

THE BIG BARRENS, and other native grassland on calcareous soils around the Shawnee Hills



Notes by Julian Campbell, June 2012 (<http://bluegrasswoodland.com>). Cover photo by Brent Harrell (http://www.fws.gov/frankfort/partners_photo_gallery.html).

The Big Barrens, and other barrens on calcareous lands around the Shawnee Hills in Tennessee, Kentucky, Indiana and Illinois.

Notes by Julian Campbell, Jun 2012: <http://bluegrasswoodland.com>.

Summary [for more technical details see subsequent pages].

“Barrens” is a historical term for the seasonally dry grasslands and open woodlands that used to cover most of the calcareous plains around the Shawnee Hills, and that extended into some of the hills on both sides. These plains drain mostly into the Green River watershed of Kentucky (including the Barren River and Nolin River), and into the White River watershed of Indiana (including the Blue River). The “Big Barrens” occurred on the central karst plains either side of the Barren River. Bedrock is mostly Mississippian limestone, calcareous shale and, especially in outer zones, chert. This rock is covered in some areas by sandy slumpage from overlying rocks, or by loess. Typical soils range from slightly acid hapludalfs and paleudalfs, to strongly acid paleudults. Also, fragipan soils are locally widespread, especially in seasonally wet swales and depressions.

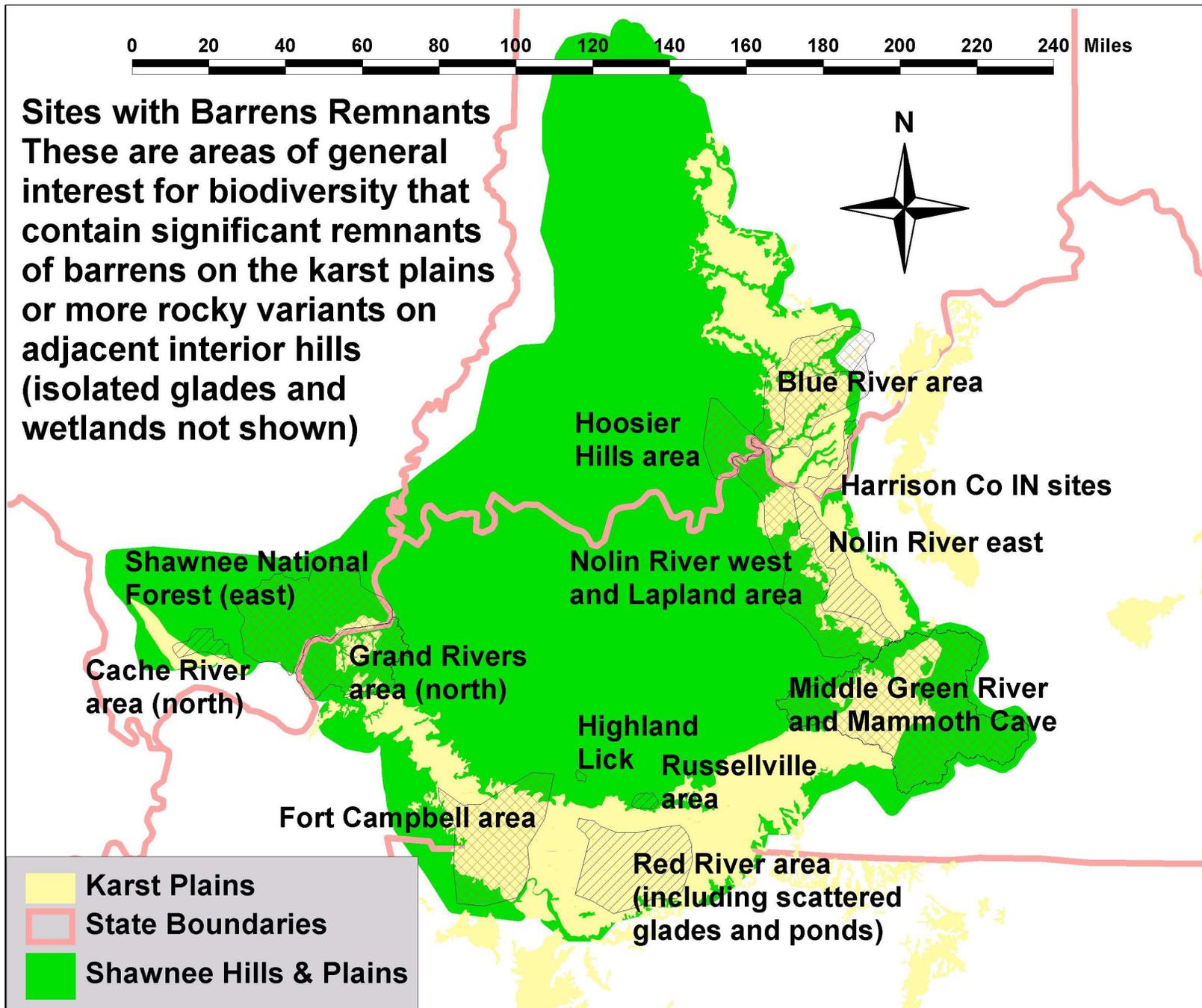
Prescribed fire by native people was the driving force that maintained grassy open conditions on these plains, allowing the original vegetation of rocky glades to expand and diversify over 1000s of years. Herbivores probably also had local effects, with herds of bison commonly moving through before settlement. There appears to have been a zonation, which needs better documentation—from more open grassland with more frequent fire on the least interrupted karst plains, to open woods with blackjack and post oak in less calcareous transitions, to deeper woods in more hilly terrain further from the karst. Typical dominants in remnants of more open grassland are little bluestem, Indian grass and locally big blue stem. On lowlands, gama grass was also common, and wetter places supported diverse marshy vegetation around ponds. Many characteristic plants are rare in this region, with ranges mostly to the south or west. Globally or regionally imperiled plants include glade indigo (*Baptisia australis* var. *aberrans*), buffalo clover (*Trifolium reflexum*), swamp lousewort (*Pedicularis lanceolata*), and prairie lettuce (*Nabalus asper*).



The sinkhole plain south of Mammoth Cave is now mostly pastured [photo by Tony Waltham at allposters.com/-sp/...i2671999_.htm].



Baptisia australis var. *aberrans* (glade indigo) is globally rare in rocky grassland, usually on medium acid soils with silt or chert [JC].



Historical forces have squeezed out the original vegetation:
(1) succession to deeper woods after decline in fire-frequency; and
(2) conversion of open land to agricultural or residential uses.
Remnants occur mostly in rights-of-way, scattered old pastures
(without dense fescue), a few old cemeteries, and similar places.
Although some woods still have post oaks and blackjacks, plus thin
ground cover of suppressed grassland plants, aggressive management
is needed to restore openings where these trees can regenerate by
themselves. As well as loss of larger mammals, several birds—
including prairie chickens—and many invertebrates have more or less
disappeared. The only extensive area with current potential for
restoration covering 1000s of acres is at Fort Campbell, where old
fields have gradually recovered a native composition in several zones.

Conservationists have been using prescribed fire for a few decades
in some areas, but goals, methods and results have varied. It has been
difficult for them to focus on botanical aspects, with clear selection of
prioritized sites, clear reporting, and mutual learning from results of
management. Rights-of-way generally harbor the most widespread
types of remnants, but they are susceptible to changes in mowing,
herbicides or other impacts, and most have been largely ignored by
agencies. The small populations of some rare plant species in these
remnants should become sources for propagation, in order to build
nurseries, demonstrations, and trial-plantings for research. Well over
10,000 acres of farmland have been sown with so-called ‘native
grasses’ during the past decade, including a large part of the CREP
(Conservation Reserve Enhancement Program) for upper Green and
Barren River watersheds. But most of this work has involved few
native species in the planted mixes, and frequent use of seed from the
Great Plains, where there are documented differences in genetic
adaptation. In marked contrast, State Nature Preserves have focused
restoration on just a few of the best remnants, usually along rocky
hillsides peripheral to the karst plains. Any planting on these
preserves is done with local native seed. Much comparative
discussion and cooperative planning is needed in order to explore the
varied potential avenues for progress between these two extremes.
Stronger focus on local plant material can be developed in the mix.



Many CREP plantings [orange] have, unnaturally, used much little
bluestem on bottomlands [fsa.usda.gov/... crep2010annualreport].



Baptisia leucantha (= *B. alba* var. *macrophylla*); the more southern
B. alba has often been planted instead [prairiemoon.com/... id=4557]

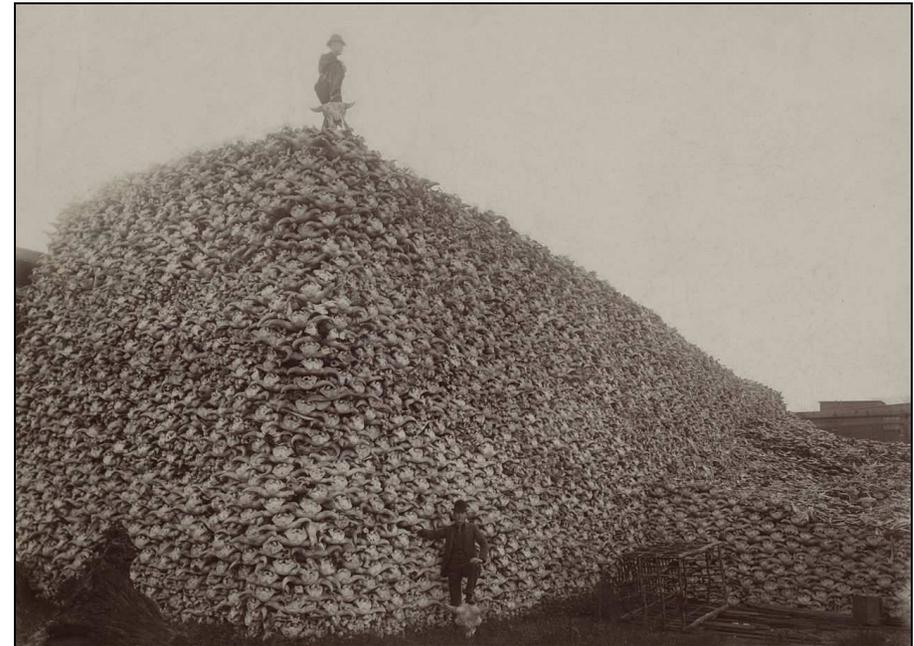


Roadside in Todd County (KY), with abundant *Echinacea simulata*—a coneflower that occurs only in the Interior Low Plateaus and Ozarks.

