Glades of the Knobstone Escarpment in Indiana

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Introduction

Glades are small natural openings within the forest with bedrock at or near the surface. In southern Indiana, glades usually occur on steep south or west-facing slopes, and usually are dominated by prairie grasses and forbs. Most of those found thus far occur on limestone (1), but a few occur on sandstone (3). Recently, glades have been located on sandstone, siltstone and shale on the Knobstone Escarpment in Clark, Floyd, and Jackson Counties of southcentral Indiana. In this paper, the methods used to locate and evaluate the Knobstone glades are discussed, and a preliminary species list is presented.

Methods

A systematic search for glades was undertaken in Floyd County (11), Clark County (12), and Jackson and Washington Counties (2). The methods used were similar to those used to find glades in Harrison, Perry and Crawford Counties, Indiana (1,3). The most recent aerial photographs available at the Agriculture Stabilization and Conservation Service offices in each county were examined, in conjunction with the 7.5 minute United States Geological Survey topographic quadrangle maps. Openings in the forest were carefully examined in an effort to locate those with potential to be natural. Openings that were obviously man-made were eliminated from consideration. Older aerial photographs were examined to further evaluate the past history of these openings.

Sites determined to be potential glades were then evaluated during a field visit. A total of thirty-three potential glades were visited. Factors used to help evaluate the quality of these areas included presence or absence of alien species, richness of native species, amount of woody encroachment, and presence or absence of obvious signs of disturbance by man.

Results

Nineteen glades were located—three in Jackson Conty, one in Clark County, and fifteen in Floyd County. In general, all of these glades are very similar to one another. They are very xeric sites, with much bedrock (siltstone, shale, sandstone) exposed, the soil is a shallow Weikert Channery Silt Loam (17), and the vegetation is sparse. The overstory consists primarily of chestnut oak (*Quercus prinus*), Virginia pine (*Pinus virginiana*), post oak (*Quercus stellata*) and black jack oak (*Q. marilandica*). Blueberries (*Vaccinium vacillans* and *V. stamineum*) are the most common shrubs. The most characteristic forbs are goat's rue (*Tephrosia virginiana*), knobs goldenrod (*Solidago sphacelata*), dittany (*Cunila origanoides*), and flowering spurge (*Euphorbia corollata*), and the most common grasses were poverty grass (*Danthonia spicata*) and little bluestem (*Andropogon scoparius*). All together thirty-five native grasses and forbs were identified (Table 1).

TABLE 1. *A preliminary species list for the Knobstone Escarpment glades in Jackson, Clark, and Floyd Counties, Indiana.*

TAXON	Jackson Co. Glades	Clark Co. Glades	Floyd Co. Glades
Acer rubrum[3]		x	x
Acer saccharum	x		
Agave virginica[3,4]			x
Agrimonia pubescens		x	x
Amelanchier sp.[3]	x	x	
Andropogon scoparius[3,4]	x	x	x
Anemone virginiana[3,4]			x
Antennaria plantaginifolia[3]	x	x	x
Apocynum cannabinum[3]	x		x
Asclepias tuberosa[3]	x		x
Asclepias viridiflora[2,3]			x
Ascyrum hypericoides[3]			x
Aster patens[3,4]		x	
Baptisia leucantha[3]			x
Carex sp.	x		
Carya ovata[3]		x	x
Cassia fasciculata[3]		x	
Celastrus scandens		x	
Cercis canadensis[3,4]			x
Cornus florida[3]	x	x	x
Conopholis americana		x	
Cunila origanoides[3,4]	x	x	x
Danthonia spicata	x	x	
Desmodium sp.		x	
Diospyros virginiana[3]			x
Euphorbia corollata[3,4]	x	x	x
Fagus grandifolia[3]	x	x	
Fraxinus americana[3]			x
Gaylussacia baccata	x		
Helianthus divaricatus[3]	x	x	x
Helianthus hirsutus[3]		x	
Heuchera sp.			x
**Hieracium venosum*		x	x
Hieracium sp.		x	
Houstonia longifolia			x
Houstonia sp.		x	
Hypericum punctatum[3]		x	
Juniperus virginiana[3,4]	x	x	x
Krigia dandelion[3]			x
Lespedeza hirta[3]		x	x
Lespedeza sp.	x		x
**Liatris squarrosa*[3,4]	x		x
Monarda fistulosa[3,4]		x	x
Nyssa sylvatica	x	x	x
Ostrya virginiana[3]	x		x
Panicum sp.	x		x
Parthenocissus quinquefolia		x	
Penstemon sp.[2]			x
Pinus virginiana		x	x
Prunus serotina			x
Quercus marilandica[3]	x	x	x
Quercus prinus	x	x	x
Quercus borealis var. *maxima*			x
Quercus stellata		x	x
Quercus velutina[3]		x	x
Rhus copallina[3]		x	x

