

# PLANT COMPOSITION IN OAK SAVANNA AND WOODLAND RESTORATION AT PRAIRIE FORK CONSERVATION AREA IN MISSOURI

Nadia E. Navarrete-Tindall, J.W. Van Sambeek, Jamie Coe, and Warren Taylor<sup>1</sup>

**Abstract**—The wooded areas of the Prairie Fork Conservation Area in central Missouri are typical of the oak/hickory forest/prairie transition zone that will require active management to restore pre-settlement, grass dominated savannas and open woodlands to improve habitat for wildlife. We initiated a management program to restore savannas and woodlands by reducing the midstory (understory) canopy and invasive species using prescribed burns, mechanical removal, and herbicide applications. Two years after removal of the midstory and several invasive shrub species, canopy coverage remains over 90 percent; however, reductions in litter and enhanced light penetration into the understory have improved native plant diversity and density. Permanent plots are inventoried annually for reemergence of native species, especially for indicator species of savannas and woodlands. More than 150 native plant species including 27 tree species were identified in fall 2004 and spring 2005. The largest changes in diversity have occurred with the native early-successional woodland forbs, cool-season grasses, and sedges.

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## INTRODUCTION

Post-European settlement land management practices including crop production and grazing, the elimination of fire, and the introduction of invasive species have eliminated or severely degraded many of the pre-settlement plant communities within the prairie and oak savanna/woodland plant communities (Smith 2001, Nigh and Shroeder 2002, Smith 2004). Based on remnants found throughout Missouri, savannas and woodland communities are high in plant diversity with most of their richness present in the ground cover herbaceous layer. For example, in Bennett Spring State Park there are 342 native plants, of which 20 are sedges, 41 grasses, and 243 are forbs (McCarty 1993, Nelson 2005). Other studies show that savannas can provide habitat to more than 40 bird species, 20 mammals, and a large number of insects (Leahy 2000). In 2000, there were reported approximately 9000 acres of remnant high quality savannas and woodlands in Missouri with the potential for 800,000 additional acres with degraded stands that could be restored with special management (Leahy 2000).

Prairie Fork Conservation Area is located in both the Glaciated Plains and the Ozark Border Divisions and has adequate conditions for prairie, savanna, or woodlands management. Characteristically this landscape consisted of upland prairies and savannas transected by wooded draws along drainages and streams. Packard (1997) define savannas as fire-maintained natural communities dominated by grasses and/or sedges and scattered fire-tolerant tree species with a 20 to 30 percent canopy cover. He defines woodlands as fire-maintained communities with grass-dominated understory and tree canopy coverage of 30 to 80 percent. Subsequently, Nelson (2005) divided woodland natural communities into 18 separate communities and savannas into six separate communities. Nelson defines woodlands as plant communities with patchy to dense ground cover with up to 300 hundred plant species observed throughout the growing season. The tree canopy coverage can be between 30 to 100 percent for woodlands and less than 30 percent for savanna.

There is considerable interest in restoring or reconstructing quality savannas and woodlands dominated by native plant species to increase plant diversity and improve wildlife habitat using prescribed burns (Shirley 1994, Packard and Mutel 1997). In Missouri, species richness of savanna and woodland plant communities remnants have been reduced greatly due to the lack of natural fires and the presence of aggressive native and non-native species (Packard and Ross 1997, McCarty 1998). Restorations may require more than

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<sup>1</sup> Nadia E. Navarrete-Tindall, Native Plant Researcher, University of Missouri, Department of Forestry, Columbia, MO 65211-7260; J.W. Van Sambeek, Research Plant Physiologist, USDA Forest Service, North Central Research Station, Columbia, MO 65211-7260; and Jamie Coe, Forester, and Warren Taylor, Forester, Prairie Fork Conservation Area, Williamsburg, MO 63388.

re-introduction of fires. For example, repeated prescribed burning for four years did not affect species richness of the understory in lowland or upland woodlands at Dinsmore Woods State Nature Preserve in Kentucky (Luken and Shea 2000). Abrams (2005) suggests that increases in mesic species such as maples and black cherry in the understory produce leaf litter less flammable than oak litter reducing the intensity and benefits of fire on the ground cover. In some cases, we need to determine the effects of frequent fires on rare plants before implementing restoration activities (Owens and Brown 2005).

