

THE VEGETATIONAL ANALYSIS OF THE PRAIRIE RESTORATION AREA
AT THE FORT SCOTT NATIONAL HISTORIC SITE, FORT SCOTT, KANSAS

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ABSTRACT

The Fort Scott Historic Site is a restored frontier military fort located in southeast Kansas in the city of Fort Scott. To enhance the 1840's environment, the National Park Service is restoring the eastern and southern perimeter of the park (2.02 hectares) to native prairie vegetation. A vegetational analysis of the prairie restoration area was done in May 1985. Sampling results were compared to a "native prairie" in southwest Missouri. Sixty-six species of forbs and grasses were identified. Downy brome grass (Bromus tectorum) had the highest percent relative frequency. Goat grass (Aegliops cylindrica) ranked highest in percent relative density and percent relative cover, and had the highest importance value (95.4). Results indicated Fort Scott Prairie to be a mixed-grass prairie. Future management suggestions are included.

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INTRODUCTION

The prairie was an important part of pioneer life on the Indian frontier during the 1800's. The National Park Service is reclaiming and restoring 2.02 hectares (approximately 5 acres) of prairie at the Fort Scott National Historic Site in Fort Scott, Kansas. The restoration of this area to native vegetation will greatly enhance the aesthetic and historic qualities of the fort, providing a landscape as it appeared in the 1840's, when Fort Scott was constructed (FIGURE 1).

Areas of undisturbed prairie vegetation are now uncommon. Small tracts of virgin prairie still survive along roadsides, bordering railroads, and unfarmable land. The unique prairie ecosystem has dwindled to 2 percent of the original 250 million acres that once extended across the continental United States. "Among the earth's habitats important to man, grasslands probably, have been more misused than any other" (Allen, 1967). This drastic loss of prairie habitat was due to overgrazing, modern farming techniques, urban sprawl, suppression of fire, and other human activities. The devastating attenuation of prairie plants has also encouraged woody plants and other undesirable vegetation to encroach upon the prairies (MO Conservation Commission, 1980).

FIGURE 1: AERIAL PHOTOGRAPH OF FORT SCOTT
NATIONAL HISTORIC SITE.



The human response to the deterioration of native prairies was to plant strains of exotic grasses where native species once grew. More forage could be produced by growing monocultures of introduced grasses in conjunction with the use of herbicides, pesticides, and fertilizers. But, this increase in the quantity of grass required a substantial investment in manpower, equipment, and chemicals (MO Conservation Commission, 1980). Also, monoculture plant communities tend towards instability.

In the last few decades, there has been an increased interest in prairies from a moderate awareness, to a blossoming consciousness of the historical, aesthetic, and the many valuable uses of prairies (Gustafson, 1978). Although all the components of a virgin prairie cannot be replaced, it is possible to re-establish many prairie species (MO Conservation Commission, 1980).

This report details the vegetational analysis of the prairie restoration area at Fort Scott National Historic Site (Purchase Order No. PX6000-5-0500).

The objectives of this study were:

1. To conduct a vegetational analysis of the Fort Scott Prairie and evaluate it's restoration success to the historic scene of the 1840's.
2. To conduct a vegetational analysis of Little Osage Prairie which could be used as a native tallgrass prairie reference for the evaluation of Fort Scott Prairie.
3. To develop management suggestions for Fort Scott Prairie based on this comparison.

STUDY AREAS

FORT SCOTT PRAIRIE

The Fort Scott National Historic Site is located in southeast Kansas in the center of the city of Fort Scott. The restored prairie is located on the southern and eastern perimeter of the park grounds. Much of the prairie was previously the site of several inhabited dwellings until these were removed in the early 1970's (Wollenhaupt personal communication, 1986).

The prairie was first seeded with native grasses and forbs in the spring of 1979, using a seed drill. (The 1979 seeding species list is not available. A second seeding was done during the spring of 1985, with a seed drill. Bare patches were hand seeded between seed drillings.

The following plant species were seeded in the spring of 1985:

1. Blue Gramma
2. Yellow Indian Grass
3. Little Bluestem
4. Grey-headed Coneflower
5. Upright Coneflower
6. Pitcher Sage
7. Purple Prairie Coneflower
8. Big Bluestem
9. Indian Grass

Current management of the prairie consists of mowing in the spring and fall, hand application of the herbicide "Round-up," to control cool season grasses, and hand removal of woody species (Wollenhaupt personal communication, 1986).

The soil of the Fort Scott Prairie is of the Clareson variety and consists of stoney, silty, clay-loam, with one to four percent slopes (Bell, 1981).

LITTLE OSAGE PRAIRIE

The Little Osage Prairie is an 80 acre tract of "native" prairie located in Vernon County, approximately 2 miles southeast of Nevada, Missouri. The study site was in the upper-middle portion of the northern 1/2 of the southwest 1/4 of Section 34-T35N, R31W in Center Township.

The soil is of the Barco-Barden-Coweta Association, consisting of shallow to deep, gently sloping to strongly sloping, well drained to moderately well drained soils, with a surface layer of fine sandy loam to silt loam. The subsoil is loam to silty clay-loam (Preston, 1977).

The Little Osage Prairie study site is similar in exposure, drainage, and soil type to the Fort Scott Prairie. The Little Osage Prairie represents an example of "native" tallgrass prairie and is compared to the Fort Scott Prairie.

