WEEK 5. BARRENS

In 1804, 14 years before Illinois became a state, surveyors from the Government Land Office (GLO) were already surveying and rating the suitability of the land in preparation for sale to the pioneers that would soon follow. These European settlers soon began entering the southern part of the state, mostly coming from Kentucky and Tennessee. Like the early settlers, surveyors started in southern Illinois and gradually worked north. They kept very accurate notes recording many characteristics of the vegetation. Though not professional botanists, they could identify the forest trees and had a woodsman's knowledge of plant communities. Their field notes and the plats produced from their surveys gave the extent and general characteristics of the major plant communities of the state (prairie, forest, barrens, and sometimes savannas). More than 100 surveyors held contracts for surveying parts of Illinois and their notes are on file in the archives of the Illinois State Library, Springfield, Illinois. A review of these notes gives us a relatively accurate picture of the vegetation of Illinois just as European settlers were entering the state.

When the surveyors, and later the pioneers, entered the rugged topography of the Shawnee hills of southern Illinois they found it covered with mostly dense stands of closed canopy forests. Open forest communities were also present, however, due to the recurring fires set by early indigenous cultures. These open woodlands, prairie openings and barrens, were common, and were mentioned in the field notes of the early surveyors. The surveyors considered the soil of barrens, which were generally associated with areas where prairie and forest met, as being "poor and third rate" for cultivation.

The 1978 Illinois Natural Areas Inventory (INAI) described barrens as local inclusions of prairie flora mixed with forest, in forested land mainly in southern and western Illinois and along major rivers. The INAI described three barren types: dry barrens, dry-mesic barrens, and mesic barrens. Dry Barrens occur on shallow soil over bedrock or on dry exposed slopes with stunted xerophytic oaks and a sparse grass layer less than 1 m tall. Dry barrens are uncommon but are the most common type of barrens in Illinois. The other two barren types are very rare in Illinois. They occur on deeper soil and have higher moisture levels resulting in taller trees and the grass layer generally exceeds 1 m in height.

Structure and Composition of the Barren Communities of Illinois

The GLO survey records indicate that barrens were common throughout much of Illinois, particularly in areas of rough topography where forests were common. Though there is disagreement as to the exact vegetation structure and composition of barrens, the GLO surveyors when describing barrens, generally mentioned the "scattering" of low, stunted, dwarfish oaks and hickories. These descriptions also commonly include remarks about the dense growth of oak and hickory brush often less than 3 m tall. Other descriptions mention the abundance of oak and hickory "grubs" along with considerable amounts of hazel, dwarf and smooth sumac, and wild plum, while an undergrowth of grasses was also mentioned. According to the GLO survey notes dense thickets of briars and vines were present in many barrens. One surveyor described a section of a Cretaceous Hills barren in extreme southern Illinois as "one continuous thicket of brush and briars beyond description".

One of the more striking characteristics of the barrens described by the GLO surveyors was their size. Because we have only observed small remnants, we tend to think of barrens as being small, usually only a few hectares in size. According to the early GLO surveyors, however, barrens that covered several sections were once fairly common in Illinois. One of the largest and best-known barrens of pioneer times was in Pope and Massac counties, where nearly 1,000 hectares of the Cretaceous Hills Section of the

Coastal Plain Natural Division was described by federal surveyors as barrens in 1806. Barrens were so prominent there that the creek running through the township has the name Barren Creek. Similarly, nearly all of the extensive ridge system that stretches from the southeastern part of Lawrence County into the southeastern part of Crawford County was originally described as barrens.

In recent years there has been a trend to stop using the term "barrens" as there is a perceived notion that it is a vague term and people are not exactly sure of its meaning. Most ecologists, field botanists, and many other students of natural landscapes, however, seem to use the term in a consistent way, and generally have a good feel as to the way the term was used by most GLO surveyors. Distinguishing features commonly mentioned are edaphic drought and soil infertility, and vegetation that is a mosaic of scattered and stunted woody growth, herbaceous heliophytes and xerophytes, and exposed substrate. Other features commonly mentioned are thin soil that is usually over bedrock or a claypan, the presence of oak and hickory grubs, the presence of prairie grasses and forbs, and hazel thickets. Also, barrens were a fire-maintained community and supported species that were adapted to both fire and drought.

In 1936 Arthur G. Vestal, a botanist at the University of Illinois, while searching for descriptions of the natural vegetation for Illinois, was impressed by the frequent mention of barrens. Although he found little botanical information about them, he stated, "their former generality of occurrence was evident." "One wonders what they may have been like and what became of them." He reasoned that the open post oak communities that were frequently swept by fires, and then occupied by grassland plants, were the "barrens" of settlers and surveyors. These areas were definitely grasslands, but grasslands with an unusually high proportion of forest herbs, and lacking many prairie species. He states, "Such vegetation might have been recognized by discriminating early residents and travelers as barrens rather than prairie."