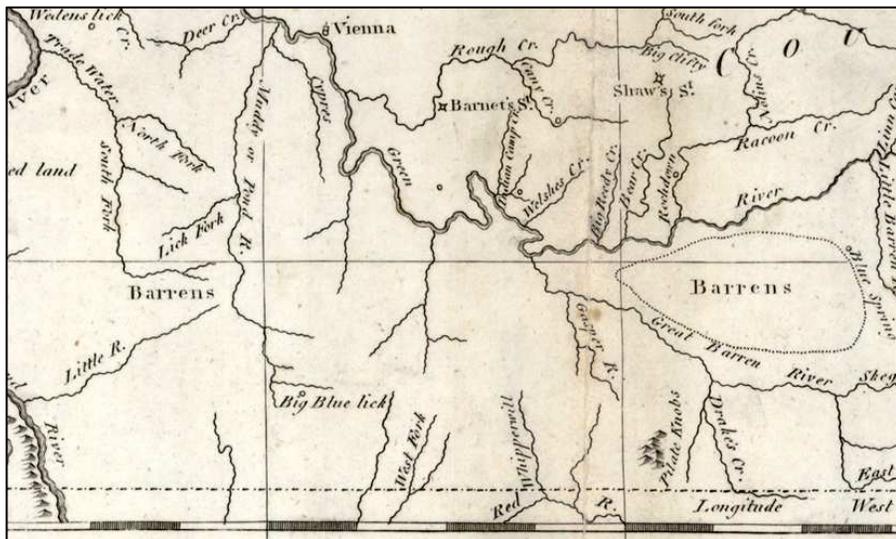
Historical Accounts. There are several insightful early writings about the barrens. A selection are quoted here; for a complete collection, see bluegrasswoodland.com/Shawnee Hills and Plains/Historical Notes.

Lyman C. Draper (1842-1856): based on interviews with family and associates of Daniel Boone; p. 274, about hunting by Boone and others in the upper Pond River area during about 1770-71.

“They at length crossed over the ridge and pursued down Bledsoe’s Creek [not Bledsoe’s Cr. in Russell Co.] within four or five miles of the Lick, when the cane became so thick in the woods that they concluded they must have mistaken the place until coming to the Lick and discovered the cause. A party of French hunters from the Illinois country had been there, slaughtered the buffaloes simply for their tongues and tallow, loaded a keel boat which lay at the mouth of Bledsoe’s Creek, and descended the Cumberland. “Bledsoe told me,” says General Hall, “that one could walk for several hundred yards in and around the lick on buffalo skulls and bones, with which the whole flat around the lick was bleached.” This great slaughter of buffaloes sufficiently explained the sudden growth of cane within a few miles of the lick.”



Out West, 1870s [Burton Historical Collection, Detroit Public Library]. The short-lived industry of buffalo slaughter started in the Ohio Valley.

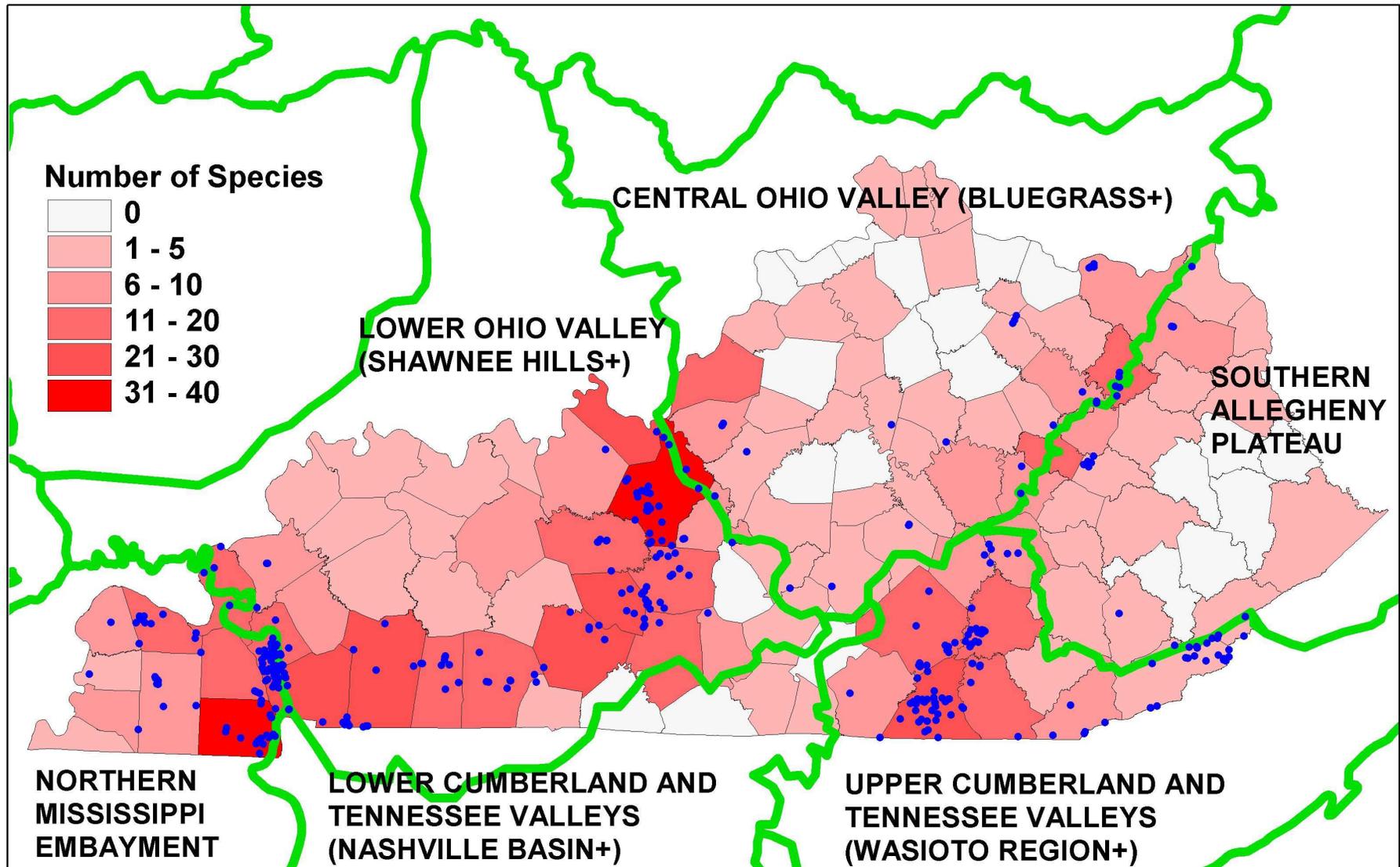


On Elihu Barker’s (1795) map, was Boone’s lick = “Big Blue Lick” or perhaps in the more extensive wetlands to southwest near Guthrie?



“Daniel Boone looks out. upon Kentucky and a great herd of buffalo” [from Z.F. Smith’s 1895 History of Kentucky; see also Belue (1996).]

Concentrations of sun-loving conservative plants in Kentucky, minus those of xeric or hydric sites. Red shading indicates numbers of species known per county (from Atlas of the Vascular Flora). Blue dots are records of Heritage Program for their subset of listed species (in the year 2001). Green lines show boundaries of ecoregional sections for effective planning of conservation.



Francois Michaux (1805): pages 215-222, travelling in August, 1802. “The Barrens, or Kentucky Meadows [on the Pennyrile Karst Plain], comprise an extent from sixty to seventy miles in length, by sixty miles in breadth. According to the signification of this word, I conceived I should have had to cross over a naked space, sown here and there with a few plants. I was confirmed in my opinion by that which the country people had given me of the meadows before I reached them. They told me that in this season I should perish with heat and thirst, and that I should not find the least shade the whole of the way, as the major part of the Americans who live in the woods have not the least idea that there is any part of the country entirely open, and still less that they could inhabit it. Instead of finding a country as it had been depicted to me, I was agreeably surprised to see a beautiful meadow, where the grass was from two to three feet high. Amidst these pasture lands I discovered a great variety of plants.

“Every year, in the course of the months of March or April, the inhabitants set fire to the grass, which at that time is dried up, and through its extreme length, would conceal from the cattle a fortnight or three weeks longer the new grass, which then begins to spring up. This custom is nevertheless generally censured; as being set on fire too early, the new grass is stripped of the covering that ought to shelter it from the spring and frosts, and in consequence of which its vegetation is retarded. The custom of burning the meadows was formerly practiced by the natives, who came in this part of the country to hunt; in fact, they do it now in the other parts of North America, where are savannas of an immense extent. Their aim in setting fire to it is to allure the stags, bisons, &c into the parts which are burnt, where they can discern them at a greater distance. Unless a person has seen these dreadful conflagrations, it is impossible to form the least idea of them. The flames that occupy generally an extent of several miles, are sometimes driven by the wind with such rapidity, that the inhabitants, even on horseback, have become a prey to them. The American sportsman and the savages preserve themselves from this danger by a very ingenious method; they immediately set fire to the part of the meadow where they are, and then retire into the space that is burnt, where the flame that threatened them stops for want of nourishment.”



Michaux noted “gerardia flava” in the barrens, now interpreted as *Aureolaria virginica*, shown here [from Jeffery Phippen; duke.edu].



He also listed “rudbeckia purpurea” [= *Echinacea p.*], now a rare species of somewhat mesic sites [from Jeff McMillian; plants.usda.gov].

**Hundred Acre Pond,
Hart Co., Kentucky
One of the best
preserved ponds on
the karst plains**

1000 feet



Charles Wilkins Short.(1836): pages 324-350. A medical doctor, he lived in Hopkinsville ca. 1817-26, the first botanist to reside in Kentucky and build up a collection of dried herbarium specimens.

On “The Barrens,” he wrote: “In many a long and solitary ride through these natural flower gardens, have our fatigues been lightened, and our spirits cheered by their floral charms. Here at one point, the ground was carpeted with the flame-coloured flowers of the *Euchroma* [*Castilleja coccinea*]; and there enamelled with the parti-colored blossoms of Violets [especially *Viola pedata*], Gentians [*Gentiana*, perhaps *quinquefolia*, *puberulenta*, *villosa*] and Trilliums [*Trillium recurvatum*, perhaps also *cuneatum*, *sessile* or *ozarkanum*]. In this spot, from amidst a tuft of humbler beauties, the majestic *Frasera* [*Frasera caroliniensis*] was seen shooting up its pyramidal head, crowned with wreaths of its very peculiar flowers; and on that [spot], various *Sumachs* [*Rhus*, perhaps *copallina*, *glabra* and *aromatica*] overhung the path, emitting from their clumps of berries a shower of acid on the traveler.”

