

PRAIRIE RESTORATION REPORT OCT. 1998- SEPT. 1999

FORT SCOTT NATIONAL HISTORIC SITE

FORT SCOTT KS

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Prairie restoration is an on going project at Fort Scott National Historic Site (FSNHS) for the past five years. There has been a significant effect on the control of exotic vegetation compared to 1994 but with no exotic control method in 1998 the exotic population has increased since 1997. The increment of the population of native forbs through native prairie sod transplantation in 1995 and the implementation of native forb seeding in 1996 and 1997 (MAP 1). Prairie restoration projects in 1999 includes the control of exotic vegetation, monitoring of the prairie sod transplantation area from 1995, and monitoring and maintaining native forb seeded areas from 1996 and 1997. Other projects were establishing areas and preparing them for native forb seeding in the fall of 1999, and spring of 2000. The formulation of native forb seed mix based on a twelve-year native vegetation study at the Osage Prairie. And completing date on botanical survey of prairie Units A, B1, B2 conducted for percent frequency of all vegetation presents.

PHOTO-DOCUMENTATION

Slide photo-documentation (SPD) is an important tool in prairie restoration at FSNHS. The information collected in SPD indicates the condition of prairie units, success or failure of projects, vital information in identification, and a useful interpretative source. Since 1994, slide photographs have been taken to document development in prairie units, exotic populations, prairie fire, individual native species, native prairie examples, and the restoration projects including: 1995 sod transplantation and native forbs seed planting. The FSNHS Prairie slides volume 1 contains photos of prairie fire burn, prairie unit A, B, and C. The FSNHS Prairie slides volume 2 contains photos of individual native examples, native prairie examples, restoration projects, and exotic species located in Prairie Units.

TARGETED VEGETATION AND REMOVAL

The vegetation targeted for removal in the summer of 1999 includes the same exotic forbs and woody vegetation as the past summers (TABLE 1). These species are targeted because of their invasive or aggressive abilities and that they are not native prairie species, mostly introduced from Eurasia. To control the population growth of exotic and woody vegetation chemical, manual, and mechanical methods were used to remove species.

TARGETED EXOTIC VEGETATION

Sorghum halapense (Johnson Grass), *Melilotus officinalis* (Yellow Sweet Clover), *Securigera varia* (Crown Vetch), and *Rhus radicans* (Poison Ivy) were the major focus of exotic vegetation removal for the summer of 1999. Other species that are secondary importance for targeted vegetation removal include *Ambrosia trifida* (Giant Ragweed), *A. artemissifolia* (Common Ragweed), *Bromus inermis* (Smooth Brome), *B. tectorum* (Downy Brome), and *Campsis radicans* (Trumpet Vine). The remaining exotic species on TABLE 1 were removed because they do not represent the true native prairie species.

The presence of *Sorghum halapense* (Johnson Grass) still has a significant population in all prairies Units (MAP 2). There has been an increase in some population area in all prairie Units due to the lack of a control method in 1998. Unit A still contains Johnson Grass on the NE corner hill behind HS-14 and two large areas by the drain W of the Austrian Pines. *Sorghum halapense* was also located around the electrical transformer W of HS-14 in Unit A. The presence of Johnson Grass was also located W of HS-32 around the security light and a small area 20 yards, into the prairie, W of the same security light. But Johnson Grass has been eliminated in the transplantation area along the prairie trail. The eradication of this exotic from here is due to the digging up and removing the plants and rhizomes of this species. The southwest border and the south corner of Unit B2 still contained a reduced population of

MAP 2: EXOTIC VEGETATION *Sorghum halapense* (JOHNSON GRASS) LOCATION IN 1994, 1997, AND 1999
AT FORT SCOTT NATIONAL HISTORIC SITE.

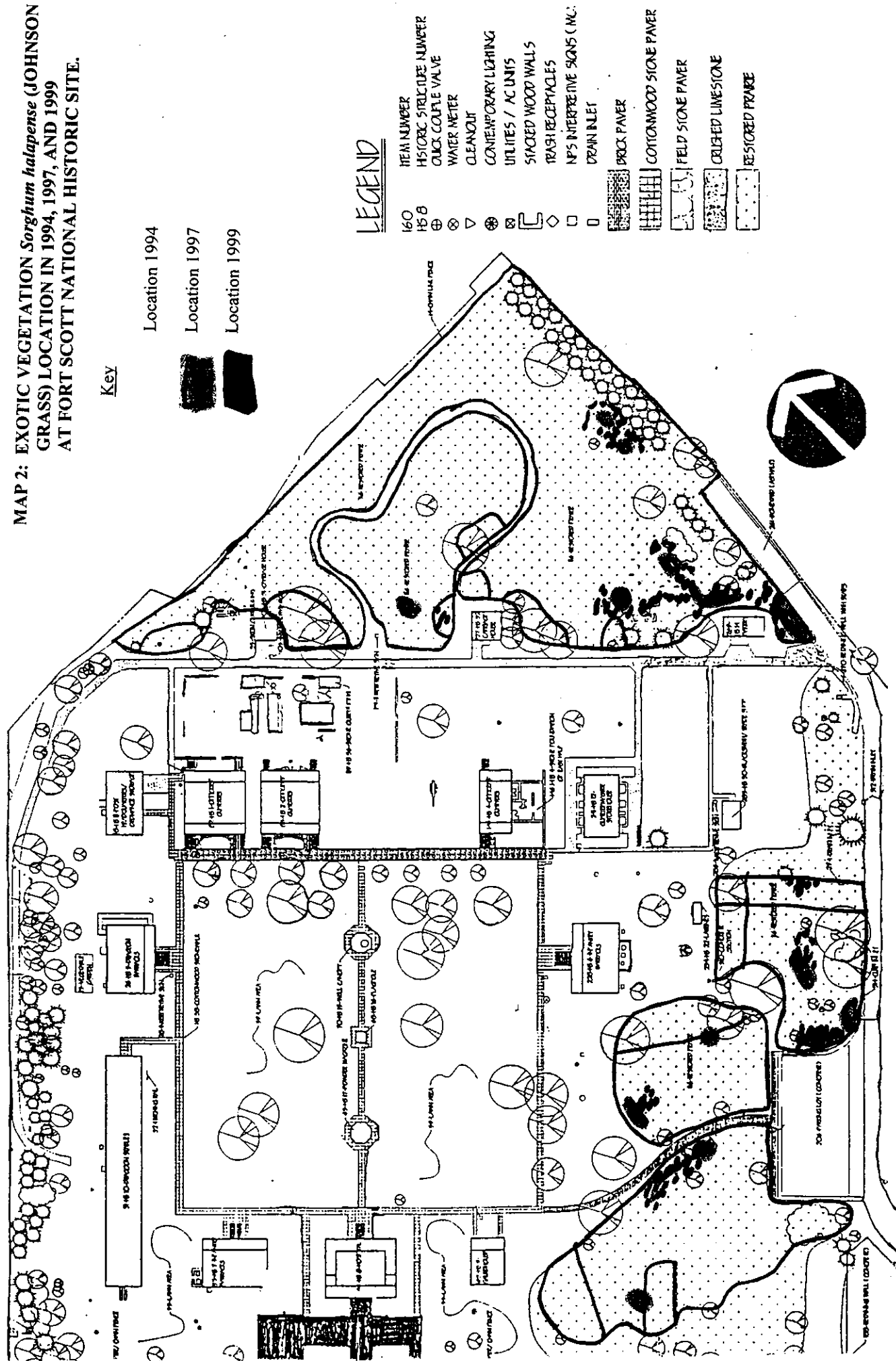


TABLE 1: FORT SCOTT NATIONAL HISTORIC SITE TARGETED VEGETATION FOR REMOVAL IN THE SUMMER OF 1999.		
SCIENTIFIC NAME	COMMON NAME	UNIT LOCATION
Exotic Vegetation		
<i>Ambrosia artemisiifolia</i>	Common Ragweed	A,B,C
<i>Ambrosia trifida</i>	Giant Ragweed	A,B,C
<i>Abutilon theophrasti</i>	Velvetleaf	A
<i>Bromus inermis</i>	Smooth Brome	A,B,C
<i>Bromus tectorum</i>	Downy Brome	A,B,C
<i>Campsis radicans</i>	Trumpet Vine	A,B
<i>Festuca arundunacea</i>	Tall Fescue	A,B,C
<i>Lathyrus latifolius</i>	Sweet Pea	A,B
<i>Melilotus officinalis</i>	Yellow Sweet Clover	A,B,C
<i>Parthenocissus spp.</i>	Virginia Creeper	A,B
<i>Phytolacca americana</i>	Pokeweed	A,B
<i>Rhus radicans</i>	Poison Ivy	A,B,C
<i>Rumex crispus</i>	Curly Dock	A,B,
<i>Securigera varia</i>	Crown Vetch	A,B,C
<i>Sorghum halapense</i>	Johnson Grass	A,B,C
<i>Vitis spp.</i>	Grape	A,B
Woody Vegetation		
<i>Acer negundo</i>	Box Elder	A,C
<i>Alianthus altissima</i>	Tree of Heaven	A,B
<i>Celtis occidentalis</i>	Hackberry	A,B,C
<i>Cercis canadensis</i>	Redbud	B,C
<i>Diospyros virginiana</i>	Persimmon	A
<i>Juglans nigra</i>	Black Walnut	A,B,C
<i>Maclura pomifera</i>	Osage Orange	A,B
<i>Morus alba</i>	White Mulberry	A,B,C
<i>Prunus americana</i>	Wild Plum	A,C
<i>Quercus rubra</i>	Red Oak	C
<i>Robinia pseudo-acacia</i>	Black Locust	A
<i>Ulmus americana</i>	American Elm	A,B,C
<i>Ulmus parvifolia</i>	Chinese Elm	B,C

Sorghum halapense. Unit B2 also contained a population of Johnson Grass in the middle of the Unit under the shade of the Bitternut Hickory (295 on the Cultural Landscape Report, CLR). There was also about a dozen plants around the four water mains on the N side by the Fire Service Road in Unit B2. Unit B1 had a large group of Johnson Grass along the NW side and a few sporadic plants were also found under the American Elm tree on the NE side by the picnic

area (MAP 2). Unit C contained the same areas as 1997 but with a larger population of the exotic species. These areas are located at the west end of the railroad tie fence along the red brick path around the Redbud tree. And the other three groups of Johnson Grass, were located along the red brick path 10 to 20 yards from the N border of Unit C starting at the Sugar Maple (217 CLR). There was a area of Johnson Grass that was located on the S side of Unit C, about 20 yards from the Red Oak (177 CLR) on the border.

Compared to 1994, the presence of *Securigera varia* (Crown Vetch) has continued to be greatly reduced to weak and sparsely populated areas (MAP 3). The reduction of Crown Vetch in Unit C has been reduced to very few plants located E of the Wild Plum thicket under the Red Cedar trees (199.1 & 199.2 CLR) by the RV parking lot. With addition of chemical eradication this area should be eliminated in the next year or so. The Austrian Pines along the NE border of Unit A contained a solid population in 1994 this population has been eliminated to a few plants in the chain link border fence. Four years ago this area had extensive invasion and the exotic species has diminished to immature weak plants. A continued success for the elimination of this exotic is around the Cottonwood tree (225 CLR) this was first noticed in 1997. The last location of Crown Vetch in Unit A is found N between HS-14 and the Wild Plum thicket (257 CLR). The ground cover of this moderate population has been significantly reduced compared to 1994.