METHODS

Techniques for prairie assessment were based on comparisons with other natural prairies (Harper, 1982). The Quadrat Plot method of sampling was used. In each sample plot, the list-count method (Brower and Zar, 1977) was used to tabulate the species and numbers present. Plots, 25 X 50 cm, were distributed at regular 10 meter intervals along transect lines. Transect lines were spaced at 10 meter intervals, west to east, across the study area. The 25 cm X 50 cm plot size had been determined to yield 85% frequency for the most common species in a previous prairie study in southwest Missouri (Jackson and Bensing, 1982).

A species area curve was utilized to determine if adequate sampling had been done to represent the plant community. Thirty-six plots were sampled from May 20th through May 24, 1985, at the Fort Scott Prairie (FIGURE 2). Thirty-two plots were sampled as examples of "native" prairie from June 11th thru June 18, 1985, at the Little Osage Prairie (FIGURE 3).

The percent relative frequency, percent relative density, and percent relative cover, were calculated for each of the species found. The Coefficient of Community was calculated for both prairies.

The frequency, the percent of sample plots in which a given species occurs, was calculated using the formula:

$$\frac{\text{Number of plots in which species occurs}}{\text{Total number of plots sampled}} \times 100$$

FIGURE 2: ILLUSTRATION SHOWING THE LOCATION OF SAMPLING
TRANSECTS AT FORT SCOTT NATIONAL HISTORIC SITE
PRAIRIE RESTORATION AREAS A AND B (HORIZONTAL
LINES). SHADED AREAS REPRESENT BUILDINGS AND
PARADE GROUNDS.

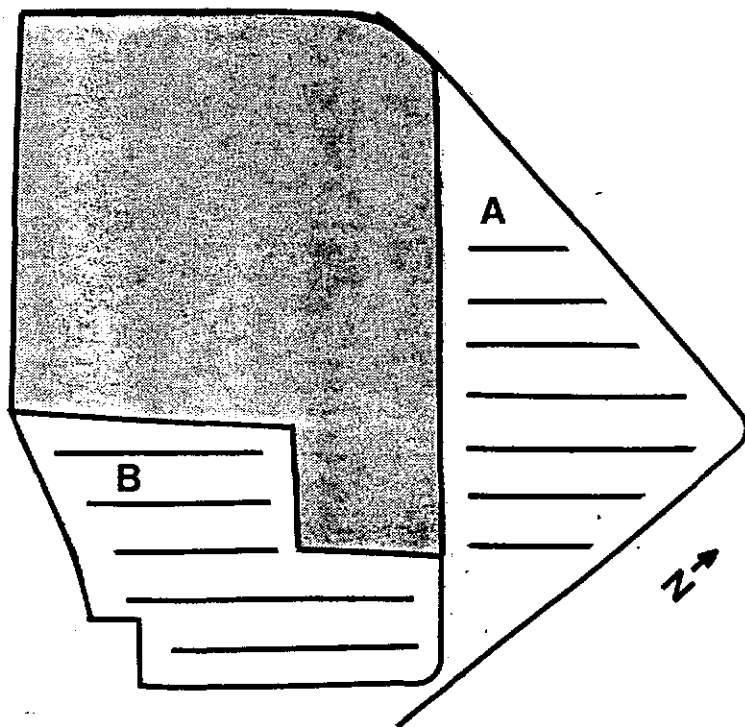
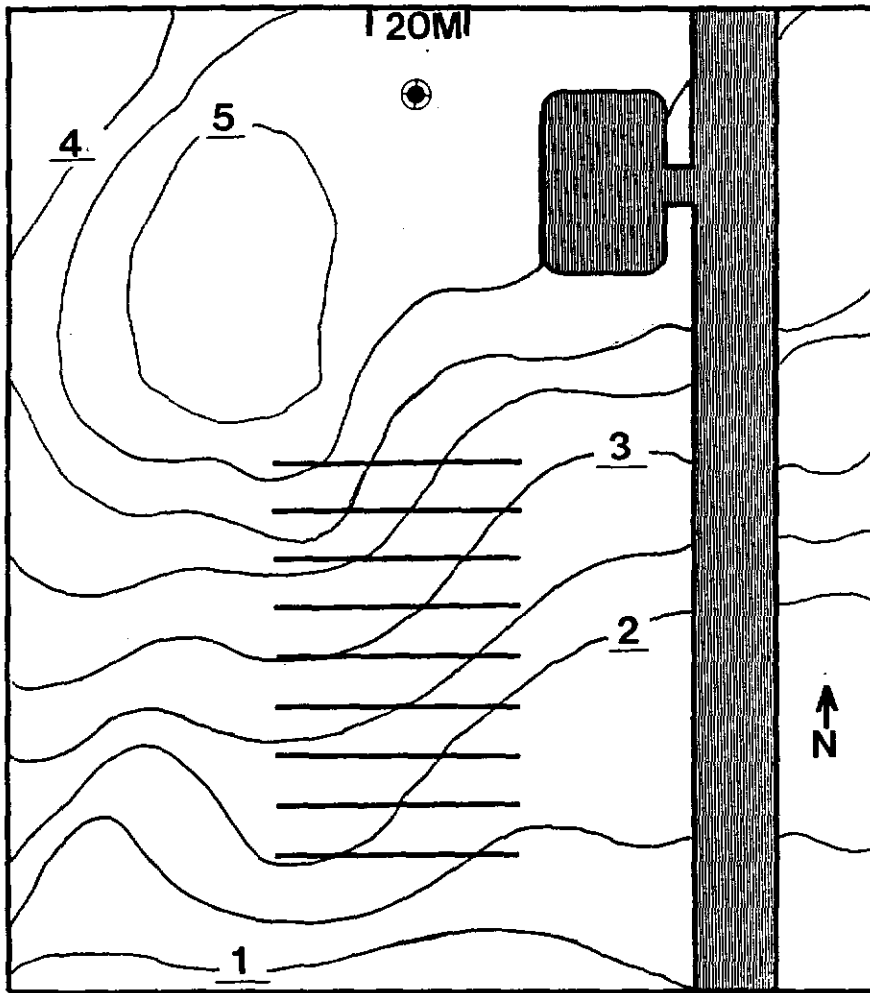