“Now, would burst upon the view a smooth sheet of water, skirted with the blue and purple hues of the *Pontederia* [*P. cordata*] and *Decodon* [*D. verticillatus*], intermixed with the scarlet berries of the *Prinos* [*Ilex verticillatus*], whilst its surface was covered over with the large and floating leaves and splendid flowers of the *Cyamus* [*Nelumbo lutea*]; and then, in endless vistas, was stretched before the eye a waving sea of gigantic grasses. In such a scene as this, none but a recreant to nature and underserving of her pleasures, could remain indifferent to the charms spread in such lavish profusion around; and, although we were not idle, inattentive or unobservant of them, yet do we now find cause for bitter regrets, that we did not then more industriously avail ourselves of the opportunities thus enjoyed, for studying, examining and collecting the productions of that rich and interesting region.”

Michaux, Rafinesque and Short were the only botanists to explore Kentucky’s original barrens. Based on their observations, plus modern remnants, we know approximately where major concentrations of grassland species used to occur in the state; see map on page 8.



Above: patches of *Schoenoplectus hallii* near Mosely Pond in Logan Co., Ky. (Chester & Palmer-Ball 2011). This small rare midwestern bulrush lives in ephemeral ponds, with seed often lying dormant for several years [lower from mnfi.anr.msu.edu/element-images/2591.jpg].



Crew from University of Wyoming at Jackson Pond in Larue Co., Kentucky, during 2008 [amqua.org/news/fieldnotes/]. They re-cored this pond to analyze the sediments that are 20,000 years old. Initial research here showed that grassy openings increased in the region after 3000 years ago (Wilkins et al. 1991). This new work is led by Steve Jackson (Univ. of Wyoming) and Jack Williams (Univ. of Wisconsin, right in photo)..

Ross (1882): pages 213-215), recalling his early life with grandfather in northwestern Montgomery Co., Tennessee near the state line, on the road to Hopkinsville, Christian Co., Kentucky.

“It was late in the fall [1812] when we reached our new home. There was not the slightest improvement on the place besides the unfinished house. All around looked sad and dreary, especially, when the wind swept over the dry and withered grass, or rustled among the dead leaves of the post-oak and black-jack trees. None who ever witnessed the desolate appearance of the Kentucky Barrens in early times, during the winter season, can forget the feeling they produced. Far as the eye could reach, it seemed one barren, cheerless waste.”

“Seen at this season of the year by the early explorers, it is not strange that they called them the Barrens, or the barren lands. The pioneer hunters had no conception of their fertility, and very naturally supposed that there were only a few stunted trees in these wide prairies, because the ground was so poor. No greater mistake could have been made. During the winter [1812-1813] I first saw the tremendous fires caused by the burning of the dry grass. In many places, this grass was very thick and tall; and when perfectly dry, should it get on fire, the wind being high, the spectacle became truly sublime, especially at night. The country around far and wide, would then be illuminated by a lurid light, reflected from the clouds of black smoke in the upper regions of the atmosphere. The flames, when the wind blew strong, would move with such rapidity that animals of all kinds had to hurry forward to avoid perishing in them. They would sometimes burn the leaves on trees, twenty, or thirty feet in height. Sometimes they would consume all the fencing around the fire, in spite of all that could be done to save it.”

“No one who ever witnessed one of these great fires would ever afterward be at a loss to account for the scarcity of timber in the Barrens, as trees of all kinds, when small, were destroyed by them. Should a little twig or bush put up from the ground one season, it was sure to be burned the next. The Indians, in early times, used to set this grass on fire, when hunting, and killed great quantities of game as it fled before the flames.”

“But if, in winter, the barrens looked cheerless and dreary, it was far otherwise in spring and early summer. It would be difficult to imagine anything more beautiful. Far as the eye could reach, they seemed one vast deep green meadow, adorned with countless numbers of bright flowers springing up in all directions. At that time of the year I was sometimes sent to Hopkinsville—then called “Christian Court-house”—distant sixteen or eighteen miles. The whole distance was a scene of unvarying loveliness and beauty; only a few clumps of trees and now and then a solitary post-oak were to be seen, far as the eye could reach. Here I first saw the prairie bird, or barren-hen [prairie chicken], as we called it, which I afterwards met with in such vast numbers on the great prairies of Illinois. Here the wild strawberries grew in such profusion as to stain the horse's hoof a deep red color.”



Fragaria virginiana—the wild strawberry—is locally common on moderately fertile, well-drained soil in native grasslands of eastern states. However, it does not prosper without repeated mowing, grazing or trampling to reduce competition from grasses and taller herbs [photo from sierrapotomac.org/W_Needham/Strawberry_050710.htm].



Prescribed burning for restoration of open conditions in woods is a slow process, perhaps futile unless trees are thinned out. Instead, the original burning of native people probably began along the most heavily used animal trails on drier plains and broader ridges. Trails were hundreds of feet wide in places, where grassy fuel could accumulate in full sun. With regular ignitions along trails, usually at annual intervals, fires would then often burn into adjacent hills and even onto drier slopes near larger streams. A semi-natural zonation probably developed in this way, from grassy plains to more deeply wooded hills. [Photo comes from Hoosier National Forest at [fed.us/... boone_creek_rxburn_lg.jpg](https://www.fed.us/...boone_creek_rxburn_lg.jpg).]

Allen (1899): reprinted in McIntire & Blakeman (1947, p. 22-24), describing the Smith's Grove area of Warren Co., Kentucky, during the early period of settlement in about 1790-1810.

“The barrens were covered with hazel bush, wild strawberry and native grasses, with here and there a bunch of scrubby oaks. But little water was to be had in those dry barrens, as they were then called. Around the knobs and at the sink of the creeks on the east were some groves of timber, such as the oak and a few sugar maple, walnut and poplar. There was a variety of grass called barren grass, that grows six or seven feet high [presumably *Andropogon gerardii*], which grew here in abundance, and served no doubt as a rich pasture for the wild animals to graze upon. Some of the grass can yet be seen in the rocky country south of Smith's Grove; and in the Green river knobs north, there are still a few patches of hazle to be seen. The hazel grew in great profusion before the country was settled up, and served for birds to nest in. There were also immense crops of nuts, which furnished food for the wild turkey, prairie chicken, deer and wild pigeon.”

“THE WILD PIGEON ROOST. Some things I remember about it; it was located in the grove of timber around Smith's Grove knob, and extended out several miles. There is no record of the beginning of the roost. It may have been centuries old for all we know. When the first settlers came to the new West in the seventeenth century, they found the rivers and their tributaries lined with beech and oak forest, that furnished food for the millions of birds that annually came there to find a roosting place for the fall and winter months and when spring came, they would fly away to their favorite hatching ground where they would raise their young. They usually left before corn planting time, but there was an exception to that rule. On one or more occasions they stayed till the corn was up in the field and made short work of destroying the crop. There were millions of birds, like the sands on the sea shore, could not be counted. The roost covered from eight to ten thousand acres or more. As the flocks of hundreds and thousands of birds would come in of evenings from the beech and oak forest of Green, Barren and Cumberland rivers and their tributaries, they would circle around and often light in the tree tops, seeming to rest from their long flight of ten, fifty, and as

far as one hundred miles. As night would approach, they would gather in large gangs, and when they reached the roost, the fluttering of the wings and chatter of their songs would roar like thunder in the distance... The droppings from these millions of birds covered the ground and was an inch deep in places. That accounts for the deep rich soil of the Smith's Grove county... The pigeon roost covered hundreds of acres of scrubby timber and millions of birds would roost there in good mast years...”

[Other large roosts or flocks of passenger pigeons in Kentucky were recorded at Shelbyville during 1806 (A. Wilson); between Hardinsburg and Louisville, especially at Young's Inn at West Point in Hardin Co. during 1813 (J.J. Audubon); along banks of the Green River (Audubon); and in Calloway Co. (further historical research is needed)]

Hussey (1876): reported many plants identified from May to early August in Barren and Edmonson Cos. Among the species he listed, the following are typical of grassy open woods but are currently rare or highly sensitive in the modern landscape. Some of his collections are at the herbarium of Purdue University, and they need further inventory. A much more thorough flora of the Edmonson and Warren Co. area was conducted 10-20 years later by Sadie Price (1893), and many of her collections survive at Missouri Botanical Garden.

Asclepias phytolaccoides [= *A. exaltata*]; *Castilleja coccinea* [= *Castilleja*]; *Cirsium virginianum* [probably meaning *C. carolinianum*]; *Collinsia verna*; *Corydalis glauca* [= *C. sempervirens*]; *Leavenworthia michauxii* [= *L. uniflora*]: “just northwest of town [Glasgow Junction, now Park City], growing in a nearly filled-up sinkhole. This is quite a rare plant...”
Oenothera fruticosa; *Parthenium integrifolium*; *Phlox amoena*; *Phlox pilosa*; *Pycnanthemum lanceolatum* [probably meaning *P. pilosum*]; *Scutellaria galericulata* [unknown now in Kentucky—see Atlas]. *Trifolium reflexum*: “occurs in several localities between the railroad and Mammoth Cave... I mention it because I have never found so many specimens in any one locality before, and also to make a note of the fine rose-pink color it everywhere had.” [It still survives within the park.]



Above: “Falling Bough” by Walton Ford (2002)

[<http://www.pbs.org/art21/images/walton-ford/falling-bough-2002>]. Now extinct, the passenger pigeon was the most numerous bird on earth in the nineteenth century. Audubon described a hunt for it in Kentucky during 1831: “The pigeons, arriving by thousands, alighted everywhere, one above another, until solid masses as large as hogsheads were formed on the branches all round. Here and there the perches gave way under the weight with a crash, and falling to the ground, destroyed hundreds of the birds beneath...”

Ellsworth, J.W., & B.C. McComb (2003) [Cons. Biol. 17:1548-1558]

“It is likely that branches, twigs, and stems that were broken and deposited on the ground as a result of roosting and nesting pigeons would have provided fuel for wildfires. Dead herbaceous and understory woody plants, killed by high nutrient loads and physical burying, would have increased the availability of fine, easily combustible fuels. Furthermore, increased light conditions at the forest floor caused by the death of and damage to trees would have led to more rapid and thorough drying of accumulated fuel.”

Geology and soils. The ‘barrens’ and similar vegetation used to occur on calcareous slopes and plains around much of the ‘Shawnee Hills’—defined here to include sections in Illinois and Indiana, plus a peripheral extension into Tennessee. These areas are all drained by the lower Ohio River. Bedrock is mostly Mississippian limestone, with some calcareous shale and chert: St. Genevieve formation above and St. Louis below, the latter generally with more chert and less karst. On gentler slopes, there is also a significant addition of loess to the soil, and in western extensions the loess generally predominates as parent material. In parts of the Nolin River area (‘Elizabethtown Plain’), these rocks are largely covered by sandy slumpage from residuum of overlying rocks. Typical soils are mostly hapludalfs (Caneyville, Hagerston, Fredonia) and paleudalfs (Vertrees, Baxter, Pembroke, Sonora) on more base-rich sites, or paleudults (Frederick) on less base-rich. Fragiudalfs (Nicholson, Lawrence) and fragiudults (Dickson) are widespread in seasonally wet swales and depressions. The alfisols generally have pH of 5-6.5; the ultisols, 4.5-5.5.

