PRAIRIE RESTORATION IN JUBILEE COLLEGE STATE PARK: *WITH EMPHASIS ON 1994*

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ABSTRACT

In 1994 with the help of about 12 Nature Conservancy volunteers and with grants from the Nature Conservancy, Sierra Club, and Illinois Nongame Wildlife Check-off Fund, about 3 acres of prairie were restored from a dominant Hungarian brome plant community. Also, seed of scarce or nonexistent species were distributed in already established prairie sites. This year's restoration is an ongoing effort from prior years in both Jubilee College State Park and Jubilee College State Historic Site. The results of this year's prairie planting is unknown, but restoration in prior years have been completely successful. In addition, about 250 acres, including prairie, woodland and mixed Hungarian brome/prairie, were fire managed to control brushy species, fire-sensitive trees and garlic mustard. The beneficial effects of fire is already evident. A total kill of garlic mustard was observed in burned areas; however, dormant seeds have sprouted. The woody stem of species, like poison ivy, dogwood, sumac, multiflora rose and gooseberry were eradicated.

INTRODUCTION

Prairie restoration is a relatively new field. Although some information can be obtained from published works, much can be learned from prairie nurseries and by informal contacts. Surprisingly little on U.S. prairies was presented at last year's 15th International Botanical Congress in Yokohama. At this conference only presentations were given on fire management of *Silene regia* and bison grazing preference for prairie dog colonies.

MATERIALS AND METHODS

Materials. From the Illinois Nongame Wildlife Check-off Grant the following supplies were purchased: one 3-gallon sprayer, 2.25 gallons of Round-up™ and one pint of herbicide dye indicator (Table 1). The Nature Conservancy donated two Fedco rubber water-sprayers and two flat shovels. A grant from the Illinois Chapter of Sierra Club provided two fire-flappers, two fire-rakes, two Fedco rubber water-sprayers, two drip torches, two 6-gallon water containers, two 5 1/4-gallon kerosene containers and one 5-gallon gasoline container. In previous years, grants from the "Prairie Dogs" and The Nature Conservancy have furnished one power weed/brush chopper

with accessories, three axes, seven pruning shears, two bow saws, one back-pack water sprayer (plastic), two hard-hats with face and ear protectors, two fire-fighting flappers, and three "Pocket" fold-open saws. Prairie seeds were obtained in the fall of 1993 from Jubilee College State Park (mainly *Sorgastrum nutans, Echinacea purpurea, Liatris pycnostachya, Liatris spicata* and *Andropogon gerardii*). Additional seed species were obtained from Hal Gardner's prairie row-crops on Switzer Road (Table 2). Seeds were collected manually at time of seed ripening (Table 3) and hand-thrashed and sieved.

Seed treatment. Seeds were saved for spring 1994 planting. As a general rule grass seeds require no treatment for germination, except for *Tripsacum dactyloides*. Also, very small seeds generally require no treatment (except for example, *Sisyrinchium campestre*) However, very small seeds often require light to germinate. Most forbes seeds require a 2 month moist-cold stratification in order to germinate. Legumes need pericarp (hull) removal, scarification, zero to 10-days stratification, and inoculation with specific nitrifying bacteria. It has been my experience that only *Petalostemum* species need nitrifying bacteria; therefore, this inoculum was purchased from Prairie Moon Nursery. Specific seed treatments are shown in Table 3. Grass seeds were stored in a barn within paper bags suspended in a mouse-proof chicken-wire cage. Other seeds were stored in galvanized garbage cans. When the weather warmed, the moist-stratified seeds were moved to the 34° F room at the National Center for Agricultural Utilization Research, Peoria, IL.

Field preparation and planting. Since the areas to be planted were dominated by cool-season grass (*Bromus enermis*), this Eurasian species had to be eradicated. Area D (Fig.1) was about half planted with prairie previously; therefore, the other half (about 1 acre) was fall-sprayed with Round-up™. A burn of this area on March 12 cleared the dead grass for a moderately heavy hand-sowing in early April. Also, this same March 12 burn promoted the rapid spring growth of *Bromus enermis* in Area E (Fig. 1) permitting the spraying of Round-up on this area on April 17 (about 2 acres). Spot spraying was completed a week later, and a heavy sowing of seeds occurred a couple of days later (after a rain) directly on the partly dead grass. No soil tilling was done in either Area D or E. In the past it has been found that tilling the soil promotes weed growth. The resulting thick stands of fox-tail and other weeds have discouraged use of this method; however, tilling generally has been successful in dry seasons. Areas A and B are already established eco-systems (Fig. 1), thus seeds were distributed by hand in selected areas without herbicide treatment or tilling.

