	36			

Quadrat P13

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Anemone berlandieri</i>	Native	Perennial	Forb	N/A

<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bothriochloa ischaemum</i>	Introduced	Perennial	Grass	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Bouteloua curtipendula</i>	Native	Perennial	Grass	N/A
<i>Brickellia eupatorioides</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Callirhoe involucrata</i>	Native	Annual	Forb	N/A
<i>Castilleja indivisa</i>	Native	Annual	Forb	FAC-
<i>Cerastium glomeratum</i>	Introduced	Annual	Forb	FACU
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dichantherium oligosanthes</i>	Native	Perennial	Grass	FACU
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-
<i>Eryngium leavenworthii</i>	Native	Annual	Forb	N/A
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Gaillardia pulchella</i>	Native	Annual	Forb	N/A
<i>Gaura suffulta</i>	Native	Annual	Forb	N/A
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Glandularia bipinnatifida</i>	Native	Perennial	Forb	N/A
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Lathyrus hirsutus</i>	Introduced	Annual	Forb	N/A
<i>Lesquerella gracilis</i>	Native	Annual	Forb	FACW
<i>Limnoscadium pinnatum</i>	Native	Annual	Forb	FACW
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Panicum coloratum</i>	Introduced	Perennial	Grass	N/A
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Silphium radula</i>	Native	Perennial	Forb	N/A
<i>Sisyrinchium angustifolium</i>	Native	Perennial	Forb	FACW-
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stenaria nigricans</i>	Native	Perennial	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Veronica peregrina</i>	Native	Annual	Forb	OBL
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
<hr/>				
Total Species	51			
Total Native	42			
Total Introduced	9			
Total Annual	26			
Total Perennial	25			
Trees	2			
Shrubs	0			
Vines	0			
Grasses	9			

Sedges	0
Rushes	0
Forbs	40

Quadrat P14

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Anemone berlandieri</i>	Native	Perennial	Forb	N/A
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Brickellia eupatorioides</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Castilleja indivisa</i>	Native	Annual	Forb	FAC-
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Cuscuta indecora</i>	Native	Perennial	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dichanthelium oligosanthos</i>	Native	Perennial	Grass	FACU
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Euphorbia dentata</i>	Native	Annual	Forb	N/A
<i>Euphorbia hexagona</i>	Native	Annual	Forb	N/A
<i>Gaillardia pulchella</i>	Native	Annual	Forb	N/A
<i>Glandularia bipinnatifida</i>	Native	Perennial	Forb	N/A
<i>Lesquerella gracilis</i>	Native	Annual	Forb	FACW
<i>Liatris mucronata</i>	Native	Perennial	Forb	N/A
<i>Lindheimera texana</i>	Native	Annual	Forb	N/A
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Plantago rhodosperma</i>	Native	Annual	Forb	FACU
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stenaria nigricans</i>	Native	Perennial	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	31			
Total Native	28			
Total Introduced	3			
Total Annual	14			
Total Perennial	17			
Trees	0			
Shrubs	0			
Vines	0			
Grasses	5			
Sedges	0			
Rushes	0			
Forbs	26			

Quadrat P15

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bothriochloa ischaemum</i>	Introduced	Perennial	Grass	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Brickellia eupatorioides</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Centaurea americana</i>	Native	Annual	Forb	N/A
<i>Centaureum texense</i>	Native	Annual	Forb	N/A
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-
<i>Eryngium leavenworthii</i>	Native	Annual	Forb	N/A
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Helianthus maximiliani</i>	Native	Perennial	Forb	FACU-
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Panicum capillare</i>	Native	Annual	Grass	FAC
<i>Panicum virgatum</i>	Native	Perennial	Grass	FACW
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Rudbeckia hirta</i>	Native	Annual	Forb	FACU
<i>Sabatia campestris</i>	Native	Annual	Forb	FACU
<i>Schizachyrium scoparium</i>	Native	Perennial	Grass	FACU+
<i>Solidago petiolaris</i>	Native	Perennial	Forb	FACU+
<i>Sorghastrum nutans</i>	Native	Perennial	Grass	FACU
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stenaria nigricans</i>	Native	Perennial	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Taraxacum officinale</i>	Introduced	Perennial	Forb	FACU+
<i>Thelesperma filifolium</i>	Native	Annual	Forb	N/A
<i>Tridens albescens</i>	Native	Perennial	Grass	FAC-
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Tripsacum dactyloides</i>	Native	Perennial	Grass	FAC+
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Vernonia baldwinii</i>	Native	Perennial	Forb	UPL**
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	46			
Total Native	41			
Total Introduced	5			
Total Annual	23			
Total Perennial	23			
Trees	1			
Shrubs	0			

Vines	0
Grasses	12
Sedges	0
Rushes	0
Forbs	33

Quadrat P16

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bothriochloa ischaemum</i>	Introduced	Perennial	Grass	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Gaillardia pulchella</i>	Native	Annual	Forb	N/A
<i>Gaura suffulta</i>	Native	Annual	Forb	N/A
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Helianthus maximiliani</i>	Native	Perennial	Forb	FACU-
<i>Panicum capillare</i>	Native	Annual	Grass	FAC
<i>Schizachyrium scoparium</i>	Native	Perennial	Grass	FACU+
<i>Solanum dimidiatum</i>	Native	Perennial	Forb	N/A
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sorghastrum nutans</i>	Native	Perennial	Grass	FACU
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stenaria nigricans</i>	Native	Perennial	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Tragia betonicifolia</i>	Native	Perennial	Forb	N/A
<i>Tripsacum dactyloides</i>	Native	Perennial	Grass	FAC+
Total Species	26			
Total Native	23			
Total Introduced	3			
Total Annual	9			
Total Perennial	27			
Trees	0			
Shrubs	0			
Vines	0			
Grasses	9			
Sedges	0			
Rushes	0			
Forbs	17			

Quadrat P17

Species	Origin	Habit	Functional	Wetland Indicator
---------	--------	-------	------------	-------------------

			Group	Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ageratina altissima</i>	Native	Perennial	Forb	UPL
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bothriochloa ischaemum</i>	Introduced	Perennial	Grass	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Bouteloua curtipendula</i>	Native	Perennial	Grass	N/A
<i>Castilleja indivisa</i>	Native	Annual	Forb	FAC-
<i>Centaurea americana</i>	Native	Annual	Forb	N/A
<i>Centaureum texense</i>	Native	Annual	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Helianthus maximiliani</i>	Native	Perennial	Forb	FACU-
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Oenothera speciosa</i>	Native	Perennial	Forb	N/A
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Panicum capillare</i>	Native	Annual	Grass	FAC
<i>Panicum virgatum</i>	Native	Perennial	Grass	FACW
<i>Phalaris caroliniana</i>	Native	Annual	Grass	FACW
<i>Polytaenia nuttallii</i>	Native	Perennial	Grass	N/A
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Rudbeckia hirta</i>	Native	Annual	Forb	FACU
<i>Sabatia campestris</i>	Native	Annual	Forb	FACU
<i>Schizachyrium scoparium</i>	Native	Perennial	Grass	FACU+
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sorghastrum nutans</i>	Native	Perennial	Grass	FACU
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stenaria nigricans</i>	Native	Perennial	Forb	N/A
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Thelesperma filifolium</i>	Native	Annual	Forb	N/A
<i>Tripsacum dactyloides</i>	Native	Perennial	Grass	FAC+
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	41			
Total Native	38			
Total Introduced	3			
Total Annual	18			
Total Perennial	23			
Trees	2			
Shrubs	1			
Vines	0			
Grasses	11			
Sedges	0			
Rushes	0			
Forbs	27			