Early settlers and travelers through Illinois described the barrens as a mixture of forest and prairie with a "scattering" of trees. "Gaudy wildflowers" were interspersed among the grasses, causing the barrens to be very attractive landscapes. The woody vegetation of barrens consisted of stunted *Quercus stellata* (post oak), *Quercus alba* (white oak), *Quercus marilandica* (blackjack oak), *Quercus velutina* (black oak), barren hickory (*Carya* spp.), *Corylus americana* (hazel or hazelnut), and at least two species of sumac: *Rhus glabra (smooth sumac) and Rhus copallina (winged sumac)*. Grubs, described by some early travelers as dwarfish oaks and hickories having massive root systems, combined with hazel, sumac, and the stunted trees to give the barrens a unique appearance. These "grubs" were large bushes of various species of oaks and hickories that were repeatedly top-killed by recurring fires. In some instances these grubs were more than 100 years old, and consisted of numerous basal branches that sometimes exceeded 3 meters in height.

Presently there is no doubt that barrens were fire-maintained communities. As early as 1820 travelers and settlers wrote that frequent fires maintained the barrens. Usually the initial fire caused minor damage to the bark of a tree, but the second fire gained a foothold, removing the bark on one side and burning some of the underlying wood. By the third fire a tree was so severely damaged that it crashed to the ground and was consumed by the flames. Barrens were essentially the site of a contest between fire and timber for mastery of the land. The numerous fires in presettlement and early settlement times maintained the barrens over the encroachment of trees.

Early settlers and travelers described the disappearance of the barrens once Native Americans left an area and fires were stopped. Others described the growth of vigorous sprouts from grubs once there were no more fires. With the cessation of fires in the mid-

1800s these grubs grew into trees, commonly forming a coppice of 2 to 5 major trunks. Large areas of barrens were converted into forest, as if by magic, when the fires that had maintained the barrens were stopped and the oak sprouts and grubs became trees.

By the 1860s early botanists, travelers, and local residents were realizing that barrens were transient communities and, due to fire suppression, their replacement by forest would be completed within relatively few years. Presently few good quality examples of barrens exist in Illinois. Most have been degraded due to fire suppression and currently retain little of the species diversity and community structure that existed in the early 1800s. In general, the few remaining "barrens" have been subjected to occasional fires, have very poor quality soils, and have been relatively undisturbed by human activity.

Barrens of the Shawnee Hills Natural Division

The GLO surveyors recorded many barrens in the Shawnee Hills Natural Division of southern Illinois. Post oak, blackjack oak, and hickories, were the abundant tree species of these barrens that most often occurred over shallow bedrock and tended to be relatively small, only a few hectares in size. Degraded examples are common throughout parts of the Shawnee Hills, but most are in desperate need of management, particularly periodic fire. Before much of the region became the Shawnee National Forest in the 1930s, property owners commonly used yearly fires to "clear out the understory." Since being incorporated into the Shawnee National Forest the areas rarely burned, the general practice being to protect these forests from wildfires. Within the past 15 to 20 years, however, occasional management burns have been used to open the canopy of some barren remnants. This practice, if continued, will provide insight into management techniques that are necessary to maintain a barren.

Recently a series of 24 barrens and other natural xeric forest openings were studied throughout the Shawnee Hills Natural Division by researchers from Southern Illinois University, Carbondale. Their study found that the barrens of the Shawnee Hills were consistently characterized by open-grown trees (mostly post and blackjack oaks), with *Ulmus alata* (winged elm) the common subcanopy species, the ground layer a mixture of prairie and dry woodland herbaceous species that consistently included *Schizachyrium scoparium* (little bluestem), *Danthonia spicata* (poverty oat grass), *Helianthus* spp. (sunflowers), and *Chasmanthium latifolium* (inland oats), with 1 to 5 percent exposed rock, and a soil depth of 8-15 cm over sandstone, shale, and chert substrates. On these sites, the overall herbaceous cover was 15.9 percent, overall canopy cover was 49.4 percent, while the total number of species found in the barrens habitat was 129.

At two degraded barrens, Cave Hill and Dennison Hollow Research Natural Areas, both within the Shawnee National Forest in Saline County, the overstory was dominated by post oak. At both natural areas the canopy was closed with post oak accounting for an IV exceeding 120 (possible 200), more than 50 percent of the individuals present, and about 65 percent of the basal area (Table 5.1). Subdominants were *Carya texana* (black hickory) and blackjack oak. At Cave Hill the overstory averaged 526 stems/ha with a basal area of 15.4 m^2/ha, and an overstory cover of 52 percent, while at Dennison Hollow the overstory averaged 768 stems/ha, basal area exceeded 20.8 m^2/ha, and overstory cover was 77 percent. Nearly 70 percent of the trees encountered were less than 20 cm dbh. The woody understory was relatively open with tree saplings and shrubs averaging less than 3,000 stems/ha. The ground layer was a mixture of woodland and prairie species with woodland species dominant.