Donated in 1997 by Pat and Ted Jones, Prairie Fork Conservation Area was established by the Missouri Department of Conservation to facilitate hands-on conservation, education, and research. This area is representative of many farms situated within the transitional Ozark Border Natural Division (Nigh and Shroeder 2002). The uplands were historically covered by prairie grasses and wildflowers, while the moist stream corridors were dominated by trees and shrubs. The transition between these two ecotypes was eastern hardwoods and savanna. This 450 ha area was farmed including grazing of the woodlands for more than a century until the end of the Civil War. Although various conservation measures were initiated to control soil erosion, the woodlands within the draws and riparian zone were left largely unmanaged following the removal of livestock.

Among other objectives (Missouri Department of Conservation 1998) the current management plan calls for improving wildlife habitat through restoration or rebuilding of native prairie and savanna and grass-dominated woodlands adjacent to the creeks and intermittent streams. The goals are to restore the pre-settlement prairie/savanna ecosystem, increase native plant diversity, and provide suitable habitat for wildlife dependent on high quality savanna and woodlands such as the bell's vireo (*Vireo bellii* Audubon), loggerhead shrike (*Lanius ludovicianus* L.) and ruffed grouse (*Bonasa umbellus* L.) (Gough and others 1998). The objective of this paper is to describe the early changes in plant composition within two savanna and two woodland restorations at the Prairie Fork Conservation Area following reintroduction of fire and other treatments to remove invasive non-native and pre-climax woody species.

## **MATERIALS AND METHODS**

Prairie Fork Conservation Area is located in eastern Callaway County, southwest of Williamsburg, MO. In 2004 we surveyed the overgrown woods populating the uplands and bottomlands for remnant native plant populations. We identified two 1-ha mid-slope areas for savanna restoration and two 1-ha areas adjacent to intermittent creeks for woodland restoration. In this paper we will refer to bottomland-woodland plant communities as woodlands and upland-woodland plant communities as savannas. Corners are delimited with fiberglass poles and GPS located. Each area was divided into six 0.167 ha rectangular plots each divided into three 0.056 ha subplots (north, center, and south). The center of a 0.03 ha circular sampling plot randomly located within each subplot also was marked with a fiberglass pole. Using a 10-factor prism to determine basal area, trees with greater than 12-cm diameter-at-breast height were identified as to species and stem diameter in fall 2004 and spring 2005. Canopy coverage in each cardinal direction around each plot center was determined with a concave densitometer or solar pathfinder in spring 2004 and spring 2005.

Within each tree sampling plot, a 0.003 ha permanent sampling plot was established to inventory understory vegetation less than 12 cm dbh as to species in fall 2004 and spring 2005. Plant taxonomy for the monocots is according to Yatskievych (1999) and for the dicots is according to Steyermark (1965) (see appendix for list of all plants identified by taxa and common name). Circular 0.25 m<sup>2</sup> vegetation or ground cover sample plots were marked 2.5 m east and west of the center of each regeneration plot. One of each pair of vegetation plots was inventoried in fall 2004 and spring 2005 as to plant species and stem number using procedures described by Masters (1997). In addition, plot coverage as to percent of surface as bareground, litter, or vegetation was estimated.

In fall 2003, invasive introduced amur and Morrow's bush honeysuckles and autumn and Russian olive with stems greater than 2.5 cm inside and within 10 m of each plot were cut and stumps treated with 1:1 glyphosate:water solution. These species, especially the bush honeysuckles, were most abundant in the

woodland closest to the original homestead. In spring 2004, firebreaks were cut along the perimeter and plots burned to reduce the heavy litter layer and cover of shrubs and brambles. In addition, seedlings of these invasive species were spot sprayed with glyphosate prior to emergence of most native vegetation. In summer 2004 to further open the midstory canopy, many pioneer tree species that included most of the red cedar, green ash, white ash, sugar maple, and honeylocust were also girdled and herbicide-treated. Plots were burned again in spring 2005 and emergent bush honeysuckles were spot sprayed with glyphosate.

