

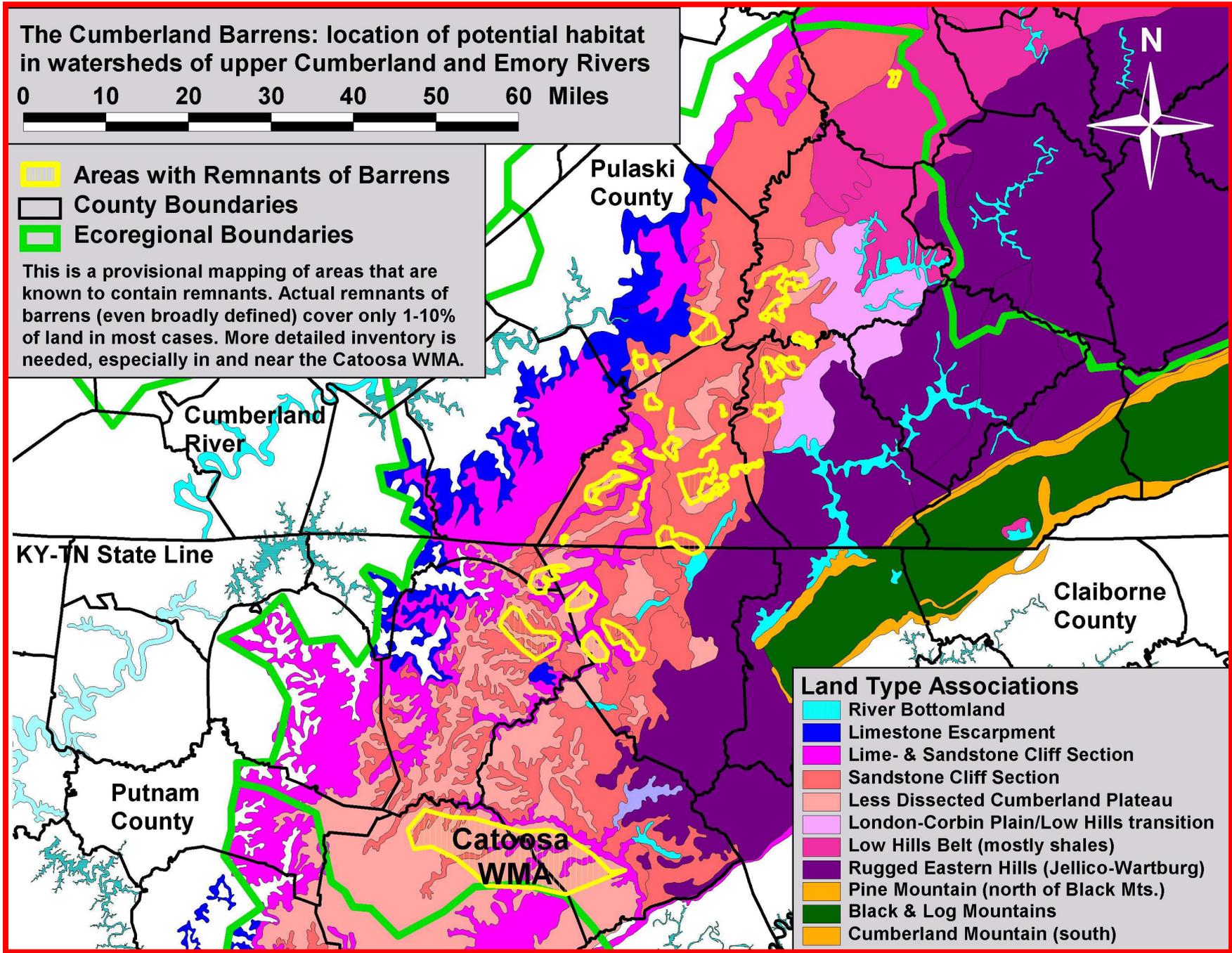
THE CUMBERLAND BARRENS

Notes by Julian Campbell
(bluegrasswoodland.com)

Dedicated to the memory
of Hal DeSelm



Cover photo: Johnson's Stand, built in 1806, among the earliest settlements of Cumberland County, Tennessee [from Melissa Grant at <http://active-rain.com/blogsvew/441528/>]. In early accounts of this route (Summerlin 1999), Francis Bailey (1797) wrote: “we arrived at Crab Orchard [20 miles to SE]. Here we found a large plain or natural meadow, containing many hundred acres covered throughout its whole extent with a tall, rich grass”; **Martin Steiner** (1799) wrote: “then we crossed barren hills where only bushes grew. Now and then one saw a little tree.”



The Cumberland Barrens: open pine/oak woods and grassland.

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

Summary (for more technical details see subsequent pages).

Broadly defined, this habitat used to cover much of the less dissected uplands on the central Cumberland Plateau, drained by the upper Cumberland River and the Emory River. Bedrock is mostly lower Pennsylvanian sandstones, with lesser amounts of siltstone and shale, plus some local coal. Typical soils are strongly acid: mostly hapludults, but including dystrochrepts on more rocky sites and fragiudults on seasonally hydric sites (swales and streamheads).