Melilotus officinalis (Yellow Sweet Clover) that had been reduced to either sparse singular plants or moderate concentrated populations in all prairie Units have increased in population since 1997 with no control methods for 1998 (MAP 4). The largest population in Unit C was located west of the Wild Plum thicket along the SW slope by the RV parking lot. This population contained both sparse singular plants and a few moderate concentrated populations. The remaining concentrations of the exotic in Unit C were sparse singular or coupled plants found in the shade of trees (213, 214, 180, 177, & 175 CLR). The trees numbered

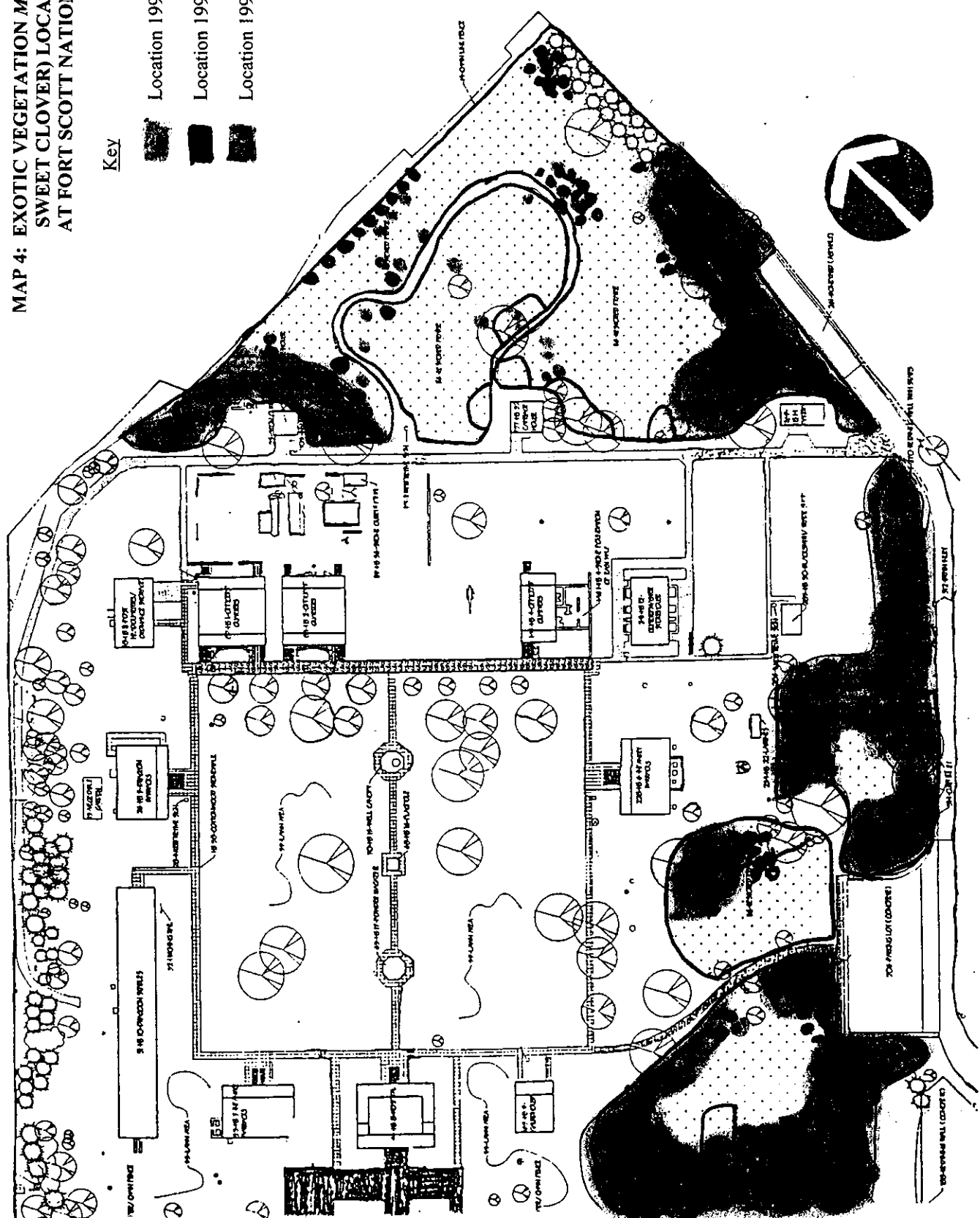
MAP 4: EXOTIC VEGETATION *Melilotus officinalis* (YELLOW SWEET CLOVER) LOCATION IN 1994, 1997, AND 1999 AT FORT SCOTT NATIONAL HISTORIC SITE.

Key

-  Location 1994
-  Location 1997
-  Location 1999

LEGEND

- | | |
|---|-------------------------------|
| 160 | ITEM NUMBER |
| 15.8 | HISORC STRUCTURE NUMBER |
|  | DUCK COUPLE VALVE |
|  | WATER METER |
|  | CLEANOUT |
|  | CONTEMPORARY LIGHTING |
|  | UTILITIES / AC UNITS |
|  | STAGED WOOD WALLS |
|  | TRASH RECEPTACLES |
|  | NPS INTERPRETIVE SIGNS (INC.) |
|  | DRAIN INLET |
|  | BRICK PAVES |
|  | COTTONWOOD STONE PAVES |
|  | FIELD STONE PAVES |
|  | COLORLED LIMESTONE |
|  | RESTORED PAVES |

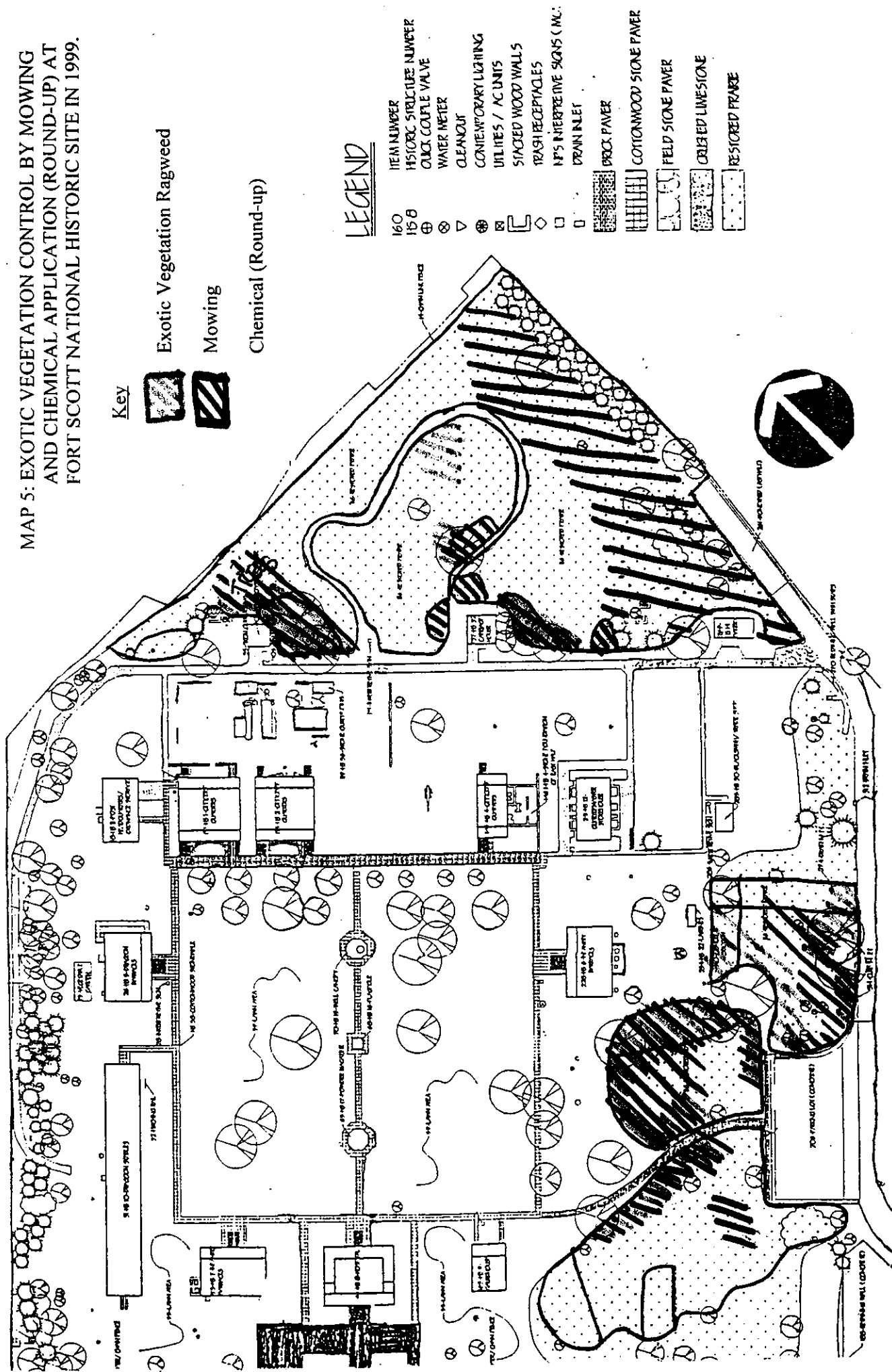


213 and 214 are located on the N side of Unit C along the red brick path with a railroad tie fence. Trees 180, 177, and 175 are located on the S border of Unit C. The Red Oak (177 CLR) has a significant increase in Yellow Sweet Clover population. Unit B1 had a more scattered individual population of Yellow Sweet Clover than last 1997 but less than 1994. These were mostly located within the shade of the Units trees and the fall native seeding areas (MAP 4). This exotic showed up this year do to the disturbance of the ground for native planting in 1996 and 1997 that exposed and causing the germination of the exotic seeds, and due to the lack of an exotic control method in 1998. Unit B1 and B2 also exhibited more scattered individual population on the N and NW sides where native forb seeding had been conducted. The main body of Unit B2 had more plants of Yellow Sweet Clover in the shade of the Bitternut Hickory (295 CLR). Unit A population had a very significant increase in *Melilotus officinalis* population compared to 1997. Scattered groups of Yellow Sweet Clover were located from HS-14 along the boneyard fence to the southern end of the Austrian Pines and out to and around W of the Wild Plum thicket (257 CLR) N of HS-14. A population explosion of the exotic that was not present in 1997 is located E and NE of HS-32 and extend across the prairie trail to the shade of the large American Elm (142 CLR). This population explosion is most likely due to the disturbance of the ground for native planting in 1997 that exposed the exotic seeds causing them to germinate and due to the lack of an exotic control method in 1998. Other locations of Yellow Sweet Clover in Unit A were along the N border fence, W of the Hackberry tree (22 CLR) extending to the Wild Plum thicket by the prairie trail, and NE of HS-31. The population along the northern border fence and NE of HS-31 contained more scattered plants. Both locations by the Wild Plum thickets were moderately established populations of *Melilotus officinalis*.

Ambrosia artemisiifolia (Common Ragweed) and *A. trifida* (Giant Ragweed) were present again this year in all prairie units. The seeds of both species will remain dormant in the ground for many years before germination; therefore eradication efforts are needed each year. The occurrence of Common Ragweed and Giant Ragweed was along the border of the prairie units in sparse to dense populations. The main location of the ragweed species in Unit A was N and E of HS-31 and in the shade of the American Elm (142 CLR) with the predominant species being Giant Ragweed. These areas in Unit A were planted with native forbs in 1997 but with no exotic control in 1998 and the disturbance of the seed bed cause a major population growth in both ragweed species (MAP 5). This area will need to be monitored in the future to control the spread of the exotics. There are other sporadic locations of Common Ragweed and Giant Ragweed throughout the remaining area of Unit A. Unit B1 contained another area that was planted with native forbs in the fall 1996 because, of a very densely populated area of Giant Ragweed, this area is from the Hackberry (307 CLR) by the picnic area to the north corner of the prairie unit. Unit B2 also contained two areas along the NW and NE borders that were planted with native forbs in the fall of 1997 because, of a very densely populated area of Giant Ragweed (MAP 5). The remaining areas in Unit B1 and B2 had a sporadic distribution of both species, but Giant Ragweed was predominant, located throughout the units. And Unit C had both species located sparsely around the Wild Plum thicket by the RV parking lot and a increase of Ragweed species by the Black Walnut trees along the railroad ties on the red brick path.

Poison Ivy (*Rhus radicans*) has been eliminated, reduced or weakened in some areas of the prairie units by repeated mowing during the growing season in 1997 and is in controllable population size. The areas of reduce were in areas of public accessibility. In Unit A Poison Ivy was located on the E side of HS-31 around the base of the Chinese Elm (117 CLR) out to the

MAP 5: EXOTIC VEGETATION CONTROL BY MOWING
AND CHEMICAL APPLICATION (ROUND-UP) AT
FORT SCOTT NATIONAL HISTORIC SITE IN 1999.



American Elm (118 CLR) that was removed in the fall of 1996, and the American Elm (142 CLR) along the prairie trail. This area was planted with native forbs in 1997 but had no exotic control in 1998. The presence of *Rhus radicans* has been eliminated around the Cottonwood NW (255 CLR) of the N corner of the bone yard. In Unit B1 Poison Ivy, has been reduced to a small area around the base of the Hackberry (307 CLR) by the picnic area, due to planting of native forbs in the fall of 1996. An area in Unit B2 where *Rhus radicans* is located but not mowed is along the SE border where the Chinese Elm and Hackberry trees (296 & 299 CLR) are located by the service road. Poison Ivy is still present at the base of the Red Oak tree (177 CLR) on the S border of Unit C.

Units A and B contained distributions of Trumpet Vine, Sweet Pea, Virginia Creeper, Pokeweed, Curly Dock, and *Vitis*. Trumpet vine and Velvetleaf are located around the Austrian Pines and the N border in Unit A, which is in the targeted area for native forb restoration in 1999. Unit B2 also contains a population of Trumpet Vine along the SE border. Sweet Pea (*Lathyrus latifolius*) was found W of HS-14 by the Austrian Pines (251.1 & 251.2 CLR) but was mowed, tilled, planted with native forbs in the fall 1997 but with no exotic control the population returned to pre-1997 growth. The center of Unit B1 contains a well establish population of Sweet Pea. Virginia Creeper and a grape species were located around the two American Elm trees (142 & 143 CLR) in the center of Unit A and behind HS-14. Unit B2 also contained these species along the border behind HS-22 and the N border of Unit B1. Pokeweed and Curly Dock are located in few single sporadic locations in Unit A around HS-31, the N corner on Unit B1, and the N corner of Unit C E of HS-9. All of the prairie units contain a distribution of *Festuca arundinacea* (Tall Fescue), *Bromus tectorum* (Downy Brome), and *B. inermis* (Smooth Brome). The presence of the Brome species is located mainly along the borders of Units A and B. The

Tall Fescue is located throughout Units B1 and B2, but along the borders and in shade of large trees in Unit A. Unit C contains only a few of the three species along the border.