Data from 0.03 ha tree sampling plots were used to determine average canopy coverage and individual tree data tallied to determine number of stems and basal area by species. Importance value was calculated as sum of relative frequency, relative density, and relative dominance (Cox 1967, Chester and others 1995). Data from 0.003 ha regeneration plots and 0.25 m<sup>2</sup> vegetation plots were summarized by species for occurrence and number of stems. For these plots, importance values were calculated at the sum of the relative frequency and relative density.

## RESULTS AND DISCUSSION

Twenty-seven native tree species were identified in fall 2004 and spring 2005 (appendix). Based on average importance value, the more prominent tree species in the woodlands were shagbark and mockernut hickories and swamp white oak followed by green ash, shingle and red oak (table 1). For the savanna plots, hickories were also the most abundant followed by green ash, shingle oak, and swamp white oak. Importance value of early successional tree species including red cedar, green and white ash, elms, sugar maple, and honey locust is lower in 2005 than in 2004 due to mechanical removal and girdling to reduce the midstory layer.

Vegetation, litter and bareground coverage changed two years after removing invasive shrubs and conducting prescribed burns in spring 2004 and spring 2005 (table 2). Pre-treatment tree canopy cover was 94 percent in 2003 and has decreased to 91 percent. Vegetation cover was increased in both woodlands and savannas while bareground decreased. Litter increased in woodlands and was reduced in savanna plots. We assume that litter was not reduced in woodlands because litter was too wet and brambles were still occupying parts of the midstory. Abrams (2005) reports that an increase in understory mesic species such as maples and black cherry produces leaf litter less flammable than leaf litter of oak/hickory dominated forest.

More than 150 native plant species were found in the understory and ground cover (table 3). We identified nine introduced plant species in both woodlands and savannas in fall 2004 and spring 2005 (appendix). Only 75 native species were identified within randomly located sampling areas. Some areas have been freed of leaf litter allowing non-competitive ephemerals such as Virginia bluebells, putty root orchid, adder's tongue, and Dutchman's breeches to grow. Seven taxa, including coralweed, white snakeroot, black snakeroot, wild licorice, nodding fescue, white grass, and clumped sedges were present in all plots and were abundant throughout (table 3). Of the more conservative species indicative of woodland and savanna plant communities, we found beak grass, bell flower, green dragon, hog peanut, mayapple, nodding tick-trefoil, Ohio horsemint, putty root and ragged orchids, wild geranium, four-leaf and purple milkweeds, rattlesnake fern, rosy sedge, and starry campion. The identification of these species has helped us determine what kind of plant communities we had in these areas.

Based on the dominant tree species and composition of the herbaceous layer, the restorations at the Prairie Fork Conservation Area are typical of dry-mesic loess/glacial till woodland (Nelson 2005). However, these plots also have characteristics typical of other woodland plant community such as dry-mesic bottomland woodland.

The document *Key to Restoration Options* (Packard and Mutel 1997) and restoration techniques recommended by the Missouri Department of Natural Resources, Missouri Department of Conservation, and USDA Forest Service are being used as tools to help in management decisions. Some of the techniques recommended include physical removal, tree girdling, prescribed burns, herbicide applications,

**Table 1—Importance value<sup>a</sup> for tree species in 2004 and 2005 at Prairie Fork Conservation Area**

Tree taxa	Woodlands		Savannas	
	2004	2005	2004	2005
<i>Carya</i> spp.	97	100	76	57
<i>Quercus bicolor</i>	65	83	25	26
<i>Fraxinus pennsylvanica</i>	28	32	50	44
<i>Q. imbricaria</i>	31	32	52	70
<i>Q. rubra</i>	3	9	14	45
<i>Juniperus virginiana</i>	17	2	32	0
<i>Ulmus americana</i>	14	5	13	3
<i>Q. shumardii</i>	7	9	4	12
<i>Q. macrocarpa</i>	0	11	8	11
<i>F. americana</i>	0	3	0	15
<i>Gleditsia triacanthos</i>	6	0	7	3
<i>Q. marilandica</i>	1	3	6	0
<i>Acer saccharum</i>	10	0	0	0
<i>U. rubra</i>	1	2	0	7
<i>Celtis occidentalis</i>	1	0	4	3
<i>Morus rubra</i>	1	4	1	0
<i>Prunus serotina</i>	5	0	1	2
<i>Platanus occidentalis</i>	3	0	2	1
<i>Cercis canadensis</i>	3	1	2	0
<i>Q. stellata</i>	3	1	0	0
<i>Q. alba</i>	3	1	0	0
<i>Juglans nigra</i>	1	3	0	0
<i>Diospyros virginiana</i>	0	0	1	1
<i>Viburnum prunifolium</i>	0	0	1	0
<i>Ostrya virginiana</i>	0	0	1	0
<i>Carpinus caroliniana</i>	0	0	1	0