Quadrat P18

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Erigeron philadelphicus</i>	Native	Perennial	Forb	FAC
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Hordeum pusillum</i>	Native	Annual	Grass	FACU
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Pascopyrum smithii</i>	Native	Perennial	Grass	FAC-
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Sinapis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Symphotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
Total Species	18			
Total Native	15			
Total Introduced	3			
Total Annual	11			
Total Perennial	7			
Trees	0			
Shrubs	0			
Vines	0			
Grasses	4			
Sedges	0			
Rushes	0			
Forbs	14			

Quadrat P19

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Allium drummondii</i>	Native	Perennial	Forb	N/A
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Centaureum texense</i>	Native	Annual	Forb	N/A
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dichanthelium oligosanthes</i>	Native	Perennial	Grass	FACU
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus canadensis</i>	Native	Perennial	Grass	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-

<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Hordeum pusillum</i>	Native	Annual	Grass	FACU
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Juncus torreyi</i>	Native	Perennial	Rush	FACW
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Oenothera speciosa</i>	Native	Perennial	Forb	N/A
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Panicum coloratum</i>	Introduced	Perennial	Grass	N/A
<i>Pascopyrum smithii</i>	Native	Perennial	Grass	FAC-
<i>Phalaris caroliniana</i>	Native	Annual	Grass	FACW
<i>Plantago rhodosperma</i>	Native	Annual	Forb	FACU
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Tragia betonicifolia</i>	Native	Perennial	Forb	N/A
<i>Tridens albescens</i>	Native	Perennial	Grass	FAC-
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
Total Species	44			
Total Native	40			
Total Introduced	4			
Total Annual	24			
Total Perennial	20			
Trees	0			
Shrubs	0			
Vines	0			
Grasses	11			
Sedges	0			
Rushes	1			
Forbs	32			

Quadrat P20

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Allium canadense</i>	Native	Perennial	Forb	FACU-
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Andropogon glomeratus</i>	Native	Perennial	Grass	FACW+
<i>Baccharis neglecta</i>	Native	Perennial	Shrub	FAC
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carex cherokeensis</i>	Native	Perennial	Forb	FACW-
<i>Carex leavenworthii</i>	Native	Perennial	Forb	N/A
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC

<i>Centaurium texense</i>	Native	Annual	Forb	N/A
<i>Chamaecrista fasciculata</i>	Native	Annual	Forb	FACU-
<i>Chamaesyce serpens</i>	Native	Annual	Forb	UPL
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb	FACU
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dichanthelium oligosanthes</i>	Native	Perennial	Grass	FACU
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Eleocharis parvula</i>	Native	Perennial	Sedge	OBL
<i>Elymus canadensis</i>	Native	Perennial	Grass	FAC+
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-
<i>Erodium cicutarium</i>	Introduced	Annual	Forb	N/A
<i>Eryngium hookeri</i>	Native	Annual	Forb	FACW
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Grindelia papposa</i>	Native	Annual	Forb	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Juncus dudleyi</i>	Native	Perennial	Rush	N/A
<i>Juniperus virginiana</i>	Native	Perennial	Tree	FACU-
<i>Liatris mucronata</i>	Native	Perennial	Forb	N/A
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Melilotus albus</i>	Introduced	Annual	Forb	FACU
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Oenothera speciosa</i>	Native	Perennial	Forb	N/A
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Phyla nodiflora</i>	Native	Perennial	Forb	FACW
<i>Plantago patagonica</i>	Native	Annual	Forb	FACU-
<i>Plantago rhodosperma</i>	Native	Annual	Forb	FACU
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Populus deltoides</i>	Native	Perennial	Tree	FAC
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Ratibida columnifera</i>	Native	Perennial	Forb	N/A
<i>Rubus aboriginum</i>	Native	Perennial	Shrub	N/A
<i>Salix nigra</i>	Native	Perennial	Tree	FACW+
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sesbania vesicaria</i>	Native	Annual	Forb	FAC+
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Strophostyles helvola</i>	Native	Annual	Forb	FACU
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Symphyotrichum lanceolatum</i>	Native	Perennial	Forb	OBL**
<i>Teucrium canadense</i>	Native	Perennial	Forb	FACW-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Typha domingensis</i>	Native	Perennial	Forb	OBL
<i>Ulmus americana</i>	Native	Perennial	Tree	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**

<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
<i>Vitis mustangensis</i>	Native	Perennial	Vine	N/A
Total Species	70			
Total Native	62			
Total Introduced	8			
Total Annual	36			
Total Perennial	34			
Trees	8			
Shrubs	3			
Vines	1			
Grasses	6			
Sedges	3			
Rushes	1			
Forbs	48			

Quadrat P21

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cardamine hirsuta</i>	Introduced	Annual	Forb	FAC
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Chamaesyce maculata</i>	Native	Annual	Forb	N/A
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Cyperus erythrorhizos</i>	Native	Annual	Sedge	OBL
<i>Cyperus polystachyos</i>	Native	Perennial	Sedge	FACW
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Eleocharis parvula</i>	Native	Perennial	Sedge	OBL
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Juniperus virginiana</i>	Native	Perennial	Tree	FACU-
<i>Leptochloa panicea</i>	Native	Annual	Grass	N/A
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Melilotus albus</i>	Introduced	Annual	Forb	FACU
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Oenothera laciniata</i>	Native	Annual	Forb	FACU
<i>Oenothera speciosa</i>	Native	Perennial	Forb	N/A
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Phalaris caroliniana</i>	Native	Annual	Grass	FACW
<i>Physalis mollis</i>	Native	Perennial	Forb	N/A
<i>Populus deltoides</i>	Native	Perennial	Tree	FAC
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Rubus aboriginum</i>	Native	Perennial	Shrub	N/A
<i>Setaria pumila</i>	Introduced	Annual	Grass	FAC

<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stachys crenata</i>	Native	Annual	Forb	FAC
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Teucrium canadense</i>	Native	Perennial	Forb	FACW-
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Ulmus americana</i>	Native	Perennial	Tree	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Veronica peregrina</i>	Native	Annual	Forb	OBL
<i>Xanthium strumarium</i>	Native	Annual	Forb	FAC-
Total Species	52			
Total Native	46			
Total Introduced	6			
Total Annual	28			
Total Perennial	24			
Trees	6			
Shrubs	1			
Vines	1			
Grasses	7			
Sedges	4			
Rushes	0			
Forbs	33			

Quadrat S1

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Achillea millefolium</i>	Native	Perennial	Forb	FACU
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Andropogon virginicus</i>	Native	Perennial	Grass	FACU+
<i>Aristida longespica</i>	Native	Annual	Grass	N/A
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bothriochloa ischaemum</i>	Introduced	Perennial	Grass	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Carex arkansana</i>	Native	Perennial	Sedge	N/A
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Coelorachis cylindrica</i>	Native	Perennial	Grass	FAC-
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Cynodon dactylon</i>	Introduced	Perennial	Grass	FACU+
<i>Dichanthelium oligosanthos</i>	Native	Perennial	Grass	FACU
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Helenium amarum</i>	Native	Annual	Forb	FACU
<i>Houstonia pusilla</i>	Native	Annual	Forb	UPL
<i>Juncus dudleyi</i>	Native	Perennial	Rush	N/A
<i>Juniperus virginiana</i>	Native	Perennial	Tree	FACU-
<i>Lechea tenuifolia</i>	Native	Perennial	Forb	N/A

