Vegetation Survey of Hillside Seeps at Turkey Run State Park

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Introduction

Hillside seeps are small areas, usually less than one-half acre in size, with saturated soil caused by seepage water flowing to the surface in a diffuse flow (8). They are found most commonly along the lower slopes of glacial moraines and river terraces where bands of sand and gravel carry the water to outlet areas forming a distinct seepline. The plant community found in these areas commonly contain plant species that are rarely encountered in central Indiana. The reason for this rare plant community is that the seep water is slightly alkaline and fairly cool (6). This unique community has not been studied in detail in central Indiana, though similar areas have been examined in central Illinois (3, 6, 7). The present study was undertaken to determine if the floristic composition and the abundance of the taxa of the Indiana hillside seeps is similar to that found in the seeps of central Illinois.

Methods

Each of the seeps was examined three times during the growing season of 1979, and five times during the growing season of 1980. During each trip the abundance of each species encountered was recorded. The abundance of a taxon was determined by finding the mean distance after a series of measurements were made between individuals of the same species (1). The species abundance class was then determined by using the scale listed below. In this scale the letter "L" is used before the abundance class designation to indicate local abundance. This letter means that the species was found in one small, localized part of the seep, and its abundance in that area is indicated by the subsequent letters

SYMBOL	MEANING	DISTANCE
VA	Very Abundant	0-3 inches apart
A	Abundant	3-6 inches apart
VC	Very Common	6-12 inches apart
C	Common	1-1½ feet apart
VF	Very Frequent	1½-2 feet apart
F	Frequent	2-3 feet apart
F–	Less Frequent	3-6 feet apart
FF	Fairly Frequent	6-12 feet apart
FO	Fairly Occasional	12-30 feet apart
O	Occasional	30-50 feet apart

Voucher specimens of all species encountered are deposited in the E. L. Stover Herbarium of Eastern Illinois University (EIU), while the nomenclature used follows Mohlenbrock (4).

Description and Location of Seeps

Both of the seeps studied are located at the eastern edge of Turkey Run State Park, Parke County, Indiana, just to the south of the covered bridge (NW¼, SW¼, Sect. 26, T17N, R7W).

Area 1: Located on a north-facing hillside to the west of trail one. It is about 37 m wide and 40 m long, and has a small stream running through it. Some larger individuals and many seedlings of *Juniperus virginiana* L. are scattered throughout the seep along with a few small trees of *Fraxinus nigra* Marsh. which are found in the lower part of the seep.

Area 2: Located on a north-facing hillside about 300 m to the east of the Lusk Earth Fill. It is 82 m long and 26 m wide, and has a small stream forming its northern boundary. A few scattered individuals of *Salix discolor* Muhl. occur in the seep.

Results and Discussion

A total of 67 species of herbaceous plants were found in the two seeps. Of these taxa, 35 were found in Area 1, while 44 were found in Area 2, with only 12 species being common to both areas. All of these taxa, along with their abundance classes are listed in TABLES 1 and 2. Most of the species listed are fairly common

TABLE 1. *Abundance classes for the plants found in the hillside seep along trail one, Turkey Run State Park, Parke County, Indiana (Area 1). For an explanation of the abundance class symbols see the Methods section of this paper.*

SPECIES	ABUNDANCE
Agrostis alba L.	C
Bidens aristosa L.	VC
Carex blanda Dewey.	FO
Carex hystricina Muhl.	O
Carex laevivaginata (K § vkenth.) Mack.	O
Carex lasiocarpa Ehrh.	O
Carex leptalea Wahlenb.	VC
Carex sterilis Willd.	A
Cassia marilandica L.	O
Chara brittonii T. F. A.	LA
Clemetis virginiana L.	O
Cyperus flavescens L.	O
Equisetum arvense L.	C
Eupatorium perfoliatum L.	O
Fragaria virginiana Duchesne.	O
Gentiana andrewsii Griseb.	LF –
Gerardia tenuifolia Vahl.	F –
Juncus brachycephalus (Engelm.) Bush.	C
Lycopus americanus Muhl.	FF
Lysimachia quadriflora Sims.	C
Mentha X piperita L.	O
Oxypolis rigidior (L.) Coulter & Rose.	C
Panicum lanuginosum Ell.	FO
Parnassia glauca Raf.	C
Pedicularis lanceolata Michx.	O
Rosa carolina L.	FO
Rudbeckia fulgida Ait. var. *sullivantii* (Boynt. & Beadle) Cronq.	F –
Scirpus americanus Pers.	C
Scripus pendulus Muhl.	O
Selaginella apoda (L.) Fern.	LVA
Senecio pauperculus Michx.	O
Solidago patula Muhl.	O
Solidago riddellii Frank.	F –
Spiranthes lucida (H. H. Eaton) Ames.	LF –
Viola pratincola Greene.	O
Zizia aurea (L.) Koch.	O

TABLE 2. *Abundance classes for the plants found in the hillside seep east of the Lusk Earth Fill, Turkey Run State Park, Parke County, Indiana (Area 2). For an explanation of the abundance class symbols see the Methods section of this paper.*