Table 5.1. Density (#/ha), basal area (m^2/ha), relative values, importance values, and average diameters (cm) of the tree species encountered in the Cave Hill and Dennison Hollow Research Natural Areas of Saline County, Illinois.

Species	Density (#/ha)	Basal Area (m^2/ha)	Rel. Den.	Rel. Dom.	I.V.	Average Diameter (cm)
Cave Hill						
post oak	264	10.812	50.3	70.0	120.3	21.4
black hickory	148	2.282	28.1	14.8	42.9	13.7
blackjack oak	40	0.918	7.6	5.9	13.5	16.3
winged elm	50	0.602	9.5	3.9	13.4	12.3
black oak	16	0.382	3.0	2.5	5.5	16.9
white oak	8	0.446	1.5	2.9	4.4	23.9
Totals	526	15.442	100.0	100.0	200.0	
Dennison Hollow						
post oak	438	13.776	57.0	66.2	123.2	18.3
black oak	146	2.678	19.0	12.8	31.8	14.8
blackjack oak	134	3.542	17.4	17.0	34.4	17.1
winged elm	16	0.216	2.1	1.0	3.1	12.8
shagbark hickory	30	0.508	3.9	2.4	6.3	14.2
white ash	2	0.108	0.3	0.5	0.8	26.2
flowering dogwood	2	0.022	0.3	0.1	0.4	11.8
Totals	768	20.850	100.0	100.0	200.0	

The data suggest that both Cave Hill and Dennison Hollow Research Natural Areas have rarely burned since being included in the national forest. The high density of smaller diameter post and blackjack oaks, the canopy cover of 52 to 77 percent, and the few prairie species encountered suggest that these areas are undergoing succession toward a closed canopy forest. The use of fire, however, could maintain an open canopy by preventing recruitment of tree saplings into the lower diameter class and removing some canopy trees.

Two other degraded barren remnants located in the Shawnee Hills have recently been studied, both in Pope County in the Shawnee National Forest. Until just recently neither barren had been subjected to management burns. One site, Gibbons Creek Barrens, was used as a fire treatment site while the other, Forest Service Barrens, served as a fire-free control site. Overstory of both sites was dominated by post oak, while the subcanopy shrub/sapling layer was dominated by winged elm. The size class distribution of the overstory trees suggested that stand closure had resulted from recruitment of post oak saplings into the canopy. These two barrens were surveyed yearly from 1989 to 1995, and the Gibson Creek Barrens was subjected to management burns prior to the 1990 and 1994 growing season (Table 5.2). The results suggest that management burns significantly reduce woody species encroachment, and that tree mortality due to these fires open the forest canopy. After two burns, overall woody stem density (including understory woody species) was about 45 percent of the baseline amount. Also, the ground layer species had significant increases in species diversity, richness, and density.

Table 5.2. Density (#/ha), of the tree species encountered at Gibson Creek Barrens and Forest Service Barrens in 1989 and 1995 after management burns at Gibson Creek Barrens in 1990 and 1994.

Species	Gibson Creek Barrens		Forest Service Barrens	
	1989	1995	1989	1995
post oak	468.0	412.3	378.0	355.0
winged elm	154.7	149.0	373.0	427.5
black hickory	97.3	85.1	60.0	60.0
white ash	76.0	69.2	5.0	2.5
shagbark hickory	49.3	42.6	97.5	105.0
others	100.0	87.7	91.5	83.0
Totals	945.3	845.9	1005.0	1033.0

Occasional long-term studies have been undertaken to determine management techniques necessary, and the length of time required, to re-establish a barrens community. This usually requires using management burns and many also involve the removal of some overstory trees. A study at Burke Branch Creek in Pope County was conducted over a 20 year period starting in 1968. During the study the site was burned in the springs of 1969, 1970, 1972, and 1973. Tree densities decreased following the burns: from 202 stems/ha in 1968 to 157 stems/ha in 1971. After burning stopped, however, tree densities rapidly increased to 337 stems/ha by 1988. Since the last management fire in 1973 fire-sensitive, shade-tolerant tree species entered the canopy and subcanopy. These species, which are usually associated with mesic sites, include *Acer rubrum* (red maple), *Acer saccharum* (sugar maple), *Liriodendron tulipifera* (tulip tree), *Fraxinus americana* (white ash), *Quercus rubra* (red oak), and *Asimina triloba* (pawpaw).

At the Branch Creek site similar changes were observed in the herbaceous layer. Prairie species such as *Andropogon gerardii* (big bluestem), *Chamaechrista fasciculata* (partridge pea), *Schizachyrium scoparium* (little bluestem), *Coreopsis tripteris* (tall tickseed), and *Sorghastrum nutans* (Indian grass) were prominent in the herbaceous layer after two fires. Their abundance decreased in the absence of fire. At the end of the study, 20 years later, and 15 years after the last fire, woodland species such as *Chasmanthium latifolium* (island oats), *Scutellaria incana* (downy skullcap), *Muhlenbergia sobolifera* (woodland satin grass), and *Luzula multiflora* (wood rush) showed a dramatic increase in importance. In contrast, the prairie species declined, all showing a decrease of at least 50 percent and some being extirpated from the site.