TARGETED WOODY VEGETATION

The removal of woody vegetation was of major importance for the summer of 1999 because of the heavy sprouting of tree saplings that were cut in 1997. Some of the re-growth was significant in size for some species and small in others. Thirteen mature trees that include Tree of Heaven (139 CLR), Black Walnut trees (140 & 141 CLR), Austrian Pines (144.1, 144.2, 144.3, & 144.4 CLR), Cottonwood trees (255 & 256 CLR), White Oak (260 CLR), American Elm (262 CLR), Red Cedar (263 CLR), and Red Mulberry (264 CLR) were removed. These mature trees were located in and around prairie Unit A and were removed to benefit the growth of native prairie species. A complete woody vegetation analysis was performed on each unit before any removal (TABLE 1). The majority of the sprouts were removed and a complete removal of many trees of 3" to 36" in diameter, estimated to be three to ten years old. All woody vegetation was recorded on a working field map based on the Cultural Landscape Report (see 1997 Field Maps folder). The most abundant species on all three Units continue to be Black Walnut (*Juglans nigra*), American Elm (*Ulmus americana*), White Mulberry (*Morus alba*), and Common Hackberry (*Celtis occidentalis*).

Unit A was the main focus for woody removal because of the number of saplings and the fourteen mature trees that needed to be eliminated. Ten of the fourteen mature trees removed in Unit A were in the 1999 targeted area for native forb seeding. The other three trees, Tree of Heaven (139 CLR) and the Black Walnut trees (140 & 141 CLR) were located E of HS-32 along the prairie border. The major species saplings of Unit A are the four most abundant species listed above and the following: Black Locust (*Robinia pseudo-acacia*), Chinese Elm (*Ulmus*

parvifolia), Box Elder (*Acer negundo*), and Persimmon (*Diospyros virginiana*). An observation of the woody infestation of Unit A is that there is species specific population depending on the area of the unit. The Black Locust infestation in the W corner of Unit A behind HS-31, due to the population of mature trees beyond the borderline fence. *Robinia pseudo-acacia* species tend to propagate by underground root suckers in clonal group and with high productivity of the root suckers in full sun, open areas, and in sandy loamy soils. The area behind HS-31 is a Clareson stony silty clay loam that is in full sun with root suckers present (Soil Survey of Bourbon County, Kansas). This area was targeted for removal of the root suckers and a mature tree. A mature Black Locust (no CLR #) and several root suckers were removed. The mature Black Locust tree was most likely one of the mother trees that cause the sucker growth problem. Another species-specific population area in Unit A that was noticed in 1997 still contained many sprouts of Box Elder. This area, from E of HS-31 to the prairie trail, is most likely due to wind blown seeds that have sprouted in the shade of the large American Elm (117 CLR). Persimmon sprouts that were found along the northern border fence come from the fruits of the mature trees that are growing along said fence. The removal of the parent trees and sprouts will help to control the spread of *Diospyros virginiana*. *Morus alba* also had a few scattered plants located in the same area along the northern border fence as *Diospyros virginiana*. Birds are most likely to be the distributor of seeds from the White Mulberry tree behind HS-14 (264 CLR). To the E of HS-32 in the shade of mature three Black Walnut trees and an American Elm (140, 141, 248, and 249 CLR) there is a large species-specific population of Black Walnut (*Juglans nigra*) sprouts. This is due to the three mature *Juglans nigra* with the mass of production walnuts and the aid of the Red Fox Squirrel that plants them in the prairie. The removal of the mature Black Walnut trees (140 & 141 CLR) will eliminate future seedling sprouts. American Elm (*Ulmus*

americana) and Chinese Elm (*Ulmus parvifolia*) are scattered throughout the E side of Unit A due to wind blown seeds from mature trees around the prairie.

Unit B has tree sprout problems of Black Walnut, American Elm, Hackberry, Tree of Heaven, and Chinese Elm in both sub-units B1 and B2. *Juglans nigra* has the most re-growth of sapling sprouts and new growth from seed in Unit B1, most likely due to the burial of nuts by the Red Fox Squirrels in the edge of the prairie. This area of growth is located along the northwestern edge of prairie Unit B1. A couple sprouts of each species of Black Walnut, American Elm, Hackberry, and Chinese Elm were located along the SE edge of Unit B1 closest to the RV parking lot. In Unit B1, Hackberry and Black Walnut saplings were located along the N border behind HS-6 and HS-22. The number of Hackberry sprouts located here is due to the seed dispersal from the mature Hackberry tree on the N corner of Unit B2. The SW border around the picnic area to the S border of the RV parking lot contained many sprouts of Tree of Heaven, Chinese Elm, and Black Walnut. The Tree of Heaven sprouts came from the seed dispersal from mature trees to the E of the service road.

The majority of the sprouts found in Unit C were Black Walnut, American Elm, Mulberry, and Hackberry. Along the N border by the rail fence and brick path a group of Black Walnut and American Elm saplings may be found. And more American Elm saplings were along the eastern hillside by the RV parking lot. Black Walnut sprouts more than likely are from red fox squirrels burying nuts and the elm sprouts from seeds of the mature trees (i.e. 220 CLR). In the eastern middle of Unit C there is Wild Plum sapling growth from root suckers. And the middle of Unit C contained a couple of Hackberry and Mulberry sprouts. Black Walnut, American Elm, and Hackberry sprouts were sporadically located along the W border by HS-9.

EXOTIC VEGETATION REMOVAL

The removal of exotic vegetation was accomplished by manual, chemical, and mechanical methods for the control the of the exotic species population growth. The manual methods used were hand pulling, hand-held clippers, and shoveling to removal root systems. The chemical method used on exotic vegetation was a 7 percent solution of a Glyphosate, commercially name Roundup Ultra. This chemical method was used on all prairie Units targeting Johnson Grass, Fescue, Ragweed, Poison Ivy, Crown Vetch, and Sweet Pea. A sickle bar mower and a Huskavarna mower mulcher were the mechanical methods of exotic vegetation removal. The areas mowed with the Huskavarna mower were for the control of exotic vegetation and to prepare seed bed for native forbs seeding in the fall (MAP 5). The areas mowed with the sickle bar mower were for the control of the growth exotic vegetation in areas targeted for native forb seeding and removal of plant material after chemical application (MAP 5). Species were hand pulled after a rain to remove not only the plant but also the root systems and any seeds that might have been present of the following species: Common Ragweed, Giant Ragweed, Velvetleaf, Yellow Sweet Clover, and Curly Dock. Virginia Creeper, Pokeweed, and Grape species were cut at ground level for removal by the hand-held clippers and stumps applied with chemical solution. The Common Ragweed and Giant Ragweed that were hand pulled were located in close proximity to other species that were also hand pulled. Other areas of Common Ragweed and Giant Ragweed were mowed repeatedly to stunt the growth of the species that were present and to prevent the growth of others. The complete eastern border side of Unit A was sprayed with Roundup Ultra and mowed (MAP 5) for the preparation of a fall 1999 native forb seeding. The exotic species located in that area were Smooth Brome, Downy Brome, Trumpet Vine, Tall Fescue, Crown Vetch, Poison Ivy, Johnson Grass, and Moth Mullein. The sickle bar

mower was used to eradicate Sweet Peas, Trumpet Vine, Virginia Creeper, Poison Ivy, and Grape species.

WOODY VEGETATION REMOVAL

The removal of woody vegetation was accomplished by manual, mechanical, and chemical methods to control the population growth of the woody species. Hand-held clippers were the manual method used and mechanical methods were chain saw and sickle bar mower. The chemical method used on woody vegetation was a 75 percent solution of a Glyphosate, commercially name Roundup Ultra. This chemical solution was applied directly to all freshly cut stumps of the mature trees, saplings, and vines. The spot application of a tree herbicide directly after cutting will help to control the growth of the saplings. All of the saplings and trees in Units A and C were removed with the clippers or chainsaw at ground level then applied with Roundup. Several saplings were removed from Unit B but there were many left. The chainsaw was used for a complete removal of many trees of 3" to 36" in diameter, estimated to be three to ten years old, on Unit A. Chainsaw work was also done on re-sprouted sapling that had grown to big for the hand-held clippers. This area was in Unit A, where there was re-growth in the Black Locust sucker saplings thicket N of HS-31, that was mowed by the sickle bar mower in 1997. This area had been burn in 1997 and 1998 but it had been found that the burning of Black Locust will kill the main stems and unfortunately tends to prolific sprouts. The repeated cutting of Black Locust during the growing season can hinder sprout growth but found to be more successful with follow up treatment of herbicides (Missouri Vegetation Management Manual). The sickle bar mower was used on areas of sprouts in all three prairie Units A, B, and C. The Wild Plum thicket on the SW corner of Unit C was mowed around to reduce and control sucker sapling growth. In the east middle of Unit C there was some sucker sapling growth of Wild Plum that was also mowed with

the sickle bar. The upper hillside of Unit B1 from Crabapple tree (319 CLR) by the red brick trail NE to the Hackberry (307 CLR) W to the prairie border was clear off with the sickle bar. And Unit B2 had some mowing with the sickle bar. This area in Unit B2 was located from the Shagbark Hickory (304 CLR) NE to the Bitternut Hickory (295 CLR) then SE of these trees to the prairie border. The Wild Plum thicket N of HS-14 in Unit A was mowed with the sickle bar to also reduce and control sucker sapling growth (MAP 5).

PRAIRIE SOD TRANSPLANTATION PROJECT

In the summer of 1995, 1.43 acres of native prairie sod was transplanted in Unit A along the prairie trail (MAP 1). The focus of the prairie sod transplantation project for the summer of 1999 was to monitor and survey the success of the prairie species. The transplant section was monitored to identify what species that survived to the forth year, flower and seed production, appearance or disappearance of a species, and to indicate the presence of exotic species.

NATIVE FORBS IN TRANSPLANT AREA

The native forb transplantation project from 1995 at FSNHS had continued success in the forth year growth of the transplanted species (MAP 1, TABLE 2). There were 44 native forb species positively identified in 1999 compared to the known 53 native forbs that were identified in the transplantation area of Unit A in the summer of 1997 (see Prairie Restoration Project Report 1997). The five species with an asterisk (*) by the scientific name were not positively identified in the transplantation area this year. These species are Plains Larkspur, Wild Strawberry, Pale Bearded Tongue, Tube Bearded Tongue, and Obedient Plant. These five native forb species bloom early in the spring and summer, and disappear before species identification was done. There were four native forb species that were not identified in the transplantation area

TABLE 2: NATIVE FORBS FOUND IN PRAIRIE SOD TRANSPLANTATION IN UNIT A IN 1999

SCIENTIFIC NAME	COMMON NAME	COEF
<i>Achillea millefolium</i>	Yarrow	
<i>Allium canadense</i>	Wild Garlic	1
<i>Amorpha canescens</i>	Lead Plant	8
<i>Antennaria neglecta</i>	Field Pussy Toes	4
<i>Arnoglossum plantagineum</i>	Prairie Indian Plantain	
<i>Asclepias tuberosa</i>	Butterfly Milkweed	5
<i>Asclepias viridis</i>	Spider Milkweed	6
<i>Aster ericoides</i>	Heath Aster	4
<i>Aster pilosus</i>	Hairy Aster	0
<i>Aster prealtus</i>	Willow Aster	7
<i>Baptisia australis</i>	Blue Wild Indigo	8
<i>Baptisia bracteata leucophaea</i>	Cream Wild Indigo	6
<i>Callirhoe alcaeoides</i>	Pink Poppy Mallow	5
<i>Delphinium virescens</i> *	Plains Larkspur	6
<i>Desmodium illinoense</i>	Illinois Tick Trefoil	4
<i>Echinacea pallida</i>	Pale Purple Coneflower	7
<i>Erigeron annuus</i>	Annual Fleabane	1
<i>Erigeron strigosus</i>	Daisy Fleabane	3
<i>Erythronium rostratum</i>	Yellow Dog's Tooth Violet	
<i>Euphorbia corollata</i>	Flowering Spurge	3
<i>Euthamia gymnospermoides</i>	Plains Grass-leaved Goldenrod	
<i>Fragaria virginiana</i> *	Wild Strawberry	2
<i>Helianthus mollis</i>	Ashy Sunflower	6
<i>Heliopsis helianthoides</i>	False Sunflower	5
<i>Hieracium longipilum</i>	Long-Bearded Hawkweed	5
<i>Hypoxis hirsuta</i>	Yellow Star Grass	4
<i>Liatris aspera</i>	Rough Blazing Star	6
<i>Linum sulcatum</i>	Grooved Yellow Flax	5
<i>Oxalis violacea</i>	Violet Wood Sorrel	5
<i>Penstemon pallidus</i> *	Pale Bearded Tongue	4
<i>Penstemon tubaeiflorus</i> *	Tube Bearded Tongue	5
<i>Petalostemon candidum</i>	White Prairie Clover	8
<i>Petalostemon purpureum</i>	Purple Prairie Clover	8
<i>Physostegia virginiana</i> *	Obedient Plant	5
<i>Psoralea tenuiflora</i>	Scurfy Pea	8
<i>Pycnanthemum tenuifolium</i>	Slender Mountain Mint	4
<i>Ratibida pinnata</i>	Gray Headed Coneflower	7
<i>Rudbeckia hirta</i>	Black Eyed Susan	1
<i>Ruellia humilis</i>	Hairy Wild Petunia	3
<i>Salvia azurea</i>	Blue Sage	4
<i>Schrankia nuttallii</i>	Cat's Claw Sensitive Briar	6
<i>Silphium integrifolium</i>	Whole Leaf Rosinweed	4
<i>Silphium laciniatum</i>	Compass Plant	6
<i>Solidago missouriensis</i>	Missouri Goldenrod	4
<i>Solidago rigida</i>	Stiff Goldenrod	4

