

# DISTRIBUTION OF ROYAL CATCHFLY (*SILENE REGIA*) WITH SPECIAL REFERENCE TO OHIO POPULATIONS

Charles C. King  
Ohio Biological Survey  
College of Biological Sciences  
The Ohio State University  
Columbus, Ohio 43210

Royal catchfly (*Silene regia* Sims) is a strikingly distinctive, scarlet-crimson flowering, Nearctic member of the pink family (Caryophyllaceae). This species was discovered by Thomas Nuttall who later offered the opinion in his classic, *The Genera of North American Plants and a Catalogue of the Species to the Year 1817*, that it is "one of the most splendid species in existence" (Nuttall, 1818:288).

Fernald (1950:634) presented the following description:

Perennial; stems erect, 0.7-1.5 m. high, closely pulverulent-pubescent, with 15-30 pairs of lance-ovate round-based puberulent firm sessile leaves; panicle elongate, ellipsoid, leafy-bracted, the branches and pedicels strongly ascending; calyx 2-2.5 cm. long, cylindrical, becoming fusiform in fruit, glandular-pilose; petals with scarlet subentire limb 1.5-2 cm. long. - Dry woods, barrens and prairies, Ga. to Okla., n. to O., Ind., s. Ill. and Mo. June-Aug.

Hitchcock and Maguire (1947:53) and Gleason (1952:142) indicated the habitat to be prairie and open woodland over a range similar to that described by Fernald. Dobbins (1937:124) and Troutman (Cusick and Troutman 1978:49, 55) included the species in their lists of Ohio prairie plants.

Although morphologically and ecologically distinct, royal catchfly has close genetic affinities with two other species: (1) the more common fire pink (*Silene virginica* L.) which occurs in rich or open woodlands, thickets, and on rocky slopes; and (2) the infrequent round-leaved catchfly (*Silene rotundifolia* Nutt.), which is limited to limestone and sandstone ledges and cliff crevices (Hitchcock and Maguire, 1947:4, 52-54; Heaslip, 1951:68-69). All three species are self-fertile and tetraploid with an n-chromosome number of 24 (Heaslip, 1951:65, 69). According to Heaslip (1951:64, 70), these three species are cross-fertile in all combinations as determined from vegetatively vigorous, but sterile, hybrids from cross-pollinations produced in the laboratory. Although the ranges of the three species overlap, populations of each are ecologically isolated because of their varying habitats. This isolation and the sterility of the hybrids prevent these populations from becoming one species (Heaslip, 1951:69).

## ORIGINAL DESCRIPTION

*Silene regia* was described as a species new to science by John Sims (1815), an English medical doctor, fellow of the Linnean Society of London, and editor of *Curtis's Botanical Magazine*. Included in his description in *Curtis's Botanical Magazine* is a beautiful color plate of the flowering portion of the plant.

Nuttall had previously collected seeds of royal catchfly sometime between September 1810 and March 1811 from plants he found "growing spontaneously in great abundance in the environs of St. Louis, on the Missis[s]ippi" (Sims, 1815). At the time, however, Nuttall was engaged in a collecting expedition supported by Professor Benjamin S. Barton of the University of Pennsylvania and the Philadelphia Linnaean Society. Nuttall was under contract prohibiting him from publishing any of his findings (Pennell, 1936:45-49). As discussed by Graustein (1967:40, 83), these restrictions, apparently, did not prohibit Nuttall from providing seeds and live plants to certain seedpersons and horticulturists. In any case, Alymer B. Lambert, a botanist, horticulturist, and vice-president of the Linnean Society of London, received some seeds and planted them in his garden at Boyton, Willshire, England (Sims, 1815).

Sims (1815), who was not subjected to the publishing restrictions that inhibited Nuttall, wrote the scientific description of the species based upon "dried specimens in Mr. Lambert's herbarium." In this description, Sims fully acknowledged Nuttall as the original discoverer of the species.

Presumably, the type specimen remained deposited in the Lambert Herbarium (Hitchcock and Maguire, 1947:53). The Lambert Herbarium, however, was dismembered at a sale in 1842 (Graustein, 1967:364) and the fate of the type specimen is unknown. Edward Tuckerman, a botanist from Boston, Massachusetts, purchased half of the American portion of the Herbarium and in 1856, donated these specimens to the Academy of Natural Sciences in Philadelphia (Graustein, 1967:364-365). Apparently, the *Silene regia* type specimen was not included as it is not at the Academy (Stuckey, 1977, personal communication). Another noteworthy specimen, however, is at the Academy. It was collected by Nuttall on his 1816 trip through the Ohio valley and bears the label, "Ohio and Kentucky." Although this specimen cannot be considered to be a type (Stuckey, 1966:193), it is very likely the oldest specimen of *Silene regia* in existence.