Characteristic species. There appears to have been a zonation from more open grassland with more frequent fire on more extensive, seasonally dry plains with deeper soils, to deeper woods on more rugged terrain with openings restricted to warm rocky slopes. Typical dominants in remnants of more open grassland are poverty grass (*Danthonia*), little bluestem (*Schizachyrium*), Indian grass (*Sorghastrum*) and locally big blue stem (*Andropogon gerardii*) or even gama grass (*Tripsacum*) on seasonally wetter ground. On more base-rich soils, additional grasses include dropseeds (*Sporobolus* spp.), grease-grass (*Tridens*) and wild ryes (*Elymus* spp.). On acid infertile soils, there are beard-grass (*Gymnopogon*), plume-grasses (*Erianthus* spp.) and distinctive broomsedges (*Andropogon* spp.). The attached table shows the approximate separation of species along the moisture and pH-related gradients.

In transitions to more wooded sites, some grasses become more common, including poverty grasses on drier sites (*Danthonia*), early panic grasses (several species of *Dichanthelium*) on varied sites, and wild oats (*Chasmanthium latifolium*) on relatively mesic sites. Trees

that used to occur most frequently in these transitions were oaks (blackjack, post, southern red, shingle and others on wetter ground), hickories (especially mockernut), black gum and persimmon. In areas with less influence of fires, there were thickets of hazel, sumacs, prairie willows, plums, varied briars and vines. In areas converted to farmland during initial settlement—when fires were still often used, persimmon and sassafras formed a locally distinctive forest type after fields were abandoned. But in more recent decades without frequent fires in farmland, cedars—and locally pines (*Pinus virginiana*)—have become increasingly dominant in old fields. Maples have become much more common in woodland understoreys.

There used to be a high diversity of other graminoids (*Carex*, *Scleria*, *Juncus*, etc.) and forbs in these grasslands. Forbs included several species of little foxglove (*Agalinis*), milkweed (*Asclepias*), tick-trefoils (*Desmodium*), boneset (*Eupatorium*), sunflower (*Helianthus*), St. John’s wort (*Hypericum*), bush-clover (*Lespedeza*), blazing star (*Liatris*), milkwort (*Polygala*), upland mint (*Pycnanthemum*), rosin-weed/prairie-dock (*Silphium*), goldenrod (*Solidago*), and aster (*Symphytotrichum*); see complete list below.



The Michauxs noted that common woodland plants, such as ‘pussy toes’ (*Antennaria plantaginifolia*), used to grow in the barrens as well as plants that depend on full sun [photo: prairiemoon.com/.. 2010/04]



Male Prairie Chicken [flickr.com/people/rebeccaboyd...]: “Fort Campbell may offer the best opportunity to reintroduce greater prairie chicken to this part of its historical range... As a minimum, a feasibility study has been recommended by the participating interests” (Ford et al. 2000).

Rare species (plants, animals). About a third of the 300-350 plant species in these grasslands or open woodlands (see p. 13 & 15) are considered ‘conservative’ (not at all weedy, p. 4) or rare in this region. Such species are generally absent from more disturbed remnants, and reseeding will be required in much restoration. Most of these rarer species have ranges centered in southeastern states or midwestern states, and occur here near their the limits. A few are largely restricted to the Interior Low Plateaus, southern Ridge and Valley, Piedmont or adjacent Coastal Plain: *Baptisia australis* var. *aberrans*, *Echinacea simulata*, *Nabalus barbatus*, *Phlox pilosa* ssp. *deamii*, *Pycnanthemum torreyi*, *Silphium pinnatifidum* and *Symphyotrichum priceae*. About 10-15 species are globally rare (G3 to G1) or at least imperiled within the Ohio Valley (marked *** in the list below); most of these are midwestern. But the only globally endangered (G1) plant may be *Phlox pilosa* ssp. *deamii*.

Several larger vertebrates have become locally extinct, including the prairie chicken, elk, bison, wolf, bear and mountain lion. The globally extinct passenger pigeon may have been particularly fond of the small-seeded oaks that surrounded the barrens. State-listed rare birds that still survive locally include the globally imperiled Bachman’s sparrow of open woods; also Bewick’s wren of shrubby zones, lark sparrow, Henslow’s sparrow and barn owl of grassland. Other species of concern (mostly declining across their ranges) include blue-winged warbler, prairie warbler and loggerhead shrike of shrubby zones; quail, grasshopper sparrow, short-eared owl and northern harrier of grassland. Rare reptiles include the southeastern five-lined skink, scarlet kingsnake and northern pine snake; these are near the edge of their range in southeastern states.

Many rare invertebrates no doubt occur in remnants of the barrens, but there has been little systematic survey. Regionally extinct species include the burying beetle (*Nichrophorus americanus*), which may have concentrated in open oak-hickory woodlands (often feeding on passenger pigeons). Rare butterflies include the oak hairstreak (*Satyrium favonius*), which often feeds on blackjack oak.



Phlox amoena (above) and *P. pilosa* (below) are both somewhat uncommon in the region; plants of apparent hybrid origin (*deamii*) are endangered [photos from [vanderbilt.edu/...](http://vanderbilt.edu/); and [prairiemoon.com/...](http://prairiemoon.com/)].



Bachman's Sparrow (roysephotos.com/zzBachmansSparrow3.jpg).



Bewick's Wren (roysephotos.com/zzBewicksWren6.jpg)



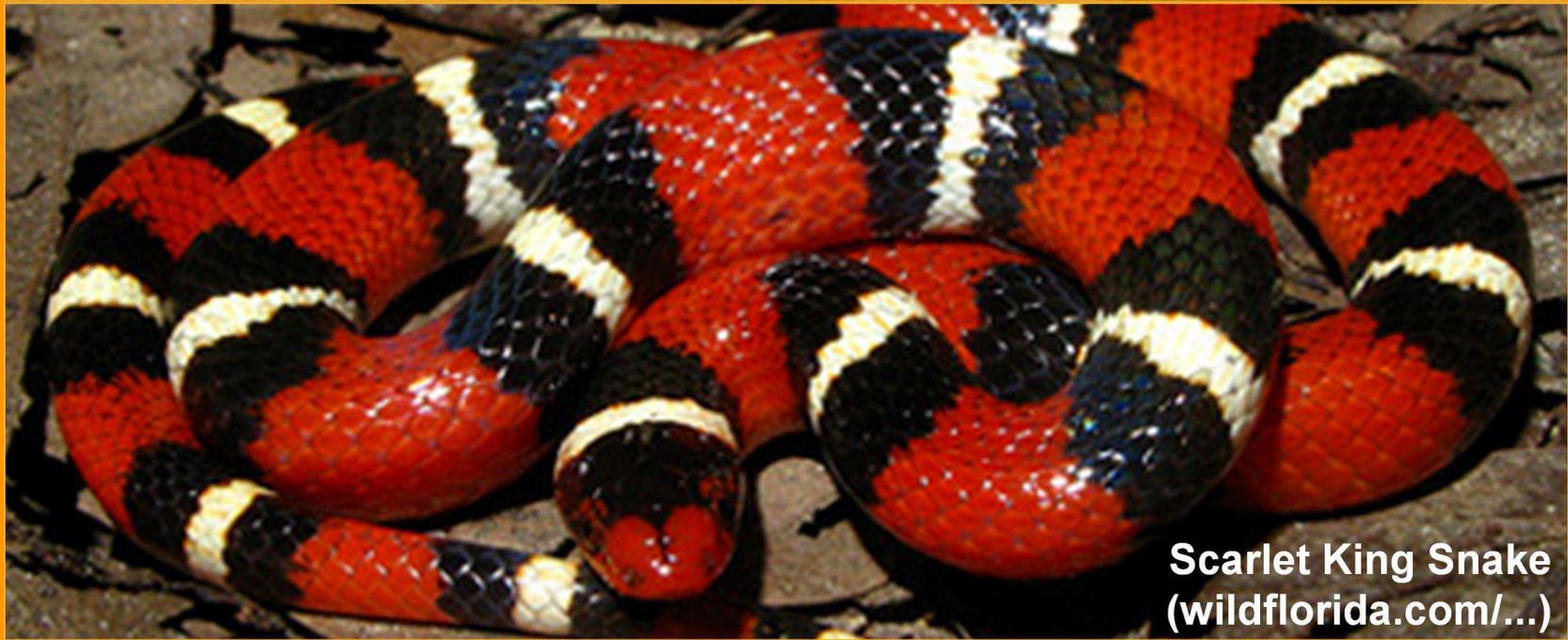
Lark Sparrow (bird-friends.com/pics/.../LarkSparrow1LR.jpg)



Henslow's Sparrow (sdakotabirds.com/.../henslows_sparrow.jpg)



Northern Pine Snake
(coastalplainsreptiles.com/...)



Scarlet King Snake
(wildflorida.com/...)

GENERAL SEPARATION OF GRASSES IN INTERIOR LOW PLATEAUS ALONG ECOLOGICAL GRADIENTS.

Only species typical of full sun are included. Species are located where they are most common, but some species have wide ranges. This is an approximation, to be tested with plot data; there is much overlapping of species along the gradients.

* annuals; # cool-season (C3 versus C4); bold = most common to locally dominant; [] = rare, locally extinct or peripheral.