<i>Tradescantia ohiensis</i>	Common Spiderwort	4
<i>Vernonia fasciculata</i>	Common Ironweed	6
<i>Viola pedata</i>	Bird's Foot Violet	5
<i>Viola pedatifida</i>	Prairie Violet	10

* Species not positively identified in 1999.

in 1999 these are, *Liatris squarrosa* (Scaly Blazing Star), *Lithospermum canescens* (Hoary Puccoon), *Plantago aristata* (Bracted Plantain), and *Polytaenia nuttallii* (Prairie Parsley). In 1997 there were less than three plants of each of these four native forb species. Scaly Blazing Star, Hoary Puccoon, Bracted Plantain, and Prairie Parsley were not identified in the transplantation area in 1999. These prairie species many have suffered fire stress from the May 1998 and March 1999 prescribed burn, or were unable to compete with surrounding species, or have possible gone into a dormant root stage. *Lithospermum canescens* (Hoary Puccoon) was found blooming directly before the May 1998 prescribed prairie burn and did not survive the burn. There may have been enough fire stress in May 1998 to kill or hurt the taproot of the Hoary Puccoon. The May 1998 prescribed burn may have caused fire stress on the Scaly Blazing Star and Prairie Parsley since they have early spring growth and bloom. The Bracted Plantain is a small forb species that could have very easily been unable to compete with the taller surrounding species. The following species were found in the transplanted area, Blue Wild Indigo, Creamy Wild Indigo, Cat's Claw Sensitive Bair, Bird's Foot Violet, and Prairie Violet, but did not bloom in 1999. There is one species that is an exotic to true native prairies, *Chrysanthemum leucanthemum* (Ox-Eye Daisy), that has been allowed to grow since it has become naturalized to prairies in the area.

NATIVE GRASSES IN TRANSPLANT AREA

The transplanted sod still contains all fourteen of the grasses identified in 1997 (TABLE 3). The Prairie Cord Grass has increase from about a dozen species present between two populations in 1997, to over 160 species distributed in four populations in 1999. Gama Grass continues to grow and expand, doubling the clump population from four large clumps in 1997 to nine clumps in 1999. The clumps of Gama Grass produced over a dozen spike seed heads per clump. The spike seed heads are 6-10 inches in length with three to four spikes per head and will produce 8-12 large grains per spike. This production of seeds should broadcast grains into the surrounding prairie, resulting in continual growth of the species population. The diameter of the Gama Grass clumps ranged from two feet to six feet wide. The clumps of Big Bluestem, Switch Grass, and Indian Grass flowered and produced seed again this year. Other species that are also doing well are Side-Oats Grama Grass and Scribner's Panic Grass, they are found throughout the transplantation area. There are still two clumps each of June Grass and Little Bluestem.

TABLE 3: KNOWN NATIVE GRASSES LOCATED PRAIRIE SOD
TRANSPLANTATION AREA IN 1999

SCIENTIFIC NAME	COMMON NAME	COEF
<i>Andropogon gerardii</i>	Big Bluestem	5
<i>Andropogon scoparius</i>	Little Bluestem	5
<i>Bromus kalmii</i>	Prairie Brome	
<i>Bouteloua curtipendula</i>	Side-Oats Grama Grass	7
F. Cyperaceae	Sedge	
<i>Elymus canadensis</i>	Canada Wild Rye	5
F. Juncaceae	Rush	
<i>Koeleria macrantha</i>	June Grass	6
<i>Panicum ologosanthos-scribnerianum</i>	Scriber's Panic Grass	3
<i>Panicum virgatum</i>	Switch Grass	4
<i>Sorghastrum nutans</i>	Indian Grass	5
<i>Spartina pectinata</i>	Prairie Cord Grass	5
<i>Sporobolus heterolepis</i>	Prairie Dropseed	6
<i>Tripsacum dactyloides</i>	Gama Grass	5

EXOTICS IN TRANSPLANT AREA

The exotics present in the transplantation area in 1999, are the same five species as the summer of 1997 (TABLE 4). The most aggressive exotic present is the Tall Fescue, followed by Yellow Foxtail. All seed heads were removed from the above species and Deptford Pink and Rough Fruited Cinquefoil to prevent seed dispersal. All exotic species but Tall Fescue were removed by hand pulling. Because *Festuca arundinacea* has root systems it is difficult to remove by hand and a spring burn is helping to eliminate it. The following species were found in 1996 but not found in 1997 or this year are: Queen Anne's Lace (*Daucus carota*), Common St. John's-wort (*Hypericum perforatum*), Sericea Lespedeza (*Lespedeza cuneata*), Heal-All (*Prunella vulgaris*), and Red Clover (*Trifolium pratense*). The eradication of these species is due to the removal of the seedpod, plant, and root systems in early spring before the exotics had gone to seed. There is one species that is an exotic to true native prairies, *Chrysanthemum leucanthemum* (Ox-Eye Daisy), that has been allowed to grow the past summers since it has become naturalized to prairies in the area.

TABLE 4: EXOTICS FOUND IN THE TRANSPLANTATION AREA IN 1999	
SCIENTIFIC NAME	COMMON NAME
<i>Chrysanthemum leucanthemum</i>	Ox-Eye Daisy
<i>Dianthus armeria</i>	Deptford Pink
<i>Festuca arundinacea</i>	Tall Fescue
<i>Potentilla recta</i>	Rough Fruited Cinquefoil
<i>Setari glauca</i>	Yellow Foxtail

INSECTS NOTICED IN AND AROUND TRANPLSNT AREA

The majority of insects were Lepidoptera (Butterflies and Moths), and Odonata (Dragonflies and Damselflies) species observed in and around the prairie units and the grounds of FSNHS. In addition to the Lepidoptera and Odonata species noticed there was also a few

reptiles and small mammals observed in the prairie units and around buildings of FSNHS. The Lepidoptera species were flying back and forth between the flowers in the prairie units and the garden N of HS-1. Some of the most predominant species are the same as 1997. These species are Black Swallowtail (*Papilio polyxenes asterius*), Zebra Swallowtail (*Eurytides marcellus*), Tiger Swallowtail (*Pterourus glaucus glaucus*), Monarch (*Danaus plexippus*), Painted Lady (*Vanessa cardui*), Clouded Sulfur (*Colias philodice philodice*), Pearl Crescent (*Phyciodes tharos tharos*), Hackberry Butterfly (*Asterocampa celtis celtis*), and a variety of Skipper's (F. *Hesperiidae*). Other Lepidoptera species that were not as dominant are Ailanthus Webworm Moth (*Atteva punctella*) Eight-Spotted Forester (*Alypia octomaculata*), Great Leopard Moth (*Epantheria scribonia*), Beautiful Wood-Nymph (*Eudryas grata*), Question Mark (*Polygonia interragationis*), and Plume Moth (F. *Pterophoridae*). The Snowberry Clearwing (*Hernaris diffinis*) was present again this year, busily flying around the Asclepias (Milkweed) in Unit C. The Pea Weevil (*Bruchus pisorus*) was found on the Slender Mountain Mint and Long Horned Beetles (*Tetraopes tetraphthalmus*) were located on Ashy Sunflower, False Sunflower, Gray Headed Coneflower, Black Eyed Susan, and Whole Leaf Rosinweed. The Ashy Sunflower, False Sunflower, and Whole Leaf Rosinweed were also host to the Ambush Bug and a variety of flower spiders. The Orthoptera (Grasshoppers, Katydids, & Crickets) and Hemipteras (Aphids, Leafhoppers, & True Bugs) were abundant again this year. The Odonata species were abundant in the air over the prairie units darting back and forth in search of prey. There were numerous Hymenoptera (Bees & Wasps) were visiting the forbs in search of either sweet nectar or insect prey. There were also a few Ephemeroptera (Mayflies) again this year. By HS-31 in prairie Unit A two species of skinks were observed in the leaves, these were a Broadhead Skink and a Northern Prairie Skink. There were four species of snakes, a Western Ribbon Snake, a Garter Snake, a Black Snake, and a Rough Green Snake were observed in the prairie units. The Black

Snake was a juvenile found behind the boneyard in a pile of tree limbs and leaves. A Screw was discovered in some vegetation to be put in the Dumpster, the little critter was released back into the prairie by the Boneyard. Many rabbits were observed in all prairie units as well as the stray gray cat. A couple of Box Turtles were located in Units A and C. One of the turtles was a Three Toed Box Turtle and the other a Ornate Box Turtle. The UPS deliveryman delivered the Ornate Box Turtle to FSNHS. He found this mature turtle on Wall Street and didn't want the turtle to get run over. The Ornate Box Turtle was released in Unit A.

FALL 1996 NATIVE FORB SEEDING

The forb enhancement goal for FSNHS is to increase the diversity of the native forbs on the prairie. With that in mind, a new project of seeding the prairie units with native forbs was insinuated in the fall of 1996. This project was started in the summer of 1994 and continued in the summer of 1995 with the hand collecting and cleaning of native forb seeds. The native forbs located on the Little Osage Prairie and local native prairies within a 50 mile radius to Fort Scott, were used as a guideline for enhancement of FSNHS prairie. The location of seed producing forbs to collect for the enhancement of the prairie units was limited to the 50 miles radius from Fort Scott. This limit was used to focus on the forb species that are native to the Fort Scott area.

PLANTING AREA

A grand total of 228 square meters of prairie Unit A and Unit B1 at FSNHS was mowed, tilled, and seeded with twenty-two species of native prairie forbs and Little Bluestem for a cover species. The areas of the first native forb planting was the N corner of Unit A W of HS-31 containing 92 square meter and the N side of Unit B1 behind HS-6 containing 136 square meters (MAP 1). These areas were selected for the native seeding because the one, Unit B1, contained a large number of exotic vegetation and the other, Unit A, had a thin population of

native grasses in that area. The beginning preparation for seeding was to repeatedly mow the areas to stunt or kill off the growing vegetation. Then to till the areas 4-6 inches deep to kill any growing plants, break up existing root systems, aerate and loosen the soil to allow the incorporation of the native forb seeds into the ground by the freezing and thawing over the winter months.

NATIVE FORBS USED FOR SEEDING

The native forbs that were used for seeding in 1996 were hand collected in 1994 and 1995 from surrounding area prairies. The location of the native seeds, the methods of collecting, cleaning, and seeding ratios of the forbs can be found in the following reports: FSNHS Prairie Restoration Report 1994, FSNHS Prairie Restoration Report 1995, and FSNHS Prairie Restoration Report Oct. 1996-Sept. 1997. The twenty-two species that were planted in 1996 were of good quality and found in high quantities on the Little Osage Prairie, and local prairies (TABLE 5). Gary Sullivan at Wilson's Creek National Battlefield donated Little Bluestem (*Schizachyrium scoparium*) seed to use as a cover species for the native forb planting. A few of the species such as *Baptisia*, *Petalostemon*, and *Schrankia* required specific care to the seed to enhance germination results. All three species required light scarification. The *Baptisia* and *Petalostemon* also required inoculant after scarification before planting. The inoculant was purchased from The Natural Garden in St. Charles, Illinois. Once all the native forb seeds were measured, and if needed scarified and inoculated, the seeds were mixed with cottonseed hulls for broadcasting in November. The cottonseed hulls provided the medium to broadcast the native forb seed in, to prevent the wind dispersal of seeds and as a ground cover over the winter. Cottonseed hulls were purchased locally from Miller's Feed & Oil in 50-pound bags.