Ecological considerations. As seen in Table 3, plants have ecological preferences. It would be a complete waste of seeds to place them where they will not thrive. Plants preferring savanna conditions were located in partial shade. Plants thriving in wet to wet-mesic conditions were seeded in Area B (a wet bottom) and in wet draws in Area A. Since Area E was heavily seeded

with tall-grass species, forbes species found to be very tolerant of tall-grass were utilized, namely *Baptisia* sp., *Lespedeza capitata*, *Penstemon digitalis*, and *Silphium laciniatum*. The other forbes placed in Area E were mainly varieties available in excess. It is not likely that any of these latter species will overcome tallgrass. A federally endangered species, *Petalostemum foliosum*, was carefully located in specific spots within the areas indicated by Table 2. The seeds of three Illinois endangered species also were planted (*Filipendula rubra*, *Silene regia*, and *Zizia aptera*).

Fire management. About 250 acres of prairie, mixed Eurasian/prairie grasses, and woodlands were burned. Part of Area F (hill prairies) was fall burned in 1993. On March 5, the remainder of Area F was burned. Subsequently, on March 12 about 150 acres of mixed eco-systems were burned north of Jubilee-Brimfield Rd. (see large area highlighted in yellow). On March 19 the 60-70 acre prairie designated as Area C (Fig. 1) was fire managed. On April 2 a burn of a small garlic-infested woodland area north of Jubilee-Brimfield Rd. was completed (about 4-5 acres). This latter acreage was an east and north-facing slope that failed to ignite on March 12.

RESULTS AND DISCUSSION

It is too early to assess the results of the 1994 planting, but previous restorations will be described. Prior to 1990, most seeding was restricted to introducing new species into already established prairies. One strategy simply employed distributing seeds, and another involved seeding on disturbed areas. The latter method has proved to be the most successful. For example, after a horse trail was relocated, seed was sown directly on the trail with excellent results. Also excellent results were obtained by sowing seeds on soil sterilized with burning of brush piles. Although placing seed in established areas had variable success, the results were often slow to be recognized. One planting of *Liatris pycnostachya* in Area B required about 8 years to be seen blooming.

In 1990 about 1/4 of Area D was roto-tilled and spring planted. This planting was only moderately successful. Partially shaded areas did better than full sun, possibly because of dry conditions and certainly due to heavy fox-tail growth. In early summer of 1991 another 1/4 of Area D was herbicided with Round-up™ herbicide. While I was on sabbatical leave in Sweden, Nature Conservancy volunteers collected seeds at the Gardner property in the fall of 1991 and sowed them immediately on the herbicided plot (no soil disturbance). This effort was very successful. In the fall of 1992 a variation of the same method was tried at Jubilee College State Historic Site. After a fall herbicide treatment (Round-up™) of about 3 acres, seeds collected at the Gardner row crops and Jubilee College State Park were fall planted. Because we were deficient in certain species, additional seeds were ordered from the Department of Conservation Nursery in Mason County for sowing in the spring of 1993. Overall seed density was moderately heavy. Assessment in the fall of 1993 was tentatively encouraging. However, it was suspected (but not confirmed) that the Dept.

of Conservation forbes seed was not cold-moist stratified because poor germination was seen with these species. However, because the grasses do not require stratification, the grasses obtained from the Dept. were successfully germinated by 1993. Eight species of grass, ten legumes, and 43 other forbes species were seeded in this plot (total of 61). In the Historic Site planting we were careful to maintain two separate ecosystems. The areas to the south and east were planted almost entirely in tall-grass (*Tripsacum dactyloides*, *Andropogon gerardii*, *Sorgastrum nutans*, and *Panicum virgatum*). The remainder was planted exclusively in forbes and short grass. This technique permits the forbes a chance to grow without competition from the more aggressive tall-grass.