FIGURE 3: ILLUSTRATION SHOWING THE LOCATION OF SAMPLING
TRANSECTS AT LITTLE OSAGE PRAIRIE (HORIZONTAL
LINES). SHADED AREAS REPRESENT THE PARKING LOT
AND ROAD. NUMBERS ARE THE ALTITUDE RANGE IN
METERS.



Relative frequency was found using the species with the highest frequency as 100%, and then calculating the relative frequency values for the other species in relation to this.

Density was calculated using the formula:

$$\frac{\text{Total number of individuals of a particular species}}{\text{Total area sampled}}$$

Relative density was found using the species with the highest density as 100%, and then calculating the relative density values for the other species in relation to this.

Percent cover was calculated using the formula:

$$\frac{\text{Total percent covered by species A}}{\text{Number of plots species A occurred}} \times 100$$

Relative cover was found using the species with the highest percent cover as 100%, and then calculating the relative cover for the other species in relation to this.

Importance values were calculated by adding the relative frequency, relative cover, and relative density for each species, and then dividing by three.

To quantify community similarity between the Fort Scott Prairie and the Little Osage Prairie, the Quotient of Similarity (Brower and Zar, 1977) was calculated using the formula:

Coefficient of Community=

$$\frac{2 X (\text{number of species common to both communities})}{\text{Total species community 1} + \text{total species community 2}}$$

RESULTS

FORT SCOTT PRAIRIE

There were 66 species of forbs and grasses identified at the Fort Scott Prairie (TABLE 1). Downy brome grass (Bromus tectorum) had the highest percent relative frequency, followed by Goat grass (Aegliops cylindrica) (86.3), and then Mouse-ear chickweed (Cerastum vulgatum) (71.3) (TABLE 2). Goat grass ranked highest in percent relative density and percent relative cover. Smooth brome grass (Bromus inermis) had the second highest percent relative cover (91.0), followed by Side oats grama (Bouteloua curtipendula) (90.3). Little barley (Hordium pusillum) had the second highest percent relative density (63.0), followed by Downy brome grass (59.1). Aegliops cylindrica had the highest importance value (95.4), followed by bromus tectorum (66.9), and then Hordium pusillum (63.3).

 TABLE 1: FT. SCOTT PRAIRIE SPECIES LIST

-----SCIENTIFIC NAMES-----	-----COMMON NAMES-----
1. <u>Bromus inermis</u>	Smooth Brome Grass
2. <u>Bromus tectorum</u>	Downy Brome Grass
3. <u>Andropogon scoparius</u>	* Little Bluestem
4. <u>Andropogon gerardi</u>	* Big Bluestem
5. <u>Hordium pusillum</u>	Little Barley
6. <u>Aegilops cylindrica</u>	Goat Grass
7. <u>Sorghastrum nutans</u>	* Indian Grass
8. <u>Panicum virgatum</u>	* Switch Grass
9. <u>Bouteloua curtipendula</u>	Side Oats Grama
10. <u>Buchloe dactyloides</u>	Buffalo Grass
11. <u>Trifolium repens</u>	White Clover
12. <u>Trifolium pratense</u>	Red Clover
13. <u>Melilotus officinalis</u>	Yellow Sweet Clover
14. <u>Trifolium campestre</u>	Large Hopclover
15. <u>Trifolium dubium</u>	Least Hopclover
16. <u>Lactuca scariola</u>	* Wild Lettuc
17. <u>Lactuca canadensis</u>	* Opium Lettuc
18. <u>Plantago aristata</u>	Plantain
19. <u>Plantago virginica</u>	Hairy Plantain
20. <u>Geranium carolinianum</u>	Cranesbill Geranium
21. <u>Cerastium vulgatum</u>	* Mouse-ear Chickweed
22. <u>Gallium aparine</u>	* Bedstraw
23. <u>Veronica arvensis</u>	Veronica (Speedwell)
24. <u>Chaerophyllum procumbens</u>	Wild Chervil
25. <u>Acalpha virginica</u>	* Three Seeded Mercury
26. <u>Specularia perfoliata</u>	Venus's Looking Glass
27. <u>Convolvulus arvensis</u>	Field Bindweed
28. <u>Lespedeza stipulacea</u>	Korean Clover
29. <u>Tragopogon spp.</u>	Goats Beard
30. <u>Erigeron annuus</u>	* Daisy Fleabane
31. <u>Oxalis europaea</u>	* Yellow Wood Sorrel
32. <u>Taraxacum officinale</u>	Dandelion
33. <u>Allium canadense</u>	Wild Garlic
34. <u>Lepidium virginicum</u>	* Pepper Grass
35. <u>Nothoscordum bivalve</u>	False Garlic

* indicates species common to Little Osage Prairie

 TABLE 1: FT. SCOTT PRAIRIE SPECIES LIST (Cont.)