TABLE 5: NATIVE PRAIRIE FORBS AND PRAIRIE GAMA GRASS SEEDS COLLECTED
IN 1994 AND 1995 FOR SEEDING IN 1996 AT FSNHS

SCIENTIFIC NAME	COMMON NAME	AMOUNT IN OZ.
<i>Amorpha canescens</i>	Leadplant	0.3
<i>Asclepias tuberosa</i>	Butterfly Milkweed	1.6
<i>Asclepias viridis</i>	Spider Milkweed	mixed w/above
<i>Baptisia australis</i>	Blue Wild Indigo	2.2
<i>Baptisia bracteata leucophaea</i>	Creamy Wild Indigo	mixed w/above
<i>Desmodium illinoense</i>	Illinois Tick Trefoil	0.3
<i>Dodecatheon meadia</i>	Shooting Star	<0.1
<i>Echinacea pallida</i>	Pale Purple Coneflower	10.9
<i>Hieracium longipilum</i>	Long Bearded Hawkweed	<0.1
<i>Liatris aspera</i>	Rough Blazing Star	0.6
<i>Liatris punctata</i>	Prairie Blazing Star	4.9
<i>Liatris pycnostachya</i>	Dotted Blazing Star	mixed w/above
<i>Linum sulcatum</i>	Grooved Yellow Flax	0.2
<i>Penstemon spp.</i>	Bearded Tongue	0.3
<i>Petalostemon candidum</i>	White Prairie Clover	40.8
<i>Petalostemon purpureum</i>	Purple Prairie Clover	mixed w/above
<i>Polytaenia nuttallii</i>	Prairie Parsley	4.2
<i>Ratibida pinnata</i>	Gray Headed Coneflower	1.6
<i>Rudbeckia hirta</i>	Black Eyed Susan	2.6
<i>Schrankia nuttallii</i>	Cat's Claw Sensitive Bair	<0.1
<i>Silphium laciniatum</i>	Compass Plant	1.4
<i>Tripsacum dactyloides</i>	Gama Grass	0.2

FIRST YEAR GERMINATION OF 1996 SEEDING

The spring of 1997 produced the results of the first native forb seeding at FSNHS. There was germination of at least ten species of native forbs that were seeded in November of 1996 between the two Units A and B1 (TABLE 6). The units were monitored throughout the summer for seedling growth and watered whenever it got extremely dry. The seeded areas were mowed when needed to keep the existing native grasses and exotic vegetation at a 6-8 inch height. This constant mowing would allow seedlings to grow with less competition for light, water, and minerals. This would give the seedlings a better chance at survival by allowing the root systems of the native species to grow deep for the needed nutrients. In Unit A, the seeded area was driven over and parked in by all types of heavy construction equipment ranging from trucks, to

backhoes, and bulldozers. This construction equipment killed several native forb seedlings and broke off others. The small *Baptisia* stems seem to have flexed under the heavy equipment to continue growing, or broke off and would sometimes re-sprout. The *Asclepias* seedlings that were found in Unit A did not survive the heavy construction equipment running over them.

TABLE 6: FIRST YEAR GERMINATION, IN 1997, OF NATIVE FORB SPECIES SEEDED IN NOVEMBER OF 1996 IN PRAIRIE UNITS A AND B1			
SCIENTIFIC NAME	COMMON NAME	UNIT A # FOUND	UNIT B # FOUND
<i>Asclepias</i> ssp. *	Milkweed	5	0
<i>Baptisia</i> ssp. **	Wild Indigo	9	5
<i>Echinacea pallida</i>	Pale Purple Coneflower	24	8
<i>Petalostemon</i> ssp.	Prairie Clover	3	0
<i>Linum sulcatum</i>	Grooved Yellow Flax	10	0
<i>Ratibida pinnata</i>	Gray Headed Coneflower	12	6
<i>Rudbeckia hirta</i>	Black Eyed Susan	22	16
* may have both species <i>A. tuberosa</i> & <i>A. viridis</i>			
** believed to be <i>Baptisia australis</i>			

THIRD YEAR GROWTH AND GERMINATION OF 1996 SEEDING

The first native forb seeding has resulted in only four species present in the third year germination out of twenty-two species that were broadcasted in 1996 (TABLE 7). There was a decrease in the species population and individual species population from the first year growth. The decrease in species population and individual species population is the result of no monitoring methods in the summer of 1998. Unit A and Unit B1 contained a large number of exotic vegetation that was left uncontrolled in the summer of 1998. The result was a population explosion in the exotic species from the disturbed seedbed and rapid growth that over shadowed the struggling native forb species. These exotic species must be controlled or the native species that are present will more than likely disappear. The individual species population decreased

**TABLE 7: THIRD YEAR GERMINATION AND THE INDIVIDUAL SPECIES
POPULATION PERCENTAGE OF DECREASE OR INCREASE, IN 1999, OF NATIVE
FORB SPECIES SEEDED IN NOVEMBER OF 1996 IN PRAIRIE UNITS A AND B1**

SCIENTIFIC NAME	COMMON NAME	UNIT A	UNIT B	% DECREASE/INCREASE	
		# FOUND	# FOUND	UNIT A	UNIT B
<i>Asclepias</i> ssp. *	Milkweed	0	0	-100	0
<i>Baptisia</i> ssp. **	Wild Indigo	0	0	-100	-100
<i>Echinacea pallida</i>	Pale Purple Coneflower	30	10	+25	+25
<i>Petalostemon</i> ssp.	Prairie Clover	2	0	-33	0
<i>Linum sulcatum</i>	Grooved Yellow Flax	0	0	-100	0
<i>Ratibida pinnata</i>	Gray Headed Coneflower	5	10	-58	-33
<i>Rudbeckia hirta</i>	Black Eyed Susan	7	16	-68	-27
* may have both species <i>A. tuberosa</i> & <i>A. viridis</i>					
** believed to be <i>Baptisia australis</i>					

from 27% to 100% depending on the species and the Unit. Unit A had construction of an electric line through the seeded area with heavy construction equipment that contributed to a larger individual species population percentage decrease than Unit B1. *Echinacea pallida* (Pale Purple Coneflower) was the one and only exception; it increased by 25 % on both Units. The individual population increment of *Echinacea pallida* could be from dormancy in the seeds that was not broken until the second or third year that allowed germination. But the overgrowth of exotic species has kept the Pale Purple Coneflower species at seedling size.

FALL 1997 NATIVE FORB SEEDING

The 1997 native forb seeding at FSNHS was a continuation of forb enhancement with mixed result in the second year. The native forbs located on the Little Osage Prairie and local native prairie within a 50 mile radius to Fort Scott were used as the guideline for the enhancement of FSNHS prairie. The native forb species selected for seeding in 1997 were chosen from a list of forb species found on the Little Osage Prairie and with in a 50 mile radius to Fort Scott. The seeds to be used in the fall seeding have been purchased from three area

native wildflower dealers that are within 250 miles from Fort Scott. These dealers are: Missouri Wildflower Nursery at Jefferson City Missouri, Hamilton Seeds at Elk Creek Missouri, and DeLange Seed House at Girard Kansas.

PLANTING AREA

Ten plots in all prairie Units A, B1, B2, and C, were selected for the fall 1997 native forb seeding with a grand total of 8432 square feet to be seeded (MAP 1). These areas were mowed repeatedly and tilled 4-6 inches deep in preparation for the seeding in November. The six plots selected for native forb seeding in Unit A, were chosen because of the exotic vegetation that was growing in the area. The first plot in Unit A is identified as Unit A1, it contains 281 square feet and is located W of HS-32 around the security light. The second plot is Unit A2; it contains 137 square feet and is located behind and N of HS-32. Unit A3 plot contains 540 square feet to be seeded and is located beside the prairie trail N of HS-32 and around the large American Elm tree (142 CLR) in the middle of Unit A. The next two plots are between HS-32 and HS-14 along the southern border of Unit A by the back road. Unit A4 is directly W of HS-14 past the electric transformers and contains 300 square feet to be seeded. Unit A5, 1270 square feet, is the second largest plot in Unit A to be seeded with native forbs. Its' location is directly E of HS-32 around the American Elm (248 CLR), and Black Walnut trees (249, & 141 CLR). The largest in Unit A is plot Unit A6 with 1488 square feet and is located directly E of HS-31 around the American Elm tree (117 CLR). The next two plots are found in Unit B2 and were selected for native forb seeding because of the construction around and in the unit by the Fire Service Road. The first plot Unit B2-1 contains 1633 square feet and is the NE border of the prairie unit closest to HS-30. Unit B2-2 is the next plot in Unit B2, containing 642 square feet and is located on the NW border of the unit closest to HS-22, the company latrines. The last two plots to be seeded are in Unit C, and were selected for native forb seeding because of the construction of the Fire Service

Road disturbed the area. Plot Unit C1, 746 square feet, is located directly E of HS-9 and covers the whole W border of the prairie unit. The next plot is Unit C2; it contains 1395 square feet and is located in the prairie unit heading NE from the Red Oak tree (177 CLR).

NATIVE FORBS USED FOR SEEDING

The 24 species of native prairie forbs that were selected for seeding in 1997, were found on the local native prairies and on the Little Osage Prairie (TABLE 8). These species were selected for their individual competitive ability and ease of conditioning, how easily establishment occurs. The individual competitive ability of the forb species ranged from medium

TABLE 8: NATIVE PRAIRIE FORBS SELECTED FOR FALL 1997 NATIVE FORB ENHANCEMENT SEEDING AT FORT SCOTT NATIONAL HISTORIC SITE				
SCIENTIFIC NAME	COMMON NAME	COEF	COMPET. ABILITY	EASE COND.
<i>Amorpha canescens</i>	Leadplant	8	medium	difficult
<i>Asclepias tuberosa</i>	Butterfly Milkweed	5	low	difficult
<i>Baptisia australis</i>	Blue Wild Indigo	6	good	mix
<i>Baptisia leucantha</i>	White Wild Indigo	8	medium	mix
<i>Coreopsis palmata</i>	Prairie Coreopsis	6	good	medium
<i>Dodecatheon media</i>	Shooting Star	5	medium	mix
<i>Echinacea pallida</i>	Pale-Purple Coneflower	7	excellent	easy
<i>Echinacea purpurea</i>	Purple Coneflower	5	good	easy
<i>Eryngium yuccifolium</i>	Rattlesnake Master	8	excellent	easy
<i>Helianthus mollis</i>	Ashy Sunflower	6	aggressive	easy
<i>Liatris aspera</i>	Rough Blazing Star	6	medium	mix
<i>Liatris pycnostachya</i>	Prairie Blazing Star	6	medium	mix
<i>Monarda fistulosa</i>	Wild Bergamot	4	aggressive	easy
<i>Penstemon digitalis</i>	Foxglove Beard-tongue	4	good	easy
<i>Petalostemon candidum</i>	White Prairie Clover	8	medium	mix
<i>Petalostemon purpureum</i>	Purple Prairie Clover	8	medium	mix
<i>Ratibida columnifera</i>	Long-head Coneflower	3	aggressive	easy
<i>Ratibida pinnata</i>	Gray Headed Coneflower	5	aggressive	easy
<i>Rudbeckia hirta</i>	Black Eyed Susan	1	aggressive	easy
<i>Salvia azurea</i>	Blue Sage	4	medium	mix
<i>Schrankia nuttilla</i>	Cat's Claw Sensitive Briar	6	good	mix
<i>Silphium laciniatum</i>	Compass Plant	6	excellent	easy
<i>Solidago rigida</i>	Stiff Goldenrod	6	good	easy
<i>Tradescantia ohiensis</i>	Ohio Spiderwort	4	good	mix

to aggressive. And the ease of conditioning ranged from two difficult species to some mixed and the majority being easily established. One point six pounds of pure live seed was used to seed the total 8432 square feet. Gary Sullivan at Wilson's Creek National Battlefield donated Little Bluestem (*Schizachyrium scoparium*) seed to use as a cover species for the native forb planting. The native forb seeds and Little Bluestem were measured; if needed scarified and inoculated before the seeds were mixed with cottonseed hulls and broadcasted in December. The inoculant was purchased from The Natural Garden in St. Charles, Illinois. The cottonseed hulls provided the medium to broadcast the native forb seed in, to prevent the wind dispersal of seeds and as a ground cover over the winter. The purchased of 300 pounds of Cottonseed hulls was from a local company, Miller's Feed & Oil in 50-pound bags.

SECOND YEAR GERMINATION OF 1997 SEEDING

The second year success of the ten plots seeded with 24 native forb species in 1997 had results that ranged from 16.6 to 58.3 percent germination of the species (TABLE 9). The individual species population ranged from 0 to 20 plants per species per plot. Unit C1 and C2 seeding areas had the greatest germination of species out of the twenty-four species in the native forb mix. There, where 13 species in C1 and 14 species in C2 that were present in the second year. Units A2 with 37.5 % species germination and A5 with 41.6% species germination were fairly successful. The remaining six units, A1, A3, A4, A6, B2-1, and B2-2, had less than a 33.3% species germination rate out of the twenty-four species in the native forb mix.