<sup>a</sup> Importance value 300 is the sum of relative dominance of trees with d.b.h. 12 cm or larger, relative frequency and relative density. Each value is the average of two savanna or two woodland plots.

**Table 2—Percent ground cover in 2004 and 2005 on savanna and woodland restoration plots at Prairie Fork Conservation Area**

Ground cover	Woodlands		Savannas	
	2004	2005	2004	2005
Vegetation	32	48	21	41
Bareground	47	18	24	21
Litter	21	34	55	38

**Table 3—Understory and ground cover vegetation in 2004 and 2005 with importance value<sup>a</sup> > 1 for savanna and woodland restoration plots at Prairie Fork Conservation Area<sup>b</sup>**

Tree taxa	Savannas		Woodlands		Tree taxa	Savannas		Woodlands	
	2004	2005	2004	2005		2004	2005	2004	2005
<i>Agrimonia parviflora</i>	1	1	2	1	<i>Juniperus virginiana</i>	1	1	2	0
<i>Allium</i> spp.	0	2	0	1	<i>Lactuca</i> spp.	0	1	0	1
<i>Amphicarpa bracteata</i>	8	9	1	4	<i>Leersia virginica</i>	10	22	8	24
<i>Aplectrum hyemale</i>	0	0	0	1	<i>Lonicera mackii</i>	1	1	1	2
<i>Arisaema dracontium</i>	0	0	0	1	<i>Menispermum canadense</i>	0	3	0	0
<i>Aristolochia serpentaria</i>	0	0	3	0	<i>Monarda fistulosa</i>	0	0	0	1
<i>Aster anomalous</i>	0	1	3	3	<i>Oxalis</i> spp.	3	3	2	1
<i>Boehmeria cylindrica</i>	9	5	0	2	<i>Panicum clandestinum</i>	0	3	0	1
<i>Botrychium virginianum</i>	0	0	0	1	<i>Parthenocissus quinquefolia</i>	6	5	3	5
<i>Carex</i> spp.	23	16	17	17	<i>Phlox divaricata</i>	0	1	0	0
<i>Carya</i> spp.	2	1	0	1	<i>Platanthera lacera</i>	0	1	0	0
<i>Celastrus scandens</i>	1	0	0	0	<i>Polygonum scandens</i>	2	0	0	0
<i>Celtis occidentalis</i>	1	0	1	0	<i>Polygonum</i> spp.	3	8	0	1
<i>Cercis canadensis</i>	2	0	0	1	<i>Polygonum virginianum</i>	3	2	0	1
<i>Claytonia virginica</i>	0	1	0	0	<i>Polystichum acrostichoides</i>	1	2	2	1
<i>Coniza canadensis</i>	1	0	0	0	<i>Prunus americana</i>	1	0	0	0
<i>Cornus</i> spp.	0	0	1	0	<i>Prunus serotina</i>	1	1	1	1
<i>Cuscuta gronovii</i>	1	0	0	0	<i>Quercus</i> spp.	1	1	3	1
<i>Daucus carota</i>	0	1	0	0	<i>Ranunculus abortivus</i>	1	1	8	3
<i>Dioscorea villosa</i>	0	1	0	0	<i>Rhus aromatica</i>	2	1	3	2
<i>Elymus canadensis</i>	1	0	0	1	<i>Ribes missouriense</i>	3	2	2	6
<i>Elymus villosus</i>	3	0	5	1	<i>Rosa multiflora</i>	1	1	0	5
<i>Eupatorium altissimum</i>	0	17	8	21	<i>Rubus</i> spp.	3	1	2	0
<i>Eupatorium rugosum</i>	24	6	21	16	<i>Ruellia humilis</i>	2	0	1	3
<i>Festuca arundinaceae</i>	0	0	2	0	<i>Sanicula gregaria</i>	10	16	32	15
<i>Festuca subverticillata</i>	14	10	12	3	<i>Sassafrass albidum</i>	0	0	1	4
<i>Fraxinus pennsylvanica</i>	1	2	2	0	<i>Silphium perfoliatum</i>	1	0	0	0
<i>Galium aparine</i>	11	12	2	3	<i>Solidago</i> spp.	0	0	4	0
<i>Galium circaeans</i>	10	8	26	15	<i>Strophostyles helvola</i>	4	0	2	1
<i>Galium triflorum</i>	2	1	1	1	<i>Symphoricarpos orbiculatus</i>	5	7	14	9
<i>Geranium maculatum</i>	1	0	3	0	<i>Toxicodendron radicans</i>	0	2	0	0
<i>Geum canadense</i>	16	0	0	0	<i>Ulmus</i> spp.	3	0	3	2
<i>Gleditsia triacanthos</i>	0	8	0	8	<i>Verbascum blattaria</i>	0	0	0	1
<i>Glyceria striata</i>	0	1	0	0	<i>Viola pubescens</i>	0	2	0	0
<i>Hackelia virginiana</i>	2	0	0	0	<i>Viola</i> spp.	3	14	4	5
<i>Helianthus hirsutus</i>	0	0	0	4	<i>Vitis</i> spp.	3	1	1	1