## SYNONYMS

Sims (1815) suggested that his *Silene regia* may perhaps be the variety found by Michaux in the Illinois country, and simultaneously with his original description of the species, Sims created a synonym "*Silene virginica*, var. *illinoensis*," using Michaux (1803:272) as an authority. Michaux, however, had only listed "in regione Illinoensi" as habitat for *Silene virginica*. Since the morphologically distinct *S. virginica* does occur in Illinois (Mohlenbrock and Ladd, 1978), Sims' postulation was very likely erroneous, and his suggestion of a variety *illinoensis* only initiated confusion where there was none. K.A. Otth (1824:382) in de Candolle's *Prodromus* acknowledged this synonym.

A second synonym, *Muscipula regia* Bannisterii, listed by Sims (1815) in the same publication, was also based on ill-conceived rationale. Sims postulated that his *Silene regia* "possibly . . . may have been the same that Bannister sent a design of to the Bishop of London." Sims continued, "whether it be or not, his [Bannister's] name of *regia* cannot be badly applied to the most splendid plant of the genus." Apparently, Sims adopted the specific epithet "*regia*" for his newly described species from this name of Bannister. Although Sims' using of *regia* was quite appropriate because of the royal characteristics of this plant, his listing of *Muscipula regia* as a synonym based on such scanty evidence was not appropriate.

Rafinesque (1840:18-19) described *Silene scabra* Raf. "from the barrens of West Kentucky." As indicated by Fernald (1944), this species "is very definitely *Silene regia* Sims," and as frequently has been the case with many of Rafinesque's taxa, *Silene scabra* has been relegated to synonymy.

In 1893, Kellerman and Werner (1895:178) prepared a manuscript "Catalogue of Ohio Plants" in which they used the name "*Silene illinoensis* (Michaux)" and indicated that *Silene regia* was a synonym. Printing of the "Catalogue" was completed shortly thereafter, but binding into a finished volume was delayed until 1895. During this delay, Kellerman inserted four pages (80a-d) of changes "to make the Nomenclature correspond to that officially adopted by the American Botanists and published in the 'List of Pteridophyta and Spermatophyta of Northeastern North America.'" One of these changes (p. 80c) returned the name *Silene regia* and deleted the name "*Silene illinoensis* (Michaux)." The volume was finally bound and made available in 1895. Therefore, even though "*Silene illinoensis* (Michaux)" appears in the "Catalogue" (p. 178), this name was not actually published since it was corrected and eliminated within the same volume (p. 80c). A casual reading of the volume, however, will not detect this correction, and "*Silene illinoensis* (Michaux)" has been offered as a legitimate synonym for *Silene regia* in some publications, for example, Hitchcock and Maguire (1947:53). Jones and Fuller (1955:202) appropriately indicate that "*Silene illinoensis*

(Michaux) is a "nomen illeget."

As indicated by Hitchcock and Maguire (1947:2), Rohling in 1812 separated *Melandryum* (*Melandrium* of some authors) from *Silene*. Rohrbach (1868) and Williams (1896), both European authorities on *Silene*, recognized this segregate and as a result, the names *Melandrium reginum* A.C.H. Braun and *Melandrium illinoense* Rohrbach became established in the European literature as replacements for *Silene regia*. American authorities of *Silene*, however, have not accepted a distinct genus *Melandrium* as appropriate for North American plants. The rationale for this decision is presented by Hitchcock and Maguire (1947:2-5) and Heaslip (1951:62-64, 69). Since *Melandrium* is not a recognized name for North American species, *M. reginum* and *M. illinoense* have been relegated to synonymy. Early references and synonymy were summarized by Watson (1878:109).

Several common names for *Silene regia* appear in the literature. Sims (1815) in his original description used the name "Splendid Catch-fly," but this name rarely appears thereafter. Nuttall (1818:288) used "Catch-Fly" and "Wild-Pink" collectively for the genus *Silene*, but he did not present a common name for *Silene regia*. Torrey (1824) also referred to *Silene* as "Catch-fly," but *Silene regia* was not included in his publication. Torrey and Gray (1838-1840:193) did include *Silene regia* in their *Flora of North America*, but they gave no common name. John L. Riddell (1835:365) in his *Synopsis of the Flora of the Western States*, possibly was the first to use the name "Royal catch-fly" in a floristic publication. Sullivant (1840) used it as did Gray (1848:59) in his *A Manual of the Botany of the Northern United States*. "Royal catchfly" has been used predominately for the species by authors of floras and floristic studies since. Britton and Brown (1913, 2:65) used it but also added "Wild Pink" as a second common name. Gleason (1952, 2:142) and Gleason and Cronquist

(1963:299) deleted the name "royal catchfly" and refer to *Silene regia* only as "Wild Pink" in spite of their use of "Wild Pink" for other species of *Silene*.