-----SCIENTIFIC NAMES-----	-----COMMON NAMES-----
36. <u>Capsella bursa-pastoris</u>	Shepherd's Purse
37. <u>Lamium purpureum</u>	Dead Nettle
38. <u>Lamium amplexicaule</u>	Henbit
39. <u>Houstonia spp.</u>	Bluets
40. <u>Potentilla recta</u>	* Rough Fruited Cinquifol
41. <u>Erigeron canadensis</u>	* Horseweed
42. <u>Mirabilis nyctaginea</u>	Wild Four-O'clock
43. <u>Phytolacca americana</u>	Polkweed
44. <u>Ratibida pinnata</u>	* Grey-Headed Coneflower
45. <u>Achillea millefolium</u>	* Yarrow
46. <u>Verbascum thapsus</u>	* Flannel Mullein
47. <u>Viola kitaibeliana</u>	* Johnny Jump-ups
48. <u>Rumex crispus</u>	* Curled Dock
49. <u>Claytonia virginica</u>	* Spring Beauty
50. <u>Cassia fasciculata</u>	* Partridge Pea
51. <u>Ambrosia spp.</u>	* Ragweed
52. <u>Carex spp.</u>	* Sedge
53. <u>Croton spp.</u>	* Croton
54. <u>Ornithogalum umbellatum</u>	* Star-of Bethlehem
55. <u>Ranunculus septentrionalis</u>	* Marsh Buttercup
56. <u>Tradescantia spp.</u>	* Spiderwort
57. <u>Linaria vulgaris</u>	* Butter and Eggs
58. <u>Iris spp.</u>	Blue Flag
59. <u>Lathyrus latifolius</u>	Perennial Pea
60. <u>Helianthus grosseserratus</u>	Sawtooth Sunflower
61. <u>Helianthus maximiliani</u>	Maximillian Sunflower
62. <u>Solidago spp.</u>	Goldenrod
63. <u>Erysimum capitatum</u>	Western Wallflower
64. <u>Daucus carota</u>	* Queen Anns'Lace
65. <u>Schrankia uncinata</u>	* Sensitive Brier
66. <u>Rudbeckia triloba</u>	* Brown-eyed Susan

* indicates species common to Little Osage Prairie

TABLE 2: PERCENT RELATIVE FREQUENCY, COVER, DENSITY, AND IMPORTANCE VALUE AT FORT SCOTT PRAIRIE.

PRAIRIE PLANT SPECIES	RELATIVE FREQUENCY %	RELATIVE COVER %	RELATIVE DENSITY %	IMPORTANCE VALUES
<u>Aegliops cylindrica</u>	86.30	100.00	100.00	95.40
<u>Bromus tectorum</u>	100.00	41.70	59.10	66.90
<u>Hordium pusillum</u>	54.50	72.00	63.00	63.30
<u>Panicum virgatum</u>	54.50	77.40	39.50	57.10
<u>Cerastium vulgatum</u>	71.30	46.30	39.00	52.30
<u>Trifolium dubium</u>	68.00	56.30	16.00	46.70
<u>Bouteloua curtipendula</u>	22.60	90.30	15.40	42.70
<u>Andropogon gerardi</u>	22.60	82.60	18.50	41.20
<u>Chaerophyllum procumbens</u>	54.50	50.40	16.00	40.30
<u>Bromus inermis</u>	13.60	91.00	11.30	38.40
<u>Andropogon scoparius</u>	27.20	80.30	22.00	35.80
<u>Trifolium repens</u>	4.40	86.00	8.60	33.00
<u>Melilotus officinalis</u>	36.60	60.90	1.00	32.70
<u>Daucus carota</u>	13.60	54.40	1.40	32.10
<u>Buchloe dactyloides</u>	9.00	76.90	9.90	30.70
<u>Sorghastrum nutans</u>	18.10	64.80	6.20	29.70
<u>Chaerophyllum texanum</u>	4.40	76.00	2.00	27.40
<u>Potentilla recta</u>	4.40	76.90	0.30	27.20
<u>Convolvulus arvensis</u>	36.30	38.60	1.60	25.50
<u>Erigeron annuus</u>	27.20	44.40	1.40	24.30
<u>Lespedeza stipulacea</u>	27.20	32.30	2.10	20.50
<u>Tragopogon spp.</u>	4.40	57.60	0.04	19.30
<u>Lactuca scariola</u>	31.80	20.70	0.60	17.70
<u>Ratibida pinnata</u>	4.40	48.00	0.47	17.60
<u>Carex spp.</u>	4.40	48.00	0.04	17.10
<u>Lactuca canadensis</u>	9.00	40.30	0.09	16.40
<u>Erysimum capitatum</u>	18.00	26.00	0.60	15.00
<u>Capsella Bursa-pastoris</u>	4.40	3.80	1.70	14.80
<u>Galium aparine</u>	27.20	11.10	0.80	13.00
<u>Geranium carolinianum</u>	27.20	10.10	0.34	12.50
<u>Acalpha virginica</u>	31.80	4.00	0.51	12.00
<u>Plantago aristata</u>	13.60	20.30	0.51	11.40
<u>Plantago virginica</u>	9.00	24.00	0.47	11.10
<u>Trifolium pratense</u>	9.00	24.00	0.47	11.10
<u>Schrankia spp.</u>	1.00	21.10	0.72	7.60
<u>Croton spp.</u>	13.60	5.70	0.21	6.50
<u>Veronica arvensis</u>	13.60	3.80	0.01	5.80
<u>Specularia perfoliate</u>	13.60	3.80	0.17	5.80
<u>Oxalis europaea</u>	4.40	11.50	0.04	5.30
<u>Taraxicum officinale</u>	4.40	9.60	0.04	4.60
<u>Cassia fasciculata</u>	1.50	8.80	1.08	3.80
<u>Lepidium virginicum</u>	4.40	5.70	0.04	3.30
<u>Ambrosia artemissiifolia</u>	0.90	3.80	1.08	1.90