<i>Liatris mucronata</i>	Native	Perennial	Forb	N/A
<i>Linum sulcatum</i>	Native	Annual	Forb	N/A
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Maclura pomifera</i>	Native	Perennial	Tree	UPL
<i>Neptunia lutea</i>	Native	Perennial	Forb	FACU
<i>Opuntia phaeacantha</i>	Native	Perennial	Forb	N/A
<i>Panicum capillare</i>	Native	Annual	Grass	FAC
<i>Pascopyrum smithii</i>	Native	Perennial	Grass	FAC-
<i>Plantago aristata</i>	Native	Annual	Grass	N/A
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Quercus macrocarpa</i>	Native	Perennial	Tree	FAC-
<i>Quercus stellata</i>	Native	Perennial	Tree	UPL**
<i>Ratibida columnifera</i>	Native	Perennial	Forb	N/A
<i>Rubus aboriginum</i>	Native	Perennial	Shrub	N/A
<i>Rudbeckia hirta</i>	Native	Annual	Forb	FACU
<i>Sabatia campestris</i>	Native	Annual	Forb	FACU
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Torilis arvensis</i>	Native	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Tragia betonicifolia</i>	Native	Perennial	Forb	N/A
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Zanthoxylum clava-herculis</i>	Native	Perennial	Tree	FAC-
Total Species	52			
Total Native	48			
Total Introduced	4			
Total Annual	18			
Total Perennial	34			
Trees	9			
Shrubs	2			
Vines	2			
Grasses	10			
Sedges	1			
Rushes	1			
Forbs	28			

Quadrat S2

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Achillea millefolium</i>	Native	Perennial	Forb	FACU
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Andropogon virginicus</i>	Native	Perennial	Grass	FACU+
<i>Bothriochloa ischaemum</i>	Introduced	Perennial	Grass	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A

<i>Brickellia eupatorioides</i>	Native	Perennial	Forb	N/A
<i>Carya illinoensis</i>	Native	Perennial	Tree	FAC+
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Coelorachis cylindrica</i>	Native	Perennial	Grass	FAC-
<i>Cornus drummondii</i>	Native	Perennial	Tree	FAC
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Croton texensis</i>	Native	Annual	Forb	N/A
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Engelmannia peristenia</i>	Native	Perennial	Forb	N/A
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Fraxinus americanus</i>	Native	Perennial	Tree	FACU
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Gaillardia pulchella</i>	Native	Annual	Forb	N/A
<i>Juniperus virginiana</i>	Native	Perennial	Tree	FACU-
<i>Lespedeza virginica</i>	Native	Perennial	Forb	N/A
<i>Liatris mucronata</i>	Native	Perennial	Forb	N/A
<i>Neptunia lutea</i>	Native	Perennial	Forb	FACU
<i>Opuntia phaeacantha</i>	Native	Perennial	Forb	N/A
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Prunus angustifolia</i>	Native	Perennial	Shrub	N/A
<i>Quercus macrocarpa</i>	Native	Perennial	Tree	FAC-
<i>Quercus stellata</i>	Native	Perennial	Tree	UPL**
<i>Rhus glabra</i>	Native	Perennial	Shrub	N/A
<i>Rubus aboriginum</i>	Native	Perennial	Shrub	N/A
<i>Sabatia campestris</i>	Native	Annual	Forb	FACU
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Sisyrinchium angustifolium</i>	Native	Perennial	Forb	FACW-
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Symphoricarpos orbiculatus</i>	Native	Perennial	Shrub	FACU
<i>Teucrium canadense</i>	Native	Perennial	Forb	FACW-
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
Total Species	42			
Total Native	39			
Total Introduced	3			
Total Annual	11			
Total Perennial	31			
Trees	10			
Shrubs	4			
Vines	2			
Grasses	4			
Sedges	0			
Rushes	0			
Forbs	22			

Quadrat S3

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ageratina altissima</i>	Native	Perennial	Forb	UPL
<i>Amaranthus tuberculatus</i>	Native	Annual	Forb	FACW**

<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Ampelopsis arborea</i>	Native	Perennial	Shrub	FAC
<i>Carex cherokeensis</i>	Native	Perennial	Sedge	FACW-
<i>Carya illinoensis</i>	Native	Perennial	Tree	FAC+
<i>Chamaecrista fasciculata</i>	Native	Annual	Forb	FACU-
<i>Cocculus carolinus</i>	Native	Perennial	Vine	FACU
<i>Crepis pulchra</i>	Introduced	Annual	Forb	N/A
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Cyperus esculentus</i>	Introduced	Perennial	Sedge	FACW
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Grindelia papposa</i>	Native	Annual	Forb	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Heterotheca subaxillaris</i>	Native	Annual	Forb	UPL
<i>Ipomoea lacunosa</i>	Native	Annual	Forb	FACW
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Melilotus albus</i>	Introduced	Annual	Forb	FACU
<i>Populus deltoides</i>	Native	Perennial	Tree	FAC
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Setaria pumila</i>	Introduced	Annual	Grass	FAC
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Solidago canadensis</i>	Native	Annual	Forb	FACU+
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Symphotrichum lanceolatum</i>	Native	Perennial	Forb	OBL**
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Tridens albescens</i>	Native	Perennial	Grass	FAC-
<i>Ulmus americana</i>	Native	Perennial	Tree	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
<i>Vitis mustangensis</i>	Native	Perennial	Vine	N/A
<i>Xanthium strumarium</i>	Native	Annual	Forb	FAC-
Total Species	38			
Total Native	31			
Total Introduced	7			
Total Annual	20			
Total Perennial	18			
Trees	4			
Shrubs	1			
Vines	4			
Grasses	4			
Sedges	2			
Rushes	0			
Forbs	23			

Quadrat S4

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ageratina altissima</i>	Native	Perennial	Forb	
<i>Allium canadense</i>	Native	Perennial	Forb	
<i>Ambrosia trifida</i>	Native	Annual	Forb	

<i>Ampelopsis arborea</i>	Native	Perennial	Shrub
<i>Andropogon glomeratus</i>	Native	Perennial	Grass
<i>Andropogon virginicus</i>	Native	Perennial	Grass
<i>Berchemia scandens</i>	Native	Perennial	Vine
<i>Bothriochloa ischaemum</i>	Introduced	Perennial	Grass
<i>Cardamine hirsuta</i>	Introduced	Annual	Forb
<i>Carex leavenworthii</i>	Native	Perennial	Sedge
<i>Carya illinoensis</i>	Native	Perennial	Tree
<i>Celtis laevigata</i>	Native	Perennial	Tree
<i>Chamaecrista fasciculata</i>	Native	Annual	Forb
<i>Chrysopsis pilosa</i>	Native	Annual	Forb
<i>Cynodon dactylon</i>	Introduced	Perennial	Grass
<i>Desmanthus illinoensis</i>	Native	Perennial	Forb
<i>Desmodium obtusum</i>	Native	Perennial	Forb
<i>Elymus virginicus</i>	Native	Perennial	Grass
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree
<i>Geranium dissectum</i>	Introduced	Annual	Forb
<i>Ilex decidua</i>	Native	Perennial	Shrub
<i>Lactuca serriola</i>	Introduced	Annual	Forb
<i>Lythrum alatum</i>	Native	Perennial	Forb
<i>Melilotus albus</i>	Introduced	Annual	Forb
<i>Mikania scandens</i>	Native	Perennial	Vine
<i>Myosotis macrosperma</i>	Native	Annual	Forb
<i>Oenothera laciniata</i>	Native	Annual	Forb
<i>Oxalis stricta</i>	Native	Perennial	Forb
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb
<i>Ratibida columnifera</i>	Native	Perennial	Forb
<i>Setaria pumila</i>	Introduced	Annual	Grass
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree
<i>Smilax bona-nox</i>	Native	Perennial	Vine
<i>Solanum dimidiatum</i>	Native	Perennial	Forb
<i>Sorghum halepense</i>	Introduced	Perennial	Grass
<i>Strophostyles helvola</i>	Native	Annual	Forb
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb
<i>Symphyotrichum lanceolatum</i>	Native	Perennial	Forb
<i>Toxicodendron radicans</i>	Native	Perennial	Vine
<i>Triodanis perfoliata</i>	Native	Annual	Forb
<i>Ulmus americana</i>	Native	Perennial	Tree
<i>Valerianella radiata</i>	Native	Annual	Forb
<i>Veronica peregrina</i>	Native	Annual	Forb
<i>Vicia sativa</i>	Introduced	Annual	Forb
<i>Vitis mustangensis</i>	Native	Perennial	Vine
<i>Zanthoxylum clava-herculis</i>	Native	Perennial	Tree
<hr/>			
Total Species	46		
Total Native	37		
Total Introduced	9		
Total Annual	16		
Total Perennial	30		
Trees	6		
Shrubs	2		
Vines	5		
Grasses	7		
Sedges	1		
Rushes	0		
Forbs	24		
<hr/>			