## DISTRIBUTIONAL STUDIES

I was introduced to royal catchfly on 19 June 1976 by Dr. Edward S. Thomas, Curator of Natural History, Emeritus, The Ohio Historical Society, while he was conducting a field trip to Chuckery Cemetery (now Bigelow Cemetery State Nature Preserve), a pioneer cemetery in northern Madison County, Ohio (Carr, 1981; King, 1981; Overton, 1981). Although not yet in flower, the plants (about 30) were, nevertheless, quite distinctive. Thomas said that this population had been known to botanists at The Ohio State University for almost half a century, and that he knew of no other extant populations in the state (Thomas, 1963, 1975). I observed these plants blooming on several subsequent visits during July and August 1976 (Figs. 1, 2).

On 22-24 August 1976, while attending the Fifth Midwest Prairie Conference in Ames, Iowa, I inquired of several colleagues concerning the distribution and status of royal catchfly in their areas. Most of these individuals were not familiar with the species, and little information was obtained. Shortly thereafter, I initiated a study to determine the distribution of *Silene regia*, especially in Ohio, but also more generally throughout its range. I sought information from herbarium records, the literature, field reconnaissance in Ohio, and personal communications.

## HERBARIUM RECORDS

Although *Silene regia* is a morphologically distinct species, rarely it may be confused with *Silene virginica* even by experienced curators.



Figure 1. Royal catchfly (*Silene regia*) in full flower, Bigelow Cemetery State Nature Preserve, Madison County, Ohio. (Photograph by Richard E. Moseley, Jr.)



Figure 2. Royal catchfly (*Silene regia*) in Bigelow Cemetery State Nature Preserve, Madison County, Ohio. (Photograph by Richard E. Moseley, Jr.)

Accepting this small degree of potential error, I sent letters to curators of 112 selected herbaria east of the Rocky Mountains and 2 in England requesting collection data from their holdings of *Silene regia*. Curators from 59 herbaria reported having specimens (Table 1), and curators from 39 herbaria reported having no specimens. The other 16 curators, primarily of small herbaria, did not reply.

I verified the accuracy of the species determinations of all specimens reported for Ohio from Ohio herbaria prior to recording the data. I accepted as valid almost all the species determinations and records as reported from other herbaria. For several records which suggested questionable identifications and/or range extensions, I requested those specimens to be sent to me for verification; and a few of those specimens, indeed, had been misidentified. Before returning them, I annotated all specimens sent to me at my request. To provide opportunity for future researchers to make specific determinations, the locations of all specimens of *Silene regia* reported to me in this study are identified as indicated.

State and county-of-record were determined, when possible, from credible information supplied from each herbarium and listed by county in Table 2. When determination of county-of-record was not possible, but state-of record was, the herbarium was cited under "County not specified" for the appropriate state. Counties-of-record as determined from herbarium records were also included in the distributional map presented in Figure 3.

### Problematic Records

Ten herbarium records as listed below were determined to be problematic and are not included in Table 2 or Figure 3 unless specified:

1. An undated specimen at NY was reported to have been collected by Dr. Holmes, Montreal, Canada. This specimen probably is the source of the account published by Torrey and Gary (1838-1840:193) about which they justifiably questioned its credibility as a record of the species being indigenous to Quebec. No other Canadian records have been detected in the current study, and the addition of Quebec to the range of *Silene regia* based on this questionable record is not warranted.
2. A specimen at US is mistakenly labeled "Miami County, Alabama" since there is no Miami County in Alabama. The collector is indicated as "J. Ridell" in 1839. Possibly, the collector was John L. Riddell and the collection locality was Miami County, Ohio; but such conclusions are only conjecture.
3. A specimen at MO from the Bernhardt Herbarium was collected in 1854, but the notation indicating the collection locality is unintelligible (Croat, 1980, personal communication).
4. A specimen at MSC collected by C. F. Wheeler, 29 July 1896, from the Botanical Gardens of Michigan Agricultural College (Michigan State University) at East Lansing, Michigan, obviously does not constitute a valid record of the species being indigenous to Michigan. Voss (1976, personal communication) reported that he was not aware of any published reports of the species in Michigan.
5. An undated specimen at PH was reported to have been collected in Iowa by C.W. Williamson. No other Iowa records have been located in this study and the addition of Iowa to the range of *Silene regia* based on this fragmentary record is not warranted.