<sup>a</sup> Importance value 200 is the sum of relative frequency and relative density of ground cover. Each value is the average of two savanna or two woodland plots.

<sup>b</sup> Only tree seedlings are included in this table.

and reintroduction of extirpated species. To address the later, local seed has been obtained from shrubs, native grasses, and herbaceous plants at Prairie Fork Conservation Area, local savanna and woodland remnants, and roadsides in Callaway and surrounding counties. Herbaceous native vegetation not found during plant surveys and indicative of savanna or woodlands will be reintroduced from seed or seedlings starting in Spring 2006. Planned introductions include native cool season grasses such as river oats and manna grass, legumes such as slender and round-head lespedezas, and woody species such as paw paw, wafer ash, buttonbush, wild plum, native dogwoods and native roses.

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**Appendix—List of native and introduced vegetation<sup>a</sup> observed in savanna and woodland restorations at Prairie Fork Conservation Area**

<b>Taxa</b>	<b>Common name</b>	<b>N/I</b>
<i>Acer rubrum</i> L.	Red Maple	N
<i>Acer saccharum</i> Marshall	Sugar Maple	N
<i>Agrimonia parviflora</i> Ait.	Agrimony	N
<i>Allium cernuum</i> Roth	Nodding Wild Onion	N
<i>Ambrosia bidentata</i> Michx.	Small Ragweed	N
<i>Amphicarpa bracteata</i> (L.) Hook.	American Hog Peanut	N
<i>Apios americana</i> Medic.	Groundnut	N
<i>Aplectrum hyemale</i> (Muhl. Ex. Willd) Torr.	Putty Root Orchid	N
<i>Arisaema dracunculoides</i> (L.) Schott.	False Dragon	N
<i>Aristolochia serpentaria</i> L.	Virginia Snakeroot	N
<i>Asclepias purpurascens</i> L.	Purple Milkweed	N
<i>Asclepias quadrifolia</i> L.	Fourleaf Milkweed	N
<i>Asclepias syriaca</i> L. var. <i>kansana</i> (Vail) Palmer and Steyerl.	Common Milkweed	N
<i>Aster anomalous</i> Engelm.	Woodland Aster	N
<i>Aster pilosus</i> Willd.	White Heath Aster	N
<i>Bidens polylepis</i> Blake	Beggars's Sunflower	N
<i>Blephilia ciliata</i> L. Benth. f. <i>ciliata</i>	Ohio Horsemint	N
<i>Boehmeria cylindrica</i> (L.) Sw.	False Nettle	N
<i>Botrychium virginianum</i> (L.) Sw.	Rattlesnake Fern	N
<i>Bromus pubescens</i> Muhl. Ex Willd.	Canada Brome	N
<i>Campanula Americana</i> L.	Bell Flower	N
<i>Carex gravida</i> L.H. Bailey	Long-Awned Bracted Sedge	N
<i>Carex hirtifolia</i> Mack	Hairy Sedge	N
<i>Carex normalis</i> Mack	Intermediate Sedge	N
<i>Carex rosea</i> Schkuhr ex Willd.	Rosy Sedge	N
<i>Carex shortiana</i> Dewey	Short's Sedge	N
<i>Carpinus caroliniana</i> Walter	Hornbeam	N
<i>Carya ovata</i> (Miller) K. Koch	Shagbark Hickory	N
<i>Carya tomentosa</i> (Poiret) Nutt.	Mockernut Hickory	N
<i>Cassia marilandica</i> L.	Wild Senna	N
<i>Celastrus scandens</i> L.	Bittersweet	N
<i>Celtis occidentalis</i> L.	Hackberry	N
<i>Cephalanthus occidentalis</i> L.	Buttonbush	N
<i>Cercis canadensis</i> L.	Redbud	N
<i>Chamaecrista fasciculata</i> (Michx.) Greene	Partridge Pea	N
<i>Chasmanthium latifolium</i> (Michx.) H.O. Yates	River Oats	N