■ short grassland with many annuals ■ medium grassland ■ tall grassland ■ cool-season/C3 dominated

POSITION ALONG MOISTURE GRADIENT	TYPICAL POSITION ALONG pH-RELATED GRADIENT IN SOILS		
	ACID INFERTILE SOILS: mostly ultisols (pH ca. 4-5); sandy or cherty "barrens"	AVERAGE SOILS: mixed or intermediate (pH ca. 5-6); including typical "barrens"	BASE-RICH SOILS: mostly alfisols (pH ca. 6-7); resembling midwestern "prairie"
TRULY XERIC (rocky sites)	Aristida dichotoma* [Danthonia sericea] Dichanthelium depauperatum# [Dichanthelium tenue#] ?	Danthonia spicata Aristida longespica* [Muhlenbergia capillaris] Dichanthelium linearifolium# Eragrostis capillare* ?	Spobolus vaginiflorus* [Sporobolus clandestinus] Panicum flexile* [Muhlenbergia cuspidata] Vulpia octoflora*# ?
XERIC TO SUBXERIC	Andropogon ternarius [Gymnopogon ambiguus] [Eragrostis hirsuta] ? [Dichanthelium angustifolium s.l.#] [Paspalum longepedunculatum] ?	Schizachyrium scoparium Andropogon gyrans Aristida purpurascens [Dichanthelium malacophyllum#] Paspalum setaceum s.l. ?	Sporobolus compositus sensu lato [Sporobolus heterolepis] [Bouteloua curtipendula] Eragrostis frankii* Dichanthelium oligosanthos s.l.#
SUBXERIC TO MESIC	Erianthus alopecurioides [Andropogon v. var. decipiens ?] [Dichanthelium ravenellii]#	Sorghastrum nutans Andropogon virginicus var. v. Dichanthelium acuminatum s.l.# Paspalum laeve s.l. ?	Tridens flavus Setaria parviflora ? Panicum capillare s.l.* Eragrostis pectinacea*
SOMEWHAT MESIC (drying in summer/fall)	Erianthus giganteus Dichanthelium scoparium# [Panicum longifolium] [Gymnopogon brevifolius]	Andropogon gerardii Panicum anceps Eragrostis spectabilis Paspalum pubiflorum s.l. ? [Poa chapmanniana*#]	Elymus glabriflorus# Dichanthelium clandestinum# Alopecurus carolinianus*# Hordeum pusillum*# [Phalaris carolinianus*#]
SOMEWHAT HYDRIC (swales, seeps)	Andropogon glomeratus s. stricto Panicum verrucosum Dichanthelium microcarpon# [Calamagrostis coarctata#]	Tripsacum dactyloides [Panicum virgatum] [Paspalum dissectum] ? [Calamagrostis canadensis#]	Phalaris arundinacea# Leersia lenticularis# [Paspalum floridanum s.l.] ? Echinochloa muricata*
TRULY HYDRIC (edge of water)	Panicum rigidulum [Erianthus strictus] [Dichanthelium ensifolium#] ?	Eragrostis hypnoides* Paspalum repens [Spartina pectinacea] [Glyceria acutiflora#]	Leersia oryzoides# Glyceria striata# [Glyceria septentrionalis#] [Zizania palustris*#]

Classification and ecological gradients. Confusion has come from different uses of the integrating terms: forest, woods, woodland, barrens, savanna, grassland and prairie. In the Ky. Natural Heritage system, grassland described here matches their “tallgrass prairie” on deeper soils of rolling plains, and their “limestone barrens (open woodland)” on shallower soils in more hilly areas; Homoya (1994) also described the latter in Indiana. The varied “glade” or “wet prairie” types of Heritage are local extensions onto xeric or hydric extremes. Variants on more acid soils are largely match their “sandstone prairie” or “sandstone barrens”—and include Homoya’s “chert barrens” in Indiana. Transitions to woodland on deeper soils are not covered by their classification, since these areas have been largely farmed after settlement, or largely grown up into dense forest.

For deeper understanding of native grasslands and their appropriate management, we need to develop general concepts of ecological gradients in the Ohio Valley and adjacent Midwest. Diagrams on the following pages illustrate gradients related to hydrology (xeric to hydric) and pH (ultisols to alfisols). On relatively moist, fertile soils (to lower right)—especially on lowlands, most of the original grassland was generally referred to as “prairie” in pioneer times and rapidly converted to productive farmland. It merged locally into more wooded areas with cool-season grasses, cane, reed and marsh. Most of the uplands with dry infertile soils (to upper left) were referred to as “barrens.” There was broad intergradation between these two classes, and assignment of small remnants can often be puzzling.

Fire is clearly appropriate to maintain grassland on infertile or seasonally dry sites, where fuel can accumulate. But on damp fertile soils, regular browsing would have been important, often reducing fuel for fires. Also, seasonal flooding or standing water may well have been a significant factor reducing the growth of trees. The potential interaction of all these factors remains somewhat mysterious. Unless reduced by browsing (or farming in modern landscape), much fuel can build up with the taller warm-season grasses in the central zone of these gradients. Then intense fires would have been particularly influential in this zone.



Mike Homoya (here approaching Flint Barrens) has developed a useful classification of barrens for Indiana Dept. Natural Resources.



Carol and Jerry Baskin have done much research on barrens, together with Edward W. Chester (p. 38) [uky.edu/... /SUMMER-2008...].

APPROXIMATION FOR ECOLOGICAL GRADIENTS OF GRASSLAND TYPES IN INTERIOR LOW PLATEAUS.

Four-number codes are for associations (CEGLs) in the National Vegetation Classification, followed by abbreviated names.

In several cases (~) close NVC matches are not available, but the most similar associations in USA are referenced here.

Only grassland without much woody cover is detailed here; more wooded variants are indicated on lower line in each box.

Infertile or rocky ground = “barrens” (broad historical sense) Fertile or low productive ground = “prairie”

POSITION ALONG MOISTURE GRADIENT	POSITION ALONG pH-RELATED GRADIENT IN SOILS		
	ACID INFERTILE SOILS: mostly ultisols (pH ca. 4-5); sandy or cherty “barrens”	AVERAGE SOILS: mixed or intermediate (pH ca. 5-6); including typical “barrens”	BASE-RICH SOILS: mostly alfisols (pH ca. 6-7); resembling midwestern “prairie”
TRULY XERIC (rocky sites)	‘Sandstone glades’ (or similar) 2242: Schizachyrium scoparium - Aristida dichotoma - Croton wil. See also: 4061 More wooded: 2425	Varied non-calcareous ‘Glades’ ~6544: Schizachyrium scoparium - Danthonia spicata - Carex pensylvanica / Cladonia spp. More wooded: 4062	‘Cedar glades’ (at least patches) 4340: Sporobolus (neglectus, vaginiflorus) - Aristida longispica - Panicum flexile - Panicum capillare More wooded: 4271
XERIC TO SUBXERIC	Drier ‘barrens’ on sand or chert 7707: Sch. sco. - Andropogon (gyrans, ternarius, virginicus) See also: 2212 More wooded: 2391	Drier ‘barrens’ on karst plains 7805: Sch. sco. - (Hel. mol., Hel. occ., Sil. tri.) See also: 2211 More wooded: 4756	‘Xeric Limestone prairie’ ~4078: Schizachyrium scoparium - Spo. com. - Rudbeckia fulgida s.l. See also: 4045 More wooded: 5131
SUBXERIC TO MESIC	‘Barrens’ on sandy/cherty plains 7706: And. ger. - Sch. sco. - (Calamagrostis coa., Pan. vir.) More wooded: 5134	Damper ‘barrens’ on karst plains 4063: Sch. sco. - Pan. anc. - Pan. vir. - Les. cap. - Scleria spp. More wooded: 4217	‘Tall-grass prairie’ (midwestern) ~2203: And. ger. - Sor. nut. - (Spo. het.) - Liatris spp. - Rat. pin. See also: 4757, 7932; wooded: 4738
SOMEWHAT MESIC (drying in summer/fall)	Damper sandy/cherty ‘barrens’ 7705: Andropogon gerardii - (Andropogon glomeratus, Panicum virgatum, Sorghastrum nutans) See also: 7708	‘Tall-grass prairie’ (or similar) 4677: Andropogon gerardii - (Sorghastrum nutans) See also: 7931 More wooded: 3836 (Arundinaria)	‘Wet-mesic prairie’ (midwestern) ~2024: Andropogon gerardii - Panicum virgatum - Hel. gro. See also: 4036 More wooded: 3835 (Arundinaria)
SOMEWHAT HYDRIC (swales, seeps)	‘Wet-mesic barrens’ 4006: And. ger. - Sch. sco.- Dichanthelium scoparium - Rhynchospora glomerata	‘Wet-mesic prairie’ (southeastern) 4624: Panicum virgatum - Tripsacum dactyloides More wooded: 8495	‘Reed-grass marsh’ (seasonal) ~1474: Phalaris arundinacea More wooded: 6065
TRULY HYDRIC (edge of water)	‘Wet barrens’ (depression ponds) 4750: Saccharum baldwinii - Calamagrostis coarctata - Panicum rigidulum - Rhynchospora cap.	‘Wet prairie’ (as in midwestern) 4118: Spartina pectinata See also: 6483 (exposed shore)	‘Rice-grass marsh’ (staying wet) ~5106: Leersia oryzoides - Glyceria striata - (Schoenoplectus spp., Impatiens capensis)

Issues for conservation. More work is still needed to survey remnants, describe composition and understand function in these grasslands as a basis for science-based conservation and management. Two major factors have caused the virtual disappearance of this vegetation from the region: (1) succession to deeper woods after decline in fire-frequency—especially on poorer soils with typical “barrens”; and (2) conversion to agricultural or residential land—especially on better soils with typical “prairie” (see diagram above). This ‘ecological squeeze’ has resulted in most remnants of grassland being largely confined to rights-of-way, where they need better recognition and protection.

There is much woodland where a history of open conditions is evidenced by old post oaks and blackjacks, plus thin suppressed populations of grassland plants. But much management is needed to restore openings where these trees can regenerate and reform open wooded transitions. Denser old field woods with cedars and pines—plus dreadful pine plantations—have often resulted in woods that are too dense for the plants and animals that need grassland or savanna. Agencies have been using prescribed fire for a few decades at some sites, but goals, methods and results have varied.