LITTLE OSAGE PRAIRIE

There were 93 species of forbs and grasses identified at the Little Osage Prairie (TABLE 3). Little bluestem (Andropogon scoparius) had the highest percent relative frequency, highest percent relative cover, and highest percent relative density (100) (TABLE 4). Rosin weed (Silphium integrifolium) had the second highest percent relative frequency (67.7), followed by Panicum scoparium (57.0). Spotted cowbane (Cicuta maculata) had the second highest percent relative cover (99.0), followed by Turkey Peas (Tephrosia virginiana) (75.0). Sedge (Carex spp.) had the second highest percent relative density (35.0), followed by Sensitive briar (Schrankia uncinata) (26.3). Adropogon scoparius had the highest importance value (100%), followed by Carex spp. (48.07%), then Silphium integrifolium (38.9).

 TABLE 3: LITTLE OSAGE PRAIRIE SPECIES LIST

-----SCIENTIFIC NAMES-----	-----COMMON NAMES-----
1. <u>Andropogon gerardi</u>	* Big Bluestem
2. <u>Andropogon scoparius</u>	* Little Bluestem
3. <u>Panicum virgatum</u>	* Switch Grass
4. <u>Panicum scoparium</u>	
5. <u>Panicum linearifolium</u>	
6. <u>Sorghastrum nutans</u>	* Indian Grass
7. <u>Andropogon virginicus</u>	Broom Sedge
8. <u>Setaria spp.</u>	Foxtail
9. <u>Phleum pratense</u>	Timothy
10. <u>Juncus tenuis</u>	Slender Rush
11. <u>Carex spp.</u>	Sedge
12. <u>Leptolom cognatum</u>	Fall Witch Grass
13. <u>Tephrosia virginiana</u>	Turkey Peas
14. <u>Erigeron annuus</u>	* Daisy Fleabane
15. <u>Ranunculus septentrionalis</u>	* Marsh Buttercup
16. <u>Viola sagitata</u>	Arrow-leaved violet
17. <u>Silphium integrifolium</u>	Rosin weed
18. <u>Eryngium yuccifolium</u>	Rattlesnake Master
19. <u>Antennaria plantaginifolia</u>	Pussy Toes
20. <u>Fragaria virginiana</u>	Wild Strawberry
21. <u>Oxalis europaea</u>	* Yellow Wood Sorrel
22. <u>Oxalis violacea</u>	Purple Wood Sorrel
23. <u>Ambrosia artemissiifolia</u>	* Common Ragweed
24. <u>Pycnanthemum flexuosum</u>	Narrow-leaved Mt. Mint
25. <u>Rudbeckia triloba</u>	* Brown-eyed Susan
26. <u>Psoralea psoralioides</u>	Sampsons Snakeroot
27. <u>Euphorbia corollata</u>	Flowering Spurge
28. <u>Polygala sanguinea</u>	Field Milkwort
29. <u>Schrankia uncinata</u>	* Sensitive Briar
30. <u>Rosa setigera</u>	Prairie Rose
31. <u>Sisyrinchium gramineum</u>	Stout Blue Eyed Grass
32. <u>Hypoxis hirsuta</u>	Yellow Star Grass
33. <u>Echinacea pallida</u>	Pale Purple Coneflower
34. <u>Ratibida pinnata</u>	* Grey-Headed Coneflower
35. <u>Helianthus mollis</u>	Ashy Sunflower

* indicates species common to Fort Scott Prairie

 TABLE 3: LITTLE OSAGE PRAIRIE SPECIES LIST (Cont.)

-----SCIENTIFIC NAMES-----	-----COMMON NAMES-----
36. <u>Helianthus laetiflorus</u>	Prairie Sunflower
37. <u>Helianthus grosseserratus</u>	* Sawtooth Sunflower
38. <u>Helenium flexuosum</u>	Sneeze weed
39. <u>Helenium amarum</u>	Bitterweed
40. <u>Coreopsis grandiflora</u>	Coreopsis
41. <u>Coreopsis palmata</u>	Coreopsis
42. <u>Verbascum thapsus</u>	* Flannel Mullein
43. <u>Pedicularis canadensis</u>	Wood Betony
44. <u>Achillea millefolium</u>	* Yarrow
45. <u>Ruellia humilis</u>	Wild Petunia
46. <u>Lactuca canadensis</u>	* Opium Lettuc
47. <u>Lactuca scariola</u>	* Wild Lettuc
48. <u>Cirsium spp.</u>	Thistle
49. <u>Viola kitaibeliana</u>	* Johnny Jump-ups
50. <u>Phlox pilosa</u>	Wild Sweet William
51. <u>Liatris pycnostachya</u>	Gayfeather
52. <u>Rhus glabra</u>	Smooth Sumac
53. <u>Cerastium vulgatum</u>	* Mouse ear Chickweed
54. <u>Ornithogalum umbellatum</u>	* Star-of-Bethlehem
55. <u>Asclepias verticellata</u>	Whorled Milkweed
56. <u>Asclepias tuberosa</u>	Butterfly Milkweed
57. <u>Verbena canadensis</u>	Rose Verbena
58. <u>Rumex crispus</u>	* Curley Dock
59. <u>Daucus carota</u>	* Queen Anns' Lace
60. <u>Claytonia virginica</u>	* Spring Beauty
61. <u>Amorpha canescens</u>	Lead Plant
62. <u>Dodecatheon media</u>	Shooting Star
63. <u>Baptisia leucophaea</u>	Long Bracted Indego
64. <u>Physostegia virginiana</u>	Obedient Plant
65. <u>Solidago altissima</u>	Tall Goldenrod
66. <u>Solidago graminifolia</u>	Lance leaved Goldenrod
67. <u>Eupatorium sessilifolium</u>	Boneset
68. <u>Erigeron canadensis</u>	* Horseweed
69. <u>Polytaenia nuttallii</u>	Prairie Parsley
70. <u>Cicuta maculata</u>	Spotted Cowbane

* Indicates species common to Fort Scott Prairie

 TABLE 3: LITTLE OSAGE PRAIRIE SPECIES LIST (Cont.)