FALL 1999 NATIVE FORB SEEDING

Native forb enhancement at FSNHS was continued in 1999 in Unit A. This area was selected because of the exotics present and lack there of native prairie species due to the shade provided by ten mature trees and many saplings. The trees were removed and stumps treated with a 100 percent Round-up Ultra. Exotic vegetation was sprayed with a 6 percent solution of

TABLE 9: NUMBER OF EACH SPECIES PRESENT PER PLOT IN THE SECOND YEAR, 1999, GERMINATION OF 1997 NATIVE FORB SEEDING

SCIENTIFIC NAME	PLOT NUMBER									
	A1	A2	A3	A4	A5	A6	B2-1	B2-2	C1	C2
<i>Amorpha canescens</i>	0	0	0	0	0	0	0	0	0	0
<i>Asclepis tuberosa</i>	1	2	0	0	0	1	0	0	5	6
<i>Baptisia australis</i>	9	3	0	0	2	0	3	0	1	8
<i>Baptisia leucantha</i>	0	0	0	0	0	0	0	0	0	0
<i>Coreopsis palmata</i>	0	0	0	0	2	0	8	20	0	2
<i>Dodecatheon media</i>	0	0	0	0	0	0	0	0	0	0
<i>Echinacea pallida</i>	0	0	6	0	12	2	4	1	3	2
<i>Echinacea purpurea</i>	2	3	9	0	14	3	3	2	5	3
<i>Erygium yuccifolium</i>	0	0	0	0	0	0	0	0	0	0
<i>Helianthus mollis</i>	0	0	0	0	0	0	0	0	5	3
<i>Liatris aspera</i>	0	0	0	0	0	0	0	0	0	0
<i>Liatris pynostachya</i>	0	0	0	0	0	0	0	0	0	0
<i>Monarda fistulosa</i>	5	2	2	3	5	0	0	0	1	1
<i>Penstemon digitalis</i>	0	0	0	0	0	0	0	0	0	0
<i>Petalostemon candidum</i>	0	0	0	0	0	0	0	0	3	1
<i>Petalostemon purpureum</i>	0	3	7	0	12	0	0	0	7	3
<i>Ratibida columnifera</i>	0	2	3	0	3	0	0	0	4	2
<i>Ratibida pinnata</i>	0	0	12	3	2	0	2	0	8	3
<i>Rudbeckia hirta</i>	1	0	15	9	8	6	19	5	19	6
<i>Salvia azurea</i>	0	2	2	0	0	0	10	0	15	4
<i>Schrankia nuttilla</i>	0	0	0	0	0	0	0	0	0	0
<i>Silphium laciniatum</i>	1	2	0	0	6	0	3	0	14	5
<i>Solidago rigida</i>	0	1	0	3	0	0	0	0	0	0
<i>Tradescantia ohimensis</i>	0	0	0	0	0	0	0	0	0	0
Grand totals per plot										
Plants	19	20	56	18	66	12	52	28	90	49
Total Species	6	9	8	4	10	4	8	4	13	14
Percent Germination (%)										
From 24 Species	25	37.5	33.3	16.6	41.6	16.6	33.3	16.6	54.2	58.3

Round-up Ultra, then removed after all the exotic vegetation had expired. The planting area was tilled then planted with 24 native forb species and seven native grass species in the November of 1999. Tilling 4-6 inches deep killed any re-growth of exotics, break up existing root systems,

aerate and loosen the soil to allow the incorporation of the native forb seeds into the ground by the natural freezing and thawing over the winter months. The native forbs and native grasses located on the Little Osage Prairie and local native prairies within a 50 mile radius to Fort Scott were used as the guideline for the continued enhancement of FSNHS prairie. The seeds to be used in the fall seeding were purchased from area wildflower dealers that are within 250 miles from Fort Scott. These native forb dealers are Missouri Wildflower Nursery at Jefferson City Missouri and Hamilton Seeds at Elk Creek Missouri. The native seeds used were collect, by the dealers, within Missouri, Kansas, or Oklahoma.

PLANTING AREA

A total area of 23,100 square feet located in Unit A was selected for the 1999 seeding project. This area was selected because of the exotics present and lack there of native prairie species. The area is located on the East Side of Unit A starting by HS-14 and extending 340 feet the north border line fence, and ranged from the East border line fence West in to the prairie an average of 55 feet (MAP 1). The planting area was widest on the south end by HS-14, measuring from the boneyard 90 feet West to the electric transformer (253.1 CLR). This western border extended to the North around the plum thicket (257 CLR), measuring 65 feet from the boneyard West into the prairie. On the North end of the planting area the width was 40 feet from the Austrian Pines (144.23 CLR) West to the Plum tree by the prairie trail.

The exotics located in the Unit A 1999 seeding project area include Johnson Grass, Crown Vetch, Yellow Sweet Clover, Common Ragweed, Giant Ragweed, Smooth Brome, Downy Brome, Trumpet Vine, Tall Fescue, and Poison Ivy. The Maps 2, 3, and 4 will indicate the location of the first three species in the seeding area. There were also ten trees removed because of the shade they provided that encouraged the growth of exotic. Giant Ragweed and Common Ragweed were located throughout the seeding area in population clusters in the shade

of trees. The Smooth Brome, Downy Brome, and Tall Fescue were located in the shade of the Austrian Pines (144.5-144.31 CLR) and the Hackberry Tree (144.22 CLR). Trumpet Vine was located on the North end of the planting area from the Hackberry Tree (144.22 CLR) north to the Northern border line fence. The Poison Ivy was located in the shade of the two Cottonwood trees (255 & 256 CLR) that were also removed. The following eight trees were removed and had the stumps ground out: four Austrian Pine trees (144.1-144.4 CLR).

NATIVE FORBS AND GRASSES USED FOR SEEDING

The 24 native forb species and 7 native grass species that were selected for seeding in the November of 1999, were located on the Little Osage Prairie and local native prairies within a 50 mile radius to Fort Scott. The native forb species are the same as the species selected in 1997 native forb enhancement seeding. These forb species were selected for the individual competitive ability, ease of conditioning, and how easily past establishment has occurred. A native forb mix of five pounds of pure live seed (PLS) was used to seed 23,100 square feet (TABLE 10). The amount used per species was adjusted according to the individual PLS of each native forb species and totaled 5.9 pound of the native forb mix was used. Light scarification was required of five species; these are *Baptisia australis*, *Baptisia leucantha*, *Petalostemon candidum*, *Petalostemon purpureum*, and *Schrankia nuttilla*. Scarification was accomplished by a small box lined with sand paper and a small wooden block covered with sandpaper. The *Baptisia* requires 60 grit course sand paper, *Schrankia* will work with a combination of 60 and 80 grit medium sand paper, and *Petalostemon* works best with 100 grit fine sand paper. A light pressure when scarifying the seeds will weaken the heavy seed coats of the species. If too harsh of a scarification the seeds will be crushed and result in loss of seeds. Inoculant was required for both of the *Baptisia* and *Petalostemon* species before seeding. The inoculant was purchased from The Natural Garden in St. Charles, Illinois.

TABLE 10: NATIVE PRAIRIE FORBS SELECTED FOR FALL 1999 NATIVE FORB ENHANCEMENT SEEDING AT FORT SCOTT NATIONAL HISTORIC SITE			
SCIENTIFIC NAME	COMMON NAME	Oz./SPECIES IN 5LBS.	ADJUSTED PLS Oz./SPECIES
<i>Amorpha canescens</i>	Leadplant	0.5	0.8
<i>Asclepias tuberosa</i>	Butterfly Milkweed	2.6	3.6
<i>Baptisia australis</i>	Blue Wild Indigo	11.8	14.8
<i>Baptisia leucantha</i>	White Wild Indigo	11.8	14.6
<i>Coreopsis palmata</i>	Prairie Coreopsis	3.9	4.5
<i>Dodecatheon media</i>	Shooting Star	0.3	0.4
<i>Echinacea pallida</i>	Pale-Purple Coneflower	10.5	10.7
<i>Echinacea purpurea</i>	Purple Coneflower	1.3	1.4
<i>Eryngium yuccifolium</i>	Rattlesnake Master	2.6	3.5
<i>Helianthus mollis</i>	Ashy Sunflower	1.3	1.4
<i>Liatris aspera</i>	Rough Blazing Star	3.9	5.0
<i>Liatris pycnostachya</i>	Prairie Blazing Star	3.9	4.2
<i>Monarda fistulosa</i>	Wild Bergamot	0.1	0.3
<i>Penstemon digitalis</i>	Foxglove Beard-tongue	1.3	2.0
<i>Petalostemon candidum</i>	White Prairie Clover	0.7	0.8
<i>Petalostemon purpureum</i>	Purple Prairie Clover	0.7	0.7
<i>Ratibida columnifera</i>	Long-head Coneflower	0.1	0.2
<i>Ratibida pinnata</i>	Gray Headed Coneflower	0.5	0.6
<i>Rudbeckia hirta</i>	Black Eyed Susan	0.3	0.5
<i>Salvia azurea</i>	Blue Sage	2.6	3.0
<i>Schrankia nuttilla</i>	Cat's Claw Sensitive Briar	11.8	12.5
<i>Silphium laciniatum</i>	Compass Plant	6.6	7.4
<i>Solidago rigida</i>	Stiff Goldenrod	0.3	0.4
<i>Tradescantia ohiensis</i>	Ohio Spiderwort	0.3	0.4
TOTAL Oz.		80.0	93.7
TOTAL LBS.		5.0	5.9

The 7 native grass species that were selected for seeding, were located on the Little Osage Prairie and local native prairies within a 50 mile radius to Fort Scott. A percent frequency of the dominant native prairie species located on the Osage Prairie over a twelve year study was compiled from "Effects of Prairie Management on Species Composition in Osage Prairie Natural Area: 1984-1995" (TABLE 11). This study was used to determine the most common native grass species to select for restoration. The six species that were selected, for seeding at FSNHS, from the Osage Prairie study were chosen because of their overall percent frequency, individual

TABLE 11: PERCENT FREQUENCY OF THE DOMINANT NATIVE PRAIRIE SPECIES LOCATED ON THE OSAGE PRAIRIE OVER A 12 YEAR STUDY.

Dominant Native Grass species located on the Osage Prairie.
Average of Percent Frequency found in each unit over a 12 year study.

Scientific Name	Common Name	Triennial burn	Burn as needed	Triennial hay	Biennial hay	Annual hay	Overall % Freq.
<i>Andropogon gerardii</i>	Big Blue Stem	81	87	62	66	65	72.2
<i>Andropogon scoparius</i>	Little Blue Stem	79	84	66	60	57	69.2
<i>Andropogon ternarius</i>	Split Beard Blue Stem	4	2	28	34	39	21.4
<i>Aristida purpurascens</i>	Arrow Feather (3Awn)	34	18	24	33	41	30
<i>Panicum virgatum</i>	Switch Grass	6	7	18		16	9.4
<i>Sorghastrum nutans</i>	Indian Grass	56	41	59	72	64	58.4
<i>Sporobolus heterolepis</i>	Prairie Dropseed	2		1	1		0.8
<i>Tridens flavus</i>	False Redtop			3	1		0.8

competitive ability, ease of conditioning, and availability of seed from native prairie dealers (TABLE 12). A seeding rate was formulated based on two factors, factor one: the seed size, and factor two: the percent frequency on the Osage Prairie and aggressive ability. The 23,100 square feet in Unit A required 5 pound mix of pure live seed (PLS), and the formula was adjusted according to the PLS of each species. A small amount of Switch Grass seed was used because of the ease of establishment, very aggressive ability, and the low, 9.4 percent overall frequency. Prairie Dropseed and Little Blue Stem were the highest seeding rates followed closely by Big Blue Stem and Indian Grass. Sideoats Grama was selected because it is the second most populous native grass species located at FSHNS (see Botanical Survey this document), and located on local native prairies.

TABLE 12: NATIVE PRAIRIE GRASSES SELECTED FOR FALL 1999 NATIVE ENHANCEMENT SEEDING AT FORT SCOTT NATIONAL HISTORIC SITE			
SCIENTIFIC NAME	COMMON NAME	LBS./SPECIES IN 5LBS.	ADJUSTED PLS LBS./SPECIES
<i>Andropogon gerardii</i>	Big Blue Stem	0.667	1.330
<i>Andropogon scoparius</i>	Little Blue Stem	1.000	1.200
<i>Andropogon temarius</i>	Spilt Beard Blue Stem	0.267	0.667
<i>Bouteloua curtipendula</i>	Sideoats Grama	0.267	0.667
<i>Panicum virgatum</i>	Switch Grass	0.133	0.243
<i>Sorghastrum nutans</i>	Indian Grass	0.667	1.865
<i>Sporobolus heterolepis</i>	Prairie Dropseed	2.000	2.000
TOTAL LBS.		5.000	7.972

The native forb and native grass seeds used in the fall seeding were purchased from area wildflower dealers that are within 250 miles from Fort Scott. These native prairie dealers are Missouri Wildflower Nursery at Jefferson City Missouri and Hamilton Seeds at Elk Creek Missouri. The native seeds used were collect, by the dealers, within Missouri, Kansas, or

Oklahoma and had a PLS test. Cottonseed hulls were also used to provide a ground cover and to prevent wind dispersal of the seeds. The purchase of 600 pounds of Cottonseed hulls was from Miller's feed and Oil in 50-pound bags.