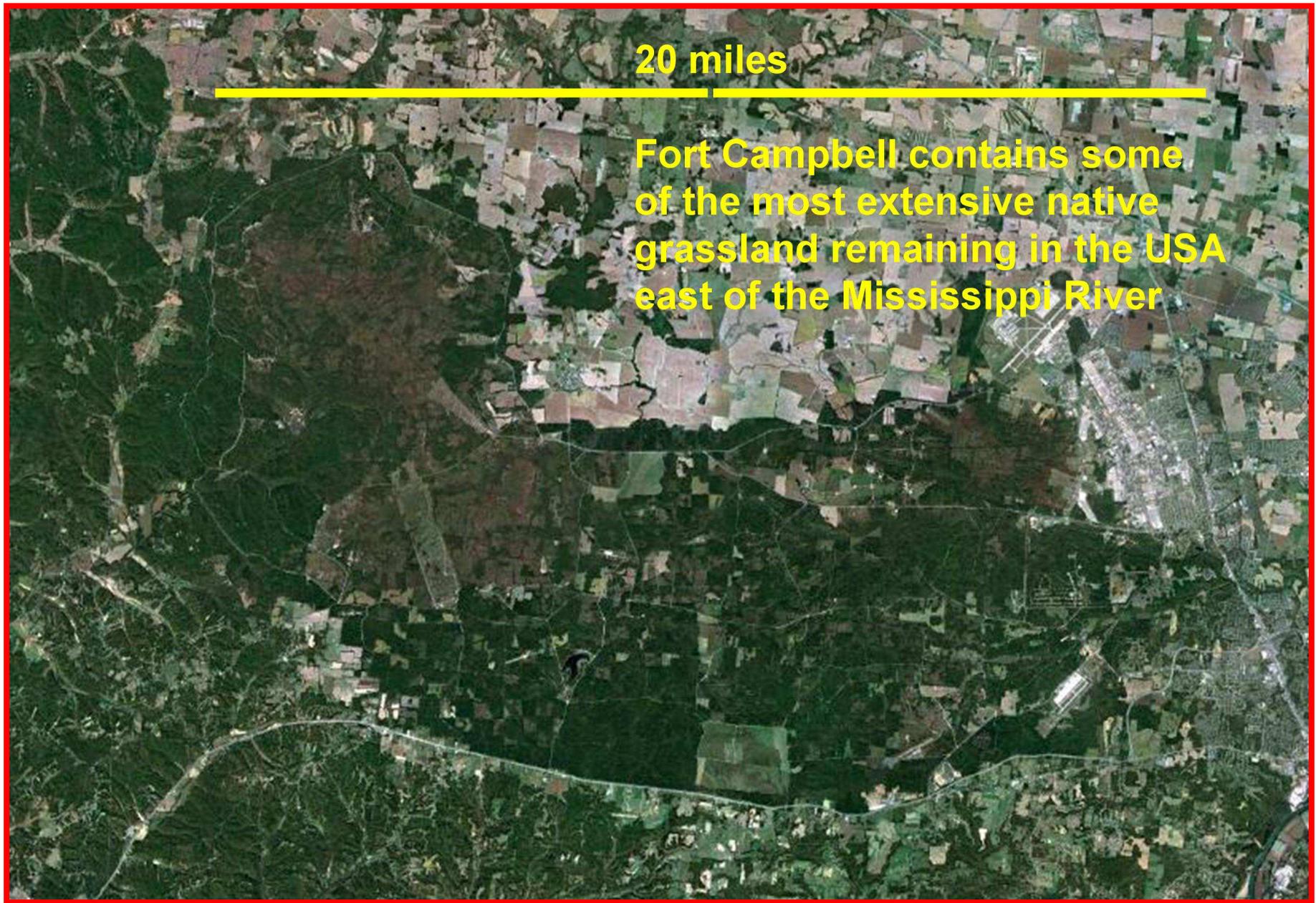
Fort Campbell is an exceptionally important site, with 1000s of acres to be burned, explored and hunted. However, conservationists working there have several significant challenges in addition to coordination with the military. There has been much unfortunate planting of loblolly pine during 1950-70, and then *Lespedeza bicolor* during 1980-90. Moreover, it appears that several plant species have virtually disappeared from the area, given two centuries of settlement. The best season for naturalistic burning may be late summer to fall. But spring often ends up being the prescribed time, when early flowering plants (*Fragaria*, *Potentilla*, *Phlox*, *Viola*) can be ‘burnt in the bud.’ The interaction of larger herbivores with fire also deserves more research, but livestock may be precluded. Inspiration for more intensive restoration at Fort Campbell can also be based on the recovery of rare or declining grassland birds. There is even some hope that prairie-chickens may be reintroduced there in the future.



Peter Zale (see also botanicazales.com) is at Ohio State University (Ornamental Plant Germplasm Center), an expert at propagating rare wildflowers, including Baptisias, Orchids, Lilies and Phloxes.



Dwayne Estes is developing grassland classification for Tennessee, documenting the flora, and describing new species—more regional synthesis is needed to guide conservation [[apsu.edu/... herbarium...](http://apsu.edu/...herbarium...)].



Six large significant federal tracts cross the Kentucky-Tennessee border: Reelfoot Lake; Land-Between-the-Lakes; Fort Campbell; Dale Hollow Lake; Big South Fork; and Cumberland Gap National Park. Cooperative work among the states and federal government is essential.

Other remnants could become integrated into a regional program for restoration, with Fort Campbell perhaps becoming one organizational center. State and federal agencies are working in diverse contexts, but their overall degrees of success—or failure—are not generally clear to the public. Schemes for extensive restoration have been initiated in some sections—especially Middle Green River watershed and Mammoth Cave area—but progress has been limited.

Smaller remnants along rights-of-way are susceptible to changes in mowing, herbicides or other impacts. Several roadsides have been mowed or herbicided too much in recent years, and there is an urgent need to persuade local managers otherwise. The small populations of some rare species along these rights-of-way can be sources for propagation, in order to build nurseries, demonstrations, and trial-plantings for research. Some sites should be established for salvage of plants from these precarious places. We should at least be able to transplant large plugs to restoration sites, matched with similar soils.

Integration of traditional conservation with horticultural and academic interests sadly lags within this region. There would clearly be much benefit from establishing one or more centers for horticultural development of native plants, perhaps adopting the whole ‘Shawnee Hills and Plains’ as a reasonable unit for marketing genetic provenance. While companies like Roundstone Seed Inc. (in Hart Co., Kentucky) are extending the for-profit market in plants of local provenance, we also need a non-profit platform to collect plant material and conduct basic research-and-development. There are many questions about taxonomic definitions, comparisons of growth rates under varied conditions, and general uses of native plants in restoration. We cannot answer these questions without some kind of research program and botanical garden—plus other demonstrations—in order to grow the species side by side.

A broad issue involved in much work on native grassland in this region is ‘quantity versus quality.’ USDA-funded programs, in particular, tend to put money into restoration of much low quality so-called ‘native grassland’—often with little or no relevance to local

interests in botanical conservation. A prime example is the Conservation Reserve Enhancement Program of the Upper Green and Barren River watersheds. Researchers at Western Kentucky University are investigating whether this program is actually enhancing water quality, and increasing populations of grassland birds. But with few native species planted and little long-term plan for maintenance, such grassland probably has limited intrinsic interest for conservation. At the other extreme, Nature Preserves in Kentucky and other states have been established around true remnants of native grassland, where there is usually strict attention to true restoration and any plantings use local seed as much as possible.

It would be useful to compare these varied efforts to date within the region. Through dialog, a better balance of activities could be achieved. More precise common language is still needed for the whole ‘native grassland conservation target’—divided into a small, manageable number of vegetation types and well designed across the landscape. It should be possible to accommodate different approaches, with mutual support and avoidance of interference. Low quality restoration on a large scale need not get in the way of small high quality projects that have higher costs per acre. Regular interaction among interested people would be useful in order to build cooperation, share information, and develop a balanced program.

In associated notes, I have outlined the rationale for a network of conservationists based on the ‘Shawnee Hills and Plains’ (see bluegrasswoodland.com). The Nature Conservancy’s initial efforts at ‘Ecoregional Planning’ during 1995-2005 have not become rooted enough in the local conservation community. They took the whole Interior Low Plateaus for analysis, but continued interaction was limited because that region is too large for regular meetings. The Shawnee Hills and Plains, centered in Kentucky, do form a more practical unit for routine organization. In addition to working on the old barrens around the fringes of this region, we can focus on the extensive forest blocks in more hilly sections, and on the difficult challenges in more cultivated sections ruled by the corn-and-beans industry. Most conservationists already work on a range of habitats.



Some remnants occur under powerlines, mowed at 1-5 year intervals. Rural Electric Cooperatives have been helpful in some cases, especially under the leadership of Jeff Hohman and others at East Kentucky Power [photo: Brent Harrell [fws.gov/frankfort/partners_photo_gallery.html](https://www.fws.gov/frankfort/partners_photo_gallery.html)].

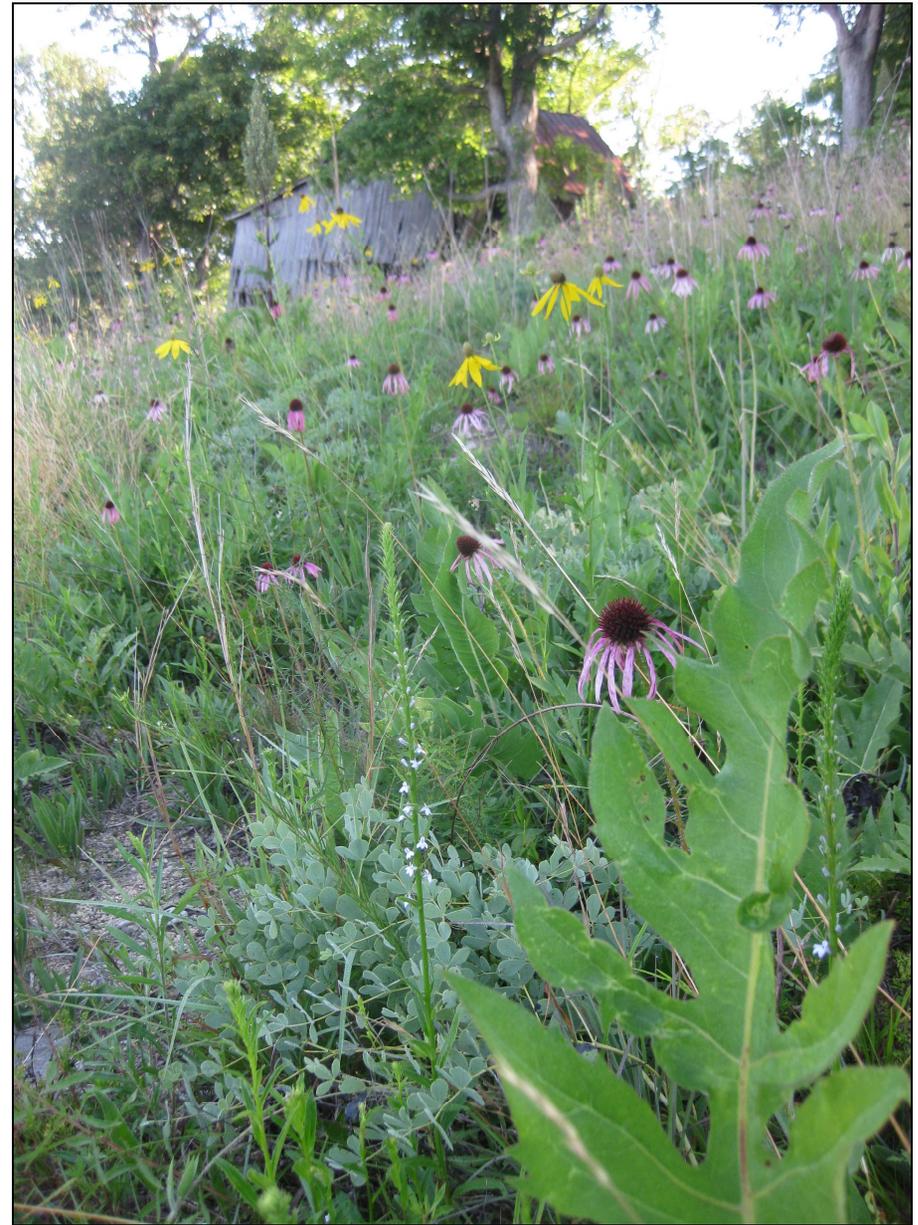
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Glade Indigo (*Baptisia australis* var. *aberrans*), with 1000s of plants on Highland Lick Road in Todd Co., Kentucky. Peter Zale and myself ‘rediscovered’ this site while hunting for *Phlox deamii* in May 2012. It was first discovered by Raymond Athey about 1970. Part of the area is now enrolled in a USDA program that has reduced mowing and allowed recovery of the species. Cooperative interests are being developed

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Another view of the Highland Lick Road site: *Silphium pinnatifidum* in foreground; also *Baptisia australis*, *Frasera caroliniensis*, *Lobelia spicata*, *Echinacea simulata*, *Ratibida pinnata*.