In the spring of 1993 Lisa Sandall, Jubilee Park Steward, obtained 1050 root stocks from the Dept. of Conservation Nursery. The roots were planted, according to their eco-type, in all prairie areas of Jubilee College State Park, except Area E and F.

As expected, fire management in the 1993-94 season was successful with both the prairie and woodlands. In the burned portions of the forest, the understory canopy opened with good kill of gooseberry bushes and poison ivy. Some small trees lost lower branch vitality, but few appeared to be killed outright. No evidence of oak/hickory mortality was observed. The prairie burns were successful in killing the woody portions of sumac, dogwood, blackberry, multiflora rose, and several other non-prairie species.

Results are already evident on the burning of about 4-5 acres of garlic mustard infested woodland. On March 12 part of this area burned, mainly a south-east facing hill. Wildflower emergence seemed somewhat earlier than usual, but the second years growth of the biennial garlic mustard was destroyed. However, the fire seemed to stimulate the germination of dormant garlic mustard seeds. A follow-up burn in the fall of 1994 would seem to be necessary to control this species. In the garlic mustard area, a second burn of east and north facing slopes was carried out on April 2. Preliminary results indicate a better kill of second year growth of garlic mustard, but again fire seemed to stimulate seedling germination.

In Jubilee College State Park a number of new species have been introduced, and species occurring in other parts of the park have been reintroduced in other areas. Table 4 gives an up-to-date accounting of introduced and indigenous species identified thus far with the species list broken down into specific areas. Figure 2 shows some photos of restoration work.

Finally, it should be mentioned that a majority of the Round-up™ herbicide (1.6 gal.) remained unused. Thus, sufficient herbicide should be available for future restorations.

ACKNOWLEDGEMENTS

Special thanks are due to Nature Conservancy volunteers who work from February to December on the first and third Saturdays of each month. Six to twelve volunteers are always present for work days. During March and early April volunteers worked all day each Saturday to complete prairie burns in the Park, including several burnings of private property. Individual volunteers also worked entire days helping with projects, like seed processing and herbicide treatment. Thanks are also due to several Sierra Club members, who helped with prairie burns.

Table 1. PURCHASES WITH ILLINOIS NONGAME WILDLIFE CHECK-OFF FUNDS.

Quantity	Item	Vendor	Cost
1	3-gallon sprayer	Brimfield Hdwre	$34.99
1	1 Quart of Round-up	Brimfield Hdwre	$29.99
1	1 Gal. of Round-up	Kelly Seed	$123.34
1	1 Gal. of Round-up	General Supply Corp.	$109.00
1	1 violet dye indicator	General Supply Corp.	$17.75
		Total	$315.07

TABLE 2. SEED USED FOR 1994 PRAIRIE PLANTINGS.

	Weight[a]	Planting location[b]
Allium cernuum, nodding wild onion	3.2 oz	A,B,D
Allium stellatum, prairie onion	3.5 oz	D
Amorpha canescens, lead plant	0.7 oz	D
Amsonia tabernaemontana, blue dogbane	2.5 lb	B,D
Andropogon gerardii, and *Sorghastrum nutans* mix	16.6 lb	E
Anemone cylindrica, thimbleweed	0.25 oz	D
Artemisia ludoviciana, louisiana sagebrush	0.7 oz**	D
Asclepias sullivantii, prairie milkweed	0.2 oz	B,D
Aster azureus, azure aster	2 oz	D
Aster ericoides, heath aster	0.8 lb*	D
Aster laevis, smooth aster	4.2 oz	D
Aster novae-angliae, new england aster	10 oz	saved
Aster oblongifolius, aromatic aster	5 oz	D
Astragalus canadensis, canadian milk vetch	0.5 oz**	D
Baptisia leucantha, white wild indigo	5 oz*	D,E
Baptisia leucophaea, cream wild indigo	4.5 oz*	D,E
Bouteloua curtipendula, sideoats grama	2.7 oz	D
Cacalia atriplicifolia, pale indian plantain	3.5 oz	D
Cassia fasciculata, partridge pea	3.3 oz**	D,E
Cassia hebecarpa, wild senna	0.7 lb**	D,E
Coreopsis palmata, prairie coreopsis	0.5 oz	D
Coreopsis tripteris, tall coreopsis	0.7 lb	D
Desmanthus illinoensis, Illinois bundleweed	1.1 lb**	D,E
Desmodium canadense, showy tick trefoil	1.1 lb	D,E
Desmodium laevigatum, smooth tick trefoil	4.5 oz	D,E
Dodecatheon meadia, shooting star	small amt	D
Echinacea pallida, pale purple coneflower	2.1 lb	A,D,E
Echinacea purpurea, purple coneflower	1 lb	D
Eryngium yuccifolium, rattlesnake master	2 lb	D
Euphorbia corollata, flowering spurge	0.1 oz	D
Filipendula rubra, queen-of-the-prairie	small amt, 3 plants	B
Gentiana flavida, cream gentian	5 oz	A,B,D
Gentiana puberulenta, prairie/downy gentian	0.7 oz	A,D
Helianthus maximilianii, maximillian's sunflower	10 oz***	D,E
Helianthus mollis, hairy sunflower	2 oz**	D
Iris shrevei, southern blue flag	1.5 oz	A,B
Lespedeza capitata, bush lespedeza	1.5 oz***	D,E
Liatris aspera, rough blazing star	2.3 oz	D
Liatris pycnostachya, gayfeather/button snakeroot	0.6 lb	B
Liatris spicata, button snakeroot/marsh blazing star	2.7 oz	B