*continued*



**Appendix—List of native and introduced vegetation<sup>a</sup> observed in savanna and woodland restorations at Prairie Fork Conservation Area (*continued*)**

<b>Taxa</b>	<b>Common name</b>	<b>N/I</b>
<i>Claytonia virginica</i> L.	Spring Beauty	N
<i>Coniza canadensis</i> (L.) Cronq.	Horseweed	N
<i>Cornus</i> L.	Dogwood	N
<i>Cuphea viscosissima</i> Jacq.	Waxweed	N
<i>Cuscuta gronovii</i> Willd. ex J.A. Schultes	Common Dodder	N
<i>Cynoglossum virginianum</i> L.	Wild Comfrey	N
<i>Cystopteris protusa</i> (Weath.) Blasdell	Lowland Fragile Fern	N
<i>Danthonia spicata</i> (L.) Beauv. ex Roem. & Schult	Poverty Grass	N
<i>Daucus carota</i> L.	Wild Carrot	I
<i>Desmodium glutinosum</i> (Muhl.) Wood	Round-Leaf Tick Trefoil	N
<i>Desmodium nudiflorum</i> (L.) DC	Nodding Tick Trefoil	N
<i>Desmodium paniculatum</i> (L.) DC.	Paniculated Tick Trefoil	N
<i>Diarrhena americana</i> P. Beauv.	American Beakgrass	N
<i>Dioscorea villosa</i> L.	Wild Yam	N
<i>Diospyros virginiana</i> L.	Persimmon	N
<i>Elaeagnus augustifolia</i> L.	Russian Olive	I
<i>Eleagnus umbellata</i> Thumb.	Autumn Olive	I
<i>Eleagnus aungustifolia</i> L.	Russian Olive	I
<i>Elymus canadensis</i> L.	Canadian Wild Rye	N
<i>Elymus hystrix</i> L.	Bottlebrush	N
<i>Elymus riparius</i> Wiegand	Streambank Wild Rye	N
<i>Elymus villosus</i> Muhl.	Downy Wild Rye	N
<i>Erechtites hieracifolia</i> (L.) Raf.	Fireweed	N
<i>Euonymus atropurpureus</i> Jacq.	Wahoo	N
<i>Eupatorium altissimum</i> L.	Tall Boneset	N
<i>Eupatorium rugosum</i> Houtt.	White Snakeroot	N
<i>Eupatorium serotinum</i> Michx.	Late Boneset	N
<i>Festuca arundinacea</i> Shreb.	Tall Fescue	I
<i>Festuca pratensis</i> Huds.	Meadow Fescue	I
<i>Festuca subverticillata</i> (Pers.) E. B. Alexeev	Nodding Fescue	N
<i>Fraxinus pennsylvanica</i> Marshall	Green Ash	N
<i>Galactea volubilis</i> L.	Milk Pea	N
<i>Galium aparine</i> L.	Cleavers	N
<i>Galium circaezans</i> Michx.	Wild Licorice	N
<i>Galium triflorum</i> Michx.	Fragrant Bedstraw	N
<i>Geranium maculatum</i> L.	Wild Geranium	N