Putman's Blue Lick in Christian County, a rare remnant of the many licks that used to be frequented by bison, elk and deer before settlement.

LIST OF TYPICAL SPECIES

Underlined: more common in remnants or historical records.

Bold: locally dominant.

s.l. = sensu lato, implying that more than one segregate occurs.

s.s. = sensu stricto

[]: broader genus concept.

! = 'sun-loving conservative' species used for map on p. 8.

* Uncommon to locally rare.

** Regionally-rare/state-listed.

*** Imperiled/extinct.in region.

Codes after (/) species names indicate atypical habitats:

A = more strongly acid soils

h = more hydric/hydroxeric

m = more submesic-woody

s = more subxeric-woody

x = more xeric/xerohydric

? = uncertain status

Excluded here are species that occur only in peripheral sections of karst plains (such as western transitions to the Coastal Plain). Also excluded are those mostly in transitions to other vegetation types: e.g. riparian zones; deeper wetlands (with *Eutrochium fistulosum*, *Juncus effusus*); rocky glades (with *Juniperus*, *Sporobolus vagini-florus*); more mesic woods (with *Acer rubrum*, *Quercus alba*); or old fields (with *Ambrosia trifida*, *Solidago altissima*, *Tridens flavus*).

Larger trees

Carya tomentosa/m

Diospyros virginiana/m

Nyssa sylvatica/m

Quercus falcata/m

Quercus imbricaria/m

Quercus marilandica/x

Quercus velutina/s

Quercus stellata/xh

Sassafras albidum/m

Ulmus alata/s

Small trees, shrubs and vines

Ceanothus americanus/s

Celastrus scandens/m ?

Crataegus crus-galli s.l./s

**Crataegus intricata* s.l./s

Crataegus pruinosa s.l./m

Cornus drummondii/m ?

Cornus florida/s

Corylus americana/m

**Malus coronaria* s.l./m

Prunus angustifolia s.l./m ?

Rhus copallina/m

Rhus glabra/m/m

Rosa carolina/s

Rosa setigera/m ?

Rubus argutus s.l. /m

Rubus flagellaris s.l./m

Salix humilis s.l./h

Smilax bona-nox s.l./x

Smilax glauca/A

Smilax rotundifolia/m

Spiraea tomentosa/Ah

Symphoricarpos orbiculatus/m

Viburnum rufidulum/x

Vitis aestivalis/s

**Zanthoxylum americanum*/m

Typical ferns and allies

Pteridium aquilinum/As

Dicot herbs: not legumes or composites

Acalypha virginica ?

**Agalinis gattingeri*/x

Agalinis purpurea s.l.

!****Agalinis skinneriana*/Axh?

Agalinis tenuifolia/A

Angelica venenosa/A

Anemone virginiana/s

Apocynum cannabinum

!**Asclepias amplexicaulis*/A

***Asclepias hirtella*

!****Asclepias purpurascens*/m

Asclepias tuberosa

Asclepias variegata/m ?

Asclepias verticillata

Asclepias viridiflora/x

!****Aureolaria pectinata*/C

Aureolaria virginica/s

Blephilia ciliata/s

!****Buchnera americana*

!****Castilleja coccinea*

Cicuta maculata/h

**Clematis versicolor*/s

!****Crocantemum bicknellii*/x

[*Helianthemum*]

**Comandra umbellata*

Convolvulus spithameus/x

Croton capitatus ?

Cuscuta campestris

***Cuscuta glomerata* ?

Dasistoma macrophylla/s

Descurainaea pinnata s.l./x ?

Diodia teres/A

**Draba brachycarpa*/x

!****Eryngium yuccifolium*

Euphorbia corollata

Fragaria virginiana

Frasera caroliniensis/s

Galium circaezans/s

Galium pilosum

Gaura biennis s.l./m ?

!****Gentiana puberulenta*

Gentiana villosa/s

**Gentianella quinquefolia*

Hedeoma pulegioides ?

Houstonia lanceolata/x

Hypericum drummondii/A

Hypericum gentianoides/Ax

Hypericum punctatum

Hypericum sphaerocarpum/xh

Hypericum stragalum/As

!**Hypericum virgatum*/A

Ipomaea pandurata

**Leavenworthia uniflora*/x

Lechea mucronata/x

Lechea tenuifolia/Ax ?

!****Lilium michiganense*/m

Linum striatum/h

!**Linum sulcatum*/x

Linum texanum

Lithospermum canescens/x

Lobelia puberula/A

Lobelia spicata s.l./x

Ludwigia alternifolia/Ah

***Ludwigia hirtella*/Ah

****Lysimachia hybrida*/h ?

Lysimachia lanceolata/m ?

Matelea obliqua/s



Buffalo clover (*Trifolium reflexum*) used to be common in burned woodlands near the barrens, but is now endangered across the Ohio Valley. There is much variation in the species across its range, and segregates need further definition even within Kentucky. Above: at Boone Creek in Perry Co., Indiana [from Kirk Larson at [fs.fed.us/wildflowers/...](http://fs.fed.us/wildflowers/)]. Below: a more typical southern plant [from [floridawildflowers.com/...](http://floridawildflowers.com/)].

Monarda fistulosa
Myosotis verna ?
Oenothera biennis
 !**Oenothera fruticosa* s.l.
 !***Oenothera linifolia*/Axh
Oxalis dillenii ?
 **Oxalis priceae*/x ?
Penstemon laevigatus ?
Penstemon pallidus ?
 **Penstemon tenuiflorus*/x
 ***Perideridia americana*/s
 !**Phlox amoena*/A
Phlox glaberrima/h
 !**Phlox pilosa* s.l.
Physalis heterophylla s.l./m ?
Physalis virginiana/x
Physostegia virginiana s.l./x
 ****Physostegia intermedia*/h
Plantago aristata/x
Plantago virginica
 **Polygala incarnata*/A
Polygala sanguinea/h
Polygala verticillata s.l.
 !****Polytaenia nuttallii*
Potentilla canadense/s
Potentilla simplex/m
Prunella vulgaris s.l.
Pycnanthemum incanum s.l./s
Pycnanthemum pilosum
Pycnanthemum tenuifolium/xh
 !****Pycnanthemum torreyi*
Rhexia mariana/Ahx ?
Rhexia virginica/Ah
Ruellia caroliniensis
Ruellia humilis s.l./x
Sabatia angularis
 !***Sabatia brachiata*/h

***Salvia azurea* s.l.
Salvia lyrata
 !****Salvia urticifolia*/s
Scutellaria incana/s
Scutellaria parvula s.l./x
 ****Silene regia*
Spigelia marilandica/m
Teucrium canadense/m ?
Thalictrum revolutum/m ?
Thaspium chapmanii/s
 !****Tomanthera auriculata*
 [Agalinis]
Trichostema dichotoma/Ax
Triodanis perfoliata s.l. ?
Valerianella radiata/m
Verbena hastata/h ?
Verbena simplex ?
Verbena urticifolia/m ?
 !***Veronicastrum virginicum*/s
 ***Viola lanceolata*/h
Viola pedata/x
Viola palmata s.l./s ?
 **Viola sagittata*/xh
Zizia aptera/s
Zizia aurea/m
 .
Typical legumes
 !****Baptisia australis* s.l./x
 !**Baptisia leucantha*
Chamaecrista fasciculata
 [Cassia, and following]
Chamaecrista nictitans/A
Clitoria mariana/As
Dalea candida/x
 !*Dalea purpurea*
Desmanthus illinoensis/hx ?
Desmodium canescens ?

Desmodium ciliare
Desmodium paniculatum s.l./m
Desmodium laevigatum/As
Desmodium marilandicum
 **Desmodium obtusum*/x
 !**Desmodium sessilifolium*
Desmodium viridiflorum/Am
Galactia volubilis
 !***Lespedeza capitata*/hx
Lespedeza hirta/As
Lespedeza intermedia/s
Lespedeza procumbens/s
Lespedeza repens/x
Lespedeza stuevei/x
Lespedeza violacea/s
Lespedeza virginica/x
 !***Orbexilum onobrychis*/m
 [Psoralea]
Orbexilum pedunculatum s.l./A
 !**Phaseolus polystachios*/Cs
 !****Psoralea tenuifolia*/x ?
 !***Rhynchosia tomentosa*/A
Senna marilandica/m
 [Cassia]
Strophostyles umbellata
Stylosanthes biflora/A
Tephrosia virginiana/Ax
 ****Trifolium reflexum*/s

Typical composites
Achillea millefolia ?
Ambrosia artemisiifolia
Ambrosia bidentata ?
Ambrosia trifida/m
Antennaria plantaginifolia/s
Bidens polylepis/h ?
 **Boltonia diffusa*/h ?

Brickellia eupatorioides
 !**Cirsium altissimum*/s
 !**Cirsium carolinianum*/A
Cirsium discolor/m ?
Coreopsis major/s
Coreopsis tripteris/m
 !**Echinacea purpurea*/s
 **Echinacea simulata*/x
Erigeron strigosus
Eupatorium album/A
Eupatorium altissimum
Eupatorium hyssopifolium s.l./xh
Eupatorium pubescens/A
Euthamia graminifolia/h ?
Gamochaeta purpurea ?
Helenium autumnale/h
Helenium flexuosum
 **Helianthus angustifolius*/Ah
Helianthus divaricatus/s
 !**Helianthus eggertii*/s
Helianthus grosseserratus/m ?
Helianthus hirsutus
Helianthus microcephalus/s
 !****Helianthus mollis***/m
Helianthus occidentalis
Heliopsis helianthoides s.l./m ?
Hieracium gronovii/s
 !***Hieracium longipilum*/A
Krigia biflora/s
Krigia dandelion/s
 !**Liatris aspera*/x
 ***Liatris cylindracea*/x ?
 **Liatris squarrosa*
 !**Liatris squarrosa*/A
 !**Liatris spicata*/h
 !****Nabalus asper*
 [Prenanthes, and following]



Prairie docks (tall *Silphium* species) of the Interior Low Plateaus: *laciniatum* (left); *pinnatifidum* (center); *terebinthaceum* (right). *S. laciniatum* ('compass-plant') and *S. terebinthaceum* have overlapping mid-western ranges, but *laciniatum* extends further south into the lower Mississippi Valley; it tends to occur on drier sites; and its flowering peak is 2-4 weeks earlier. *S. pinnatifidum* may have hybrid origin, and occurs mostly in barrens remnants of western Ky. and Tenn., where it is generally the only one of these three species. [Photos from personalpages.tds.net/~savanasp/summer.htm; getyourbotanyon.blogspot.com/2009/08/...; prairienursery.com/store/images/...]