(Table 2, continued)

Monarda fistulosa, wild bergamot	0.25 oz**	D
Parthenium integrifolium, american feverfew/wild quinine	3.7 oz	D
Penstemon digitalis, foxglove beard-tongue	0.5 lb	D,E
Petalostemum foliosum, leafy prairie clover	0.3 lb	B,D,E
Petalostemum candidum, white prairie clover	2 oz	D
Petalostemum purpureum, purple prairie clover	2 oz	D
Physostegia virginiana, obedient plant	2.3 oz**	saved
Potentilla arguta, prairie cinquefoil	3.2 oz	D
Pycnanthemum tenuifolium, slender mountain mint	2 oz**	D
Pycnanthemum virginianum, common mtn. mint	1.2 oz*	D
Ratibida pinnata, drooping coneflower	1.5 lb seed	D,E
Rudbeckia subtomentosa, sweet black-eyed susan	2.6 oz	D
Ruellia humilis, hairy ruellia	6 oz**	D
Schizachyrium/Andropogon scoparium, little bluestem grass	0.8 lb	D
Silene regia, royal catchfly	0.1 oz	D
Silphium integrifolium, rosinweed	0.8 lb	D,E
Silphium laciniatum, compass plant	3.6 lb	D,E
Silphium terebinthinaceum, prairie dock	3 oz*	D
Sisyrinchium campestre, blue-eyed grass	0.6 oz	D
Solidago rigida, rigid goldenrod	5 oz	D
Solidago speciosa, showy goldenrod	0.75 lb	D
Sporobolus heterolepis, northern dropseed	1 oz	D
Teucrium canadense virginicum, american germander	0.5oz**	saved
Tradescantia ohiensis, ohio spiderwort	ca 1 oz***	D
Tripsacum dactyloides, eastern gama grass	1.8 lb	B
Veronicastrum virginicum, culver's root	0.7 lb flwr capsules	A,B,D
Viola pedatifida, prairie violet	0.5 oz	D
Zizia aptera, Heart-leaved golden alexanders	2.5 oz	D
Total wt.	47.2 lb	

[a] Weight includes * small amount of chaff, ** medium amount of chaff, *** large amount of chaff. Not included were about 5 lbs mixed forbes seed planted in the fall.

[b] For planting location see Fig. 1. Those species "saved" will be fall planted because of failure to stratify seed.

TABLE 3. TIME OF SEED COLLECTION (1993), SEED TREATMENT, AND PLANT ECO-PREFERENCE.