Quadrat S5

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Andropogon virginicus</i>	Native	Perennial	Grass	FACU+
<i>Anemone berlandieri</i>	Native	Perennial	Forb	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Brickellia eupatorioides</i>	Native	Perennial	Forb	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carex arkansana</i>	Native	Perennial	Sedge	N/A
<i>Castilleja indivisa</i>	Native	Annual	Forb	FAC-
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Cocculus carolinus</i>	Native	Perennial	Vine	FACU
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Cynodon dactylon</i>	Introduced	Perennial	Grass	FACU+
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dichanthelium oligosanthos</i>	Native	Perennial	Grass	FACU
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Gaillardia pulchella</i>	Native	Annual	Forb	N/A
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Gaura mollis</i>	Native	Annual	Forb	FACU**
<i>Gaura suffulta</i>	Native	Annual	Forb	N/A
<i>Geranium carolinianum</i>	Native	Annual	Forb	N/A
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Ipomoea lacunosa</i>	Native	Annual	Forb	FACW
<i>Juniperus virginiana</i>	Native	Perennial	Tree	FACU-
<i>Lactuca serriola</i>	Introduced	Annual	Forb	FAC
<i>Lesquerella gracilis</i>	Native	Annual	Forb	FACW
<i>Mikania scandens</i>	Native	Perennial	Vine	FACW+
<i>Mimosa roemeriana</i>	Native	Perennial	Forb	N/A
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Nassella leucotricha</i>	Native	Perennial	Grass	N/A
<i>Opuntia phaeacantha</i>	Native	Perennial	Forb	N/A
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Physalis longifolia</i>	Native	Perennial	Forb	N/A
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Ptilimnium nuttallii</i>	Native	Annual	Forb	FACW
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Smilax bona-nox</i>	Native	Perennial	Vine	FAC
<i>Solanum dimidiatum</i>	Native	Perennial	Forb	N/A
<i>Solidago canadensis</i>	Native	Perennial	Forb	FACU+
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU

<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Stellaria media</i>	Introduced	Annual	Forb	FACU-
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Symphyotrichum lanceolatum</i>	Native	Perennial	Forb	OBL**
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Vernonia baldwinii</i>	Native	Perennial	Forb	UPL**
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
<i>Vitis mustangensis</i>	Native	Perennial	Vine	N/A
Total Species	63			
Total Native	54			
Total Introduced	9			
Total Annual	27			
Total Perennial	36			
Trees	6			
Shrubs	0			
Vines	5			
Grasses	9			
Sedges	1			
Rushes	0			
Forbs	42			

Quadrat S6

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Allium drummondii</i>	Native	Perennial	Forb	N/A
<i>Ambrosia psilostachya</i>	Native	Annual	Forb	FAC-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Amphiachyris dracunculoides</i>	Native	Annual	Forb	N/A
<i>Anemone berlandieri</i>	Native	Perennial	Forb	N/A
<i>Asclepias stenophylla</i>	Native	Perennial	Forb	N/A
<i>Asclepias viridis</i>	Native	Perennial	Forb	N/A
<i>Bothriochloa laguroides</i>	Native	Perennial	Grass	N/A
<i>Bouteloua curtipendula</i>	Native	Perennial	Grass	N/A
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carduus nutans</i>	Introduced	Annual	Forb	N/A
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Centaurium texense</i>	Native	Annual	Forb	N/A
<i>Cirsium texanum</i>	Native	Perennial	Forb	N/A
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Crataegus spathulata</i>	Native	Perennial	Tree	FAC+
<i>Croton monanthogynus</i>	Native	Annual	Forb	N/A
<i>Croton texensis</i>	Native	Annual	Forb	N/A
<i>Delphinium carolinianum</i>	Native	Perennial	Forb	N/A
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus canadensis</i>	Native	Perennial	Grass	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Erigeron strigosus</i>	Native	Annual	Forb	FAC-
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A

<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Lindheimera texana</i>	Native	Annual	Forb	N/A
<i>Mimosa roemeriana</i>	Native	Perennial	Forb	N/A
<i>Monarda citriodora</i>	Native	Annual	Forb	N/A
<i>Myosotis macrosperma</i>	Native	Annual	Forb	FAC
<i>Nassella leucotricha</i>	Native	Perennial	Grass	N/A
<i>Opuntia phaeacantha</i>	Native	Perennial	Forb	N/A
<i>Oxalis stricta</i>	Native	Perennial	Forb	FACU
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Pascopyrum smithii</i>	Native	Perennial	Grass	FAC-
<i>Plantago rhodosperma</i>	Native	Annual	Forb	FACU
<i>Polytaenia nuttallii</i>	Native	Perennial	Forb	N/A
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Prunus angustifolia</i>	Native	Perennial	Shrub	N/A
<i>Pyrrhopappus pauciflorus</i>	Native	Annual	Forb	N/A
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Solanum dimidiatum</i>	Native	Perennial	Forb	N/A
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Sonchus asper</i>	Introduced	Annual	Forb	FAC-
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Urochloa fuscata</i>	Native	Annual	Grass	FAC-
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC-**
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
Total Species	58			
Total Native	52			
Total Introduced	6			
Total Annual	30			
Total Perennial	28			
Trees	5			
Shrubs	1			
Vines	0			
Grasses	10			
Sedges	0			
Rushes	0			
Forbs	42			

Quadrat S7

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Allium canadense</i>	Native	Perennial	Forb	FACU-
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carex arkansana</i>	Native	Perennial	Sedge	N/A
<i>Carex crus-corvi</i>	Native	Perennial	Sedge	OBL
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC

<i>Crataegus spathulata</i>	Native	Perennial	Tree	FAC+
<i>Desmanthus leptolobus</i>	Native	Perennial	Forb	N/A
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Eleocharis parvula</i>	Native	Perennial	Sedge	OBL
<i>Elymus canadensis</i>	Native	Perennial	Grass	FAC+
<i>Eryngium leavenworthii</i>	Native	Annual	Forb	N/A
<i>Euphorbia bicolor</i>	Native	Annual	Forb	N/A
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Hordeum pusillum</i>	Native	Annual	Grass	FACU
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Juncus dudleyi</i>	Native	Perennial	Rush	N/A
<i>Juncus torreyi</i>	Native	Perennial	Rush	FACW
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Myosurus minimus</i>	Native	Annual	Forb	FACW+
<i>Oenothera speciosa</i>	Native	Perennial	Forb	N/A
<i>Packera tampicana</i>	Native	Annual	Forb	FACW**
<i>Phalaris caroliniana</i>	Native	Annual	Grass	FACW
<i>Polygonum amphibium</i>	Native	Perennial	Forb	OBL
<i>Polypogon monspeliensis</i>	Introduced	Annual	Grass	FACW+
<i>Prosopis glandulosa</i>	Native	Perennial	Tree	N/A
<i>Rubus aboriginum</i>	Native	Perennial	Shrub	N/A
<i>Scandix pecten-veneris</i>	Introduced	Annual	Forb	N/A
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Sporobolus compositus</i>	Native	Perennial	Grass	N/A
<i>Symphyotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Symphyotrichum ericoides</i>	Native	Perennial	Forb	FACU-
<i>Teucrium canadense</i>	Native	Perennial	Forb	FACW-
<i>Torilis arvensis</i>	Introduced	Annual	Forb	N/A
<i>Tridens albescens</i>	Native	Perennial	Grass	FAC-
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Valerianella radiata</i>	Native	Annual	Forb	FAC**
<i>Veronica peregrina</i>	Native	Annual	Forb	OBL
<i>Vicia sativa</i>	Introduced	Annual	Forb	FAC
<hr/>				
Total Species	41			
Total Native	36			
Total Introduced	5			
Total Annual	18			
Total Perennial	23			
Trees	6			
Shrubs	1			
Vines	0			
Grasses	7			
Sedges	4			
Rushes	2			
Forbs	22			