-----SCIENTIFIC NAMES-----	-----COMMON NAMES-----
71. <u>Potentilla recta</u>	* Rough Fruited Cinquifol
72. <u>Galium aparine</u>	* Bedstraw
73. <u>Viola pedatitida</u>	Prairie Violet
74. <u>Lithospermum spp.</u>	Puccoon
75. <u>Physostegia virginiana</u>	Obedient Plant
76. <u>Tradescantia ohlensis</u>	* Spiderwort
77. <u>Lepidium virginicum</u>	* Pepper Grass
78. <u>Croton capitus</u>	* Goat Weed
79. <u>Acalpha virginica</u>	* 3 Seeded Mercury
80. <u>Ambrosia trifida</u>	Giant Ragweed
81. <u>Rudbeckia hirta</u>	Black-eyed Susan
82. <u>Corydalis aurea</u>	Golden Corydalis
83. <u>Comandra richardsiana</u>	Bastard Toadflax
84. <u>Astragalus spp.</u>	Vetch
85. <u>Ploralea tenuiflora</u>	Scurfy Pea
86. <u>Penstemon digitalis</u>	Beard Tongue
87. <u>Gaura biennis</u>	Butterfly Flower
88. <u>Cassia fasciculata</u>	* Partridge Pea
89. <u>Castilleja coccinea</u>	Indian Paintbrush
90. <u>Plantago lanceolata</u>	Narrow-Leaved Plantain
91. <u>Hieracium longipilum</u>	Hawkweed
92. <u>Solidago nemoralis</u>	Gray/Old-field Goldenrod
93. <u>Solidago rigida</u>	Stiff Goldenrod

* indicates species common to Fort Scott Prairie

TABLE 4: PERCENT RELATIVE FREQUENCY, COVER, DENSITY, AND IMPORTANCE VALUE AT LITTLE OSAGE PRAIRIE.

PRAIRE PLANT SPECIES	RELATIVE FREQUENCY %	RELATIVE COVER %	RELATIVE DENSITY %	IMPORTANCE VALUE
<u>Andropogon scoparius</u>	100.00	100.00	100.00	100.00
<u>Carex spp.</u>	39.20	70.00	35.00	48.07
<u>Silphium integrifolium</u>	67.70	46.60	2.51	38.94
<u>Panicum scoparium</u>	57.00	42.50	8.00	35.84
<u>Cicuta maculata</u>	3.40	99.00	0.02	34.14
<u>Panicum linearifolium</u>	50.00	44.00	6.00	33.33
<u>Daucus carota</u>	34.00	66.00	0.03	33.00
<u>Tephrosia virginiana</u>	7.10	75.00	0.32	27.47
<u>Schrankia uncinata</u>	17.80	30.60	26.30	24.90
<u>Viola sagita</u>	50.00	19.60	1.11	23.57
<u>Andropogon virginicus</u>	21.40	40.00	7.40	22.93
<u>Sorghastrum nutans</u>	14.20	52.00	2.00	22.73
<u>Asclepias tuberosa</u>	6.80	58.00	0.06	21.62
<u>Fragaria spp.</u>	21.30	40.00	0.70	20.67
<u>Cirsium spp.</u>	3.50	58.3	0.03	20.61
<u>Panicum virgatum</u>	7.00	54.00	0.70	20.57
<u>Andropogon gerardi</u>	28.50	26.60	2.00	19.03
<u>Ruella humilis</u>	39.20	16.00	0.64	18.61
<u>Psoralea psoralioides</u>	39.20	14.60	0.61	18.14
<u>Solidago nemoralis</u>	6.80	44.60	0.06	16.95
<u>Coreopsis grandiflora</u>	25.00	24.50	0.63	16.71
<u>Baptisia leucophaea</u>	18.00	31.00	0.15	16.38
<u>Achillea spp.</u>	10.00	37.00	0.18	16.00
<u>Pycnanthemum flexuosum</u>	14.20	30.00	0.38	14.86
<u>Rudbeckia triloba</u>	17.80	24.30	0.22	14.11
<u>Eryngium yuccifolium</u>	7.00	33.00	0.06	13.35
<u>Amorpha canescens</u>	10.20	30.00	0.12	13.00
<u>Echinacea pallida</u>	25.00	13.50	0.23	12.90
<u>Physostegia virginiana</u>	21.70	16.50	0.30	12.83
<u>Liatris pycnostachya</u>	15.00	23.00	0.32	12.77
<u>Lithospermum spp.</u>	17.80	18.60	0.35	12.20
<u>Comandra richardsiana</u>	7.00	29.00	0.41	12.10
<u>Verbascum thapsus</u>	3.40	33.00	0.03	12.00
<u>Rudbeckia hirta</u>	10.20	25.00	0.15	11.78
<u>Solidago altissima</u>	6.80	26.00	0.09	10.96
<u>Coreopsis palmata</u>	18.00	13.00	0.23	10.41
<u>Helenium flexuosum</u>	10.00	20.00	0.12	10.04
<u>Galium aparine</u>	7.00	22.00	0.15	10.00
<u>Euphorbia corollatata</u>	17.80	11.00	0.29	9.70
<u>Leptoloma cognatum</u>	7.10	20.80	0.20	9.37
<u>Ambrosia artemissifolia</u>	14.20	13.70	0.18	9.36

TABLE 4: PERCENT RELATIVE FREQUENCY, COVER, DENSITY, AND IMPORTANCE VALUE AT LITTLE OSAGE PRAIRIE. (Cont.)