There appears to have been a zonation that needs better documentation—from more open grassy woods with more frequent fire on broader ridges with deeper soils, to deeper woods in more rugged terrain with openings just near cliffs. Typical dominants in remnants of more open grassland are little bluestem, Indian grass and locally big blue stem. Some trees are concentrated in zones between open grassland and deeper woodland, especially blackjack oak, post oak, shortleaf pine, persimmon and sassafras. Many characteristic plants are rare in this region, with ranges mostly to the south or east. Globally endangered species that have disappeared from the region are Chaff-seed (*Schwalbea*) and Red-cockaded Woodpecker.

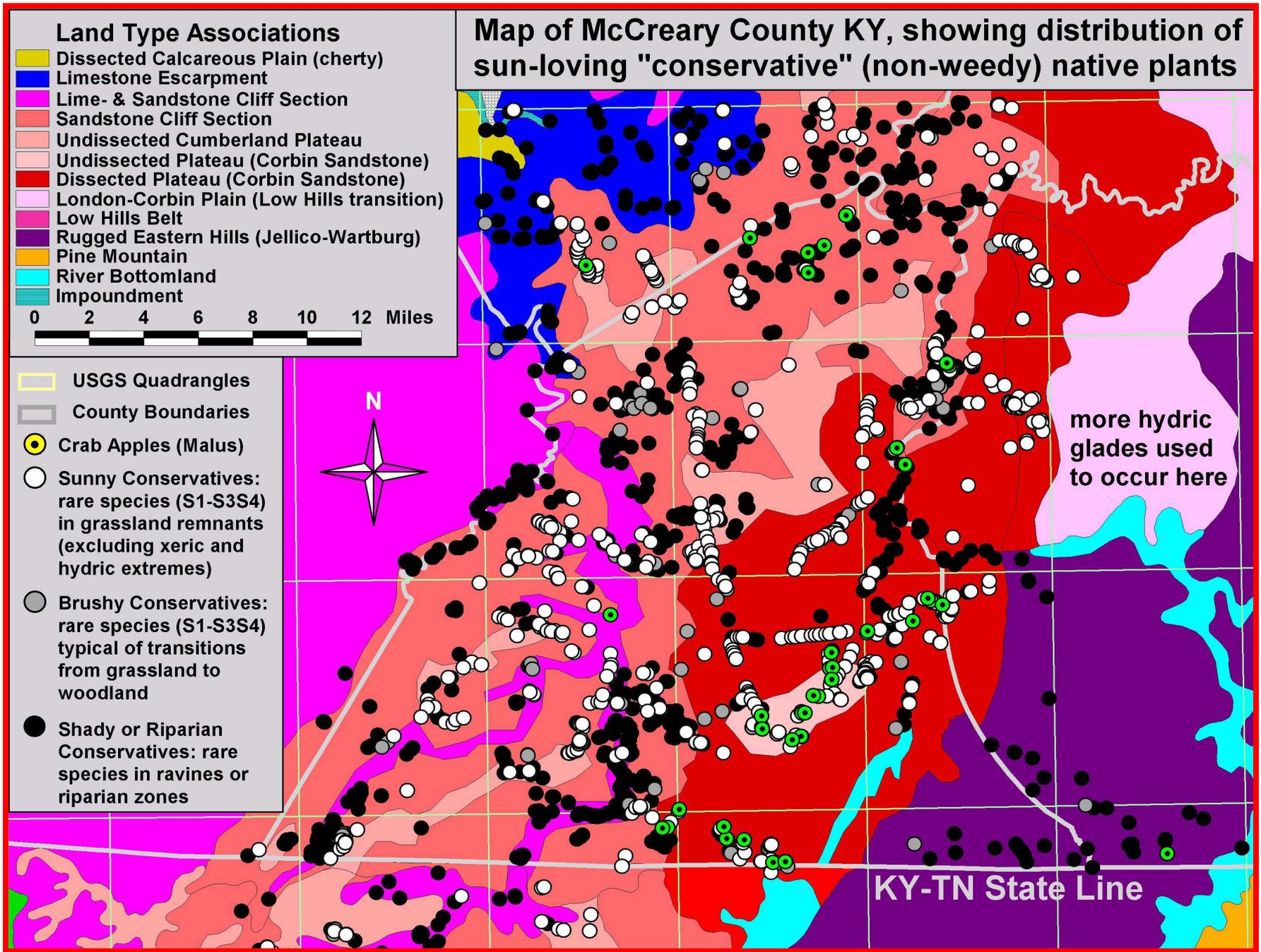
Historical problems have been: (1) succession to deeper woods after decline in fire-frequency; and (2) conversion to agricultural or residential land. Grassland remnants occur mostly along rights-of-way. Although much woodland has old shortleaf pines and post oaks, plus thin ground cover of suppressed grassland plants, aggressive management is needed to restore openings where these trees can regenerate by themselves. Agencies have been using prescribed fire for a few decades in some areas, but goals, methods and results have varied. It has often been difficult to focus on botanical aspects. Remnants along rights-of-way are susceptible to changes in mowing, herbicides or other impacts. The small populations of some rare species in these remnants should become sources for propagation, in order to build nurseries, demonstrations, and trial-plantings for research.