!****Nabalus barbatus*/A
Packera anonyma/x
 [Senecio]
 !**Parthenium integrifolium*/A
Pseudognaphalium obtusifolium
 [Gnaphalium]
Pyrrhopappus carolinianus
Ratibida pinnata
Rudbeckia hirta s.l.
Rudbeckia tenax/xh
Rudbeckia triloba/m
Sericocarpus asteroides/s
 [Aster; and following]
Sericocarpus linifolius/A
 **Silphium glabrum*/m
Silphium trifoliatum/s
 !***Silphium integrifolium*
 !***Silphium laciniatum* s.l.
 !****Silphium terebinthinaceum*** s.l.
 [mostly *pinnatifidum*]
Solidago altissima/m
Solidago bicolor s.l.
Solidago erecta/A
Solidago juncea s.l./Ahx
Solidago odora/A
Solidago nemoralis/x
 !**Solidago rigida* s.l./xm
 !**Solidago speciosa* s.l.
Symphotrichum dumosum s.l.
 [Aster; and following]
Symphotrichum laeve/x
Symph. novae-angliae/m
Symphotrichum patens/A
Symphotrichum pilosum s.s. ?
 ***Symphotrichum pratense*/x
 !****Symphotrichum priceae*
Symphotrichum sagittifolium s.l.

Verbesina helianthoides/s
Verbesina virginica ?
Vernonia gigantea/m ?
Vernonia missurica

Monocot herbs: not graminoids
 ****Cypripedium candidum*/hx
 ***Echinodorus tenellus*/h
 ***Hexalectris spicata*/s
 **Platanthera lacera*/h
 **Spiranthes tuberosa*/s
Spiranthes cernua/h
Spiranthes gracilis
Spiranthes vernalis
 ****Trillium ozarkanum*/s ?
Trillium recurvatum/m

Typical graminoids
Agrostis hyemalis
Agrostis perennans/s
Aletris farinosa/A
Alopecurus carolinianus
Allium canadense/s
Allium cernuum/x
 !****Amianthium muscitoxicum*/A
Andropogon gerardii/m
Andropogon gyrans
Andropogon ternarius/A
Andropogon virginicus/m
Aristida longespica/x
Aristida purpurascens
Aristida oligantha
 !**Carex bushii*/xh ?
 !**Carex cherokeensis* ?
 !***Carex crawei*/xh ?
Carex glaucoidea/xh ?
Carex granularis/h ?

Carex hirsutella
Carex leavenworthii
 !**Carex meadii*/x
Carex molesta s.l. ?
Carex muhlenbergii/s
Carex nigromarginata/Ax
 !**Carex physorhyncha*/A ?
Carex striatula/m
Carex umbellata/s?
Carex vulpinoidea/h
Chasmanthium latifolium/m ?
Cyperus echinatus/x ?
Cyperus lancastriensis/A ?
Cyperus retrofractus/xh A ?
Danthonia spicata/s
Dichanthelium acuminatum s.l.
 [Panicum; and following]
 !**Dichanthelium aciculare* s.l./ A
Dichanthelium ashei/m A ?
Dichanthelium boscii var. *mollis* ?
Dichanthelium depauperatum/Ax
Dichanthelium dichotomum s.l./s
Dichanthelium linearifolium/x ?
 !**Dichanthelium malacophyllum*
Dichanthelium oligosanthos s.l.
 !**Dichanthelium ravenelii*/A
Dichanthelium scoparium/h
Dichanthelium villosissimum/A
 ***Echinodorus parvulus*/h
Eleocharis bifida/hx ?
Eleocharis tenuis/h
Elymus glabriflorus s.l./m
Eragrostis capillaris
 **Eragrostis hirsuta* ?
Eragrostis spectabilis
Erianthus alopecurioides/m
 [Saccharum, and following]

Erianthus giganteus/h
 !***Gymnopogon ambiguus*
Hypoxis hirsuta/s
Juncus biflorus s.l./h
Juncus brachycarpus/h
Juncus tenuis s.l./hx
 **Muhlenbergia capillaris*/x
 ***Muhlenbergia glabrifloris*/xh ?
Nothoscordium bivalve/s
Panicum anceps/m
Panicum capillare ?
Paspalum laeve/A
Paspalum setaceum s.l. ?
 !**Poa chapmanniana*
Schizachyrium scoparium/c
 [Andropogon]
 ****Schoenoplectus hallii*/h
 [Scirpus]
Scirpus atrovirens s.l./h
Scirpus pendulus/h
Scleria oligantha/m ?
Scleria pauciflora/A
Scleria triglomerata/As ?
Setaria geniculata ?
Sisyrinchium albidum/x
Sisyrinchium angustifolium
Sphenopholis obtusata
Sorghastrum nutans
 **Sporobolus clandestinus*/x
Sporobolus compositus
Tridens flavus
 ****Tripsacum dactyloides***/hx
Vulpia octoflora s.l.



Platanthera lacera (green fringed orchid), one of the most frequent orchids in native grasslands on average soils; it tends to occur on clayey soils, damp in spring but drying out in summer. [photo: gardeninggonewild.com]



Spiranthes gracilis (slender lady's tresses orchid), perhaps the most frequent orchid in native grasslands; it occurs in moderately dry sites on average soils [photo: base.com/kenlebo/image/117470328].



Elymus glabriflorus (southeastern wild rye), the most common species of this genus in native grasslands of southeastern states; it tends to occur in more open areas, with robust exerted spikes [photo: missouriplants.com/...]



Tripsacum dactyloides (eastern gama grass), formerly dominant in swales and lowlands with damp springs and hot dry summers; it is relished by cattle and now much reduced [photo: esd.ornl.gov/ ... E_gama-grass]



Old fields in the Fort Campbell area were generally abandoned before conversion to fescue and more intensive agriculture. They offer a unique glimpse into the ecology of past millenia, and some hope for an elysian future—albeit in an unexpected military context. But will the U.S.A. truly embrace its natural heritage without a deeper appreciation of native american interests? [photo of E.W. Chester at Austin Peay Univ.].

Sites with Barrens and Glades in Pennyriple Region of Kentucky.

Counties are indicated by four-letter acronyms. Underlined sites have some degree of protection but not necessarily good management. This is a provisional listing designed to provoke comment and development into a scorecard for regular assessment. * Asterisks indicate areas with extensive deeper soils. # Indicates regular prescribed fire.

Western Pennyriple Hills

Rosenfield Preserve (LIVI): small TNC site.

#Land-Between-the-Lakes Megasite (LYON, TRIG)*: scattered remnants, esp. along roads; these need more fire and thinning..

Western Karst Plain

###Fort Campbell Megasite (CHRI, TRIG)**: this area has the most extensive potential for restoration; frequent fires useful for military.

Western Dripping Springs & Marion Hills

Crittenden Springs Glade (CRIT): nice small TNC site.

#Mantle Rock Macrosite (LIVI)* TNC site plus

Recently discovered sites in CALD (M. Hines of KSNPC)

Central Dripping Springs Hills

Sunset Barrens (WARR); and nearby Macy Highway Barrens.

#Mammoth Cave Plateau Megasite (EDMO, HART)**: many small remnants along roads, in old fields, post oak woods; best need more attention (esp. Wondering Woods), more fire and thinning. Note also nearby sites on private land: Toohey Ridge*, Brushy Knob (both BARR), Cave Research.Found.*, Hatcher Valley, Frenchman's Knob Pit, London Pace Sink (all HART); and esp. #W.Ky.Univ. (HART)*.

Central Karst Plain (Barren River).

#Mammoth Cave extension (BARR)*: a current focus for fire.

Elkton Glade remnant (TODD): largely disappeared but check.

Murphy Woods (TODD)**: thin woods with *Lilium*, *Perideridia*.

Flat Rock Glade (SIMP): best flat rock glade, KSNPC owns.

Woodburn Glade (WARR): need to refind *Gratiola quartermanii*!

#Russellville Macrosite (LOGA)*: Athey Barrens (KSNPC); Logan County Glade; Baker Prairie; Dennis Prairie

Petros-Browning Road (WARR)**: small nice deeper remnant

Plum Springs Prairie (WARR)**: small but nice remnant.

Central Karst Plain (Green River)

Middle Green River Megasite (HART, GREE, TAYL): scattered small rocky sites in hills near river; almost none on deeper soils.

Clay Hill Memorial Forest (TAYL): very small but curious remnant.

Russell Creek Glades (GREE): needs further checking.

Northern Dripping Springs Hills

Lapland Barrens (MEAD)*: TNC efforts on hold due to land sale.

Irvington Barrens (BREC): check with R. Seymour.

Corners Glades and Caves (BREC): diverse potential, no action.

Baumberger Barrens (GRAY)*: small TNC site

Meeting Creek Macrosite (GRAY, HARD): includes R. Cranfill's "wet sandy barrens" and might be extended to include following.

(#)Big Clifty Railroad Prairie (GRAY)**: small strip but protected?

#Eastview Barrens (HARD)**: excellent site but needs expansion.

Grandview Barrens (HARD)*: scattered remnants with great need.

(#)Riders Mill Macrosite (HART)**: R. Seymour and neighbors.

Northern Karst Plain (west): many small largely unprotected areas.

Howe Valley Macrosite (HARD)**: none protected, much reduced but long-term potential over large area.

Silver Mine Knob (HARD)**: no action.

(#)Knight's Barrens Macrosite (HARD)**: but deeper soils damaged.

Three Springs Knob (LARU)*: no action.

Bonnieville Railroad Prairie (HART)*: small site with *Silene regia*.

Copelin Road (HART): small nice roadside remnant

Northern Karst Plain (east)

(#)Fort Knox-Rolling Fork Megasite (HARD)**: includes rocky glades and grassland remnants along ROWs; formerly adjacent Radliff Barrens of H. Bryan (now industrial park)

Elizabethtown Beagle Club (HARD)**: 100+ acres south of town (based on earlier contacts by J. Sole).

Cedar Creek Glades (HARD): and other sites in transitions to Knobs (Muldraugh's Hill), best treated under "Bluegrass plus Knobs."