PRAIRIE PLANT SPECIES	RELATIVE FREQUENCY %	RELATIVE COVER %	RELATIVE DENSITY %	IMPORTANCE VALUE
<u>Oxalis spp.</u>	7.00	20.80	0.23	9.34
<u>Asclepias verticellata</u>	6.80	21.00	0.12	9.31
<u>Ratibida pinnata</u>	10.00	17.00	0.40	9.00
<u>Verbena canadensis</u>	3.40	25.00	0.03	9.00
<u>Plantago lanceolata</u>	14.20	12.00	0.12	8.77
<u>Rosa setigera</u>	7.10	16.60	0.06	7.90
<u>Helenium amarum</u>	10.00	13.00	0.18	7.73
<u>Sisyrinchium gramineum</u>	3.50	16.60	0.09	6.73
<u>Helianthus grossiserratus</u>	3.50	16.60	0.06	6.72
<u>Hieracium longipilum</u>	3.50	20.00	0.06	6.60
<u>Oxalis europaea</u>	14.20	5.00	0.15	6.45
<u>Hypoxis hirsuta</u>	3.50	13.00	0.03	5.51
<u>Pedicularis canadensis</u>	3.50	13.00	0.03	5.51
<u>Erigeron annuus</u>	10.70	5.00	0.15	5.23
<u>Antennaria plantaginifolia</u>	3.50	8.30	0.03	3.94
<u>Croton spp.</u>	3.50	3.00	0.03	2.10
<u>Polygala sanguinea</u>	3.50	1.60	0.03	1.71
<u>Leptoloma cognatum</u>	7.10	20.80	0.20	0.04

COEFFICIENT OF SIMILARITY

There were 30 prairie species common to both the Fort Scott Prairie and the Little Osage Prairie. The Coefficient of Similarity between the vegetational communities for the Fort Scott "restored" prairie to the Little Osage "native" prairie was 37.3%.

DISCUSSION

The vegetational analysis of the Fort Scott Prairie showed it to be as an example of mixed-grass prairie, typical of western Kansas. The Coefficient of Similarity with the Little Osage Prairie site was a low 37.3%. The Fort Scott Prairie does not represent a native tallgrass prairie. The Fort Scott Prairie has very high populations of Downy brome grass and Smooth brome grass which are management problems. Bromes tend to proliferate and choke out most other prairie species and are indicators of disturbance. Species diversity and species richness for the Fort Scott Prairie are also low.

MANAGEMENT SUGGESTIONS

The adoption of a management plan is dependent on two factors; the specific environment of Fort Scott Prairie, and the Park Service philosophy and mandate for Fort Historic Site. In this case, each factor suggests differing management systems. Two alternative management designs that support each of the opposing factors are presented. It will then be up to the National Park Service to integrate these designs into the overall resource management plan for Fort Scott National Historic Site.

MANAGEMENT PLAN MOST APPROPRIATE TO THIS UNIQUE ENVIRONMENT

- a. All seeding of prairie plants at Fort Scott Prairie should be stopped. The vegetational analysis shows very low germination of the prairie species that were seeded. It is doubtful that Fort Scott Prairie will ever be restored to a tallgrass prairie because of its original seeding scheme, its isolation, and its unique shallow and southern soil exposure. Fort Scott Prairie should be maintained as a mixed-grass prairie through burning, mowing, and the removal of woody species.
- b. Fire is an important requisite in grassland succession and equilibrium as shown in studies from the midwest (Kucera, 1983). If used properly, fire can be a great aid in establishing and perpetuating prairie plants. Burning can reduce litter build-up, arrest woody species establishment, release plant nutrients back into the soil, and help restore and maintain a healthy ecological balance. Many prairie plant species are resistant to fire and are stimulated by burning.
- c. Prairies should be burned every three years to generate vigorous growth of warm-season grasses and keep broad-leaf species controlled (Kuchler, 1972). At Fort Scott, these burns should be in the early spring to inhibit cool season grasses and promote warm season grasses. Spring burning will also minimize erosion.
- d. Mowing should be done each year at the end of the growing season, with a rotary mower. This will shred the vegetation but leave the mulch. One major advantage to mowing is to keep woody invading species in check.

- e. Suppression of invading woody species can be obtained by cutting each plant off even with the ground, and then painting the stump with a brush killer (Kuchler, 1972). The relative small size of the Fort Scott Prairie makes this a feasible management technique for woody species control.