	Time seed	Seed treat[a]	Soil Moist[b]	Sun-light[c]
Allium cernuum, nodding wild onion	9/5-9/18	C	2-4	P,S
Allium stellatum, prairie onion	9/18-10/3	C	3-5	P
Amorpha canescens, lead plant	10/17 all	C10:H:J	2-5,B	P
Amsonia tabernaemontana, blue dogbane	10/3 all	C	2-3	P,S
Andropogon gerardii, big bluestem	10/3-10/30	A	2-5	P,S
Anemone cylindrica, thimbleweed	10/3 or earlier	C	3-5	P,S
Artemisia ludoviciana, louisiana sagebrush	11/7 all	A	4-5,N	P,S
Asclepias sullivantii, prairie milkweed	10/10-10/17	C	2-3,B	P
Aster azureus, azure aster	11/7-11/11	A	3-5	P,S
Aster ericoides, heath aster	11/11 all	A	2-5	P
Aster laevis, smooth aster	9/26-10/30	A	2-4	P,S
Aster novae-angliae, new england aster	11/7 all	C	1-3	P
Aster oblongifolius, aromatic aster	12/5-12/12	A	4-5,N	P
Astragalus canadensis, canadian milk vetch	8/14-9/5	C10:H:J	2-4	P,S
Baptisia leucantha, white wild indigo	9/5 all	C10:H:J	2-5	P,S
Baptisia leucophaea, cream wild indigo	8/8 all	C10:H:J	3-5	P,S
Bouteloua curtipendula, sideoats grama	8/21-10/3	A	4-5	P,S
Cacalia atriplicifolia, pale indian plantain	9/19-10/3	C	3-4	P,S
Cassia fasciculata, partridge pea	9/11 all	C10:H:J	3-5	P
Cassia hebecarpa, wild senna	10/17 all	C10:H:J	2-3	P,S
Coreopsis palmata, prairie coreopsis	9/18-10/3	C	3-5	P,S
Coreopsis tripteris, tall coreopsis	10/8-10/23	C	2-4	P,S
Desmanthus illinoensis, Illinois bundleweed	10/3 all	A:H:J	3-5	P
Desmodium canadense, showy tick trefoil	9/5-9/18	A:J	2-4	P
Desmodium laevigatum, smooth tick trefoil	9/5-10/3	A:J	3-4	P
Dodecatheon meadia, shooting star	?	M	2-4	P,S
Echinacea pallida, pale purple coneflower	9/11 all	D:C90	3-5	P
Echinacea purpurea, purple coneflower	9/5-10/8	D:C	2-3	S
Eryngium yuccifolium, rattlesnake master	9/26-10/17	C	2-4	P,S
Eupatorium maculatum, joe pye weed	9/18 all	M	1-2	P,S
Euphorbia corollata, flowering spurge	9/5-9/26	C	2-5	P,S
Filipendula rubra, queen-of-the-prairie	9/5-9/26	C90	1-2	P
Gentiana flavida, cream gentian	10/8-10/30	D:C	2-4	P,S
Gentiana puberulenta, prairie/downy gentian	10/17-10/30	D:C	3-5	P
Helianthus maximilianii, maximillian's sunflower	10/23 all	A	2-4	P
Helianthus mollis, hairy sunflower	9/11-10/8	A	3-4	P,S
Iris shrevei, southern blue flag	8/8-8/21	C120	1-2	P,S
Lespedeza capitata, bush lespedeza	10/17 all	C10:H:J	3-5	P,S
Liatris aspera, rough blazing star	10/8-10/23	C	3-5,B	P,S

(Table 3, Continued)