Quadrat S8

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Agalinis fasciculata</i>	Native	Annual	Forb	FAC
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Bromus arvensis</i>	Introduced	Annual	Grass	FACU

<i>Cardamine hirsuta</i>	Introduced	Annual	Forb	FAC
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carex cherokeensis</i>	Native	Perennial	Sedge	FACW-
<i>Carex crus-corvi</i>	Native	Perennial	Sedge	OBL
<i>Carex leavenworthii</i>	Native	Perennial	Sedge	N/A
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Conyza canadensis</i>	Native	Annual	Forb	UPL
<i>Crataegus spathulata</i>	Native	Perennial	Tree	FAC+
<i>Cuscuta pentagona</i>	Native	Perennial	Forb	N/A
<i>Dracopis amplexicaulis</i>	Native	Annual	Forb	FAC+
<i>Elymus virginicus</i>	Native	Perennial	Grass	FAC
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Galium aparine</i>	Native	Annual	Forb	FAC-
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Lythrum alatum</i>	Native	Perennial	Forb	OBL
<i>Phalaris caroliniana</i>	Native	Annual	Grass	FACW
<i>Physalis mollis</i>	Native	Perennial	Forb	N/A
<i>Rumex crispus</i>	Introduced	Perennial	Forb	FACW
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Symphotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Teucrium canadense</i>	Native	Perennial	Forb	FACW-
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Tridens albescens</i>	Native	Perennial	Grass	FAC-
<i>Triodanis perfoliata</i>	Native	Annual	Forb	FAC
<i>Ulmus alata</i>	Native	Perennial	Tree	FACU
<i>Ulmus americana</i>	Native	Perennial	Tree	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC
<i>Veronica peregrina</i>	Native	Annual	Forb	OBL
Total Species	32			
Total Native	29			
Total Introduced	3			
Total Annual	14			
Total Perennial	18			
Trees	6			
Shrubs	0			
Vines	1			
Grasses	4			
Sedges	3			
Rushes	0			
Forbs	18			

Quadrat W1

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Azolla caroliniana</i>	Native	Annual	Other	OBL
<i>Carex crus-corvi</i>	Native	Perennial	Sedge	OBL
<i>Ceratophyllum demersum</i>	Native	Perennial	Forb	OBL
<i>Chara</i> sp.			Other	
<i>Echinodorus berteroi</i>	Native	Perennial	Forb	OBL
<i>Eleocharis palustris</i>	Native	Perennial	Sedge	OBL
<i>Hydrocotyle umbellata</i>	Native	Perennial	Forb	OBL
<i>Lemna obscura</i>	Native	Perennial	Forb	OBL
<i>Mikania scandens</i>	Native	Perennial	Vine	FACW+

<i>Nelumbo lutea</i>	Native	Perennial	Forb	OBL
<i>Pluchea odorata</i>	Native	Annual	Forb	OBL**
<i>Ranunculus abortivus</i>	Native	Perennial	Forb	FAC+
<i>Salvinia molesta</i>	Introduced	Annual	Other	OBL**
<i>Schoenoplectus tabernaemontana</i>	Native	Perennial	Sedge	OBL
<i>Spirodela polyrrhiza</i>	Native	Perennial	Forb	OBL
<i>Typha domingensis</i>	Native	Perennial	Forb	OBL
<i>Wolffia columbiana</i>	Native	Perennial	Forb	OBL
<i>Zannichellia palustris</i>	Native	Perennial	Forb	OBL
Total Species	19			
Total Native	17			
Total Introduced	1			
Total Annual	3			
Total Perennial	15			
Trees	0			
Shrubs	0			
Vines	1			
Grasses	0			
Sedges	3			
Rushes	0			
Forbs	12			
Other	3			

Quadrat W2

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Azolla caroliniana</i>	Native	Annual	Other	OBL
<i>Bidens frondosa</i>	Native	Perennial	Forb	FACW
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carex crus-corvi</i>	Native	Perennial	Sedge	OBL
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Chara</i> sp.			Other	
<i>Crataegus spathulata</i>	Native	Perennial	Tree	FAC+
<i>Echinodorus berteroi</i>	Native	Perennial	Forb	OBL
<i>Eclipta prostrata</i>	Native	Annual	Forb	FACW
<i>Eleocharis parvula</i>	Native	Perennial	Sedge	OBL
<i>Fraxinus pennsylvanica</i>	Native	Perennial	Tree	FACW-
<i>Geum canadense</i>	Native	Perennial	Forb	FAC
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Lemna obscura</i>	Native	Perennial	Forb	OBL
<i>Ludwigia peploides</i>	Native	Perennial	Forb	OBL
<i>Mikania scandens</i>	Native	Perennial	Vine	FACW+
<i>Nitella</i> sp.			Other	
<i>Opuntia phaeacantha</i>	Native	Perennial	Forb	N/A
<i>Phyla nodiflora</i>	Native	Perennial	Forb	FACW
<i>Physalis longifolia</i>	Native	Perennial	Forb	N/A
<i>Pluchea odorata</i>	Native	Annual	Forb	OBL**
<i>Polygonum amphibium</i>	Native	Perennial	Forb	OBL
<i>Sideroxylon lanuginosum</i>	Native	Perennial	Tree	FACU
<i>Sorghum halepense</i>	Introduced	Perennial	Grass	FACU
<i>Spirodela polyrrhiza</i>	Native	Perennial	Forb	OBL
<i>Toxicodendron radicans</i>	Native	Perennial	Vine	FAC
<i>Ulmus crassifolia</i>	Native	Perennial	Tree	FAC

Total Species	28
Total Native	25
Total Introduced	1
Total Annual	6
Total Perennial	20
Trees	5
Shrubs	0
Vines	2
Grasses	1
Sedges	2
Rushes	0
Forbs	15

Quadrat W3

Species	Origin	Habit	Functional Group	Wetland Indicator Status
<i>Ambrosia trifida</i>	Native	Annual	Forb	FAC
<i>Azolla caroliniana</i>	Native	Annual	Other	OBL
<i>Cardiospermum halicacabum</i>	Native	Annual	Forb	FAC
<i>Carex cherokeensis</i>	Native	Perennial	Sedge	FACW-
<i>Carex crus-corvi</i>	Native	Perennial	Sedge	OBL
<i>Celtis laevigata</i>	Native	Perennial	Tree	FAC
<i>Forestiera acuminata</i>	Native	Perennial	Shrub	OBL
<i>Gleditsia triacanthos</i>	Native	Perennial	Tree	FAC
<i>Helianthus annuus</i>	Native	Annual	Forb	FAC
<i>Iva annua</i>	Native	Annual	Forb	FAC
<i>Justicia americana</i>	Native	Perennial	Forb	OBL
<i>Mikania scandens</i>	Native	Perennial	Vine	FACW+
<i>Salix nigra</i>	Native	Perennial	Tree	FACW+
<i>Solidago petiolaris</i>	Native	Perennial	Forb	N/A
<i>Symphotrichum divaricatum</i>	Native	Annual	Forb	N/A
<i>Teucrium canadense</i>	Native	Perennial	Forb	FACW-
Total Species	16			
Total Native	16			
Total Introduced	0			
Total Annual	6			
Total Perennial	10			
Trees	3			
Shrubs	1			
Vines	1			
Grasses	0			
Sedges	2			
Rushes	0			
Forbs	8			

