

PRAIRIE RESTORATION REPORT OCT. 1996- SEPT. 1997

FORT SCOTT NATIONAL HISTORIC SITE

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PREPARED BY:

DENISE E. JAMES

PARK RANGER/BIOLOGICAL SCIENCE TECHNICIAN

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INTRODUCTION

Prairie restoration is an on going project at Fort Scott National Historic Site (FSNHS) for the past four years. There has been a significant effect on the control of exotic vegetation and the increment of the population of native forbs through native prairie sod transplantation and the implementation of native forb seeding (MAP 1). Prairie restoration projects in 1997 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. Other projects were establishing areas and preparing them for native forb seeding in the fall of 1997, formulating a native forb seed mix based on the native vegetation at the Little Osage Prairie. And conducting botanical survey of prairie Units A, B1, B2 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

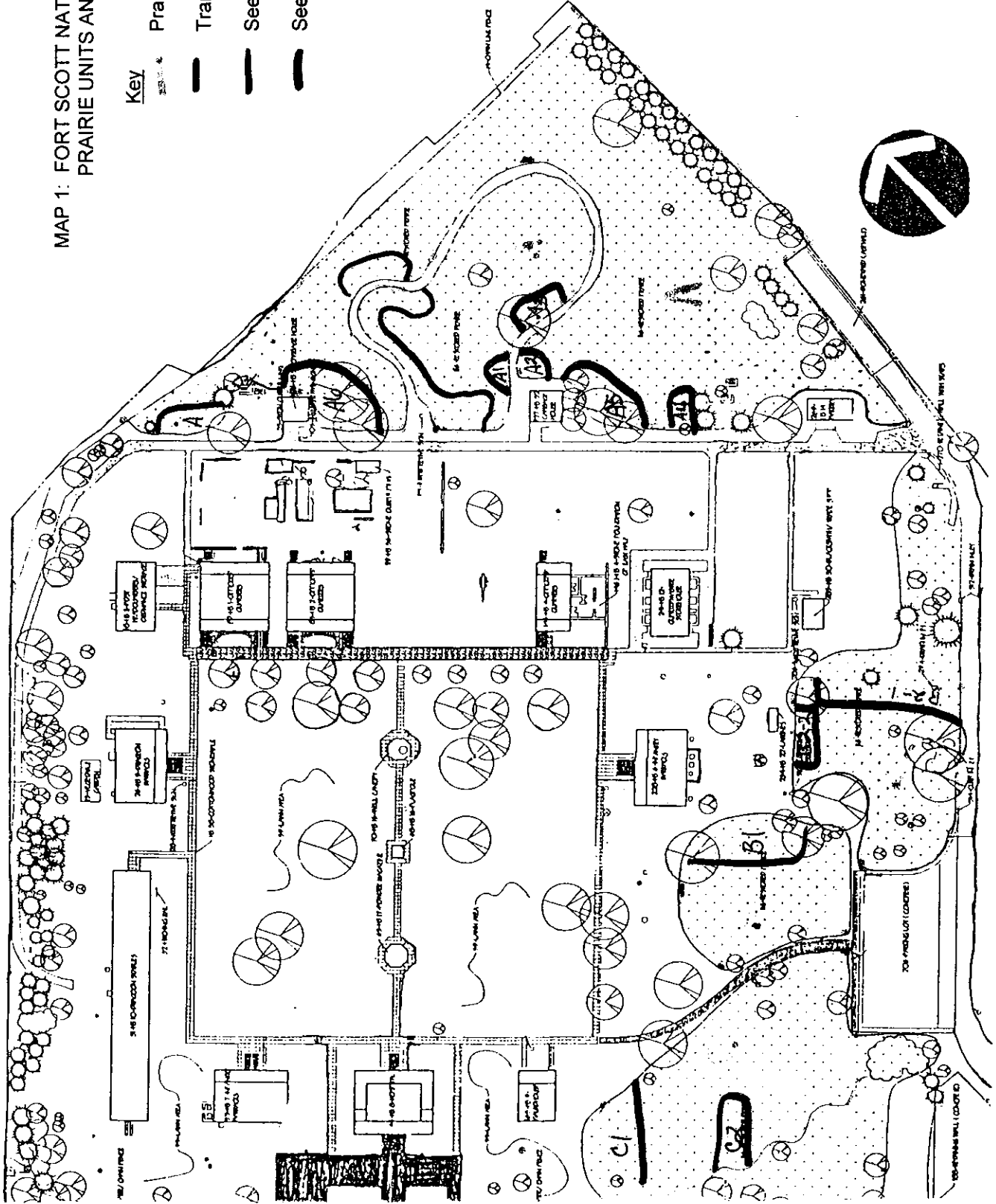
MAP 1: FORT SCOTT NATIONAL HISTORIC SITE
PRAIRIE UNITS AND PROJECT LOCATIONS

Key

-  Prairie Unit Boundary
-  Transplantation Area Boundary
-  Seeding 1996 Plot Boundary
-  Seeding 1997 Plot Boundary

LEGEND

- 160 PEN NUMBER
- 168 HISTORIC STRUCTURE NUMBER
- ⊕ QUICK COUPLE VALVE
- ⊗ WATER METER
- ▽ CLEANOUT
- ⊗ CONTENTS OF LIGHTING
- ⊗ UTILITIES / AC UNITS
- ⊗ STACED WOOD WALLS
- ⊗ TRASH RECEPTACLES
- ⊗ NPS INTERPRETIVE SIGNS (N.I.S.)
- DRAIN INLET
-  BRICK PAVEMENT
-  COTTONWOOD STONE PAVEMENT
-  FIELD STONE PAVEMENT
-  COLORED LIMESTONE
-  RESTORED PRAIRIE



exotic species located in Prairie Units. The restoration projects were the majority of slide photographs take this year. These SPD indicates exotic control in prairie units, presence of native forbs in Unit A and B, the seeding of and first year seedlings growth from the fall 1996 native forb seeding project, new prairie species located in sod transplantation area, and second year growth of sod transplantation species.

TARGETED VEGETATION AND REMOVAL

The vegetation targeted for removal in the summer of 1997 includes the same exotic forbs and woody vegetation as the past three 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. The removal of the exotic and woody vegetation was accomplished by manual and mechanical methods to control the population growth of the species.