Liatris pycnostachya, gayfeather/button snakeroot	9/26-10/8	C	1-3,B	P
Liatris spicata, button snakeroot/marsh blazing star	10/17 all	C	1-3,B	P
Monarda fistulosa, wild bergamot	9/11-10/8	A	2-5	P,S
Parthenium integrifolium, american feverfew	9/5-10/17	C	2-4	P
Penstemon digitalis, foxglove beard-tongue	10/3 all	C30:G	3-4	P,S
Petalostemum foliosum, leafy prairie clover	8/21-10/17	A:H:I:J	3-4	P
Petalostemum candidum, white prairie clover	9/5-10/8	A:H:I:J	3-4	P
Petalostemum purpureum, purple prairie clover	9/5-9/26	A:H:I:J	3-5,B	P
Physostegia virginiana, obedient plant	10/8 all	C	2-3	P,S
Potentilla arguta, prairie cinquefoil	8/8-9/5	C:G	2-5	P,S
Pycnanthemum tenuifolium, slender mountain mint	9/5-10/30	A	3-4	P
Pycnanthemum virginianum, common mtn. mint	10/17-10/30	A	2-3	P,S
Ratibida pinnata, drooping coneflower	8/14-9/11	C	2-4	P
Rudbeckia subtomentosa, sweet black-eyed susan	9/18-10/3	C	2-3	P,S
Ruellia humilis, hairy ruellia	10/17 all	C	3-5	P,S
Schizachyrium/Andropogon scoparium, little bluestem	10/17-11/11	A	3-5	P,S
Silene regia, royal catchfly	8/8-9/5	A	3-4	P,S
Silphium integrifolium, rosinweed	8/21-9/18	C	2-4	P
Silphium laciniatum, compass plant	9/18-10/15	C	2-4	P
Silphium terebinthinaceum, prairie dock	9/5-10/23	C	2-4	P
Sisyrinchium campestre, blue-eyed grass	before Aug.	C90:G	3-5	P
Solidago rigida, rigid goldenrod	10/8-10/23	C:G	3-5	P
Solidago speciosa, showy goldenrod	10/23-11/11	C:G	3-5	P,S
Sorghastrum nutans, indian grass	10/3-10/30	A	3-5	P
Sporobolus heterolepis, northern dropseed	8/14-10/8	A	2-4	P,S
Teucrium canadense virginicum, american germander	10/8 all	C	2-3	S
Tradescantia ohiensis, ohio spiderwort	9/5-10/17	C120:G	2-5	P,S
Tripsacum dactyloides, eastern gama grass	8/8-10/3	C	2-3	P
Veronicastrum virginicum, culver's root	10/8-10/17	A:D	2-4	P,S
Viola pedatifida, prairie violet	6 + 8/14-10/23	C:D	3-4	P
Zizia aptera, Heart-leaved golden alexanders	8/8-9/5	C120:G	3-4	P

[a] Seed treatments are as follows: A, no treatment; C, two months of moist-cold stratification except as specified in number of days (C90 means 90 days of stratification); D, seeds need light to germinate; G, seeds prefer early spring sowing; H, seeds require scarification; I, inoculation with specific nitrifying bacteria required; J, pericarp (or hull) are removed; M, fall planted.

[b] Soil moisture preferred as follows: 1 = very wet; 5 = very dry; B = loose soil (loam or sandy); N = sand/gravel.

[c] Sunlight conditions: P, full sun prairie; S, partial sun savanna.

TABLE 4. JUBILEE COLLEGE STATE PARK PRAIRIE SPECIES

	Area and introductions[a]
Allium canadense, wild garlic	C
Allium cernuum, nodding wild onion/*Allium stellatum*, prairie onion	A*
Amorpha canescens, lead plant	A*
Amsonia tabernaemontana, blue dogbane	A*,B*
Andropogon gerardii, big bluestem	A,C
Anemone canadensis, Canada anemone	C
Anemone cylindrica, thimbleweed	A
Antennaria neglecta, pussytoes	A,C
Apocynum sibiricum, indian hemp	A,B,C
Asclepias syriaca, common milkweed	A,C
Asclepias verticillata, horsetail milkweed	C
Aster azureus, azure aster	A**,C
Aster ericoides, heath aster	A,C
Aster novae-angliae, new england aster	A,B
Baptisia leucantha, white wild indigo	A,C
Buchloe dactyloides, buffalo grass	A*
Cacalia atriplicifolia, pale indian plantain	A**,C
Carex annectens, yellow-fruited sedge	B
Carex bebbii, beautiful/Bebb's sedge	A,B,C
Carex bicknellii, Bicknell's sedge?	C
Carex gravida, heavy sedge	A,C
Carex meadii, Mead's sedge	A
Carex pallescens, pale sedge?	A,B,C
Carex shortiana, Short's sedge	A,B,C
Cassia hebecarpa, wild senna	A*
Ceanothus americanus, new jersey tea	A
Coreopsis tripteris, tall coreopsis	A,B,C
Cyperus erythrorhizos,	B
Desmanthus illinoensis, Illinois bundleflower	A*
Desmodium canadense, showy tick trefoil	A
Echinacea pallida, pale purple coneflower	A*,C*
Echinacea purpurea, purple coneflower	A**
Equisetum arvense, common horsetail	B,C
Erigeron philadelphicus, marsh fleabane	A,C
Eryngium yuccifolium, rattlesnake master	A***,B*,C
Eupatorium maculatum, joe pye weed	A
Eupatorium perfoliatum, common boneset	B
Euphorbia corollata, flowering spurge	A,C
Filipendula rubra, queen-of-the-prairie	B*
Fragaria virginiana, wild strawberry	C