An ** by the wetland indicator status indicates that the federal wetland status was used, as no status has been assigned for Region 6

LITERATURE CITED

- Allred, B. W. 1949. Distribution and control of several woody plants in Texas and Oklahoma. *Journal of Range Management* 2:17-29
- Anonymous. No date. Daubenmire method. Retrieved 11/10/99.
http://fire.r9.fws.gov/ifcc/monitor/Daubenmire_method.htm
- Ansley, R. J. and G. A. Rasmussen. 2005. Managing native invasive Juniper species using fire. *Weed Technology* 19:517-522
- Arend, J.A. 1950. Influence of fire and soil in distribution of eastern red cedar in the Ozarks. 48:129-130
- Atwood, W. W. 1940. The physiographic provinces of North America. Ginn and Company, Boston, MA. 536 pp.
- Axelrod, D. I. 1985. Rise of the Grassland Biome, Central North America. *Botanical Review* 51(2):163-201.
- Bailey, J. K., J. A. Schweitzer, and T. G. Whitham. 2001. Salt cedar negatively affects biodiversity of aquatic macroinvertebrates. *Wetlands*. 21(3):442-447
- Bailey, R. G. 1998. *Ecoregions*. Springer-Verlag, New York, NY. 176 pp.
- Baker, W. L. 1992. Effects of settlement and fire suppression on landscape structure. *Ecology* 73(5):1879-1887
- Barbour, M. G. and W. Billings. 1988. *North American Terrestrial Vegetation*. Cambridge University Press, New York, NY. 434 pp.
- Barbour, M.G., J. H. Burke, W. D. Pitts, F. S. Gilliam, and M. W. Schwartz. 1999. *Terrestrial Plant Ecology*. The Benjamin/Cummings Publishing Company, Inc., Menlo Park, CA.
- Barko, J. W., D. G. Hardin, and M. S. Matthews. 1982. Growth and morphology of submersed freshwater macrophytes in relation to light and temperature. *Canadian Journal of Botany* 60:877-887
- Barry, D., M. Forbes, and K. Dickson. 2001. Lewisville Lake Environmental Learning Area Natural Resource Management Plan. <http://www.ias.unt.edu/llela/>
- Barry, D. and A. J. Kroll. 1999. A phytosociological description of a remnant bottomland hardwood forest in Denton County, Texas. *Texas Journal of Science* 51(4):309-316.

Batcher, M. S. 2000a. Element Stewardship Abstract for *Melia azedarach*. The Nature Conservancy, Arlington, VA

Batcher, M. S. 2000b. Element Stewardship Abstract for *Ligustrum* spp. The Nature Conservancy, Arlington, VA.

Beck, K. G. 1999. Biennial Thistles. Pp 145-153. In: Sheley, R. L. and J. K. Petroff (eds). *Biology and Management of Noxious Rangeland Weeds*. Oregon State University Press, Corvallis, OR 438 pp.

Beitinger, T. J. 2006. University of North Texas. Personal communication.

Berger, J. J. 1993. Ecological restoration and non-indigenous plant species: a review. *Restoration Ecology* 1:74-82

Biondi, E., E. Feoli, and V. Zuccarello. 2004. Modelling environmental responses of plant associations: a review of some critical concepts in vegetation study. *Critical Reviews in Plant Sciences* 23(2):149-156

Branson, F. A. 1985. Vegetation changes on western rangelands. Range Monograph Number 2. Society for Range Management, Denver, CO. 75 pp.

Buckallew, R. R. and G. M. Caddell. 2003. Vascular flora of the University of Central Oklahoma Selman Living Laboratory, Woodward County, Oklahoma. *Proceedings of the Oklahoma Academy of Sciences* 83:31-45.

Carpenter, A. T. 1998. Element Stewardship Abstract for *Tamarix ramosissima* Ledebour, *Tamarix pentandra* Pallas, *Tamarix chinensis* Loureiro, and *Tamarix parviflora* DeCandolle. The Nature Conservancy, Arlington, VA.

Carpenter, J. R. 1940. The grassland biome. *Ecological Monographs* 10:617-684

Carter, V. and N. B. Rybicki. 1985. The effects of grazers and light penetration on the survival of transplants of *Vallisneria americana* Michx in the tidal Potomac River, Maryland. *Aquatic Botany* 23:197-213

Chambers, P. A., John Mark Hanson, Janice M. Burke, and Ellie E. Prepas. 1990. The impact of the crayfish *Orconectes virilis* on aquatic macrophytes. *Freshwater Biology* 24:81-91.

Chiarucci, A., J. B. Wilson, B. J. Anderson, and V. DeDominicis. 1999. Cover versus biomass as an estimate of species abundance: does it make a difference to the conclusions? *Journal of Vegetation Science* 10:35-42.

Collins, O.B., F. E. Smeins, and D. H. Riskind. 1975. Plant communities of the Blackland Prairie of Texas. Pp 75-88 In: Wali, M. K. (ed) 1975. *Prairie: A Multiple View*, The University of North Dakota Press, Grand Forks, ND. 367 pp.

Converse, C. K. 1983. Element Stewardship Abstract for *Juniperus virginiana*. The Nature Conservancy, Arlington, VA

Cook, C. W. and R. Hurst. 1963. A quantitative measure of plant association on ranges in good and poor condition. *Journal of Range Management* 15:266-273

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. United States Department of the Interior, Fish and Wildlife Service. Washington, D.C. 45 pp.

Crins, W. J. 1989. The Tamaricaceae in the southeastern United States. *Journal of the Arnold Arboretum*. 70:403-425.

Dahl, T.E. and C. E. Johnson. 1991. Status and Trends of Wetlands in the Conterminous United States, Mid-1970s to Mid-1980s. United States Department of the Interior, Fish and Wildlife Service, Washington, D.C.

DeLoach, C. J., P. A. Lewis, J. C. Herr, R. I. Carruthers, J. L. Tracy and J. Johnson. 2003. Host specificity of the leaf beetle, *Diorhabda elongata deserticola* (Coleoptera: Chrysomelidae) from Asia, a biological control agent for saltcedars (*Tamarix*: Tamaricaceae) in the western United States. *Biological Control* 27:117-147

Diamond, D. D. and F. E. Smeins. 1985. Composition, classification, and species response patterns of remnant tallgrass prairies in Texas. *American Midland Naturalist*, 29:321-334

Dice, L. R. 1943. The Biotic Provinces of North America. Ann Arbor Press, Ann Arbor, MI. 78 pp

Diggs, G. M. Jr., B. L. Lipscomb, and R. J. O'Kennon. 1999. Shinner's & Mahler's Illustrated Flora of North Central Texas. Botanical Research Institute of Texas, Fort Worth, TX. 1626 pp.