TARGETED EXOTIC VEGETATION

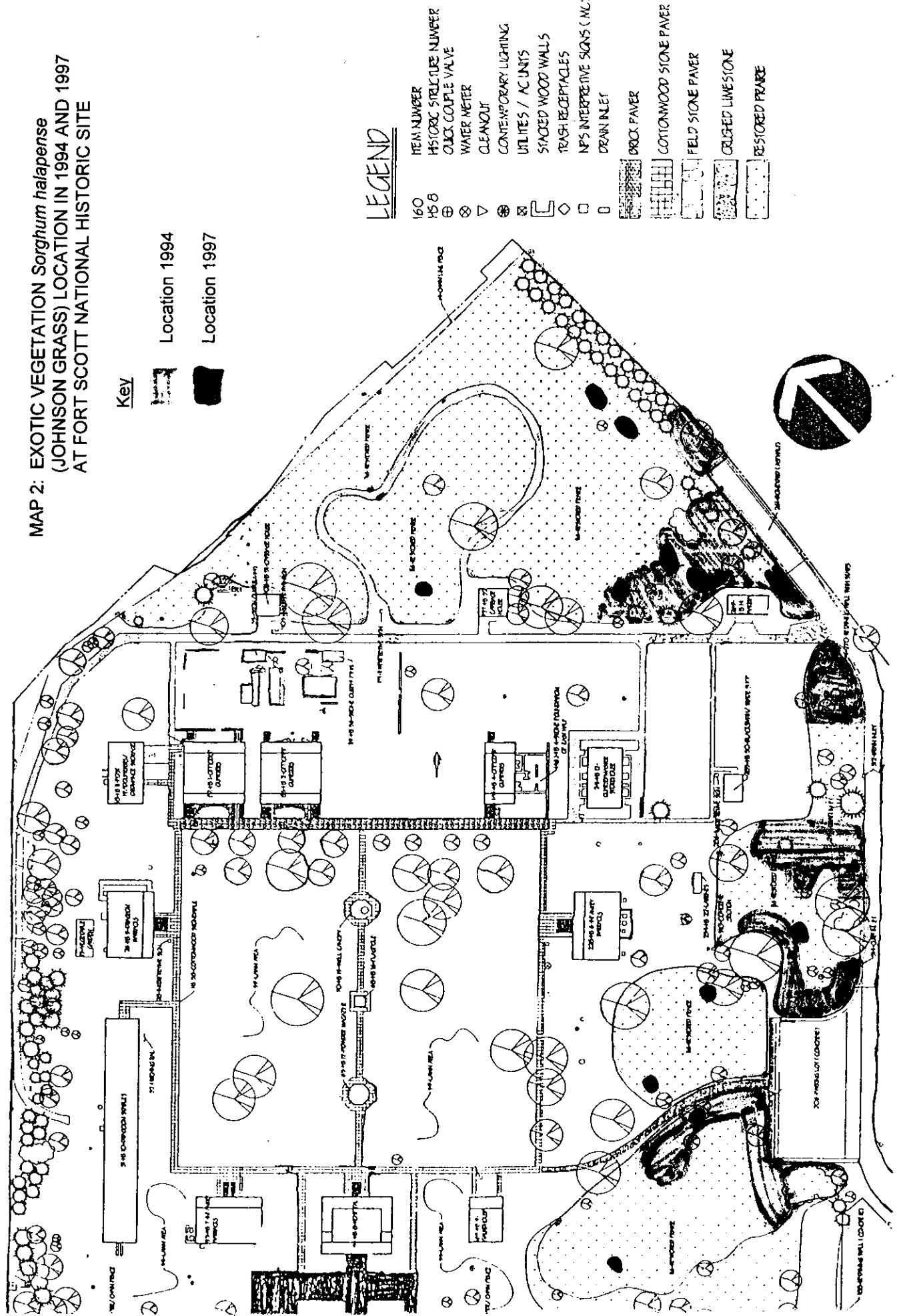
Sorghum halapense (Johnson Grass), *Melilotus officinalis* (Yellow Sweet Clover), *Securigera varia* (Crown Vetch), and *Rhus radicans* (Poison Ivy) were the major focus of exotic vegetation removal for the summer of 1997. Other species that are secondary importance for targeted vegetation removal include *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.

TABLE 1: FORT SCOTT NATIONAL HISTORIC SITE TARGETED VEGETATION
FOR REMOVAL IN THE SUMMER OF 1997.

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>Verbascum blattaria</i>	Moth Mullein	A
<i>Vitis spp.</i>	Grape	A,B
Woody Vegetation		
<i>Acer negundo</i>	Box Elder	A,C
<i>Alnus 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

The presence of *Sorghum halapense* (Johnson Grass) is still significant in all prairies Units (MAP 2). The reduction of Johnson Grass in some areas is due to control

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



method last year or to the placement of the fire suppression road (FSR). This disturbance, from the FSR, is located in the northeast side of prairie Unit B2. In 1996, Johnson Grass was located on the northeast side around the Scotch Pine. The FSR disturbed this area removing the Scotch Pine and taking part of the prairie unit for construction of the road. Therefore, removing the presence of Johnson Grass. The southwest border and the south corner of Unit B2 still contained a reduced population of *Sorghum halapense*. Unit B1 had three groups of Johnson Grass along the NW side in 1996 and this area was reduced to one group in 1997 (MAP 2). A few sporadic plants of Johnson Grass were also found under the American Elm tree on the NE side of Unit B1 by the picnic area. In 1996, *Sorghum halapense* was located in B1 along the border by the NW corner of the RV parking lot. There were no plants located in this area in 1997.

Unit C contained the same areas as 1996 but with a reduced 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 condensed 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 on the Cultural Landscape Report, CLR). There was a small 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. 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 just as 1995 (MAP 2). 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.

Compared to 1994, the presence of *Securigera varia* (Crown Vetch) has been 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 by the RV parking lot. With continued 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. But, *Securigera varia* has been eliminated in all but the NE corner of the Austrian Pines in Unit A. Four years ago this area had extensive invasion and the exotic species is diminish to immature weak plants. An another area of success in Unit A for the elimination of this exotic is the hillside E of HS-14 and around the Cottonwood tree (225 CLR). 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) has been reduced to either sparse singular plants or moderate concentrated populations in all of prairie Unit A (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, & 175 CLR). Unit B1 had a more scattered individual population of Yellow Sweet Clover than last year but less than 1994. These were mostly located within the fall 1996