(Table 4 continued)

Gentiana puberulenta, prairie/downy gentian	A**,C
Gentiana quinquefolia occidentalis, stiff gentain	A,C
Helianthus grosseserratus, sawtooth sunflower	A,B,C
Heuchera richardsonii grayana, prairie alumroot	C
Hieracium gronovii, hairy hawkweed	C
Hordeum jubatum, squirrel-tail grass	B
Hordeum pusillum, little wild barley	A
Hypericum pyramidatum, great st. johns-wort	B
Iliamna remota, kankakee mallow	B*
Juncus tenuis, path rush	A,B,C
Kuhnia(Brickellia) eupatorioides, false boneset	A
Lespedeza capitata, bush lespedeza	A,C
Liatris aspera, rough blazing star	A,C
Liatris pycnostachya, gayfeather/button snakeroot	A*,B*
Liatris spicata, button snakeroot/marsh blazing star	B*
Lobelia silphilitica, blue cardinal flower	B
Lobelia spicata, spiked lobelia	A,C
Lysimachia ciliata, fringed loosestrife	B
Lythrum alatum, winged loosestrife	B
Monarda fistulosa, wild bergamot	A***
Onosmodium molle/hispidissimum, marbleseed	A*
Panicum oligosanthes scribnerianum, scribner's panic grass	A,C
Parthenium integrifolium, american feverfew/wild quinine	A*
Penstemon digitalis, foxglove beard-tongue	A*,B*,C*
Petalostemum candidum, white prairie clover	A*
Petalostemum purpureum, purple prairie clover	A*
Physalis virginiana	A
Physalis grandiflora	A
Physostegia virginiana, obedient plant	B*
Plantago virginica, dwarf plantain	C
Potentilla arguta, prairie cinquefoil	A**
Potentilla simplex, common cinquefoil	A,C
Pteridium aquilinum, bracken fern	C
Pycnanthemum tenuifolium, slender mountain mint	A,C
Pycnanthemum virginianum, common mtn. mint	A**,C
Ratibida pinnata, drooping coneflower	A***
Rosa carolina, pasture rose	A,C
Rosa setigera, prairie rose	B
Rudbeckia hirta, black-eyed susan	A***,C
Rudbeckia subtomentosa, sweet black-eyed susan	A*,B*
Ruellia humilis, hairy ruellia	A**

(Table 4 continued)

Salix humilis humilis, prairie willow	A,C
Schizachyrium/Andropogon scoparium, little bluestem grass	A,C
Scirpus pendulus, red bulrush	A,B
Silphium integrifolium, rosinweed	A,C
Silphium laciniatum, compass plant	A,B**,C
Silphium perfoliatum, cup plant	B
Silphium terebinthinaceum, prairie dock	A,B**,C
Sisyrinchium albidum, blue-eyed grass	A
Sisyrinchium campestre, blue-eyed grass	C
Solidago canadensis, tall goldenrod	A,B,C
Solidago graminifolia, grassleaf goldenrod	B
Solidago nemoralis, old field goldenrod/dyers weed	A,C
Solidago rigida, rigid goldenrod	A,C
Solidago speciosa, showy goldenrod	A**,C
Sorghastrum nutans, indian grass	A,C
Specularia perfoliata, venus' looking-glass	C
Sporobolus heterolepis, northern dropseed	C
Teucrium canadense virginicum, american germander	A,B
Tradescantia ohiensis, ohio spiderwort	A,C
Tripsacum dactyloides, eastern gama grass	B*
Vernonia fasciculata, common/western ironweed	A,C
Veronicastrum virginicum, culver's root	A***
Viola papilionacea/pratincola, common blue violet	A,C

[a] See Fig. 1 for key to areas. * Introduced into park; ** introduced into areas indicated, but is found elsewhere in park; *** increased populations of plants originally found in sparse quantities.