Barrens of the Wabash Border Natural Division

In east-central Illinois, many barrens were listed by the GLO surveys for the counties associated with the Wabash River in the Wabash Border Natural Division. In Crawford County, barrens were recorded for areas of rough topography in the southeastern part of the county where one large barren covered the majority of one township and was surrounded by savanna. They also recorded some smaller barrens associated with forests. The dominant witness trees listed for these barrens were white and black oaks, hickories, sugar maple, and *Fagus grandifolia* (American beech). Tree density averaged 29.7 trees/ha (Table 5.3). The understory species recorded by the GLO surveyors for the large barren area were “high grass, briars and vines,” while the smaller barrens had an understory of hazel or were described as open.

Table 5.3. Density (#/ha), basal area (m^2/ha), relative values, importance values, and average diameters (cm) of the tree species encountered in the barrens of Crawford and Lawrence counties, Illinois.

Species	Density (#/ha)	Basal Area (m^2/ha)	Rel. Den.	Rel. Dom.	I.V.	Average Diameter (cm)
Crawford County						
white oak	10.9	1.92	36.8	42.0	78.8	45.5
hickories	9.2	0.88	30.9	19.2	50.1	33.5
black oak	4.8	1.13	16.2	24.8	41.0	47.7
American beech	0.9	0.20	2.9	4.4	7.3	53.3
sugar maple	0.9	0.05	2.9	1.2	4.1	27.9
others (6 species)	3.0	0.38	10.3	8.4	18.7	
Totals	29.7	4.56	100.0	100.0	200.0	
Lawrence County						
white oak	21.8	3.68	40.4	47.8	88.2	46.5
hickories	10.6	1.00	19.6	13.0	32.6	33.8
black oak	8.5	1.19	15.6	15.4	31.0	50.0
elms	3.6	0.57	6.6	7.4	14.0	42.4
sweet gum	2.3	0.34	4.2	4.4	8.6	39.9
blackjack oak	2.3	0.26	4.2	3.4	7.6	33.8
ashes	2.0	0.27	3.6	3.6	7.2	40.1
silver maple	0.7	0.08	1.2	1.0	2.2	38.1
others (9 species)	2.4	0.32	4.6	4.0	8.6	40.9
Totals	54.2	7.71	100.0	100.0	200.0	

When the GLO survey of Crawford County was done between 1805 and 1811 the surveyors described the barrens as somewhat depauperate communities with an open canopy, dry, poor soils, and a highly variable understory. Fire and poor soil that probably had a shallow, impermeable clay layer were the most important factors in creating and maintaining barrens. The differences between the two presettlement barrens areas of Crawford County are probably attributed to their soil differences as well as fire intensity and frequency. The small barrens associated with forest, that had an open understory, or an understory with hazelnut, suggest that edaphic factors (claypan), and frequent fires were responsible for the existence of these barrens. In contrast, the large barren associated with savanna, and having an understory of high grasses, briars, and vines, was created by high intensity fires under drought conditions and high fuel loads. About 70 years later, in 1883, the small barrens were described as “inferior land, a good deal of it seems to be some kind of oak flat with a light thin soil” while the large barren was described as “being almost entirely destitute of timber, except a few scattered, scrubby oaks and shellbark hickories”.

To the south in Lawrence County, the GLO surveyors recorded barrens for about 15 percent of the land area. The larger barrens were in the eastern portion of the county and were confined to an extensive ridge system that stretched across the length of the county in a north to south orientation. These barrens were described as brushy, briary, and poor to very poor land with a scattering of timber. Some small barrens associated with forests and open woodlands were scattered throughout the western part of the county. They were situated on dry, level to rolling areas and were described as being thinly timbered with an understory consisting primarily of blackjack oak and hazel. The dominant trees in the barrens were white oak, hickories, black oak, elms, blackjack oak and *Liquidambar styraciflua* (sweet gum) (Table 5.3). Tree density in the barrens was 54.2 trees/ha while the common understory species listed were brush, briar, blackjack oak, high grass, vines, and hazelnut.

Barrens of the Southern Till Plain Natural Division

Barrens are still relatively common in the Southern Till Plain Natural Division, but most have been modified by woody encroachment, invasive species, and fire suppression. One high quality open barren community is Beadles Barrens Nature Preserve, Edwards County. The presettlement landscape near this preserve was primarily forest to open woodland communities interspersed with prairie. The barrens was originally located in an ecotone of a prairie/forest transition along the north edge of Birk's Prairie. Presently the barrens covers about 4 hectares of a gently south-facing slope. The thin soils of the barren are derived from loess over Illinoian till, are moderately well drained with low organic material, and have a compact hardpan that resists root growth.