MAP 3: EXOTIC VEGETATION *Securigera varia* (CROWN VETCH) LOCATION IN 1994 AND 1997 AT FORT SCOTT NATIONAL HISTORIC SITE

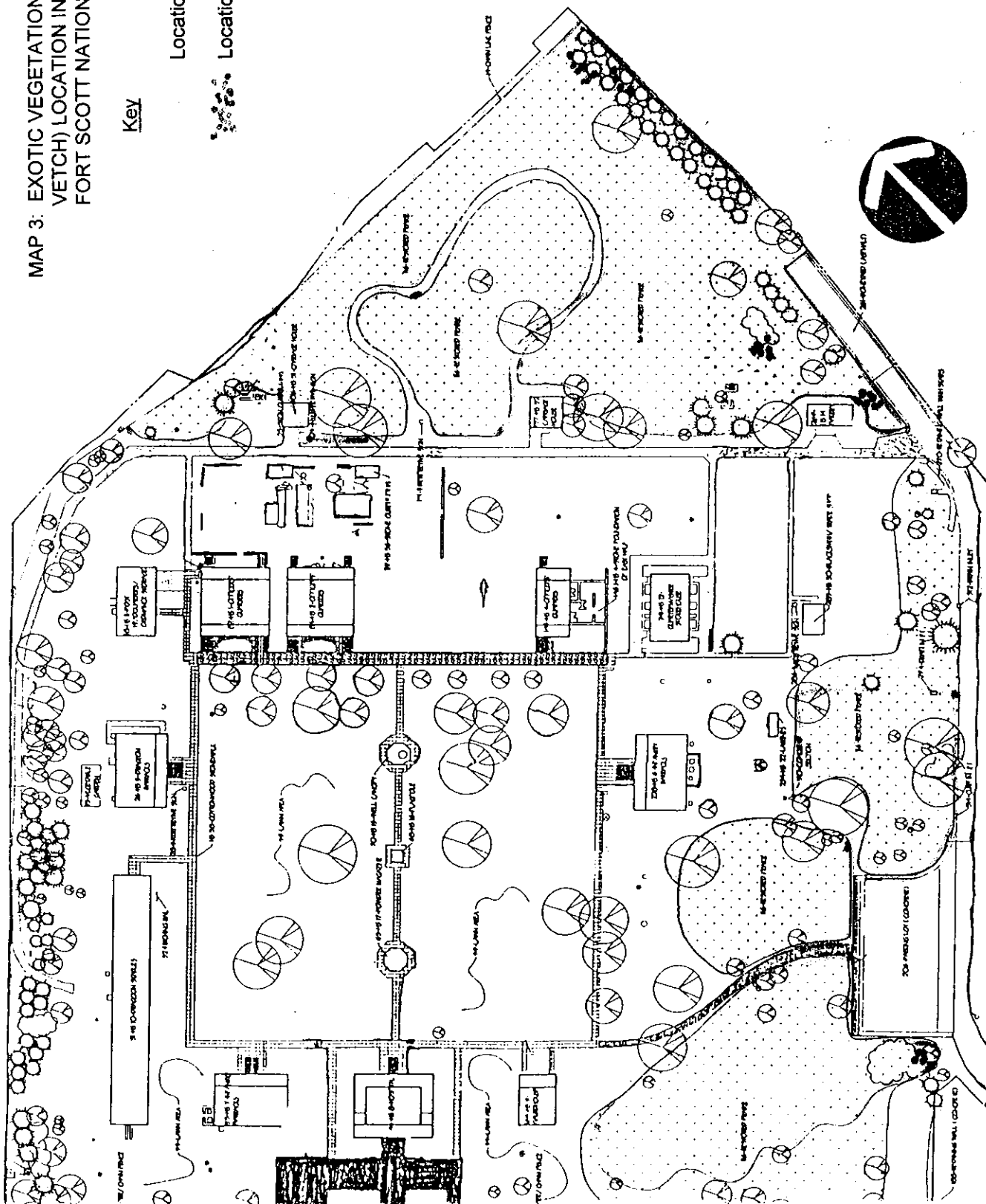
Key

Location 1994

Location 1997

LEGEND

- | | |
|------|------------------------------|
| 160 | HEW NUMBER |
| HS 8 | HISTORIC STRUCTURE NUMBER |
| ⊕ | QUICK COUPLE VALVE |
| ⊗ | WATER METER |
| ▽ | CLEANOUT |
| ⊙ | CONTEMPORARY LIGHTING |
| ⊞ | UTILITIES / AC UNITS |
| ⌒ | STACKED WOOD WALLS |
| ◇ | TRASH RECEPTACLES |
| □ | NPS INTERPRETIVE SIGNS (N/C) |
| ○ | DRAIN INLET |
| | BRICK PAVEMENT |
| | COTTONWOOD STONE PAVEMENT |
| | FIELD STONE PAVEMENT |
| | CRUSHED LIMESTONE |
| | RESTORED PRAIRIE |