*continued*

**Appendix—List of native and introduced vegetation<sup>a</sup> observed in savanna and woodland restorations at Prairie Fork Conservation Area (*continued*)**

<b>Taxa</b>	<b>Common name</b>	<b>N/I</b>
<i>Geum canadense</i> Jacq.	White Avens	N
<i>Gleditsia triacanthos</i> L.	Honey Locust	N
<i>Glyceria striata</i> (Lam.) Hitchc.	Fowl Manna Grass	N
<i>Hackelia virginiana</i> (L.) I. M. Johnston	Beggar's Lice	N
<i>Hammamelis vernalis</i> Sarg.	Ozark Witchhazel	N
<i>Helianthus hirsutus</i> Raf.	Bristly Sunflower	N
<i>Hypericum sphaulatum</i> (Spach) Steud.	Shrubby St. John's-wort	N
<i>Impatiens capensis</i> Meerb.	Spotted Touch-Me-Not	N
<i>Impatiens pallida</i> Nutt.	Yellow Flower	N
<i>Juglans nigra</i> L.	Black Walnut	N
<i>Juniperus virginiana</i> L.	Red Cedar	N
<i>Lactuca canadensis</i> L.	Wild Lettuce	N
<i>Lactuca</i> L.	Lettuce Species	N
<i>Leersia virginica</i> Willd.	White Grass	N
<i>Lespedeza cuneata</i> (Dumont)G. Don	Sericea Lespedeza	I
<i>Lespedeza procumbens</i> Michx.	Creeping Lespedeza	N
<i>Lespedeza violacea</i> (L.) Pers.	Bush Clover	N
<i>Lobelia cardinalis</i> L.	Cardinal Flower	N
<i>Lonicera maackii</i> (Rupr.) Maxim.	Amur Honeysuckle	I
<i>Lonicera morrowii</i> Gray	Morrow's Honeysuckle	I
<i>Menispermum canadense</i> L.	Moonseed	N
<i>Mertensia virginica</i> (L.) Pers.	Virginia Bluebells	N
<i>Monarda fistulosa</i> L.	Bee Balm	N
<i>Morus rubra</i> L.	Red Mulberry	N
<i>Muhlenbergia sobolifera</i> (Muhl.) Trin.	Rock Muhly	N
<i>Osmorhiza claytonii</i> (Michx.) Clarke	Sweet Cicely	N
<i>Ostrya virginiana</i> (Miller) K.Koch	Musclewood	N
<i>Oxalis</i> L.	Wood Sorrel	N
<i>Panicum acuminatum</i> Sw.	Panic Grass	N
<i>Panicum clandestinum</i> L.	Deer Tongue Grass	N
<i>Panicum commutatum</i> Schult	Panic Grass	N
<i>Parietaria pensylvanica</i> Muhl.	Mercury	N
<i>Parthenocissus quinquefolia</i> (L.) Planch.	Virginia Creeper	N
<i>Penstemon digitalis</i> Nutt. ex Sims	Beardtongue	N
<i>Phacelia purshii</i> Buckl.	Woodland Phacelia	N
<i>Phlox divaricata</i> L.	Wild Sweet William	N

*continued*

**Appendix—List of native and introduced vegetation<sup>a</sup> observed in savanna and woodland restorations at Prairie Fork Conservation Area (*continued*)**