A few trees are widely scattered on Beadles Barrens, but most were restricted to the barren margins and in a small grove on the barrens. Along the east margin of the barren, post oak dominated the open woodland, while various species of hickory were also important, including *Carya ovata* (shagbark hickory), *Carya tomentosa* (mockernut hickory), and *Carya glabra* (pignut hickory) (Table 5.4). In this marginal region, which had recently been subjected to management fires, woodland sedges (*Carex* spp.) and *Helianthus divaricatus* (woodland sunflower) dominated the ground layer, but prairie grasses and forbs were encountered where the forest canopy was open. The small grove near the middle of the barren was protected from fire by a steep slope and a creek. In this small grove *Diospyros virginiana* (persimmon), post oak, shagbark hickory, and black oak were the dominant species (Table 5.4). Woodland grasses and forbs along with a few prairie species occurred in the ground layer.

Table 5.4. Density (#/ha), basal area (m²/ha), relative values, importance values, and average diameters (cm) of the tree species encountered at the barren margin and in a small grove on Beadle Barrens Nature Preserve, Edwards County, Illinois.

Species	Density (#/ha)	Basal Area (m^2/ha)	Rel. Den.	Rel. Dom.	I.V.	Average Diameter (cm)
Barren Margin						
post oak	80.0	9.477	27.1	47.3	74.4	36.7
shagbark hickory	124.0	5.841	42.1	29.2	71.3	23.6
mockernut hickory	22.6	1.433	7.7	7.2	14.9	27.2
pignut hickory	22.7	1.015	7.7	5.1	12.8	22.5
black oak	7.9	0.803	2.7	4.0	6.7	31.5
shingle oak	9.3	0.308	3.2	1.5	4.7	19.6
white oak	5.4	0.285	1.8	1.4	3.2	25.0
red mulberry	6.6	0.159	2.3	0.8	3.1	16.6
wild black cherry	3.9	0.341	1.4	1.7	3.1	29.7
hackberry	4.0	0.155	1.4	0.8	2.2	20.8
winged elm	4.0	0.051	1.4	0.3	1.7	12.3
American elm	2.7	0.047	0.8	0.2	1.0	14.9
green ash	1.3	0.111	0.4	0.5	0.9	32.6
Totals	294.4	20.026	100.0	100.0	200.0	
Small Grove						
persimmon	128	5.480	29.6	25.0	54.6	22.3
post oak	104	6.528	24.0	29.9	53.9	25.3
shagbark hickory	56	2.616	13.0	11.9	24.9	22.7
black oak	64	1.928	14.8	8.8	23.6	18.9
pin oak	32	1.784	7.4	8.1	15.5	26.3
southern red oak	8	2.456	1.9	11.2	13.1	62.5
sassafras	32	1.016	7.4	4.6	12.0	19.8
shingle oak	8	0.120	1.9	0.5	2.4	14.0
Totals	432	21.928	100.0	100.0	200.0	

More than 150 species of prairie grasses and forbs were found on Beadles Barrens. In the open barrens, prairie plants dominated with *Schizachyrium scoparium* (little bluestem) the common prairie grass and *Solidago nemoralis* (gray goldenrod) the dominant prairie forb (Table 5.5). For such a small area species diversity was high, and some of the species encountered were conservative prairie species. Also, very few exotic invasive species were encountered in the preserve. Generally these exotic taxa were restricted to areas of disturbance, both natural and anthropomorphic.

Numerous degraded barrens are present in the South Till Plain Natural Division. Many dry ridges and upper slopes were probably originally barren communities maintained by frequent fires that originally were set by Native Americans and more recently by a farmer trying to keep the understory open for grazing. With the cessation of grazing, which occurred in most parts of Illinois in the 1940s and 1950s, these open forests with a grassy understory were subjected to woody invasion. During the past 60-70 years many of these barrens became closed forest, resulting in the loss of much of the typical barrens ground layer vegetation. Attempts are presently being undertaken to restore some of these degraded barrens.

Table 5.5 Frequency (%), average cover, and importance values of the ground layer species encountered on Beadles Barrens Nature Preserve, Edwards County, Illinois. *invasive species