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

Key

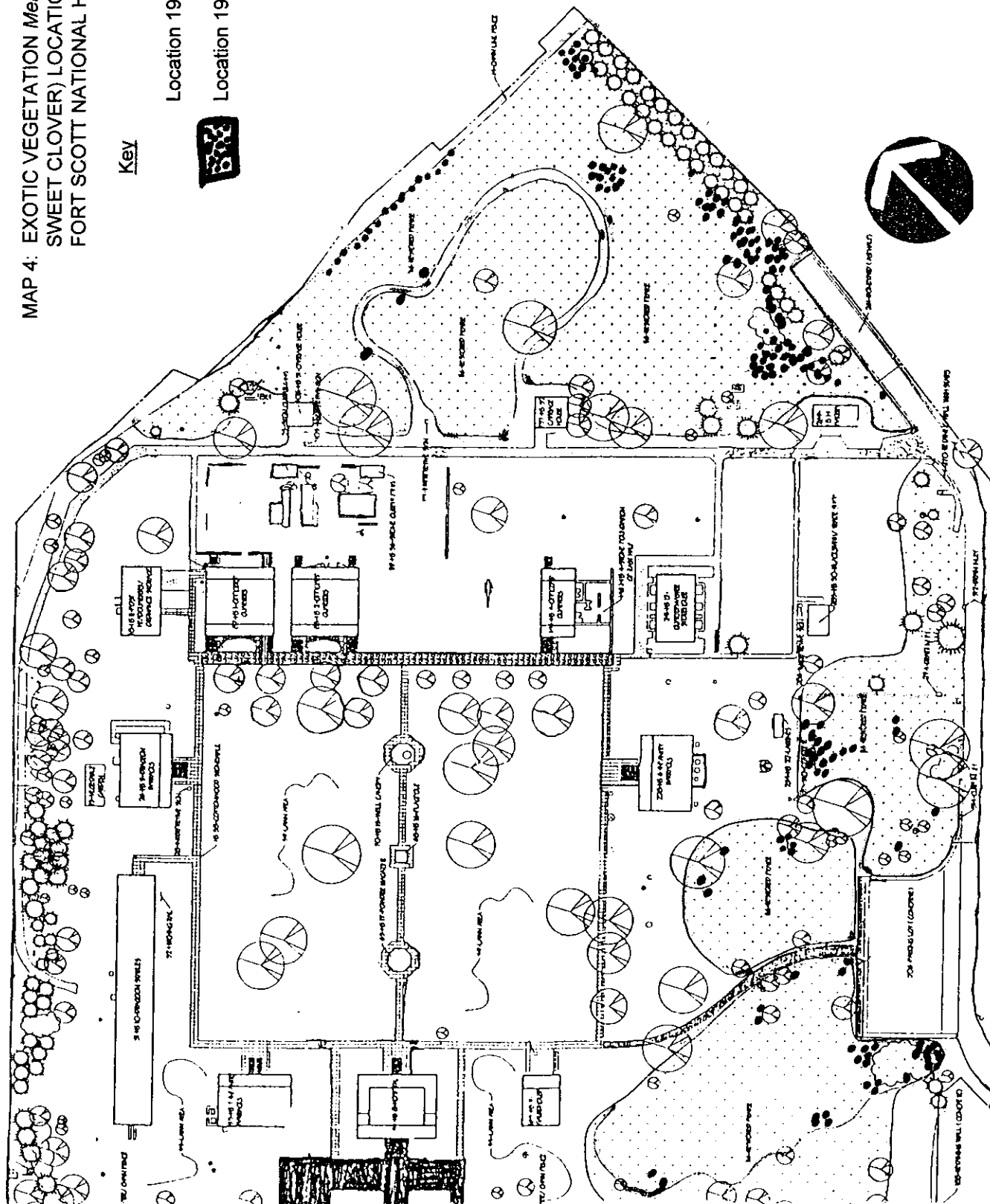
Location 1994

Location 1997



LEGEND

ITEM NUMBER	160
HISTORIC STRUCTURE NUMBER	H5 B
QUICK COUPLE VALVE	⊗
WATER METER	⊗
CLEANOUT	▽
CONTINGUARY LIGHTING	⊗
UTILITIES / AC UNITS	⊗
STACED WOOD WALLS	⊗
TRASH RECEPTACLES	⊗
NPS INTERPRETIVE SIGNS (N.G.)	⊗
DRAIN INLET	⊗
BRICK PAVEMENT	⊗
COTTONWOOD STONE PAVEMENT	⊗
FIELD STONE PAVEMENT	⊗
CELTIC LIME STONE	⊗
RE STORED PAVEMENT	⊗



native seeding area (MAP 1) and showed up this year do to the disturbance of the ground for native planting, exposing and causing the germination of the exotic seeds. Unit B2 also exhibited more scattered individual population on the NW side where ground preparation for native forb seeding was being conducted. The main body of Unit B2 had four singular plants of Yellow Sweet Clover. Unit A population was the same as last year. Scattered groups of Yellow Sweet Clover were located from HS-14 along the boneyard fence to the southern end of the Austrian Pines. Other locations of Yellow Sweet Clover in Unit A in along the N border fence, W of the Hackberry tree (22 CLR) around the Wild Plum thicket by the prairie trail, and W of the Wild Plum thicket (257 CLR) N of HS-14. The population along the northern border fence was 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 mowed, tilled, and planted with native forbs (see Native Forb Planting 97-98 later in report). 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 96-97 because, of a very densely populated area of Giant Ragweed from the Hackberry (307 CLR) by the picnic area to the north corner of the prairie unit. 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 the Black Walnut trees along the railroad ties on the red brick path.

Poison Ivy (*Rhus radicans*) has been reduced or weakened in some areas of the prairie units by repeated mowing during the growing season. 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 American Elm (118 CLR) that was removed in the fall of 1996, and the American Elm (142 CLR) along the prairie trail. These areas were mowed, tilled, and planted with native forbs in 97-98. The presence of *Rhus radicans* has been reduced to a few spindly plants around the Cottonwood NW 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 the mowing, tilling, and 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 meager distributions of Trumpet Vine, Sweet Pea, Virginia Creeper, Pokeweed, Curly Dock, and Grape. Trumpet vine, Velvetleaf, and Moth Mullein are located around the Austrian Pines and the N border in Unit A. 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 97-98. The center of Unit B2 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 and the N corner on Unit B1. 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 1997 because of the heavy sprouting of tree saplings that were cut in 1996. Some of the re-growth was significant in size for some species and small in others. 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 sprouts and small trees that needed to be eliminated. The major species of Unit A are the three 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. Such as the Black Locust is still a problem for the W corner of Unit A behind HS-31, due to the population of mature trees beyond the border line 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). 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. The burning of Black Locust will kill the main stems and unfortunately tends to prolific sprouts. From the E of HS-31 to the prairie trail seem to be another species-specific population area in Unit A with fourteen sprouts of Box Elder. This area 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. Continued trimming of the sprouts and removal of the parent trees 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 would eliminate future seedling sprouts. One of the mature trees, 141 CLR, is targeted for removal because the heart of the tree is rotten with carpenter ants present. 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. The spot application of a tree herbicide directly after cutting of the sprouts would help to control the growth of the saplings, or the removal of the root system. 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 and mechanical methods to control the population growth of the exotic species. The manual methods used were hand pulling, hand-held clippers, and shoveling to removal root systems. 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

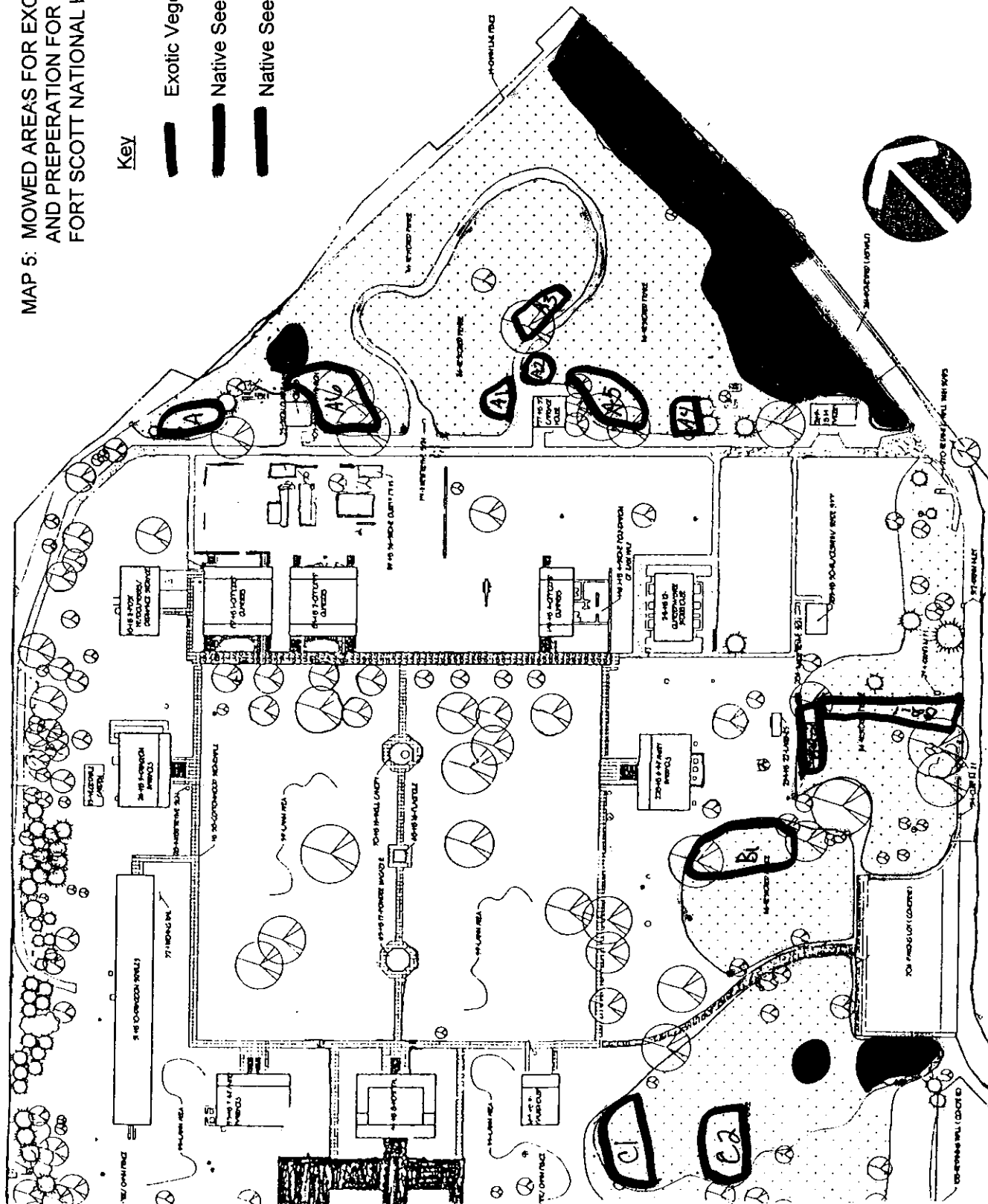
MAP 5: MOWED AREAS FOR EXOTIC VEGETATION CONTROL
AND PREPARATION FOR NATIVE FORB SEEDING AT
FORT SCOTT NATIONAL HISTORIC SITE IN 1997