<b>Taxa</b>	<b>Common name</b>	<b>N/I</b>
<i>Physalis virginiana</i> P. Mill.	Ground Cherry	N
<i>Pilea pumila</i> (L.) Gray	Clearweed	N
<i>Plantago</i> L.	Plantain	N
<i>Platanthera lacera</i> (Michx.) G. Don	Ragged Orchid	N
<i>Platanus occidentalis</i> L.	Sycamore	N
<i>Poa sylvestris</i> A. Gray	Woodland Bluegrass	N
<i>Podophyllum peltatum</i> L.	Mayapple	N
<i>Polygonum scandens</i> L.	False Buckwheat	N
<i>Polygonum punctatum</i> Ell.	Water Smartweed	N
<i>Polygonum virginianum</i> L.	Virginia Knotweed	N
<i>Polystichum acrostichoides</i> (Michx.) Schott	Christmas Fern	N
<i>Prenathes alba</i> L.	White Lettuce	N
<i>Prunus americana</i> Marshall	Wild Plum	N
<i>Prunus serotina</i> Ehrh.	Black Cherry	N
<i>Quercus alba</i> L.	White Oak	N
<i>Quercus bicolor</i> Willd.	Swamp White Oak	N
<i>Quercus imbricaria</i> Michaux	Shingle Oak	N
<i>Quercus macrocarpa</i> Michaux	Bur Oak	N
<i>Quercus marilandica</i> Muenchh.	Black Jack Oak	N
<i>Quercus rubra</i> L.	Northern Red Oak	N
<i>Quercus shumardii</i> Buckley	Shumard Oak	N
<i>Quercus stellata</i> Wangenh.	Post Oak	N
<i>Ranunculus abortivus</i> L.	Short-Leaf Buttercup	N
<i>Rhus aromatica</i> Ait.	Fragrant Sumac	N
<i>Ribes missouriense</i> Nutt.	Gooseberry	N
<i>Rosa multiflora</i> Thunb. ex Murray	Multiflora Rose	I
<i>Rosa setigera</i> Michx.	Wild Rose	N
<i>Rubus flagellaris</i> Willd.	Dewberry	N
<i>Rubus pensilvanicus</i> Poir	Blackberry	N
<i>Ruellia humilis</i> Nutt.	Wild Petunia	N
<i>Sambucus canadensis</i> L.	Elderberry	N
<i>Sanicula gregaria</i> E. Bickn.	Black Snakeroot	N
<i>Sassafras albidum</i> (Nutt) Nees	Sassafras	N
<i>Scrophularia marilandica</i> L.	Figwort	N
<i>Silene stellata</i> (L.) Ait. f.	Starry Campion	N
<i>Silphium perfoliatum</i> L.	Cup Plant	N

*continued*

**Appendix—List of native and introduced vegetation<sup>a</sup> observed in savanna and woodland restorations at Prairie Fork Conservation Area (*continued*)**

<b>Taxa</b>	<b>Common name</b>	<b>N/I</b>
<i>Sisyrinchium campestre</i> E.P. Bicknell	Blue-Eyed Grass	N
<i>Smilax tamnoides</i> L. var. <i>hispida</i> (Muhl.)	Bristly Greenbrier	N
<i>Solanum carolinense</i> L.	Carolina Nightshade	N
<i>Solidago altissima</i> L.	Tall Goldenrod	N
<i>Solidago nemoralis</i> Ait.	Old-Field Goldenrod	N
<i>Strophostyles helvola</i> L. Ell.	Wild Bean	N
<i>Symphoricarpos orbiculatus</i> Moench.	Coralweed	N
<i>Thalictrum</i> L.	Meadow Rue	N
<i>Teucrium canadense</i> L.	Germander	N
<i>Toxicodendron radicans</i> L.	Poison Ivy	N
<i>Tradescantia virginiana</i> L.	Spiderwort	N
<i>Ulmus americana</i> L.	American Elm	N
<i>Ulmus rubra</i> Muhlenb.	Slippery or Red Elm	N
<i>Urtica dioica</i> L. var. <i>procera</i> (Muhl.)Wald.	Stinging Nettle	N
<i>Verbascum blattaria</i> L.	Moth Mullein	N
<i>Verbena hastata</i> L.	Purple Verbena	N
<i>Verbena urticifolia</i> L.	White Verbena	N
<i>Vernonia</i> Schreb.	Ironweed	N
<i>Viburnum prunifolium</i> L.	Blackhaw	N
<i>Viola pubescens</i> Ait.	Yellow Violet	N
<i>Viola</i> L.	Unidentified Violets	N
<i>Viola triloba</i> Schwein.	Three-Lobed Violet	N
<i>Vitis</i> L.	Wild Grapes	N
<i>Woodsia obtusa</i> (Spreng.) Torr.	Cliff Fern	N
<i>Xanthium strumarium</i> L.	Cocklebur	I

N=native; I=introduced.

<sup>a</sup>Plant names according to Yaskievych (1999) and Steyermark (1965).