Species	Frequency %	Mean Cover	Importance Value
Schizachyrium scoparium	99	36.42	61.5
Solidago nemoralis	96	13.51	28.5
Pycnanthemum tenuifolium	83	7.37	18.4
Carex spp.	75	0.90	8.5
Dichanthelium acuminatum	81	0.41	8.4
Crotonopsis elliptica	73	0.37	7.5
Stylosanthes biflora	52	0.26	5.4
Lespedeza virginica	27	1.01	4.1
Potentilla simplex	33	0.47	3.9
Acalypha gracilens	32	0.23	3.4
Antennaria neglecta	8	1.75	3.3
Lechea tenuifolia	27	0.33	3.1
Linum medium	28	0.14	2.9
*Achillea millefolium**	23	0.15	2.4
Ambrosia bidentata	23	0.11	2.4
Aster pilosus	21	0.17	2.2
Oxalis stricta	21	0.11	2.2
Quercus stellata	8	0.79	1.9
Rubus allegheniensis	15	0.34	1.9
Solidago canadensis	9	0.67	1.9
Rubus flagellaris	12	0.36	1.7
Eragrostis spectabilis	13	0.23	1.6
Sorghastrum nutans	3	0.87	1.6
*Kummerowia striata**	15	0.07	1.5
Diodia teres	13	0.06	1.4
Euphorbia corollata	9	0.18	1.2
Aristida dichotoma	11	0.05	1.1
Danthonia spicata	5	0.41	1.1
Rosa carolina	9	0.11	1.1
Ruellia humilis	11	0.05	1.1
Liatris pycnostachya	9	0.08	1.0
Campsis radicans	8	0.17	1.0
others (31 species)		1.69	10.8
Totals		69.84	200.0
Bare ground and litter		28.01	

Two barrens that are presently being managed by fire are the Stephen A. Forbes State Park Barrens in Marion County and Buhnerkempe Barrens in Clay County. Both barrens are small, each covering less than 2 hectares and are associated with ridge tops and shallow slopes. The overstory of both barrens was similar, white oak and post oak accounted for more than 50 percent of the IV and nearly 75 percent of the total basal area (Table 5.6). Recent management burns resulted in an open understory with few woody seedlings, saplings and shrubs, while the overstories of the two barrens ranged from 70 to 85 percent closed. The ground layer was sparse at both sites, bare ground and litter accounted for 63 to 83 percent of the cover. Species diversity was high with 166 herbaceous species recorded on the sites, 25 percent being prairie grasses and forbs.

Table 5.6 Density (#/ha), basal area (m^2/ha), relative values, importance values, and average diameters (cm) of the tree species encountered at Stephen A. Forbes State Park Barrens, Marion County, and Buhnerkempe Barrens, Clay County, Illinois.

Species	Density (#/ha)	Basal Area (m^2/ha)	Rel. Den.	Rel. Dom.	I.V.	Average Diameter (cm)
Stephen A. Forbes State Park Barrens						
white oak	146	12.808	29.4	53.7	83.1	30.1
post oak	80	5.272	16.1	22.1	38.2	25.5
black oak	74	3.662	14.9	15.4	30.3	20.0
shagbark hickory	90	0.572	18.1	2.4	20.5	18.2
pignut hickory	68	1.026	13.7	4.3	18.0	11.6
mockernut hickory	12	0.416	2.4	1.7	4.1	15.9
others (7 species)	26	0.082	5.4	0.4	5.8	
Totals	496	23.838	100.0	100.0	200.0	
Buhnerkempe Barrens						
white oak	176	9.876	28.8	43.6	72.4	25.2
post oak	172	7.546	28.1	33.3	61.4	22.7
mockernut hickory	78	1.424	12.7	6.3	19.0	13.9
shagbark hickory	56	0.834	9.2	3.7	12.9	12.7
black oak	22	1.302	3.6	5.8	9.4	25.2
silver maple	36	0.396	5.9	1.7	7.6	10.5
white ash	32	0.500	5.2	2.2	7.4	13.2
others (12 species)	40	0.752	6.5	3.4	9.9	
Totals	612	22.630	100.0	100.0	200.0	

Barrens of the Western Forest-Prairie Natural Division

Most barrens were probably located in the southern half of Illinois. Barrens, however, occur in northern Illinois, particularly in the forested regions west of the Grand Prairie Natural Division. Some modern authors, as well as some GLO surveyors, mention barrens in the Grand Prairie Natural Division. Most of the “barrens” recorded for this natural division, however, should probably be referred to as shrub (or grub) savannas. Very degraded forests and savannas in this part of Illinois are usually on deep soil, or are associated with sand deposits. Catastrophic fires, resulting from drought and heavy fuel loads, could destroy a prairie grove, savanna, or forest that was normally protected from fire. These areas, as the result of grub formation and the rapid and extensive growth of prairie shrubs [*Rhus* spp. (sumacs), *Rubus* spp. (blackberries), *Prunus americana* (wild plum) and *Corylus americana* (hazelnut)], would resemble the barrens of southern and western Illinois.

Two barren communities in the Western Forest-Prairie Natural Division have been examined. Both were classified as dry-mesic barrens by the INAI, both are presently being managed using occasional burns to maintain and open canopy, and both are protected. Argyle Hollow Barrens Nature Preserve is located in Argyle Lake State Park, McDonough County, while the second, McKee Creek Barrens is located in Siloam Springs State Park, Adams County. At both sites white oak was the dominant overstory species accounting for over 50 percent of the importance value and more than 80 percent of the basal area (Table 5.7). Most trees were between 25 and 45 cm dbh, but some exceeded 75 cm dbh. The larger trees commonly had an open-grown appearance with large branches within 4 m of the ground. Other oak species included small numbers of post and black oaks, while mockernut hickory and shagbark hickory were rarely encountered. Low numbers of mesic tree species were found on the barrens with sugar maple and white ash being the most common. Overstory cover ranged from 60 percent at Argyle Hollow Barrens to 87 percent at McKee Creek Barrens.