SPECIFIC MANAGEMENT GOALS AND RECOMMENDATIONS FOR PRAIRIE RESTORATION MANAGEMENT UNITS A AND B--APPROPRIATE TO THE HISTORIC MANDATE:

- a. Establish the units as a grassland area with a mesic-tallgrass prairie ecosystem through competition with existing short grass and weedy species.
- b. Establish a high diversity of forbs over the units. Forbs are desirable in this area because it is quite visible to visitor traffic. Fire can be used at specific times of the year to favor either the forbs or the warm-season grasses.
- c. Prescribed burning, conducted just after the cool-season grasses green (mid-April). This will reduce cool-season grass competition, remove organic matter to facilitate reseeding, and stimulate existing warm-season grasses.
- d. Overseeding of native grasses and forbs (using a seed drill) to increase the percentage of native grasses within the stand. A prairie drill may be loaned at no charge, from the Missouri Department of Conservation. (Contact person is Tom Toney in Golden, Missouri).

Seeding Rates:

(Common name nomenclature of plants according to Flora of Missouri, Julian Steyermark (1977), Iowa State University Press). Seeds may be purchased from Chism's Harvest Farm Nursery, Rt 1 Box 154, Webb City, Missouri 64870.

Big Bluestem (native)....	4.5 lbs/ac
Indian grass (native)....	3.5 lbs/ac
Switchgrass (Blackwell)..	0.25 lbs/ac
Little Bluestem (Aldous).	0.25 lbs/ac
Maximillian Sunflower....	7.0 oz/ac
Illinois Bundleflower...	14.0 oz/ac
White Prairie Clover.....	4.0 oz/ac
Rattlesnake Master.....	4.0 oz/ac
Thickspike Gayfeather...	13.0 oz/ac
Yellow Prairie Coneflower	4.0 oz/ac

- e. Greenhouse established prairie forbs should be planted. Bedding plants should be greenhouse started by mid-January. Plants should be transferred from the flats to the soil in mid-April. This propagation should be done the year following an early spring burn. It is suggested that fifty individual plants of each recommended species be planted in areas of low visitor traffic, on moderate slope, throughout units A and B. We have found that the average mortality rate for propagated and hand planted native prairie forb bedding plants is 52% (Unpublished observations at George Washington Carver National Monument). This is still the most successful way to establish these plants due to their poor response from mechanical seeding in the field. It is suggested that a commercial source be contacted to supply the bedding plants. We have had good success with Chism's Harvest Farm Nursery, Rt. 1 Box 154, Webb City, Missouri 64870. They should be contacted in early December to prepare for a spring planting.

The following is a list of prairie forbs that Chism has propagated and planted at George Washington Carver National Monument. This list includes only those plants which have demonstrated significant post-propagation success through one growing season.

(Common name nomenclature of plants according to Flora of Missouri, Julian Steyermark (1977), Iowa State University Press).

black-eyed susan	pale purplecone flower
rattlesnake master	partridge pea
*compass plant	thickspike gayfeather
pitcher sage	purple prairiecone flower
*button blazing star	yellow prairiecone flower
sky blue aster	Illinois bundleflower
*sweet black-eyed susan	*lead plant

*indicates plants with high mortality due to damping off during unusually wet seasons (observations at George Washington Carver National Monument, 1984-1985).

- f. Mowing should be used following an early spring burn or seed planting to control weed growth. The weeds should never be allowed to get taller than the new grass population. We have found that in areas that have experienced an extreme disturbance in the last twenty years, such as this historic site, the stress of burning or planting will stimulate a vigorous growth of common ragweed and giant ragweed. Mowing is a good way to control these annual plants. If many of these noxious weeds still persist, mowing between September tenth and September twenty-fifth will precede fruit set and avoid re-establishment of a major soil seed bank. Mowing can be used as a management tool to promote warm season grasses and inhibit cool season grasses throughout the year.

- g. Mechanical removal of invading woody species should be implemented on a regular basis. Frequent observations should be made throughout the year, checking for woody sprout growth from remaining rootstock. Spot application of wick applied herbicides such as "Roundup," on green tissue, will aid in woody species control.
- h. A vegetational analysis should be conducted two years following implementation of burning, seeding, planting, and mowing in order to evaluate these management practices. Extension service soil analysis should be conducted every two years.
- i. Complete management records detailing the time and kind of management practice should be kept.
- j. The following is a suggested timetable for the implementation of the management techniques outlined in this section.

PRAIRIE MANAGEMENT PROGRAM TIME TABLE

YEAR	MONTH	BURN-MOW-SEED-PULL	WOODY PLANT-	HERBICIDE-VEG ANALYSIS	
1988	APRIL	X	X	X	
	MAY		X		
	JUNE				
	JULY		X		
	AUGUST				
	SEPT		X(if needed)		
	OCT			X	
YEAR	MONTH	PLANT-MOW-RESEED-PULL	WOODY PLANT-	HERBICIDE-VEG ANALYSIS	
1989	APRIL	X			
	MAY		X		
	JUNE				
	JULY		X		
	AUGUST				
	SEPT				
	OCT			X	
YEAR	MONTH	BURN-MOW-RESEED-PULL	WOODY PLANT-	HERBICIDE-VEG ANALYSIS	
1990	APRIL				
	MAY			X	
	JUNE				
	JULY				
	AUGUST				
	SEPT				X
	OCT			X	

CONCLUSIONS

The management practices should be continued to promote the existing vegetation. This is a fine example of a mixed-grass prairie and should be protected. The establishment of a "true" tallgrass prairie is feasible, but due to the limiting physical conditions, restoration to a tallgrass prairie would jeopardize the historic scene by causing a four to five year transition period. This transition period would be characterized by increased growth of undesirable first sere weedy annuals such as common ragweed (Ambrosia artemissifolia) and downy brome. If a tallgrass prairie is the ultimate climax vegetation, it will develop through natural successsion over an extended period of time.

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