Key

-  Exotic Vegetation Control
-  Native Seeding 1996 Plots
-  Native Seeding 1997 Plots

LEGEND

ITEM NUMBER	
160	HISTORIC STRUCTURE NUMBER
HS B	QUICK COUPLE VALVE
⊗	WATER METER
▽	CLEANOUT
⊕	CONTEMPORARY LIGHTING
⊗	UTILITIES / AC UNITS
⌈	STACKED WOOD WALLS
◇	TRASH RECEPTACLES
□	NPS INTERPRETIVE SIGNS (IN)
□	DRAIN INLET
	BRICK PAVEMENT
	COTTONWOOD STONE PAVEMENT
	FIELD STONE PAVEMENT
	CRUSHED LIMESTONE
	RESTORED PRAIRIE



of grasses and exotic vegetation in the native forb seeded areas (MAP 5). These areas were kept mowed to a height of 6-8 inches to reduce the competition for the native forb seedlings and allow them to become established plants. 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, Curly Dock, and Johnson Grass. A combination of hand pulling and shovel were used on Johnson Grass because of the rhizomatous root system. The rhizome of *Sorghum halapense* were collected and placed in a trash bag to prevent the spreading of the species while transporting the species out of the prairie units to the dump. Virginia Creeper, Pokeweed, and Grape species were cut at ground level for removal by the hand-held clippers. 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 mowed (MAP 5) to either control and or eliminate many exotic species located in that area. These species are 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, Virginia Creeper, Poison Ivy, and Grape species.

WOODY VEGETATION REMOVAL

The removal of woody vegetation was accomplished by manual and mechanical methods of 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. All of the saplings and sprouts in Units A and C were removed with the clippers by cutting them off at ground level. 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. The sickle bar mower was used on four areas of sprouts two on Unit C and two on Unit A. 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 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). Also in Unit A, there was re-growth in the Black Locust sucker saplings thicket N of HS-31 that was mowed by the sickle bar mower.

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 1997 was to monitor and survey the success of the prairie species. The transplant section was monitored to identify what species that survived to the second year, flower and seed production, appearance of new species, and to indicate the presence of exotic species.

KNOWN TRANSPLANTED NATIVE FORBS

The native forb transplantation project from 1995 at FSNHS had continued success in the second year growth of the transplanted species. Of the known transplanted forbs from the donor prairie in 1995 (see Prairie Restoration Project Report 1995) 80% of the transplanted forbs were identified in Unit A in 1997. A total of 53 native forbs were identified in the transplantation area of Unit A in the summer of 1997 (MAP 1, TABLE 2). Of the 53 forbs all but seven; Blue Wild Indigo, Creamy Wild Indigo, Wild Strawberry, Long-Bearded Hawkweed, Bracted Plantain, Cat's Claw Sensitive Bair, Bird's Foot Violet, and Prairie Violet, of the transplanted species bloomed in Unit A.

TABLE 2: NATIVE FORBS FOUND IN PRAIRIE SOD TRANSPLANTATION IN UNIT A IN 1997		
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>Liatris squarrosa</i>	Scaly Blazing Star	5
<i>Linum sulcatum</i>	Grooved Yellow Flax	5
<i>Lithospermum canescens</i>	Hoary Puccoon	6
<i>Oxalis violacea</i>	Violet Wood Sorrel	5
<i>Penstemon pallidus</i>	Pale Bearded Tongue	4
<i>Penstemon tubaeformis</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>Plantago aristata</i>	Bracted Plantain	1
<i>Polytaenia nuttallii</i>	Prairie Parsley	8
<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

NEWLY IDENTIFIED NATIVE FORBS

Of the 53 forbs there were 12 new native forb species found in the transplantation area in 1997 that were not found in 1996 (TABLE 3). These newly identified species caused a 6% increase of the known transplanted native forbs located in Unit A transplantation section from 1996 to 1997. The occurrence of these new species could be

TABLE 3: NEW SPECIES OF NATIVE FORBS IDENTIFIED IN TRANSPLANT AREA IN 1997 BUT WERE NOT FOUND IN 1996

SCIENTIFIC NAME	COMMON NAME	# OF PLANTS
<i>Arnoglossum plantagineum</i>	Prairie Indian Plantain	7
<i>Aster ericoides</i>	Heath Aster	15
<i>Aster pilosus</i>	Hairy Aster	23
<i>Aster prealtus</i>	Willow Aster	19
<i>Callirhoe alcaeoides</i>	Pink Poppy Mallow	10
<i>Delphinium virescens</i>	Plains Larkspur	1
<i>Erythronium rostratum</i>	Yellow Dog's Tooth Violet	1
<i>Hypoxis hirsuta</i>	Yellow Star Grass	5
<i>Liatris squarrosa</i>	Scaly Blazing Star	3
<i>Lithospermum canescens</i>	Hoary Puccoon	1
<i>Oxalis violacea</i>	Violet Wood Sorrel	6
<i>Polytaenia nuttallii</i>	Prairie Parsley	1

due to the root stress when transplanted, dormancy of the roots and/or seeds, and new growth from established native for seed banks in the sod at the time of the transplant.