Table 5.7 Density (#/ha), basal area (m^2/ha), relative values, importance values, and average diameters (cm) of the tree species encountered at Argyle Hollow Barrens, McDonough County, and McKee Creek Barrens, Adams County, Illinois.

Species	Density (#/ha)	Basal Area (m^2/ha)	Rel. Den.	Rel. Dom.	I.V.	Average Diameter (cm)
Argyle Hollow Barrens						
white oak	144	20.2	69.2	94.6	163.8	41.4
mockernut hickory	32	0.7	15.4	3.3	18.7	16.1
black oak	16	0.2	7.7	1.1	8.8	13.7
shagbark hickory	16	0.2	7.7	1.0	8.7	13.3
Totals	208	21.3	100.0	100.0	200.0	
McKee Creek Barrens						
white oak	128	21.7	50.0	82.0	132.0	45.7
post oak	48	3.7	18.8	14.0	32.8	31.0
black oak	24	0.5	9.4	1.9	11.3	15.8
sugar maple	24	0.2	9.4	0.8	10.2	10.7
black walnut	8	0.1	3.1	0.4	3.5	13.4
hop hornbeam	8	0.1	3.1	0.3	3.4	10.5
shagbark hickory	8	0.1	3.1	0.3	3.4	12.0
white ash	8	0.1	3.1	0.3	3.4	10.5
Totals	256	26.5	100.0	100.0	200.0	

Due to management with periodic fires, both barrens had a park-like appearance; the understory open with few shrubs or saplings present. Numerous tree seedlings were present, however, and commonly exceeded 17,000 stems/ha. The recurring fires top-killed these seedlings, though some re-sprouting the next year they never reached the sapling layer. If the fires were stopped, these seedlings would rapidly grow into a dense thicket.

The ground layer of both barrens consisted of a mixture of forest and prairie grasses and forbs (Table 5.8). Forest species were, by far, the most important, the few species listed as

“others” in the table included some of the few prairie species encountered. Other prairie
Table 5.8

Frequency (%), average cover, and importance values of the ground layer species encountered at the Argyle Hollow Barrens Nature Preserve, McDonough County, and the McKee Greek Barrens, Adams County, Illinois. *invasive species

	Lake Argyle Barrens			McKee Creek Barrens		
Species	Freq.	Mean	I.V.	Freq.	Mean	I.V.
Parthenocissus quinquefolia	74	13.76	54.0	28	2.04	12.0
Carex pensylvanica	84	10.88	48.5	62	3.00	21.5
Rubus flagellaris	42	3.80	19.8	4	0.60	2.8
Solidago ulmifolia	30	3.17	15.4	82	5.93	34.9
Helianthus divaricatus	26	1.64	10.3	22	4.54	19.0
Dichanthelium acuminatum	36	0.33	9.1	4	0.02	0.9
Antennaria plantaginifolia	20	0.64	6.2	--	--	--
Viola pedata	20	0.35	5.4	--	--	--
Danthonia spicata	10	0.25	3.0	6	0.08	1.4
Toxicodendron radicans	8	0.38	2.8	2	0.06	0.6
Smilacina racemosa	6	0.42	2.5	2	0.06	0.6
Rosa carolina	8	0.19	2.3	16	0.48	4.6
Potentilla simplex	4	0.36	2.0	4	0.12	1.2
Aster turbinellus	6	0.18	1.9	--	--	--
Anemonella thalictroides	8	0.04	1.9	10	0.10	2.2
Carex hirsutella	6	0.08	1.6	12	0.16	2.8
Galium concinnum	6	0.08	1.6	20	1.08	7.3
Hieracium longipilum	6	0.03	1.5	--	--	--
Elymus virginicus	4	0.07	1.2	8	0.04	1.6
Galium circaezans	4	0.07	1.2	10	0.30	2.8
Carex muhlenbergii	4	0.02	1.1	16	0.13	3.4
Acalypha gracilens	4	0.02	1.1	16	0.08	3.3
*Poa compressa**	4	0.02	1.1	--	--	--
Aureolaria grandiflora	2	0.06	0.7	--	--	--
Euphorbia corollata	2	0.06	0.7	--	--	--
Muhlenberegia sobolifera	--	--	--	32	5.13	22.8
Desmodium glutinosum	--	--	--	20	1.51	8.7
Aster anomalus	--	--	--	24	1.20	8.4
Phlox divaricata	--	--	--	22	1.09	7.8
Bromus pubescens	--	--	--	14	0.42	4.0
Festuca subverticillata	--	--	--	16	0.18	3.6
Sanicula canadensis	--	--	--	16	0.18	3.6
Amphicarpa bracteata	--	--	--	10	0.49	3.5
Ageratina altissima	--	--	--	10	0.49	3.5
Tradescantia ohiensis	--	--	--	12	0.31	3.3
Lactuca canadensis	--	--	--	4	0.31	1.8
Geum canadense	--	--	--	6	0.13	1.5
Lespedeza violacea	--	--	--	4	0.07	1.0
Others	--	0.08	3.1	--	0.28	3.6
Totals		36.98	200.0		30.61	200.0
Bare ground and litter		62.14			67.09	