Less dissected parts of the Plateau now have a mosaic of forest and field, but before settlement there was more intergradation [ORNL].



More dissected parts of the Plateau are mostly forested. Before settlement fires were somewhat interrupted by ravines. Now small rocky glades are scattered above cliffs, but their flora and fauna are different from species typical of grassland on deeper soils [SELC].



Geology and soils. This habitat occurs mostly on broad ridges and flatter uplands in the central Cliff Section of the Cumberland Plateau. These areas are drained by the upper Cumberland River to Kentucky (with its South Fork), and the Emory River to Tennessee (with its tributary the Obed). Bedrock is mostly lower Pennsylvanian sandstones, with lesser amounts of siltstone and shale, plus some local coal. Shales with coals occur mostly in upper strata and in eastern transitions. Soil series on sandstone are dystrochrepts on more rocky sites (Dekalb/Ramsey, Steinsburg/Alticrest), hapludults on deeper soils (Lily/Chavies), and fragiudults on more hydric sites (Clark-range). Parallel catenas occur on siltstone and shale (Highsplint/Weikert; Gilpin/Rayne, Wernock/Lonewood; Tilsit/Johnsburg, etc.). In most cases, these soils are strongly acid, with pH of 4.5-5.5.

Characteristic species. There appears to have been a zonation from more open grassland with more frequent fire on broader ridges with deeper soils, to deeper woods on more rugged terrain with openings just near cliffs. Typical dominants in remnants of more open grassland are little bluestem (*Schizachyrium*), Indian grass (*Sorghastrum*) and locally big blue stem (*Andropogon gerardii*). More wooded sites have abundant porcuine-grass (*Piptochaetium*). Drier sites grade into more xeric woods and clifftop glades with downy poverty-grass (*Danthonia sericea*), dryland early panic-grass (*Dichantherium depauperatum*), and short sedges. Damper sites have much slender wood-oats (*Chasmanthium laxum*), wetland early panic-grass (*Dichantherium microcarpon*), taller sedges and rushes. The diverse herbs on these varied sites include frequent legumes (especially *Desmodium* & *Lespedeza*) and composites (esp. *Eupatorium*, *Helianthus*, *Solidago* & *Symphotrichum*); also common are bracken (*Pteridium*), *Agalinis tenuifolia*, *Angelica venenosa*, *Galium pilosum*, *Euphorbia corollata*, *Lobelia puberula* and *Pycnanthemum tenuifolium*. Some trees are typical of zones between open grassland and deeper woodland, especially blackjack oak (*Q. marilandica*), post oak (*Q. stellata*) and shortleaf pine (*P. echinata*), plus persimmon and sassafras in old fields. The shrub layer includes several ericaceous species (*Gaylussacia*, *Kalmia*, *Oxydendrum*, *Rhododendron*, *Vaccinium*) and much sumac (*Rhus copallina*).



With 82,000 acres, Catoosa Wildlife Management Area presents the best opportunity for restoration of large areas with grassland and open woods (savanna) on the Plateau. Pat Keyser et al. (Barrioz 2010) are conducting valuable research here [dnrhc.blogspot.com/2010/10/].



Northern Coal-Skink [from virginiaherpetologicalsociety.com]. This is rarely reported from the Upper Cumberland region.



Northern Pine Snake [from Mammoth Cave area by Phil Peak at <http://www.ectotherms.net/>]. Last Cumberland records were in 1970s.



Eastern Slender Glass Lizard [pair in Edmonson Co., from Phil Peak at fieldherpforum.com]. It is rarely seen on the Cumberland Plateau.



Spotted Skunk [from audubonmagazine.org]. There may be no confirmed records from the Upper Cumberland region since 1992.

Rare species (plants, animals). About a quarter of the 160-170 typical plant species (see p. 13 & 15) are considered ‘conservative’ (not at all weedy, p. 4) or rare in this region. Most of these species have ranges centered in southeastern states, and occur here near their northern limits. Several are largely restricted to southern Appalachian, Piedmont or Atlantic coastal regions: *Agalinis decemloba*, *Baptisia tinctoria*, *Gaylussacia brachycera*, *Liatris microcephala*, *Lilium philadelphicum*, *Robinia boyntonii*, *Salvia urticifolia* and *Viola emarginata*. The chaff-seed (*Schwalbea*) has disappeared from this region; it is a globally endangered species that appears to be highly dependent on fire (see p. 10). Rare animals include the Appalachian subspecies of Coal Skink, the southeastern Slender Glass Lizard, Pine Snake, Red-cockaded Woodpecker (with other birds of savanna or grassland), and the southeastern subspecies of Spotted Skunk. The woodpecker is federally listed as endangered; it has disappeared from Kentucky and Tennessee, but remains locally secure in open grassy pine woods of some southeastern states (p. 8).