DiTomaso, J. M. 1998. Impact, biology, and ecology of saltcedar (*Tamarix* spp.) in the southwestern United States. *Weed Technology* 12:326-336

Dobson, A. P, A. D. B. Bradshaw, and A. J. M. Baker. 1997. Hopes for the future: restoration ecology and conservation biology. *Science* 277:515-522

Duncan, K. W. 1994. Saltcedar: establishment, effects and management. *Wetland Journal* 6(3):10-13

Duncan, K. W. and K. C. McDaniel. 1998. Saltcedar (*Tamarix* spp.) management with Imazapyr. *Weed Technology* 12:337-344

- Dyksterhuis, E. J. 1948. The vegetation of the western cross timbers. *Ecological Monographs* 18(3):325-376
- Eckhardt, N. 1987a. Element Stewardship Abstract for *Melilotus officinalis*. The Nature Conservancy Arlington, VA
- Eckhardt, N. 1987b. Element Stewardship Abstract for *Daucus carota*. The Nature Conservancy, Arlington, VA
- Everitt, B. L. 1998. Chronology of the spread of Tamarisk in the central Rio Grande. *Wetlands* 18(4):658-668
- Ewel, K. C. 1990. Multiple Demands on Wetlands. *BioScience* 40(9):660-666.
- Federal Geographic Data Committee. 1997. Vegetation Classification Standard. United States Geological Survey, Reston, VA FGDC-ST-005.
- Federal Interagency Committee for Wetland Delineation. 1989. Federal Manual for Identifying and Delineating Jurisdictional Wetlands. U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S. D.A. Soil Conservation Service, Washington, D.C. Cooperative Technical Publication. 76 pp plus appendices.
- Foreman, C. T. 1947. The Cross Timbers. University of Oklahoma Press, Muskogee, OK. 123 pp
- Fralish, J. S. and S. B. Franklin. 2002. Taxonomy and Ecology of Woody Plants in North American Forests (Excluding Mexico and Subtropical Florida). John Wiley & Sons, Inc. New York, NY. 611 pp.
- Friederici, P. 1995. The alien saltcedar. *American Forests* 101(1/2):44-47
- Gibson, D. J. 1989. Effects of animal disturbance on tallgrass prairie vegetation. *The American Midland Naturalist* 121:144-154.
- Goodall, D. W. 1969. A procedure for recognition of uncommon species combinations in sets of vegetation samples. *Plant Ecology* 18:19-35.
- Gotelli, N. J. and A. M. Ellison. 2004. A Primer of Ecological Statistics. Sinauer Associates, Sunderland, MA. 510 pp.
- Great Plains Flora Association. 1986. Flora of the Great Plains. University Press of Kansas, Lawrence, KS. 1402 pp.
- Gurevitch, J, S. M. Scheiner, and G. A. Fox. 2002. The Ecology of Plants. Sinauer Associates, Inc., Sunderland, MA

Hahs, A., N. J. Enright, and I. Thomas. 1999. Plant communities, species richness and their environmental correlates in the sandy heaths of Little Desert National Park, Victoria. *Australian Journal of Ecology* 24:249-257.

Handbook of Texas Online, s.v. 2006.

<http://www.tsha.utexas.edu/handbook/online/articles/LL/rolac.html> (accessed November 20, 2006)

Heidel, B. 1987. Element Stewardship Abstract for *Carduus nutans*. The Nature Conservancy, Arlington, VA

Hobbs, R. J. and L. F. Huenneke. 1992. Disturbance, diversity and invasion: implications for conservation. *Conservation Biology* 6(3):324-337

Hodges, J. D. 1997. Development and ecology of bottomland hardwood sites. *Forest Ecology and Management*. 90:117-125.

Horton, J.S., F. C. Mounts, and J. M. Kraft. 1960. Seed germination and seedling establishment of Phreatophyte species. US Department of Agriculture, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO

Howard, S. W., A. E. Dirar, J. O. Evans, and F. D. Provenza. 1983. The use of herbicides and/or fire to control saltcedar (*Tamarix*). *Proceedings of the Western Society of Weed Science* 36:65-72.

Huston, M. and T. Smith. 1987. Plant succession: life history and competition. *The American Naturalist* 130(2):168-198

Kintzios, S., M. Mardikis, K. Passadeos and G. Economou. 1999. *In vitro* expression of variation of glyphosate tolerance in *Sorghum halepense*. *Weed Research* 39:49-55.

Kline, V. M. 1986. Response of sweet clover (*Melilotus alba* Desr.) and associated prairie vegetation to seven experimental burning and mowing treatments.

Kucera, C. L., John H. Ehrenreich, and Carl Brown. 1963. Some effects of fire on tree species in Missouri prairie. *Iowa State Journal of Science* 38(3):179-185

Launchbaugh, J. L. 1972. Effect of fire on shortgrass and mixed prairie species. *Proc. Tall Timbers Fire Ecology Conference* 12:129-151

Lodge, D. M. 1991. Herbivory on Freshwater Macrophytes. *Aquatic Botany* 31:195-224.

Mitsch, W. J. and J. G. Gosselink. 2000. *Wetlands*. John Wiley, New York, NY.

- Mitsch, W. J. and R. F. Wilson. 1996. Improving the success of wetland creation and restoration with know-how, time and self-design. *Ecological Applications* 6(1):77-83.
- Mitsch, W. J., X. Wu, R. W. Nairn, P. E. Weihe, N. Wang, R. Deal and C. E. Boucher. 1998. Creating and restoring wetlands. *BioScience* 48(12):1019-1030.
- Mueller-Dombois, D. and H. Ellenberg. 2002. *Aims and Methods of Vegetation Ecology*. The Blackburn Press, Caldwell, NJ. 547 pp.
- McKinley, T. L., R. K. Roberts, R. M. Hayes, and B. C. English. 1999. Economic comparison of herbicides for Johnsongrass (*Sorghum halepense*) control in glyphosate-tolerant soybean (*Glycine max*). *Weed Technology* 13:30-36
- National Oceanic and Atmospheric Administration. 2006. NCDC: Climate at a Glance. <http://cumv/s.ncdc.noaa.gov/cgi-bin/ca63/hrtdisplay3.pl>
- McNab, W. H. and P. E. Avers. 1994. *Ecological Subregions of the United States: Section Descriptions*. United States Department of Agriculture Forest Service Washington DC.
- Newman, D. 1993. Element Stewardship Abstract for *Sorghum halepense*. The Nature Conservancy, Arlington, VA.
- Odum, E. P. 1969. The strategy of ecosystem development. *Science* 164:262-270.
- Oliver, C. D. and B. C. Larson. 1996. *Forest Stand Dynamics*. John Wiley & Sons, Inc., New York, NY. 520 pp.
- Ott, R. A. Jr. 2005. Influence of Native Macrophytes and Herbivory on Establishment and Growth of *Hydrilla verticillata* in pond-scale mesocosms. Ph.D. Dissertation, Stephen F. Austin State University, Nacogdoches, TX. 138 pp.
- Oyer, E. B., G. A. Gries, and B. J. Rogers. 1959. The seasonal development of Johnson grass plants. *Weeds* 8:13-19
- Packard, S. and C. F. Mutel (eds). 1997. *The Tallgrass Prairie Restoration Handbook for Prairies, Savannas, and Woodlands*. Island Press, Washington, D.C. 463 pp.
- Pearce, C. M. and D. G. Smith. 2003. Saltcedar: distribution, abundance, and dispersal mechanisms, northern Montana, USA. *Wetlands* 23(2):215-228
- Pickett, S. T. A. and M. L. Cadenosso. 2005. Vegetation Dynamics. Pp172-198. In: van der Maarel (ed). *Vegetation Ecology*. Blackwell Publishing, Oxford, England. 395 pp.

Piper, G. L. 1999. St. Johnswort. Pp 372-381. In: Sheley, R. L. and J. K. Petroff (eds). Biology and Management of Noxious Rangeland Weeds. Oregon State University Press, Corvallis, OR 438 pp.

Pitcher, D. 1989. Element Stewardship Abstract for *Xanthium strumarium*. The Nature Conservancy, Arlington, VA.