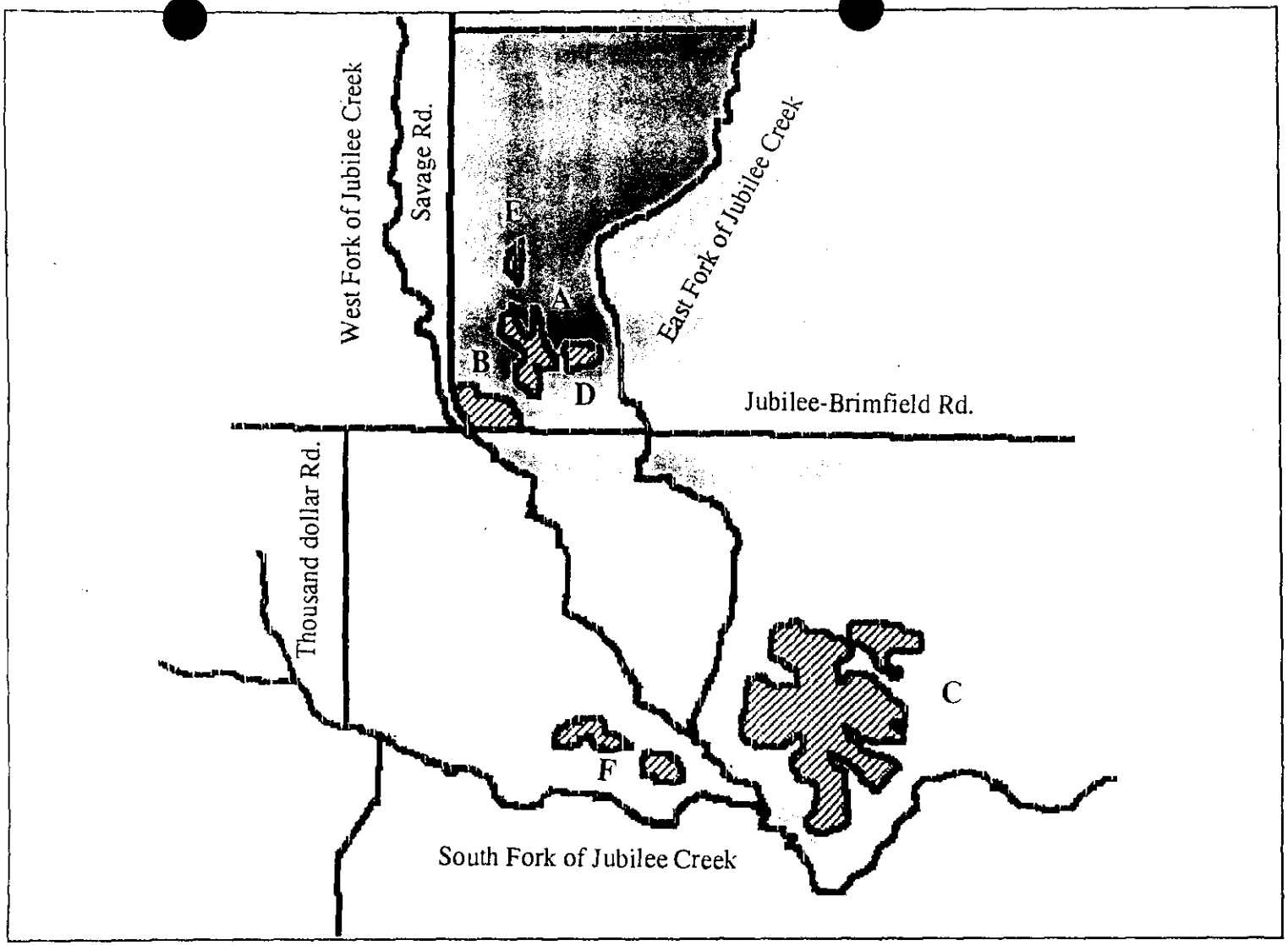

Figure 1. Map of Jubilee College State Park prairies. Areas D and E are restored prairies. Yellow highlight indicates areas burned in fall '93/spring '94.