Cross-walk with other classifications. Some confusion stems from different uses of the integrading terms: forest, woods, woodland, barrens, savanna, grassland and prairie. In the Ky. Natural Heritage system, the vegetation outlined here matches (more or less) their “sandstone barrens (open woodland)” and “sandstone prairie” in typical open phases. Xeric phases grade into their “Xeric Virginia pine forest/woodland” and “Cumberland Plateau sandstone glade.” Deeper woods grade into their “Appalachian pine-oak forest” and “Appalachian subxeric forest.” In the NatureServe system (their CEGL numbers), more open phases here match their Appalachian grassland types with little bluestem (7707) or big bluestem (7705). Open woods match their types with shortleaf pine (3560), or mixed with blackjack & post oak (3765), or mixed with post & chestnut oak (4445). Xeric phases with much Virginia pine grade into their mixed pine forest (7119) or “cliff-top barrens” (4061). Deeper woods grade into their pine-oak or oak types with increasing amounts of chestnut oak (e.g. 7500, 7493, 3706) or white oak (e.g. 8427, 8430). [For internal reference, the core classes included here are JC 10 or 08, with edaphic variants A, B and locally C in both cases.]



Crabapples [here *Malus angustifolia*] were locally dominant in thickets on and near the Appalachian Plateaus, as indicated by historical records, place-names, and the remaining clusters of trees (see p. 4).



The Red-cockaded Woodpecker requires large areas of open piney woods, but can also forage much in associated hardwoods (Hines & Kalisz 1995). Their numbers declined drastically in Kentucky and Tennessee during the 20th Century. Photo: one of last birds in Kentucky during 2001, from Horace Brown [sentinelnews.com].



Artificial excavation for nests can aid the woodpecker, which remains secure in a few southern localities. But after such micro-management on Daniel Boone National Forest from the 1970s until 2001, the last ones were relocated to NC as pines died due to the beetle epidemic [photo from Talledega National Forest].

Issues for conservation. This habitat type is still not well understood, even by scientists and land-managers. Two basic factors have caused its virtual disappearance from the region: (1) succession to deeper woods after decline in fire-frequency; and (2) conversion to agricultural or residential land. This ‘ecological squeeze’ has resulted in the best remnants of vegetation being largely confined to rights-of-way, where they need better recognition and protection. There is much woodland where past history of open conditions is evident in old shortleaf pines and post oaks, plus thin ground cover of suppressed grassland plants. But much management is needed to restore openings where these trees can regenerate by themselves. Artificial plantings of pines 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. At the open extreme, Catoosa Wildlife Management Area (between I-40 and the Obed Rv.) now has much grassland to be explored and hunted. Their increase in burning was facilitated by the pine-beetle outbreak of 1998-2002. Daniel Boone National Forest has designed burning partly to reduce fuel and promote oaks in general, rather than focussing on the true ‘barrens’—which will need more frequent fire. The Big South Fork (National Park Service) has begun to burn but, again, its stated goals emphasize “hazard fuel accumulations, maintaining cultural landscapes, and controlling exotic species” rather than restoring native vegetation. 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*, *Krigia*, *Potentilla*, *Phlox*, *Viola*) can be ‘burnt in the bud.’ Interaction of large browsing animals with fire also deserves more research.

Remnants along rights-of-way are susceptible to changes in mowing, herbicides or other impacts. In McCreary County, several roadsides have been mowed too much in recent years, and there is an urgent need to adjust management. Also, the small populations of some rare species can become sources for propagation, in order to build nurseries, demonstrations, and trial-plantings for research.



Shining phlox (*amoena*) is one of the few spring-flowering plants in the grassland. It may be reduced by disturbance early in the year.



Birds-foot Violet (*pedata*) remains more common on rocky sites, with less fuel or fodder, where burning and browsing has been less severe.