PROJECTED 2000 NATIVE FORB SEEDING

Native forb and native grass enhancement at FSNHS is projected for the year 2000 in Unit B1 and Unit B2 with an estimate of 40,000 square feet (MAP 1). This area is targeted because of the exotics present and lack there of native prairie species due to the shade provided by seven mature trees and many saplings. The native species to be used in the reseeding of Unit B1 and B2 will have the same guidelines as the 1999 seeding. The native species are to be located on the Little Osage Prairie and local native prairies within a 50 mile radius to Fort Scott. This limit is established to focus on the native forb and native grasses to the Fort Scott area.

PREPERATION

The seven mature trees: Bitternut Hickory (295 CLR), Tree of Heaven (301 CLR), American Elm (302 CLR), two Apple (305 and 306 CLR), two Shagbark Hickory (308 and 309 CLR), and saplings are targeted for removal with application of herbicide to the stumps. All other vegetation is to be mowed with the sickle bar mower and the vegetation removed. The ground will then be tilled to the depth of 2-3 inches. This will break up the existing root systems, kill any re-growth in exotic species, provide an aeration of soil, and loosen the soil to allow the incorporation of the native seeds into the ground by the freezing and thawing over the winter months.

NATIVE FORBS AND NATIVE GRASSES FOR SEEDING

The 24 native forb species and 7 native grass species that are targeted for seeding in the November of 2000, were located on the Little Osage Prairie and local native prairies within a 50 mile radius to Fort Scott. The native forb species are the same as the species selected in 1999

native forb enhancement seeding. These forb species were selected for the individual competitive ability, ease of conditioning, and how easily past establishment has occurred. A native forb mix of eight pounds of pure live seed (PLS) is estimated to seed 40,000 square feet in Unit B1 and B2 (TABLE 13).

TABLE 13: NATIVE PRAIRIE FORBS SELECTED FOR FALL 2000 NATIVE FORB ENHANCEMENT SEEDING AT FORT SCOTT NATIONAL HISTORIC SITE			
SCIENTIFIC NAME	COMMON NAME	Oz./SPECIES IN 8LBS. PLS	ADJUSTED PLS Oz./SPECIES
<i>Amorpha canescens</i>	Leadplant	0.84	0.0
<i>Asclepias tuberosa</i>	Butterfly Milkweed	4.20	0.0
<i>Baptisia australis</i>	Blue Wild Indigo	18.89	00.00
<i>Baptisia leucantha</i>	White Wild Indigo	18.89	00.00
<i>Coreopsis palmata</i>	Prairie Coreopsis	6.30	0.00
<i>Dodecatheon media</i>	Shooting Star	0.53	0.00
<i>Echinacea pallida</i>	Pale-Purple Coneflower	16.79	00.00
<i>Echinacea purpurea</i>	Purple Coneflower	2.10	0.00
<i>Eryngium yuccifolium</i>	Rattlesnake Master	5.25	0.00
<i>Helianthus mollis</i>	Ashy Sunflower	2.62	0.00
<i>Liatris aspera</i>	Rough Blazing Star	6.30	0.00
<i>Liatris pycnostachya</i>	Prairie Blazing Star	6.30	0.00
<i>Monarda fistulosa</i>	Wild Bergamot	0.21	0.00
<i>Penstemon digitalis</i>	Foxglove Beard-tongue	2.10	0.00
<i>Petalostemon candidum</i>	White Prairie Clover	1.05	0.00
<i>Petalostemon purpureum</i>	Purple Prairie Clover	1.05	0.00
<i>Ratibida columnifera</i>	Long-head Coneflower	0.21	0.00
<i>Ratibida pinnata</i>	Gray Headed Coneflower	0.84	0.00
<i>Rudbeckia hirta</i>	Black Eyed Susan	0.63	0.00
<i>Salvia azurea</i>	Blue Sage	4.20	0.00
<i>Schrankia nuttilla</i>	Cat's Claw Sensitive Briar	18.89	00.00
<i>Silphium laciniatum</i>	Compass Plant	10.50	0.00
<i>Solidago rigida</i>	Stiff Goldenrod	0.42	0.00
<i>Tradescantia ohiensis</i>	Ohio Spiderwort	0.53	0.00
TOTAL Oz.		129.00	00.00
TOTAL LBS.		8.00	0.00

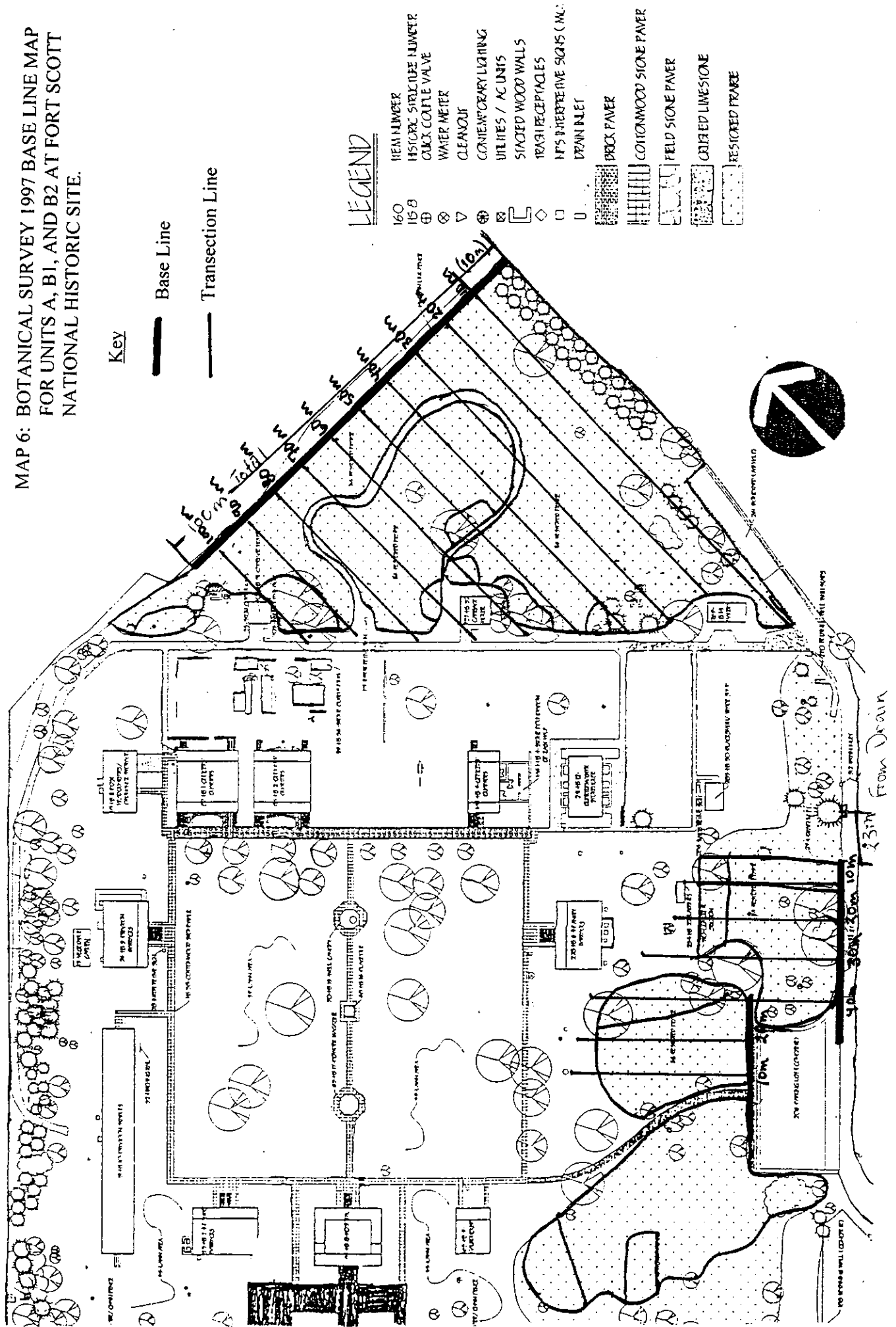
The 7 native grass species that were selected for seeding are the same species used in 1999 seeding, based on the Osage Prairie Study (TABLE 11). All native grass species were located on the Little Osage Prairie and local native prairies within a 50 mile radius to Fort Scott. The species that were selected for seeding at FSNHS were chosen because of their overall percent frequency, individual competitive ability, ease of conditioning, and availability of seed from native prairie dealers (TABLE 14). A seeding rate was formulated based on two factors, factor one: the seed size, and factor two: the percent frequency on the Osage Prairie and aggressive ability. It is estimated that the 40,000 square feet in Unit B1 and B2 will require 9 pound mix of pure live seed (PLS), and the formula was adjusted according to the PLS of each species.

TABLE 14: NATIVE PRAIRIE GRASSES SELECTED FOR FALL 2000 NATIVE ENHANCEMENT SEEDING AT FORT SCOTT NATIONAL HISTORIC SITE			
SCIENTIFIC NAME	COMMON NAME	LBS./SPECIES IN 9LBS. PLS	ADJUSTED PLS LBS./SPECIES
<i>Andropogon gerardii</i>	Big Blue Stem	1.20	0.00
<i>Andropogon scoparius</i>	Little Blue Stem	1.80	0.00
<i>Andropogon temarius</i>	Spilt Beard Blue Stem	0.48	0.00
<i>Bouteloua curtipendula</i>	Sideoats Grama	0.48	0.00
<i>Panicum virgatum</i>	Switch Grass	0.24	0.00
<i>Sorghastrum nutans</i>	Indian Grass	1.20	0.00
<i>Sporobolus heterolepis</i>	Prairie Dropseed	3.60	0.00
TOTAL LBS.		9.00	0.00

BOTANICAL SURVEY

A botanical survey was taken of prairie Units A, B1, and B2 in the summer and early fall of 1997 at FSNHS (MAP 6). Since time was limited it would not allow for, the collection of herbarium species to support the botanical survey data, or for the survey of Unit C. The base line in Unit A started 10m from the NE corner of the north prairie border fence. The base line

MAP 6: BOTANICAL SURVEY 1997 BASE LINE MAP
FOR UNITS A, B1, AND B2 AT FORT SCOTT
NATIONAL HISTORIC SITE.



measured to 100m and was marked at each incremental of 10m. In Unit B1 the base line was measured from the last railroad post in the E corner of Unit C heading NE in a straight line along the brick path by the RV parking lot. The base line in Unit B1 measured to 40m and was marked at each incremental of 10m. In Unit B2 the base line was started at zero at 23m from the drain inlet (312.1 CLR) along the service road. The base line for Unit B2 measured to 50m and was marked at each incremental of 10m. These 10m incremental created the starting point for the ten transect line off of the base line in Unit A, B1, and B2. The survey was conducted on the 100m transect line at every 10m intervals until the prairie border was reached but not including the border in the survey. At these intervals a coin was flipped to determine the survey plot location on either the left or the right side of the transect line at each plot sample. If the coin was heads up then the plot sample was on the right and if tails then the plot sample was on the left. The sample plot form had the dimensions of half a meter by one meter. The sample plot form was made from half-inch PCV pipe. The species of each vascular plant were identified and given a coverage classification based on the amount of area each species took up within the sample plot. These coverage classification were 0-1%, 1-5%, 5-25%, 25-50%, 50-75%, 75-95%, and 95-100%. Cover estimation of the vascular plant species was of foliar cover not basal cover. Non-vascular plants were not identified due to the low ecological significance. The following books were used as identification guides for the survey: Flora of the Great Plains, Wildflowers and Weeds of Kansas, and Pasture and Range Plants.