species were growing near the barren edges, or in very low frequencies on the barrens, not occurring in the survey quadrates. The continued management with fire should open the canopy and promote an increase in prairie species. The year after a fire at the McKee Creek Barrens, *Trifolium reflexum* (buffalo clover) was found. Apparently the seeds of this Illinois endangered species had been lying dormant in the soil and the heat from the fire promoted germination.

Gray's Post Oak Barrens, Saline County, Illinois
Gray's Post Oak Barrens is an Illinois Natural Areas Inventory site located about 9 km southeast of Harrisburg in Saline County. This woodlot is located on the western edge of the Bottomlands Section of the Wabash Border Natural Division. Due to its location near the Southern Till Plain Natural Division, this site has many floristic similarities to post oak woodlands and forests on xeric sites. This site was classified as a dry barren by the INAI in 1978. Presently this barrens is considered one of the better quality dry barren communities in the state.

Gray's Barren is located on a broad, gently rolling terrace near the confluence of the Saline River and the South Fork of the Saline River, and varies from 106 to 110 meters above sea level. A few small dry post oak barrens are on scattered upland knolls the largest covers about 3.0 hectares. Markland soils support these small dry barrens. These well-drained soils developed in shallow silty and clayey lake-deposited sediments and occur on slopes along drainage ways adjacent to bottomlands, erosion having removed much of the original silt loam surface layer.

Only seven tree species were encountered during overstory sampling of the barrens (Table 5.9). Post oak was the leading dominant, accounting for nearly all of the IV (192.7 of a possible 200) and had an average diameter of 22.2 cm. Winged elm ranked second with an IV of 3.8, and was the only other canopy tree to be represented by more than five individuals. There is no indication of past cutting, and the canopy cover was less than 45 percent.

Table 5.9 Density (#/ha), basal area (m^2/ha), relative values, importance values, and average diameters (cm) of the tree species encountered at Gray's Post Oak Barrens, Saline County, Illinois.

Species	Density (#/ha)	Basal Area (m^2/ha)	Rel. Den.	Rel. Dom.	I.V.	Average Diameter (cm)
post oak	399	17.229	94.5	98.2	192.7	22.2
winged elm	12	0.159	2.9	0.9	3.8	13.1
blackjack oak	4	0.064	1.0	0.3	1.3	13.8
shagbark hickory	3	0.055	0.7	0.3	1.0	14.8
cherrybark oak	2	0.021	0.5	0.1	0.6	11.5
red ash	1	0.010	0.2	0.1	0.3	11.5
red cedar	1	0.008	0.2	0.1	0.3	10.3
Totals	422	17.546	100.0	100.0	200.0	

The woody understory was open, the barrens appearing park-like. Also, the ground layer vegetation was sparse, bare ground and litter having a cover of nearly 50 percent. *Danthonia spicata* (poverty oat grass) dominated, accounting for more than half of the cover with an IV of 100.3 (possible 200), while xeric mosses and lichen were common.

Seedlings of a few tree species were common ground layer components, while various sedge species (*Carex* spp.) were also important. Numerous prairie grasses and forbs were present on the site but were mostly in low numbers and only common under areas of very open canopy.

Ten post oaks were felled when the site was being studied in 2001. In all cases only large dead or near-dead trees were selected. All were post oaks that were gnarled and stunted and appeared to be the oldest trees on the site. None exceeded 10 meters in height and ranged in diameter from 23.0 to 38.7 cm dbh (mean 30.7). Numbers of growth rings ranged from 146 to 239 (mean 189). Some of the cross-sections were partially decomposed, making precise annual ring counts difficult. Therefore, these values should be considered as minimum ages of the trees. Only two fire scars were found, both on one tree, the earlier scar from about 1884, and the last in 1948.

Gray's Barrens is one of the few sites that still retains the barren aspect. While it is not uncommon to find this assemblage of species as small inclusions within woodlands, it is highly unusual for them to occupy an area of this size. It appears that soil conditions rather than fire played a key role in the development and persistence of the barren community at this site. Markland soils contain elevated levels of carbonates and calcareous materials that can cause trees to exhibit a gnarled, stunted growth form like those found here. This may explain the small size and relatively great age of the trees. Many of the trees that were aged started growing before European settlement of the region.