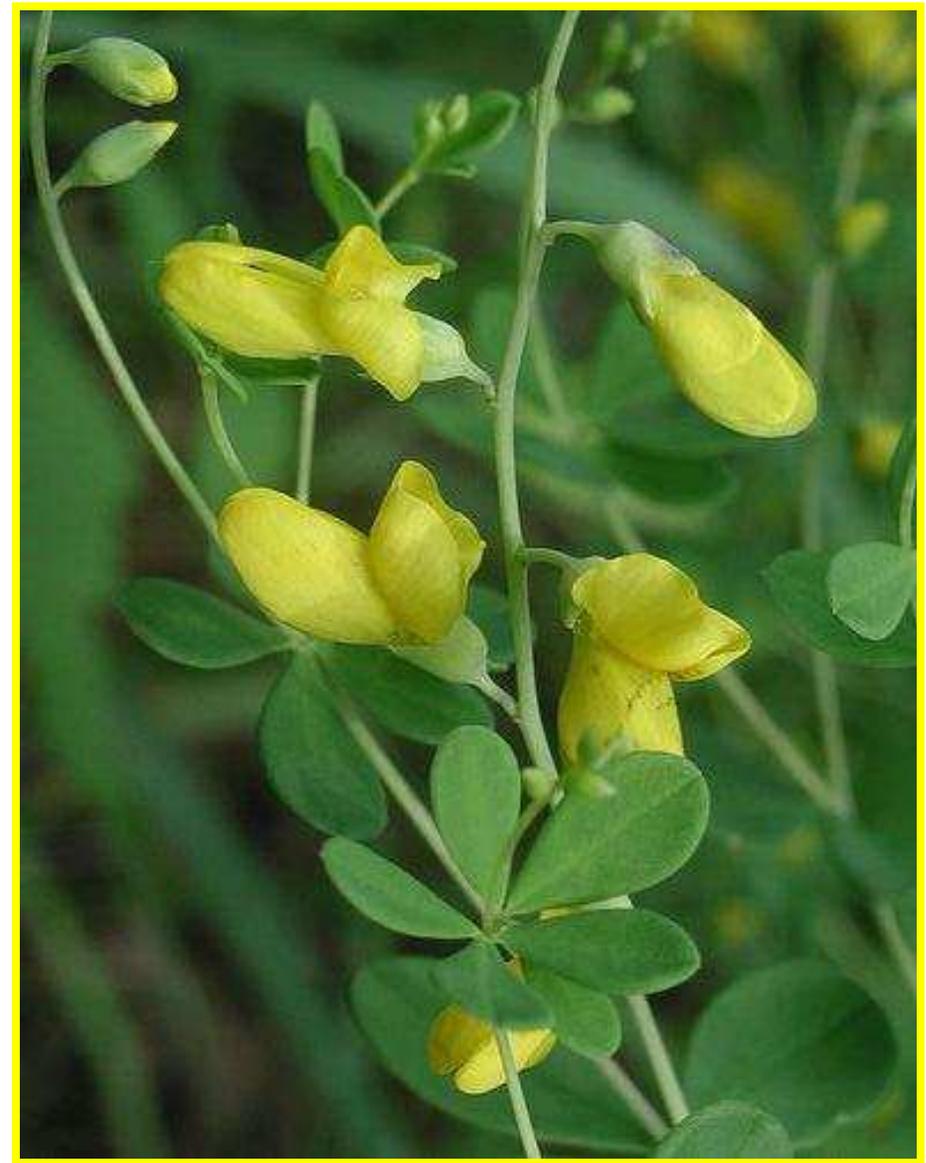
Schwalbea americana: upper left from H & C Nourse (www.fs.fed.us)
landscape from Fuz Sanderson, NC DOT (picasaweb.google.com)
lower right: younger shoot from Janet Novak (ct-botanical-society.org)

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Nettle-leaved sage (*Salvia urticifolia*) occurs mostly on medium-acid soils from the Carolina Piedmont to the southern Interior Low Plateaus, usually in remnants of 'barrens' or thin open woodland [photo from davesgarden.com/members/Gerris2/].



Atlantic yellow indigo (*Baptisia tinctoria*) is widespread on sandy soils in open woods and fields of northeastern states, but west of the Blue Ridge it is rare and largely restricted to remnants of 'barrens' [photo from <http://marciabonta.com/category/wild-indigo/>].

LIST OF TYPICAL SPECIES

Underlined: most common and characteristic in best remnants.

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

s.s. = sensu stricto (excluding other segregates).

[]: broader genus concept.

* Uncommon to locally rare.

** Regionally-rare/state-listed.

*** Regionally disappeared.

! = 'sunny conservatives' (p. 4)

= 'brushy conservatives' (p. 4)

Codes after (l) species names:

A = most on strongly acid soils

C = most on somewhat base-rich

h = usually hydroxeric-hydric

m = usually submesic

s = usually woody transitions

x = usually xeric/xerohydric

Some species are excluded that occur mostly in transitions to other vegetation types.

Typical larger trees/s

Acer rubrum s.l./mh

Carya glabra/Cm

Carya pallida

Carya tomentosa/Cm

****Castanea dentata*/Am?

Diospyros virginiana/Cm

Nyssa sylvatica/m

Oxydendrum arboreum/A

Pinus echinata

Pinus rigida/A

Pinus virginiana/x

Quercus alba/C

Quercus coccinea/A

Quercus falcata

Quercus marilandica/x

Quercus montana/A

Quercus velutina/Cm

Quercus stellata/xh

Sassafras albidum/Cm

Small trees, shrubs and vines/s

Amelanchier arborea/C

##**Aronia arbutifolia*/h

Aronia melanocarpa/x

****Castanea pumila*

Ceanothus americanus/C

##**Crataegus intricata* s.l./C

Crataegus pruinosa/C

Cornus florida/C

Gaylussacia baccata/Ax

Gaylussacia brachycera/x

##**Hypericum hypericoides*

Kalmia latifolia/A

##**Malus angustifolia*

Oxydendrum arboreum/s

**Prunus angustifolia*/C

Rhododendron calendulaceum/x

Rhodod. cumberlandensis/h

Rhodod. periclymenoides/m

Rhus copallina

##**Robinia boyntonii*/x

Rubus allegheniensis/m

Rubus argutus s.l. /m

Rubus flagellaris s.l.