Quimby, P. C. Jr., C. J. DeLoach, S. A. Wineriter, J. A. Goolsby, R. Sobhian, C. D. Boyette and H. K. Abbas. 2003. Biological control of weeds: research by the United States Department of Agriculture – Agricultural Research Service: selected case studies. Pest Management Science 59:671-680.

Ricketts, T. H., Eric Dinerstein, D. M. Olson, C. J. Louks, W. Eichbaum, D. DellaSala, K. Kavanagh, P. Hedao, P. T. Hurley, K. M. Carney, R. Abell, and S. Walters. 1999. Terrestrial Ecoregions of North America: a Conservation Assessment. Island Press, Washington, D.C.

Riskind, D. H. and O. B. Collins. 1975. The Blackland Prairie of Texas: conservation of representative climax remnants. Pp 361-367 Wilcove, D. S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying threats to imperiled species in the United States. BioScience 48(8):607-615

Risser, P.G., E. C. Birney, H. D. Blocker, S. W. May, W. J. Parton, and J. A. Wiens. 1981. The True Prairie Ecosystem. Hutchinson Ross Publishing Company, Stroudsburg, PA. 557 pp.

Rommann, L., W. E. McMurphy, E. Snook, D. Ankle, K. Vaughn, and D. Rollins. 1979. Pasture and Range Judging in Oklahoma. Oklahoma State University, Stillwater, OK. 31 pp.

Shimer, John A. 1972. Field Guide to Landforms in the United States. The Macmillan Company, New York, NY. 272 pp.

Simberloff, D. 1996. Impacts of introduced species in the United States. Consequences 2(2)

Sisneros, D. 1991. Herbicide Analysis: Lower Colorado River Saltcedar Vegetation Management Study. United States Department of the Interior, Bureau of Reclamation, Washington, D.C.

Smart, R. M. and G. O. Dick. 1999. Propagation and Establishment of Aquatic Plants Handbook. Technical Report A-99-4. US Army Corps of Engineers, Engineer Research and Development Center, Washington, D.C.

Smart, R. M., G.O. Dick, and R. D. Doyle. 1998. Techniques for Establishing Native Aquatic Plants. Journal of Aquatic Plant Management. 36:44-49.

- Smart, R. M., G. O. Dick, and J. R. Snow. 2005. Update to the Propagation and Establishment of Aquatic Plants Handbook. ERDC/EL TR-05-4. US Army Corps of Engineers, Engineer Research and Development Center, Washington, D.C.
- Smart, R. M., R. D. Doyle, J. D. Madsen, and G. O. Dick. 1996. Establishing native submersed plant communities for fish habitat. American Fisheries Society Symposium 16:347-356.
- Sousa, W. P. 1984. The role of disturbance in natural communities. Annual Review of Ecology and Systematics. 15:353-391.
- Spence, D. H. N. and J. Chrystal. 1970. Photosynthesis and zonation of freshwater macrophytes. New Phytol. 69:205-215a.
- Sprugel, D. G. 1991. Disturbance, equilibrium, and environmental variability: what is 'natural' vegetation in a changing environment? *Biological Conservation* 58:1-18
- Stahle, D. W. and J. G. Hehr. 1984. Dendroclimatic relationships of post oak across a precipitation gradient in the southcentral United States. Annals of the Association of American Geographers 74(4):561-573
- Stelljes, K. B. and M. Wood. 2000. Foreign agents imported for weed control. Agricultural Research 48(3):4-9
- Stromberg, J. C. 1998. Functional equivalency of saltcedar (*Tamarix chinensis*) and Fremont cottonwood (*Populus fremontii*) along a free-flowing river. Wetlands 18(4):675-686
- Texas Department of Transportation. 2002. Travel Map of Texas.
- Tiner, R.W.1999. Wetland Indicators: A Guide to Wetland Identification, Delineation, Classification, and Mapping. CRC Press, Boca Raton, FL. 392 pp.
- Tiner, R. W. 1996. Practical considerations for wetland identification and boundary delineation. In: Mulamootil, G.I., B. G. Warner, and E. A. McBean (eds), Wetlands: Environmental Gradients, Boundaries, and Buffers, CRC Press, Inc, Boca Raton, FL.
- Tiner, R. W. Jr. 1984. Wetlands of the United States: Current Status and Recent Trends. U.S. Fish and Wildlife Service Newton Corner, MA. 59 pp
- Trager, M. D., G. W.T. Wilson, and D. C. Hartnett. 2004. Concurrent effects of fire regime, grazing and bison wallowing in tallgrass prairie vegetation. American Midland Naturalist 152:237-247

- Turner, B. L., H. Nichols, G. Denny, and O. Doron. 2003. Atlas of the Vascular Plants of Texas. BRIT Press, Ft. Worth, TX. 2 vols, 888 pp.
- Tyrl, R. J., S. C. Barber, P. Buck, W. J. Elisens, J. R. Estes, P. Folley, L. K. Magrath, C. E. S. Taylor, and R. A. Thompson. 2005. Keys and Descriptions for the Vascular Plants of Oklahoma. Flora Oklahoma Inc, Noble, OK. 264 pp.
- United States Department of Agriculture. 1936. Atlas of American Agriculture. United States Government Printing Office, Washington, D.C.
- United States Department of Agriculture, Soil Conservation Service. 1980. Soil Survey of Denton County, TX. US Government Printing Office, Washington, D.C. 160 pp, plus maps
- United States Department of Agriculture, United States Forest Service. 1987. Ecosystem classification handbook. FSH 12/87 R-1. Missoula, MT.
- United States Department of Agriculture and Natural Resources Conservation Service. The PLANTS Database. 6 March 2006. (<http://plants.usda.gov>). Data compiled from various sources by Mark W. Skinner National Plant Data Center, Baton Rouge, LA.
- United States Fish and Wildlife Service. 1989. National wetlands priority conservation plan. United States Department of the Interior, Washington, D.C.
- United States Geological Survey. 2001. USGS – National Wetlands Research Center. United States Department of the Interior, Washington, D.C.
- Voigt, J. W. and J. E. Weaver. 1951. Range condition classes of native Midwestern prairie: an ecological analysis. Ecological Monographs 21(1):39-60.
- Wentz, W. A. 1981. Wetlands value and management. United States Fish and Wildlife Service and United States Environmental Protection Agency, Washington, D.C.
- West, N. E. 1993. Biodiversity of rangelands. Journal of Range Management 46:2-13.
- Wilcove, D. S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying threats to imperiled species in the United States. BioScience 48(8):607-615
- Wilen, B.O. and M.K. Bates. 1995. The US Fish and Wildlife Service's National wetlands inventory project. Vegetatio. 118:153-169.
- Willard, D. E., V.M. Finn, D. A. Levine and J. E. Klarquist. 1990. Creation and restoration of riparian wetlands in the agricultural Midwest. In: J. A. Kusler and M. E. Kentula (eds.), Wetland creation and restoration: the status of the science. Island Press, Washington, D.C.

Winhager, S. 1999. An Assessment of the Use of Seeding, Mowing, and Burning in the Restoration of an Oldfield to Tallgrass Prairie in Lewisville, TX. Ph.D. dissertation, University of North Texas, Denton, TX. 280 pp.

Zar, J. H. 1999. Biostatistical Analysis. Prentice Hall, Upper Saddle River, NJ.

Zavaleta, E. 2000. The economic value of controlling an invasive shrub. *Ambio* 29(8):462-467

Zollinger, R. K. and R. Parker. 1999. Sowthistles. Pp 336-349 In: Sheley, R. L. and J. K. Petroff (eds). *Biology and Management of Noxious Rangeland Weeds*. Oregon State University Press, Corvallis, OR 438 pp.