NATIVE GRASSES IN TRANSPLANT AREA

The transplanted sod still contains all fourteen of the grasses identified in 1996 (TABLE 4). The Prairie Cord Grass had about a dozen species present between the two populations of the species. Gama Grass had continues to grow and expand to four large clumps with a dozen spike seed heads a 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 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

TABLE 4: KNOWN NATIVE GRASSES LOCATED IN 1997 PRAIRIE SOD TRANSPLANTATION AREA		
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>Boutlelouw curtispindula</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

throughout the transplantation area. There are still two clumps each of June Grass and Little Bluestem.

EXOTICS IN TRANSPLANT AREA

The exotics present in the transplantation area have been reduced by 50 percent to five species for the summer of 1997 (TABLE 5). The most aggressive exotic present is the Tall Fescue, followed by Ox-Eye Daisy and Yellow Foxtail. All seed heads were removed from the above three, to prevent seed dispersal, and Deptford Pink and Rough Fruited Cinquefoil. All exotic species but Tall Fescue, were removed by hand pulling. Because *Festuca arundinacea* has extensive root systems it is difficult to remove by hand and a spring burn would help to eliminate it. The species that were not found this year are the following: Queen Anne's Lace (*Daucus carota*), Common St. John's-wort (*Hypericum perforatum*), Sericea Lespedeza (*Lespedeza cuneata*), Heal-All (*Prunella*

velgaris), and Red Clover (*Trifolium pratense*). The eradication of these species is due to the removal of the seedpod, plant, and root systems last spring before the exotics had gone to seed.

TABLE 5: EXOTICS FOUND IN THE TRANSPLANTATION AREA IN 1997	
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 last year. 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

(*Ecpantheria scribonia*), Beautiful Wood-Nymph (*Eudryas grata*), Question Mark (*Polytonia interstincta*), and Plume Moth (F. *Pterophoridae*). The Snowberry Clearwing (*Hemerobius diffinis*) was present again this year, busily flying around the Asclepias (Milkweed) in Unit C. The Pea Weevil (*Bruchus pisorius*) was found on the Slender Mountain Mint and Long Horned Beetles (*Tetraopes tetrophthalmus*) 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, Katydid, & Crickets) and Hemiptera (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, a Garter Snake, a Black Snake, and a species of Skink were observed. The Black Snake was seen four times throughout the summer in this area. A Skink 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. In Units B and C snakes were heard crawling through but a positive identification was never made. These snakes were more than likely other Black Snakes. A couple of Box Turtles were located in Units A and C.

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 5). 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. And, both areas had close access to water for watering the seedlings that did germinate in the spring. 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. For the methods and location of their collecting and cleaning of the seeds see the FSNHS Prairie Restoration Report 1994 and FSNHS Prairie Restoration Report 1995. 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 6). Native forbs that were collected in 1994 were tested for Percent Viability and Percent Germination. All seeds that were tested were viable. I had a consultation with Lisa Thomas, at Wilson's Creek National Battlefield at Republic Missouri, to help me calculate the seeding ratio per square meter per species (TABLE 7). The native Species with less than 0.1oz were not calculated in the ratio and native forb species in the same families were calculated together. Gary Sullivan, who is also at Wilson's Creek National Battlefield donated Little Bluestem (*Schizachyrium scoparium*) seed to use as a cover species for the native forb planting. The germination rate of the Little Bluestem was 70.00 % and the seeding ratio was adjusted accordingly. 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. This was accomplished by a small 4 x 6 inch box lined with medium grit sandpaper (80-100) and a small 3 x 3 inch wood block covered with the same sandpaper. Small amounts of the seed were placed into the box and then rubbed with the sandpaper block until the

TABLE 6: 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

protective chaff was remove and small scratches could be seen on the seed coat. The *Petalostemon* species used the 100-120-grit sandpaper and the *Baptisia* and *Schrankia* needed the 80-grit sandpaper. 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

TABLE 7: FALL 1996 NATIVE FORBS SEEDING RATES OF OUNCES OF SEEDS PER SQUARE METERS PER SPECIES		
SCIENTIFIC NAME	UNIT A	UNIT B1
<i>Amorpha canescens</i>	0.179	0.121
<i>Asclepias ssp.</i>	0.954	0.646
<i>Baptisia ssp.</i>	1.312	0.888
<i>Dodecatheon meadia</i>	0.060	0.040
<i>Echinacea pallida</i>	1.491	1.009
<i>Liatris ssp.</i>	3.280	2.219
<i>Penstemon ssp.</i>	0.179	0.121
<i>Petalostemon ssp.</i>	1.044	0.706
<i>Polytaenia nuttallii</i>	2.505	1.694
<i>Ratibida pinnata</i>	0.476	0.323
<i>Rudbeckia hirta</i>	0.155	0.105
<i>Schrankia nuttallii</i>	0.060	0.040
Total amount forb seeds in oz.	11.698	7.912
<i>Schizachyrium scoparium</i>	2.000	1.300
Total Amount Seeds in oz. Of Forbs & Little Bluestem	13.698	9.212

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.

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 8). 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. *Rudbeckia hirta* had the most abundant germination and growth of all the species, but was to be expected since it is an aggressive

TABLE 8: FIRST YEAR GERMINATION OF NATIVE FORB SPECIES SEEDED IN NOVEMBER OF 1996 IN PRAIRIE UNITS A AND B1			
SCIENTIFIC NAME	COMMON NAME	UNIT	# FOUND
<i>Asclepias</i> ssp. *	Milkweed	A	5
<i>Baptisia</i> ssp. **	Wild Indigo	A,B	14
<i>Echinacea pallida</i>	Pale Purple Coneflower	A,B	32
<i>Petalostemon</i> ssp.	Prairie Clover	A	3
<i>Linum sulcatum</i>	Grooved Yellow Flax	A	10
<i>Ratibida pinnata</i>	Gray Headed Coneflower	A,B	18
<i>Rudbeckia hirta</i>	Black Eyed Susan	A,B	38
* may have both species <i>A. tuberosa</i> & <i>A. viridis</i>			
** believed to be <i>Baptisia australis</i>			

species that will grow just about anywhere. Black Eyed Susan was very visual on Unit B1 with sixteen plants produced first year blooms. Unit A had six Black Eyed Susan plants bloom and five or six other plants that did not. *Rudbeckia hirta* had very good basal growth many of the plants ranged from six to fourteen inches in diameter. The next most abundant species were *Ratibida pinnate*, another aggressive grower, and *Echinacea pallida*, with an excellent competitive ability to aggressive growers. Both of these Coneflowers had several basal leaves at two to twelve inches in diameter. Photo-documentation was made using a 12-inch ruler to show growth of the species. In one area of Unit A, there was eight species of *Echinacea pallida* within a twelve-inch space. The

Baptisia species is believed to be *B. australis* because of the leaf formation. This Wild Indigo had sturdy stem for a small 5-inch tall seedling. 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* stem seems to have flexed under the heavy equipment to continue growing, or broke off and would sometimes re-sprout. The Grooved Yellow Flax had a great first year growth with about a dozen plant germinating in Unit A and grew to maturity to produce flowers and seeds. The *Asclepias* were found in Unit A, but these seedlings did not survive the heavy construction equipment running over them. The *Petalostemon* species were a surprise discovery because the seedlings are very tiny and delicate no more than two inches tall. They were stumbled upon near the *Baptisia* species in Unit A. And were not found again after the construction equipment drove over the area.