Salix humilis s.l./h

Smilax glauca/x

Smilax rotundifolia/Cm

##**Toxicodendron vernix*/h

Vaccinium arboreum/x

Vaccinium corymbosum

Vaccinium pallidum

Vaccinium stamineum

Viburnum dentatum s.l./m

Vitis aestivalis/C

Vitis rotundifolia/m

Typical ferns and allies

!****Lycopodiella appressa*/h

[*Lycopodium*]

Lygodium palmatum/h

Pteridium aquilinum

Thelypteris noveboracensis/h

Dicot herbs: not legumes or composites

!****Agalinis decemloba*/A

Agalinis purpurea/h

Agalinis tenuifolia

Angelica venenosa

!**Asclepias amplexicaulis*

##**Asclepias exaltata*/s ?

Asclepias variegata/m

!****Aureolaria pectinata*/C

Aureolaria virginica/s

!****Bartonia virginica*/h

!****Buchnera americana*

**Comandra umbellata*/C

Fragaria virginiana/C

Galium pilosum

Gentiana villosa/s

!*Gratiola pilosa*/h

Euphorbia corollata/C

!****Eryngium yuccifolium*

Houstonia caerulea

Hypericum gentianoides/x

!****Hypericum stans*/h

Hypericum stragalum/s

Lechea racemulosa/x

!**Ligusticum* sp./s

!****Lobelia nuttallii*/h

Lobelia puberula

Lobelia spicata s.s./Cx ?

****Matelea carolinensis* ?

!**Oenothera fruticosa* s.s. ?

!**Phlox amoena*

!****Polygala cruciata*/hx

Polygala curtisii/x

!**Polygala incarnata*

****Polygala polygama*

Polygala sanguinea/h

Polygala ambigua

Potentilla canadensis/s

##**Porteranthus trifoliatus*/s

Pycnanthemum incanum s.l./s

Pycnanthemum tenuifolium

!****Pycnanthemum verticillatum*/h

Rhexia mariana/h

Sabatia angularis/C

!****Sabatia brachiata*

!****Salvia urticifolia*

!****Sanicula marilandica*

****Schwalbea americana*/h

!****Viola fimbriatula*/x ?

**Viola emarginata*/s

!****Viola lanceolata*/h

Viola pedata/x

**Viola sagittata* s.l./h

Typical legumes

!****Baptisia tinctoria*

Chamaecrista nictitans

Clitoria mariana/s



Appalachian Wood-lily (*philadelphicum*): a globally rare plant of thin woods or grassy openings, usually on dry acid sandy soils [nhdfl.org].

Several blazing stars (*Liatris*) occur in the barrens: *squarrulosa* may be the most frequent species along roads [Tom Barnes at fs.fed.us/...].

Desmodium ciliare/Cx
Desmodium glabellum/Cm
Desmodium laevigatum/s
Desmodium marilandicum
 !***Desmodium nuttallii* ?
 !**Desmodium obtusum*
Desmodium viridiflorum/m
Galactia volubilis/c
 !***Lespedeza capitata*/Cm
Lespedeza hirta/s
Lespedeza intermedia/Cm
Lespedeza procumbens/cs
Lespedeza repens/Cx
Lespedeza virginica/Cx
Orbexilum pedunculatum s.l.
 [Psoralea]
 #**Phaseolus polystachios*/Cs
 !***Rhynchosia tomentosa*/x
Schrankia microphylla [Mimosa]
Senna nictitans/C [Cassia]
Stylosanthes biflora
 !***Tephrosia spicata*/xh?
Tephrosia virginiana/x

Typical composites

Ageratina aromatica/s
 [Eupatorium]
Antennaria plantaginifolia s.l./s
Chrysopsis mariana
 !**Cirsium carolinianum*
Conyza parva [Erigeron]
Coreopsis major/Cs
Coreopsis tripteris/Cm
Elephantopus tomentosus/s
Eupatorium album
Eupatorium hyssopifolium/xh
Eupatorium pilosum/h

Eupatorium pubescens
Eurybia surculosa/x [Aster]
Eutrochium fistulosum/h
 [Eupatorium]
 !**Helianthus angustifolius*/h
 !**Helianthus atrorubens*
Helianthus divaricatus/Cs
Helianthus hirsutus/C
Helianthus microcephalus/Cs
Helianthus strumosus/m
Hieracium gronovii
Ionactis linariifolius/x [Aster]
Krigia virginica
 !**Liatris microcephala*/x
 !***Liatris squarrosa*/C
 !**Liatris squarrulosa*/c
 !**Liatris spicata*/Ch
Nabalus serpentarius/s
 [Prenanthes]
Packera anonyma/x
 [Senecio]
 !**Parthenium integrifolium*/C?
Pityopsis graminifolia s.l./x
 [Chrysopsis]
Pseudognaphalium obtusifolium
 [Gnaphalium]/C
Pyrrhopappus carolinianus/C
Rudbeckia fulgida s.s.
Sericocarpus linifolius/x
 [Aster; and following]
Sericocarpus paternus/s
Solidago bicolor s.l.
Solidago erecta
Solidago odora
Solidago nemoralis/C
Solidago rugosa/h
 !***Symphotrichum concolor*/x