SPECIES	CAREX ZONE	IMPATIENS ZONE	ACORUS ZONE
Acorus calamus L.	–	LF –	A
Apios americana Medic.	–	O	F
Asclepias incarnata L.	–	–	FO
Aster puniceus L.	C	F –	F –
Caltha palustris L.	F	F	F –
Cardamine bulbosa (Schreb.) BSP.	C	C	–
Carex hystricina Muhl.	F	–	–
Carex laevivaginata (K § vkenth.) Mack.	–	O	–
Carex leptalea Wahl.	C	–	–
Carex shortiana Dewey.	O	–	–
Carex sterilis Willd.	A	–	–
Carex torta Boott.	O	–	–
Chelone glabra L.	O	O	–
Cirsium altissimum (L.) Spreng.	–	O	–
Cirsium muticum Michx.	FO	–	O
Cryptotaenia canadensis (L.) DC.	–	FF	–
Cuscuta gronovii Willd.	O	–	–
Eleocharis erythropoda Steud.	VA	–	–
Eupatorium maculatum L.	FO	FO	FO
Eupatorium perfoliatum L.	LC	–	–
Eupatorium rugosum Houtt.	–	O	–
Glyceria striata (Lam.) Hitchcock.	–	C	–
Impatiens biflora Walt.	–	VA	VC
Juncus brachycephalus (Engelm.) Buch.	FO	–	–
Juncus interior Wieg.	O	–	–
Leersia oryzoides (L.) Swartz.	–	O	–
Leersia virginica Willd.	–	F –	–
Liparis loeselii (L.) Rich.	–	O	–
Lobelia siphilitica L.	–	O	O
Lycopus virginicus L.	F –	–	–
Lysimachia quadriflora Sims.	O	–	–
Nasturtium officinale R. Br.	LVA	LVA	–
Oxypolis rigidior (L.) Coulter & Rose.	C	O	FO
Rudbeckia fulgida Ait. var. *sullivantii* (Boynt. & Beadle) Cronq.	C	LA	–
Rumex obtusifolius L.	–	F	–
Scirpus atrovirens Willd.	O	–	–
Scirpus validus Vahl.	F –	–	–
Selaginella apoda (L.) Fern.	LVA	–	–
Senecio pauperculus Michx.	VF	F –	F
Smilacina stellata (L.) Desf.	–	LA	–
Solidago patula Muhl.	FF	–	O
Symplocarpus foetidus (L.) Nutt.	O	C	F
Thelypteris palustris Schott.	FO	F	F
Vernonia gigantea (Walt.) Trel.	–	–	O

throughout most of Indiana and Illinois, and would be expected in this type of habitat. Eight of these taxa, however, are rarely encountered in west-central Indiana (2) and adjacent Illinois (5). For the most part, these taxa are relict species that have northern affinities. Included in this group are *Carex lasiocarpa*, *Carex leptalea*, *Carex sterilis*, *Cirsium muticum*, *Juncus brachycephalus*, *Liparis loeselii*, *Parnassia glauca*, and *Spiranthes lucida*.

The vegetation of the seep along trail one at Turkey Run State Park (Area 1) is fairly uniform and distinct vegetation zones are not present. Of the 35 species found here (TABLE 1) nearly half are listed as being fairly occasional or occasional in abundance. Of the more abundant species in the seep, members of the Cyperaceae dominate, with the most abundant taxon in the seep being *Carex sterilis*. Other important taxa of this family are *Carex leptalea* and *Scirpus americanus*. Other taxa commonly encountered are *Agrostis alba*, *Bidens aristosa*, *Equisteum arvense*, *Juncus brachycephalus*, *Lysimachia quadriflora*, *Oxypolis rigidior*, and *Parnassia glauca*. One interesting species found is the alga, *Chara brittonii*. This rather rare taxon is found in small pools and on moist soil near the upper edge of the seep.

The flora of Area 2 is much more diverse than that of Area 1 (TABLE 2). Three distinct vegetation zones exist in this seep as a result of differences in shading, moisture, and soil conditions. These are the *Carex* zone, the *Impatiens* zone, and the *Acorus* zone. The *Carex* zone, which occurs in most of the northern and central parts of the seep is extremely moist, has a thick organic soil, and is rarely shaded. It is the most diverse part of the seep, with 28 taxa occurring here. The dominant plants of this zone are *Aster puniceus*, *Cardamine bulbosa*, *Carex leptalea*, *Carex sterilis*, *Eleocharis erythropoda*, *Rudbeckia fulgida*, and *Senecio pauperculus* (TABLE 2). The *Impatiens* zone is also very moist, has a thick organic soil, and is heavily shaded. It occurs all along the southern part of the seep, as well as in fairly extensive parts of the east and west edges of the seep. Of the 25 taxa found here, most are shade tolerant. The dominant species of this zone are *Cardamine bulbosa*, *Impatiens biflora*, and *Symplocarpus foetidus*. The *Acorus* zone, is the smallest zone in the seep, and occurs in a slightly raised area in the southeastern part. This zone, which is rarely shaded, is slightly drier than the other zones, and has a thinner soil. Only 13 taxa are found here with *Acorus calamus* and *Impatiens biflora* being dominant.

The flora of the two seeps is not very similar. Of the 67 herbaceous taxa encountered, only 12 were found in both areas. For the most part, these floristic differences are caused by soil conditions. In Area 1 the soil is very thin, has a high concentration of clay, and has very little organic material. Also, at the upper part of the seep the clay parent material is exposed. Area 2, in contrast, occurs on very loose gravel and sand, and has a relatively thick, highly organic soil.

The floristic composition of Area 2 is similar to that found in many of the seeps of east-central Illinois (3). Most of the dominant species are the same, as are some of the relict and less common species. Of the taxa found in Area 2, about 70 percent are found in the Illinois seeps. The differences are probably a reflection of chance dissemination, the amount of disturbances in and around the seeps, and some differences in habitat. Area 1, in contrast, differs from most of the seeps studied in east-central Illinois (3). It is similar, however, to one mentioned by Ebinger (3) that was found at the base of Windfall Prairie in Vermilion County, Illinois. Both seeps have a similar floristic composition, and the soil is similar.

Acknowledgments

The authors would like to thank the Indiana Department of Natural Resources

for permission to study the seeps, and to Dr. Fay Kenoyer Daily for the identification of *Chara brittonii*.

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