FALL 1997 NATIVE FORB SEEDING

The native forb enhancement was continued in 1997 with another native forb seeding at FSNHS. 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 within 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 this year for the fall 1997 native forb seeding with a grand total of 8432 square feet to be seeded (MAP 5). These areas were mowed repeatedly and tilled 4-6 inches deep in preparation for the seeding in the fall around 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

All of the native forb that were seeded in the fall of 1997 at FSNHS were purchased from three area native wildflower dealers that are within 250 miles from Fort Scott. These dealers were: Mervin Wallace with Missouri Wildflower Nursery at Jefferson City Missouri, Rex and Amy Hamilton with Hamilton Seeds at Elk Creek Missouri, and Steve Ahring with DeLange Seed House at Girard Kansas. The 24 species of native prairie forbs were selected for seeding at FSNHS because they were found on the local native prairies and on the Little Osage Prairie (TABLE 9). The species were selected from their individual competitive ability and ease of conditioning, how easily establishment occurs. The individual competitive ability of the forb species ranged from medium to aggressive. And the ease of conditioning was two difficult species to some mixed and the majority being easily established. Species of native forbs that are expected to germinate the first year are Black Eyed Susan, Long-head Coneflower, Gray-head Coneflower, Prairie Coreopsis, Ashy Sunflower, Purple Coneflower, Pale-Purple Coneflower, and Compass Plant. All of these species are easy to establish and have

TABLE 9: 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 ohimensis</i>	Ohio Spiderwort	4	good	mix

either an aggressive or really good competitive ability. The remaining 16 species of native forbs may become establish the second or third year.

It was calculated that 1.6-pounds of pure live seed would be needed to seed the total 8432 square feet. To obtain this calculation two ratio factor variable were used and the recommend seeding amounts of native forbs in pounds per acre. Factor one was based on each species seed size. Factor two was based on the percent frequency that each

species was found on the Little Osage Prairie, and the species aggressive ability. The recommend quantity of native forbs to be planted is 8-pounds per acre. The 1.6-pounds of pure live seed for 8432 square feet was then converted to the ounces of each native forb species needed per plot seeded. To make measuring the native forbs easier the ounces of forbs per plot was converted to grams of forbs per plot (TABLE 10). The native forb species were then measured out to species per plot and placed in envelopes. A few of the species such as *Amorpha*, *Baptisia*, *Petalostemon*, and *Schrankia* required specific care to the seed to enhance germination results. These four species required light scarification directly before seeding, and was accomplished by the same methods as the 1996 seeding. This was the small 4 x 6 inch box lined with medium grit sandpaper (80-100) and a small 3 x 3 inch wood block covered with the same sandpaper. Small amounts of the seed were placed into the box and then rubbed with the sandpaper block until the protective chaff was remove and small scratches could be seen on the seed coat. The *Petalostemon* species used the 100-120-grit sandpaper and the *Amorpha*, *Baptisia* and *Schrankia* needed the 80-grit sandpaper. The *Baptisia* and *Petalostemon* also required inoculant after scarification before planting. The inoculant was purchased from The Natural Garden in St. Charles, Illinois. Gary Sullivan at Wilson's Creek National Battlefield donated Little Bluestem (*Schizachyrium scoparium*) seed, again this year, to use as a cover species for the native forb planting. The germination rate of the Little Bluestem was around 50% and the seeding ratio was adjusted accordingly. The native forb seeds were measured; if needed scarified and inoculated before the seeds were mixed with cottonseed hulls to be broadcast in the fall and winter. The cottonseed hulls

Table 10: Fall 1997 Native Forb Seed Planting ratio/area Conversion from ounces to grams

conversions from ounces to grams														
SPECIES	T. Area	oz F1&F2 for 1.6lbsd	Unit A1	Unit A2	Unit A3	Unit A4	Unit A5	Unit A6	Unit B2-1	Unit B2-2	Unit C1	Unit C2	T. Area	g F1&F2 for 1.6lbsd
calculation in grams	8432		281	137	540	300	1270	1488	1633	642	746	1395	8432	
		0.033325	0.016248	0.064042	0.035579	0.150617	0.176471	0.193667	0.076139	0.088472	0.165441			
<i>Dodecatheon media</i>		0.104918	2.974425	0.099123	0.048328	0.190488	0.105827	0.447999	0.5249	0.576048	0.22647	0.263153	2.974428	2.974425
<i>Rudbeckia hirta</i>		0.125902	3.569322	0.118948	0.057994	0.228587	0.126993	0.537601	0.629882	0.69126	0.271765	0.315785	3.569325	3.569322
<i>Tradescantia ohiensis</i>		0.104918	2.974425	0.099123	0.048328	0.190488	0.105827	0.447999	0.5249	0.576048	0.22647	0.263153	2.974428	2.974425
<i>Monarda fistulosa</i>		0.041967	1.189764	0.039649	0.019331	0.076195	0.042331	0.179199	0.209959	0.230418	0.090587	0.105261	1.189766	1.189764
<i>Ratibida columifera</i>		0.041967	1.189764	0.039649	0.019331	0.076195	0.042331	0.179199	0.209959	0.230418	0.090587	0.105261	1.189766	1.189764
<i>Amorpha canescens</i>		0.167869	4.759086	0.158597	0.077326	0.304781	0.169324	0.716799	0.839841	0.921678	0.362352	0.421046	4.759091	4.759086
<i>Solidago rigida</i>		0.083934	2.379529	0.079298	0.038663	0.15239	0.084661	0.358398	0.419918	0.460836	0.181175	0.210522	2.379531	2.379529
<i>Ratibida pinnata</i>		0.167869	4.759086	0.158597	0.077326	0.304781	0.169324	0.716799	0.839841	0.921678	0.362352	0.421046	4.759091	4.759086
<i>Petalostemon candidum</i>		0.209836	5.948851	0.198245	0.096657	0.380976	0.211654	0.895998	1.0498	1.152096	0.45294	0.526307	5.948857	5.948851
<i>Petalostemon purpurea</i>		0.209836	5.948851	0.198245	0.096657	0.380976	0.211654	0.895998	1.0498	1.152096	0.45294	0.526307	5.948857	5.948851
<i>Coreopsis palmata</i>		1.259016	35.6931	1.189473	0.579942	2.285858	1.269925	5.375988	6.298798	6.912576	2.717637	3.15784	35.69314	35.6931
<i>Liatris aspera</i>		1.259016	35.6931	1.189473	0.579942	2.285858	1.269925	5.375988	6.298798	6.912576	2.717637	3.15784	35.69314	35.6931
<i>Liatris pycnostachya</i>		1.259016	35.6931	1.189473	0.579942	2.285858	1.269925	5.375988	6.298798	6.912576	2.717637	3.15784	35.69314	35.6931
<i>Salvia azurea</i>		0.839344	23.7954	0.792982	0.386628	1.523905	0.846617	3.583992	4.199198	4.608384	1.811758	2.105227	23.79543	23.7954
<i>Eryngium yuccifolium</i>		0.839344	23.7954	0.792982	0.386628	1.523905	0.846617	3.583992	4.199198	4.608384	1.811758	2.105227	23.79543	23.7954
<i>Helianthus mollis</i>		0.419672	11.8977	0.396491	0.193314	0.761953	0.423308	1.791996	2.095999	2.304192	0.905879	1.052613	11.89771	11.8977
<i>Echinacea purpurea</i>		0.419672	11.8977	0.396491	0.193314	0.761953	0.423308	1.791996	2.095999	2.304192	0.905879	1.052613	11.89771	11.8977
<i>Asclepias tuberosa</i>		0.839344	23.7954	0.792982	0.386628	1.523905	0.846617	3.583992	4.199198	4.608384	1.811758	2.105227	23.79543	23.7954
<i>Penstemon digitalis</i>		0.419672	11.8977	0.396491	0.193314	0.761953	0.423308	1.791996	2.095999	2.304192	0.905879	1.052613	11.89771	11.8977
<i>Echinacea pallida</i>		3.357377	95.18164	3.171928	1.546511	6.095622	3.386467	14.33597	16.7968	18.43354	7.247035	8.42091	95.18173	95.18164
<i>Schrankia nuttallii</i>		3.777049	107.0793	3.568419	1.739825	6.857575	3.809776	16.12797	18.8964	20.73773	8.152914	9.473523	107.0794	107.0793
<i>Baptisia australis</i>		3.777049	107.0793	3.568419	1.739825	6.857575	3.809776	16.12797	18.8964	20.73773	8.152914	9.473523	107.0794	107.0793
<i>Baptisia leucantha</i>		3.777049	107.0793	3.568419	1.739825	6.857575	3.809776	16.12797	18.8964	20.73773	8.152914	9.473523	107.0794	107.0793
<i>Silphium laciniatum</i>		2.098361	59.48853	1.982455	0.96657	3.809765	2.116543	8.959985	10.498	11.52097	4.529398	5.26307	59.48859	59.48853
		25.6	725.7599	24.18595	11.79215	46.47912	25.82181	109.3118	128.0756	140.5557	55.25863	64.20943	725.7606	725.7599