[Aster; and following]
Symphotrichum dumosum
Symphotrichum patens
Symphotrichum undulatum/s
Verbesina occidentalis/m
 !**Vernonia noveboracensis*/h

Monocot herbs: not graminoids

Aletris farinosa
 !***Calopogon tuberosus*/h
 !***Cleistes bifaria*
Cypripedium acaule/As
 !**Iris verna* s.l./s
 !***Lilium philadelphicum* s.s.
 !**Platanthera lacera*/h
 !***Platanthera cristata*/Ah
 !**Spiranthes tuberosa*/s
Spiranthes cernua/h
 !***Stenanthium gramineum* s.l./h

Typical graminoids

Andropogon gerardii/Cm
Andropogon ternarius
Andropogon virginicus/Cm
Aristida dichotoma/x
Aristida purpurascens s.l. ?
 !**Calamagrostis cinnoides*/h
Carex caroliniana/h
Carex hirsutella/C
Carex muhlenbergii/s
Carex nigromarginata/x
 !**Carex physorhyncha* ?
Carex picta/s
Carex striatula/Cm
Chasmanthium laxum/h
Cyperus echinatus/x?
 !**Cyperus plukenetii*/x?

Cyperus lancastricensis
Cyperus retrofractus/xh?
Danthonia compressa/m
Danthonia sericea/x
Danthonia spicata/s
Dichanthelium acuminatum s.l./C
 [Panicum; and following]
 !**Dichanthelium aciculare*
Dichanthelium ashei/m
Dichanthelium bosci/s
Dichanthelium depauperatum/x
Dichanthelium dichotomum/Cs
Dichanthelium laxiflorum/Cm
Dichanthelium microcarpon/h
 !**Dichanthelium ravenelii*
Dichanthelium scoparium/h
Dichanthelium sphaerocarpon/s
Dichanthelium villosissimum/x
Elymus glabriflorus s.l./Cm
Erianthus alopecurioides/m
 [Saccharum]
 !***Gymnopogon ambiguus*
 !**Juncus bufonius*/hx
 !**Juncus coriaceus*/h
Juncus tenuis s.l./h
 !**Muhlenbergia capillaris*/Cx
 !***Rhynchospora recognita*/h
Panicum anceps/m
 !***Panicum longifolium*/h
Piptochaetium avenaceum/s
Schizachyrium scoparium/c
 [Andropogon]
Scleria pauciflora/x
Scleria triglomerata s.l./s ?
Sorghastrum nutans/c
 !**Sporobolus clandestinus*/Cx
 !***Xyris torta*/Ah



Porcupine grass (*Piptochaetium avenaceum*), widespread southeastern species, locally dominant in thin woods on sandy soils [photos from: John Gwaltney at southeasternflora.com; inset, Tracey Slotta, plant.usda.org/...]



Silky oatgrass (*Danthonia sericea*), widespread southeastern species, locally dominant on strongly acid xeric sites along clifftops and spreading into adjacent thinned woods [photo: forestryimages.org/... UGA1120319]