TABLE 1.—Continued

TAXON	Jackson Co. Glades	Clark Co. Glades	Floyd Co. Glades
Rhus radicans		x	
Rosa sp.		x	x
Sassafras albidum[3]	x	x	x
Sanicula marilandica			x
Smilax sp.	x	x	x
Solidago sphacelata	x	x	x
Stylosanthes biflora[3]	x		x
Swertia carolinensis[3,4]	x		
Tephrosia virginiana[3]	x	x	x
Thaspium sp.	x		
**Vaccinium arboreum*[3]			x
Vaccinium stamineum[3]			x
Vaccinium arboreum[3]	x	x	x
Viburnum acerifolium	x		
Viburnum rufidulum[3,4]			x
Vitis sp.	x	x	x

1. Nomenclature according to Gleason and Cronquist (10).
2. Taxon observed only on one site—a "prairie glade".
3. Taxon also reported from Perry and Crawford County glades and barrens (3).
4. Taxon also reported from Harrison County limestone glades (1).

* = on the "Preliminary list of endangered and threatened vascular plants of Indiana" (4,5).

Several of these species are considered rare in Indiana, including *Hieracium venosum, Liatris squarrosa*, and *Vaccinium arboreum* (4,5).

Discussion

The Knobstone Escarpment is a prominent topographic feature which defines the eastern edge of the Norman Upland where it abruptly drops into the Scottsburg Lowland (14). The bedrock of this escarpment consists mostly of relatively resistant siltstone and sandstone, interbedded with softer non-calcareous shales. The glades of the Knobstone Escarpment have more exposed bedrock, sparser vegetative cover, and a lower species richness than the other Indiana glades reported on previously. For example, only eight of the forb and grass species reported from limestone glades in Harrison County occur on the "knobstone glades" (1, Table 1). The Knobstone glades appear to be similar to the "barrens" described for Illinois by Vestal (17), who spoke of a "high proportion of forest herbs, and lacking many prairie plants." An (apparently) similar community was mentioned, but not floristically described, by Braun in The Knobs Region of Ohio (6).

Glades were found primarily in Floyd County, but some remnants were found in Jackson County, approximately 35 miles northwest of Floyd County. The only obvious difference was the absence of native populations of *Pinus virginiana* on the Jackson County sites. Structurally and floristically, these glades appear to be very similar.

The Knobstone glades may be remnants of a formerly much more extensive glade and barren flora and vegetation, as appears to be the case in other parts of southern Indiana (1,3,7,13). A few forbs, such as *Agave virginica* and *Baptisca leucantha*, and a lush prairie grass cover, occur on Bald Knob in Floyd County, on a remnant of prairie glade degraded (and now probably maintained) by herbicide spraying. This rem-

nant, on a topographic feature named "Bald Knob", lead to speculation of a more prairie-like community in presettlement times. Other evidence suggesting the former existence of barrens and glades in Southern Indiana include the old collections from Floyd County of prairie-glade species such as *Helianthus occidentalis, Ratibida pinnata, Silphium terebinthinaceum, Solidago rigida, Liatris spicata, L. aspera*, and *Buchnera americana* (8). However, none of these species was relocated on any of the Knobstone glade remnants.

As is the case for glades and barrens all over the Midwest, glades on the Knobstone Escarpment have nearly disappeared since settlement. Fire suppression and cultivation are believed to be the primary cause of their disappearance (7,9,13,15). Based on the lack of disturbance and absence of alien species, the remnants described here appear to be of high quality. They are becoming smaller due to encroachment by woody species, which shade out the forbs and grasses. Erosion is also a threat in some of the areas. Protection and management of these communities will be necessary if they are to continue to exist in Indiana.

Acknowledgments

The authors wish to thank Jerry and Carol Baskin and Mike Homoya for their field assistance and for reviewing the manuscript. We also thank the Division of Forestry, Indiana Department of Natural Resources, for permitting us to do this study.

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