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.

BOTANICAL SURVEY

A complete botanical survey was taken of prairie Units A, B1, and B2 in the summer and early fall of 1997 at FSNHS. Since time was limited, it would not allow for the survey of Unit C or the completion of the statistical data facts. The raw data has been entered on to the computer and waits further time for completion. The base line in Unit A started 10m from the NE corner of the north prairie border fence. The base line 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.

REFERENCES

- Ahring, Steve. Delange Seed House. PO Box 7. Girard, KS. 1997.
- Bader, Brian J.. "Seed Handling Basic Concepts." Uw-Aboretum. 1-7-1992.
- Bare, Janet E.. "Wildflowers and Weeds of Kansas." The Regents Press of Kansas. Lawrence, Kansas. 1979.
- Bland, Roger G., H.E. Jaques. "How to Know the Insects." Wm. C. Brown Co. Publishers. Dubuque, Iowa. 1978.
- Clarke, Wanda M., Thomas B. Bragg. "Movement of Tallgrass Prairie Plant Species from Sod Transplant into Adjacent Reestablished Grassland." Prairie Naturalist. March 1994. P67-81.
- "Common Weeds of the United States." The Agricultural Research Service of the United States Department of Agriculture. Dover Publication Inc.. New York. 1971.
- Fort Scott National Historic Site 1997 Field Maps
- Fort Scott National Historic Site Prairie Management Plan.
- Fort Scott National Historic Site Prairie Restoration Report 1994.
- Fort Scott National Historic Site Prairie Restoration Report 1995.
- Fort Scott National Historic Site Prairie Slide Notebook: Vol. 1. 1980-1997.
- Fort Scott National Historic Site Prairie Slide Notebook: Vol. 2. 1980-1997.
- Freeman, Craig C., Eileen K. Schofield. "Roadside Wildflowers of the Southern Great Plains." University Press of Kansas. 1991.
- Hahn, Craig. "Fort Scott National Historic Site Existing Condition Base Map." Fort Scott National Historic Site Cultural Landscape Report. Aug., 1993.
- Hamilton, Rex. Amy Hamilton. Hamilton Seeds. 16786 Brown Rd.. Elk Creek, MO. 1997.
- Kearns, S. Kelly. "A Comparison of Transplanting Times and Methods for Salvaging Prairie Forbs and Grasses." Proceedings of the Ninth North American Prairie Conference. 1985.
- Knobel, Edward. "Field Guide to the Grasses, Sedges, and Rushes of the United States." Dover Publications, Inc.. New York, 1980.
- Ladd, Doug. "Tallgrass Prairie Wildflowers, A Falcon Field Guide." Falcon Press Publishing Co. Inc.. Helena and Billings, Montana. 1995.
- McGregor, Ronald L.. "Flora of the Great Plains." University Press of Kansas. 1986.
- "Missouri Flora." Missouri Department of Conservation. 1992.
- Niering, William A., Nancy C. Olmstead. "The Audubon Society Field Guide to North American Wildflowers Eastern Region." Alfred A. Knop Inc.. New York, 1993.
- "Pasture and Range Plants." Phillips Petroleum Co.. Bartlesville, Oklahoma. 1980.
- Phillips, Harry R.. "Growing and Propagating Wildflowers." University of North Carolina Press. 1986.
- Richard, J.. Joan E. Heitzman. "Butterflies and Moths of Missouri." Conservation Commission of the State of Missouri. Missouri Department of Conservation. Jefferson City. MO, 1987.

- "Soil Survey of Bourbon County, Kansas." National Cooperative Soil Survey. February 1981.
- Spencer, Edwin Rollin. "All About Weeds." Dover Publications Inc.. New York. 1968.
- Sullivan, Gary. Wilson's Creek National Battlefield. Republic, MO. 1996 & 1997.
- "The Natural Garden, Inc.." 38W443 Highway 64. St. Charles, IL. 1996 & 1997.
- Thomas, Lisa. Wilson's Creek National Battlefield. Republic, MO. 1996 & 1997.
- VanBruggen, Theodore. "Wildflowers: Grasses and Other Plants of the Northern Plains and Black Hills." Fenske Printing Inc.. 1983.
- Wallace, Mervin. "Missouri Wildflower Nursery." 9814 Pleasant Hill Rd.. Jefferson City, MO. 1996 & 1997.