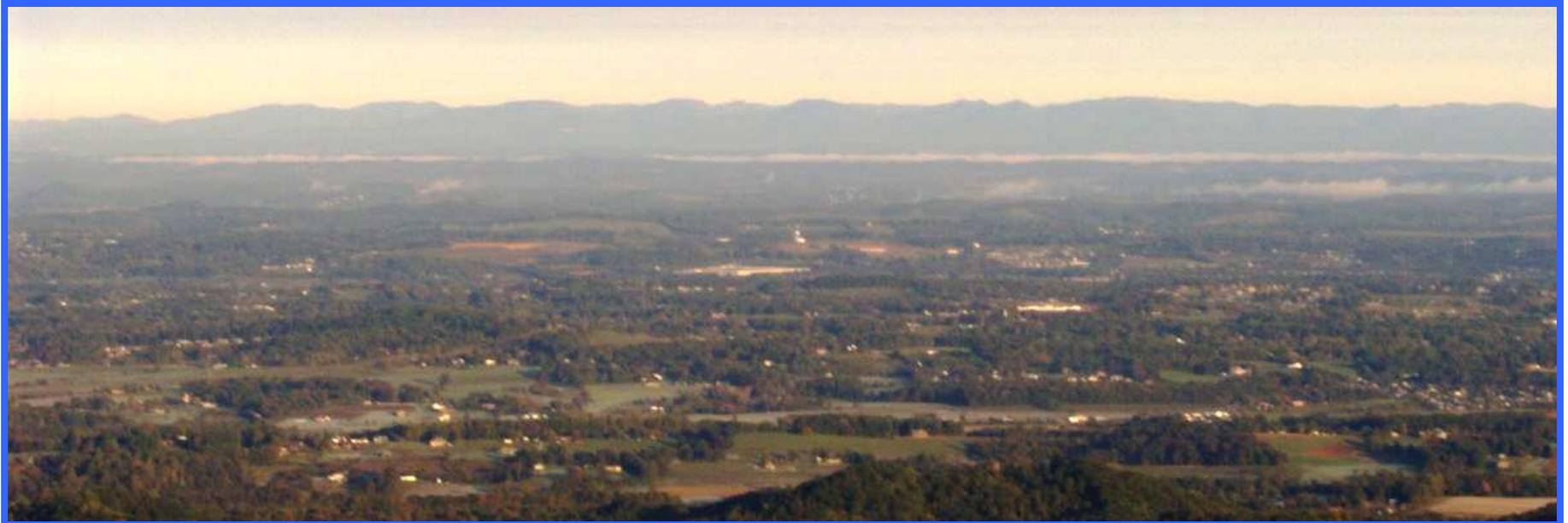
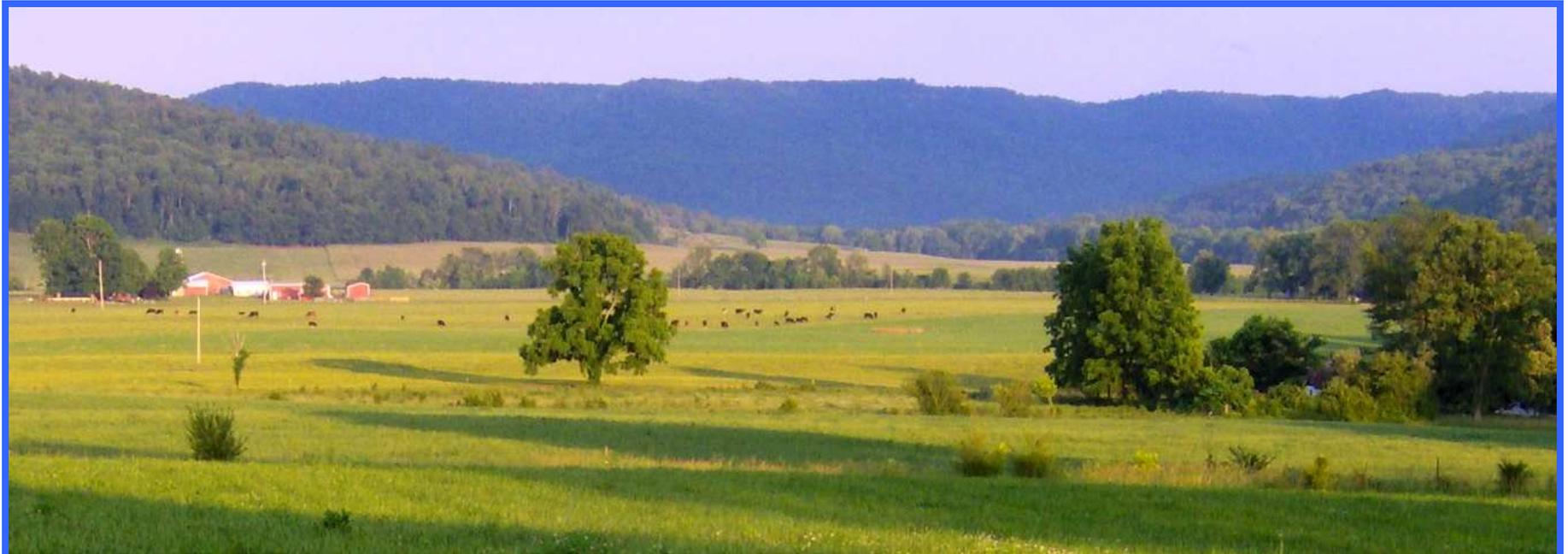
Silvery broomsedge (*Andropogon ternarius*), widespread southeastern species on dry acid soils, locally dominant in old fields and native grassland [photo: botany.csd.tamu.edu/FLORA/LCP/LCP42.JPG].



Upland plume grass (*Erianthus alopecurioides*), widespread southeastern species of brushy edges and submesic transitions to deeper woodland, especially along rights-of-way [photo: James Miller, plants.usda.gov/...]



Much forest on the Cumberland Plateau is cutover, thinned from pine-beetle, in old field succession, or in commercial pine plantations. But much also has remnants of the original barrens, and fires at 1-3 year intervals can restore the biological diversity, as in the Catoosa WMA.



Looking at the Cumberland Plateau [photos from Brian Stansberry, wikipedia.org]: above, southeast from Wolf River Cemetery (Fentress Co.); below, north-west from Look Rock (Blount Co.). Grassland was also widespread in these more developed landscapes before settlement.