BOTANICAL SURVEY RESULTS

A grand total of one hundred botanical species were identified in 1997 in Units A, B1, and B2 (TABLE 15). Individual species were not collected to support the botanical survey data due to the limitation of time. The data was formulated on the relative frequency and relative density of *Andropogon gerardii* (Big Blue Stem), because this species had the largest species

**TABLE 15: BOTANICAL SURVEY 1997 RELATIVE FREQUENCY AND RELATIVE DENSITY
OF ANDROPOGON GERARDII AT FORT SCOTT NATIONAL HISTORIC SITE**

Population Density Order #	Scientific name	Common name	Coefficient of Conservatism	Unit A total #sp n 68 plots	Unit B1 total #sp n 8 plots	Unit B2 total #sp n 11 plots	Total #sp n all plots UnitAB12	Frequency in total of 87 plots	Relative Frequency And.gera. 100%	Relative Frequency by total 678.161	Density total area 43.5sq m	Relative Density And.gera. 100%
1	Andropogon gerardii	Big Blue Stem	5	51	3	9	63	72.414	100.000	0.1061	1.4483	99.998
2	Bouteloua curtipendula	Sideoats Grama	7	40	3	1	44	50.575	69.841	0.0741	1.0115	69.840
3	Panicum virgatum	Switch Grass	4	31	5	5	41	47.126	65.079	0.0690	0.9425	65.078
4	Sorghastrum nutans	Indian Grass	5	31	4	4	39	44.828	61.905	0.0657	0.8966	61.904
5	Eupatorium rugosum	White Snakeroot	2	27	0	2	29	33.333	46.032	0.0488	0.6667	46.031
6	Solanum carolinense	Carolina Horse-nettle	0	21	1	3	25	28.736	39.682	0.0421	0.5747	39.682
7	Festuca pratensis	Meadow Fescue	exotic	15	0	4	19	21.839	30.159	0.0320	0.4368	30.158
8	Helianthus maximiliani	Maximilian Sunflower	5	11	3	1	15	17.241	23.809	0.0253	0.3448	23.809
9	Torilis arvensis	Hedge Parsley	exotic	9	3	3	15	17.241	23.809	0.0253	0.3448	23.809
10	Physalis virginiana	Virginia Ground Cherry	3*	12	2	0	14	16.092	22.222	0.0236	0.3218	22.222
11	Convolvulus arvensis	Field Bindweed	exotic	8	5	0	13	14.943	20.635	0.0219	0.2989	20.635
12	Ulmus americana	American Elm	4*	11	1	0	12	13.793	19.048	0.0202	0.2759	19.047
13	Rhus radicans	Poison Ivy	1*	9	1	1	11	12.644	17.460	0.0185	0.2529	17.460
14	Bromus secalinus	Cheat (Chess)	exotic	8	1	2	11	12.644	17.460	0.0185	0.2529	17.460
15	Galium aparine	Catchweed Bedstraw	0	8	1	1	10	11.494	15.873	0.0168	0.2299	15.873
16	Croton monanthogynus	One-seeded Croton	2	9	0	1	10	11.494	15.873	0.0168	0.2299	15.873
17	Ambrosia trifida	Giant Ragweed	0	3	3	2	8	9.195	12.698	0.0135	0.1839	12.698
18	Acalypha ostryaefolia	Three-seeded Mercury	2*	5	1	1	7	8.046	11.111	0.0118	0.1609	11.111
19	Physalis pumila	Prairie Ground Cherry	6	5	1	1	7	8.046	11.111	0.0118	0.1609	11.111
20	Cirsium altissimum	Roadside Thistle	4*	7	0	0	7	8.046	11.111	0.0118	0.1609	11.111
21	Rubus sp?	Blackberry species		7	0	0	7	8.046	11.111	0.0118	0.1609	11.111
22	Bouteloua gracilis	Blue Grama	8	7	0	0	7	8.046	11.111	0.0118	0.1609	11.111
23	Ambrosia artemisiifolia	Common Ragweed	0	4	2	0	6	6.897	9.524	0.0101	0.1379	9.524
24	Poa annua	Annual Bluegrass	exotic	3	2	1	6	6.897	9.524	0.0101	0.1379	9.524
25	Celtis occidentalis	Hackberry	4*	2	1	3	6	6.897	9.524	0.0101	0.1379	9.524
26	Conyza canadensis	Horse-weed		4	1	1	6	6.897	9.524	0.0101	0.1379	9.524
27	Campsis radicans	Trumpet Vine	3*	3	0	3	6	6.897	9.524	0.0101	0.1379	9.524
28	Desmodium illinoense	Illinois Tickclover	4	5	0	1	6	6.897	9.524	0.0101	0.1379	9.524
29	Teucrium candense	American Germander	2*	5	0	1	6	6.897	9.524	0.0101	0.1379	9.524
30	Oxalis stricta	Yellow Wood Sorrel	0	6	0	0	6	6.897	9.524	0.0101	0.1379	9.524
31	Euphorbia nutans	Eyebane	exotic	4	0	1	5	5.747	7.936	0.0084	0.1149	7.936
32	Andropogon scoparius	Little Blue Stem	5	5	0	0	5	5.747	7.936	0.0084	0.1149	7.936

**TABLE 15: BOTANICAL SURVEY 1997 RELATIVE FREQUENCY AND RELATIVE DENSITY
OF ANDROPOGON GERARDII AT FORT SCOTT NATIONAL HISTORIC SITE**

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33	Croton glandulosus	Tropic Sand	1*		0	2	2	4	4.598	6.349	0.0067	0.0920	6.349
34	Buchloe dactyloides	Buffalo Grass		5	3	0	1	4	4.598	6.349	0.0067	0.0920	6.349
35	Trifolium repens	Ladino Clover	exotic		4	0	0	4	4.598	6.349	0.0067	0.0920	6.349
36	Vitis sp?	Grape species			4	0	0	4	4.598	6.349	0.0067	0.0920	6.349
37	Setaria faberii	Perennial Foxtail	exotic		4	0	0	4	4.598	6.349	0.0067	0.0920	6.349
38	Bromus sterilis	Poverty Brome	exotic		1	2	0	3	3.448	4.762	0.0051	0.0690	4.762
39	Morus alba	White Mulberry	exotic		2	1	0	3	3.448	4.762	0.0051	0.0690	4.762
40	Pyrrhopappus carolinianus	False Dandelion		0	2	1	1	3	3.448	4.762	0.0051	0.0690	4.762
41	Digitaria sanguinalis	Hairy Crabgrass	exotic		2	0	1	3	3.448	4.762	0.0051	0.0690	4.762
42	Digitaria ischaemum	Smooth Crabgrass	exotic		2	0	1	3	3.448	4.762	0.0051	0.0690	4.762
43	Unknown #2	Unknown #2			3	0	0	3	3.448	4.762	0.0051	0.0690	4.762
44	Allium sp?	Onion species			3	0	0	3	3.448	4.762	0.0051	0.0690	4.762
45	Elymus virginicus	Virginia Wild Rye		4	3	0	0	3	3.448	4.762	0.0051	0.0690	4.762
46	Acer negundo	Box Elder	1*		3	0	0	3	3.448	4.762	0.0051	0.0690	4.762
47	Taraxacum officinale	Common Dandelion	exotic		3	0	0	3	3.448	4.762	0.0051	0.0690	4.762
48	Desmodium sp?	Tickclover			3	0	0	3	3.448	4.762	0.0051	0.0690	4.762
49	Paspalum pubiflorum	Hairy-flowered Bead Grass		4	0	2	0	2	2.299	3.175	0.0034	0.0460	3.175
50	Euphorbia dentata	Toothed Spurge		0	1	1	0	2	2.299	3.175	0.0034	0.0460	3.175
51	Lactuca canadensis	Wild Lettuce	2*		1	1	0	2	2.299	3.175	0.0034	0.0460	3.175
52	Viola pratincola	Blue Prairie Violet		3	1	1	0	2	2.299	3.175	0.0034	0.0460	3.175
53	Aster pilosus	Wild Aster		0	1	1	0	2	2.299	3.175	0.0034	0.0460	3.175
54	Vernonia fasciculata	Common Ironweed		6	1	0	1	2	2.299	3.175	0.0034	0.0460	3.175
55	Sorghum halpense	Johnson Grass	exotic		1	0	1	2	2.299	3.175	0.0034	0.0460	3.175
56	Verbena stricta	Hoary Vervain		3	1	0	0	2	2.299	3.175	0.0034	0.0460	3.175
57	Acalypha rhomboidea	Rhombic Copperleaf		0	2	0	0	2	2.299	3.175	0.0034	0.0460	3.175
58	Hemerocallis fulva	Daylily	exotic		2	0	0	2	2.299	3.175	0.0034	0.0460	3.175
59	Andropogon saccharoides	Silver Bluestem		2	2	0	0	2	2.299	3.175	0.0034	0.0460	3.175
60	Gr Unkn #2	Grass Unknown #2			2	0	0	2	2.299	3.175	0.0034	0.0460	3.175
61	Robinia pseudo-acacia	Black Locust	2*		2	0	0	2	2.299	3.175	0.0034	0.0460	3.175
62	Physalis heterophylla	Clammy Ground Cherry	3*		2	0	0	2	2.299	3.175	0.0034	0.0460	3.175
63	Salvia azurea	Blue Sage		4	2	0	0	2	2.299	3.175	0.0034	0.0460	3.175
64	Solidago canadensis	Canada Goldenrod		5	2	0	0	2	2.299	3.175	0.0034	0.0460	3.175
65	Helianthus mollis	Ashy Sunflower		6	2	0	0	2	2.299	3.175	0.0034	0.0460	3.175
66	Asclepias tuberosa	Butterfly Milkweed		5	2	0	0	2	2.299	3.175	0.0034	0.0460	3.175
67	Bromus tectorum	Downy Brome	exotic		0	1	0	1	1.149	1.587	0.0017	0.0230	1.587
68	Lonicera japonica	Japanese Honeysuckle	exotic		0	0	1	1	1.149	1.587	0.0017	0.0230	1.587
69	Unkn#8	Unknown #8			0	0	1	1	1.149	1.587	0.0017	0.0230	1.587
70	Commelina erecta	Erect Dayflower		4	0	0	1	1	1.149	1.587	0.0017	0.0230	1.587

**TABLE 15: BOTANICAL SURVEY 1997 RELATIVE FREQUENCY AND RELATIVE DENSITY
OF ANDROPOGON GERARDII AT FORT SCOTT NATIONAL HISTORIC SITE**

02/08/2001

71	<i>Carya ovata</i>	Shagbark Hickory	4*		0	0	1	1	1.149	1.587	0.0017	0.0230	1.587
72	<i>Ratibida pinnata</i>	Gray Headed Coneflower		5	0	0	1	1	1.149	1.587	0.0017	0.0230	1.587
73	<i>Ipomoea hederacea</i>	Ivyleaf Morning-glory	exotic		0	0	1	1	1.149	1.587	0.0017	0.0230	1.587
74	<i>Prunus americana</i>	Wild Plum	4*		1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
75	<i>Prunus munsoniana</i>	Wild Goose Plum	3*		1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
76	<i>Verbena urticifolia</i>	Nettle-leaved Vervain		4	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
77	<i>Symphoricarpos orbiculatus</i>	Buckbrush	1*		1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
78	<i>Euphorbia maculata</i>	Snow-on-the-Mountain		0	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
79	<i>Diospyros virginiana</i>	Persimmon	3*		1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
80	<i>Bromus inermis</i>	Smooth Brome	exotic		1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
81	<i>Medicago sativa</i>	Alfalfa	exotic		1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
82	Gr Unkn #1	Grass Unknown #1			1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
83	<i>Lactuca scariola</i>	Prickly Lettuce		0	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
84	<i>Plantago patagonica</i>	Patagonian Plantain		0	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
85	<i>Gaura longiflora</i>	Large-flowered Gaura			1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
86	<i>Rumex altissimus</i>	Pale Dock	2*		1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
87	Gr Unkn #3	Grass Unknown #3			1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
88	<i>Setaria viridis</i>	Green Foxtail	exotic		1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
89	<i>Ailanthus altissima</i>	Tree of Heaven	exotic		1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
90	<i>Panicum capillare</i>	Common Witchgrass		0	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
91	<i>Achillea millefolium</i>	Yarrow		0	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
92	<i>Tridens flavus</i>	False Redtop		1	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
93	<i>Silphium integrifolium</i>	Rosinweed		4	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
94	<i>Aster praealtus</i>	Willowleaf Aster		7	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
95	<i>Spartina pectinata</i>	Prairie Cordgrass		5	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
96	<i>Tripsacum dactyloides</i>	Eastern Gammagrass		5	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
97	<i>Petalostemum purpureum</i>	Purple Prairie Clover		8	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
98	<i>Solidago missouriensis</i>	Prairie Goldenrod		4	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
99	<i>Aster ericoides</i>	Heath Aster		4	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
100	<i>Apocynum cannabinum</i>	Indian Hemp Dogbane		3	1	0	0	1	1.149	1.587	0.0017	0.0230	1.587
									683.908			13.6782	

* indicates vegetation that is adventive or weedy species.

population. The Coefficient of Conservatism, as assigned by Missouri Department of Conservation, was used to determine the quality and desirability of individual species. The Coefficient of Conservatism ranges for zero to ten with ten as the highest value of quality and desirability of individual species. A species with a ten value of Coefficient of Conservatism is also a rare species to find in the ecosystem. All thirty-two native prairie species that were identified and located in the survey units had a Coefficient of Conservatism of four or higher, with the exception of eight species. These species are Yellow Wood Sorrel, Blue Prairie Violet, Hoary Vervain, Silver Blue Stem, Patagonian Plantain, Yarrow, False Redtop, and Indian Hemp Dogbane. The Coefficient of Conservatism was three or lower on all of the above species because they are a low quality species and /or have been naturalized to the prairie ecosystem. Of the top ten species identified 50% of them were native prairie species, four native grasses: Big Blue Stem, Sideoats Grama, Switch Grass, Indian Grass, and one native forb Maximilian Sunflower. All of these native prairie species were seeded in 1979, the original prairie seeding. Then of the top twenty-five species identified 28% were native prairie species. These included the above five native prairie species plus one native grass, Blue Grama and one forb, Prairie Ground Cherry. It is unknown when Blue Grama grass was introduced into Unit A. The Prairie Ground Cherry is a species that is typically found in disturbed areas, rocky soils, or waste areas and will disappear if higher quality species are successful in establishing species population. The majority of the 68 non-native species are very low quality of Coefficient of Conservatism and/or true exotics. These 68 species are typically found in disturbed or woody areas but can be controlled and eliminated with proper management of prescribed burns, manual maintenance, and native seeding.

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