**Table 1.** List of 59 herbaria containing specimens of royal catchfly (*Silene regia*) as located in this study and arranged alphabetically by standard abbreviation as presented by Holmgren and Keuken (1974).

APCR	Arkansas Polytechnic College, Russellville, Ark. 72801	MU	Miami University, Oxford, Ohio 45056
AUA	Auburn University, Auburn, Ala. 36830	MUS	Muskingum College, New Concord, Ohio 43762
BGSU	Bowling Green State University, Bowling Green, Ohio 43403	NCU	University of North Carolina, Chapel Hill, N.C. 27514
BKL	Brooklyn Botanic Garden, Brooklyn, N.Y. 11225	ND, NDG	University of Notre Dame, Notre Dame, Indiana 46556
BM	British Museum (Natural History) London, Engl. SW7 5BD	NO	Tulane University, New Orleans, La. 70118
BUT	Butler University, Indianapolis, Indiana 46208.	NY	The New York Botanical Garden, Bronx, N.Y. 10458
CINC	University of Cincinnati, Cincinnati, Ohio 45221	OKLA	Oklahoma State University, Stillwater, Okla. 74074
CM	Carnegie Museum, Pittsburgh, Pa. 15213	OS	The Ohio State University, Columbus, Ohio 43210
CU	Cornell University, Ithaca, N.Y. 14850	OWU	Ohio Wesleyan University, Delaware, Ohio 43015
DMNH	The Dayton Museum of Natural History, Dayton, Ohio 45414	PAC	The Pennsylvania State University, University Park, Pa. 16802
DUKE	Duke University, Durham, N.C. 27706	PENN	University of Pennsylvania (housed at The Academy of Natural Sciences) Philadelphia, Pa. 19103
F	Field Museum of Natural History, Chicago, Ill. 60605	PH	The Academy of Natural Sciences, Philadelphia, Pa. 19103
FSU	The Florida State University, Tallahassee, Fla. 32306	PUR	Purdue University, West Lafayette, Indiana 47907
GA	The University of Georgia, Athens, Ga. 30602	SDU	The University of South Dakota, Vermillion, S.D. 57069
GEO	Emory University, Atlanta, Ga. 30322	SIU	Southern Illinois University at Carbondale, Carbondale, Ill. 62901
GH	Harvard University, Cambridge, Mass. 02138	SMS	Southwest Missouri State University, Springfield, Mo. 65802
ILL	University of Illinois at Urbana-Champaign, Urbana, Ill. 61801	SMU	Southern Methodist University, Dallas, Tex. 75222
ILLIS	Illinois Natural History Survey, Urbana, Ill. 61801	SOTO	The School of the Ozarks, Point Lookout, Mo. 65726
IND	Indiana University, Bloomington, Indiana 47401	TENN	The University of Tennessee, Knoxville, Tenn. 37961
ISC	Iowa State University, Ames, Iowa 50010	UARK	University of Arkansas, Fayetteville, Ark. 72701
ISM	Illinois State Museum, Springfield, Ill. 62706	UMKC	University of Missouri-Kansas City, Kansas City, Mo. 64110
JHWU	Wittenberg University, Springfield, Ohio 45501	UMO	University of Missouri-Columbia, Columbia, Mo. 65201
K	Royal Botanic Gardens, Kew, Richmond, Surrey, Engl.	US	Urbana College, Urbana, Ohio 43078
KANU	The University of Kansas, Lawrence, Kansas 66044	VDB	National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560
KE	Kent State University, Kent, Ohio 44242	VPI	Vanderbilt University, Nashville, Tenn. 37235
MICH	The University of Michigan, Ann Arbor, Mich. 48109	WAB	Virginia Polytechnic Institute and State University, Blacksburg, Va. 24061
MIN	University of Minnesota, St. Paul, Minn. 55108	WIS	Wabash College, Crawfordsville, Indiana 47933
MISS	The University of Mississippi, University, Miss. 38677		University of Wisconsin—Madison, Wis. 53706
MO	Missouri Botanical Garden, St. Louis, Mo. 63166		
MOR	Morton Arboretum, Lisle, Ill. 60532		
MSC	Michigan State University, East Lansing, Mich. 48824		

**Table 2.** Distribution of royal catchfly (*Silene regia*) by states and counties as determined from credible herbarium and published records, and personal communications. Herbaria are abbreviated as indicated in Table 1.

<b>Alabama</b>			
County not specified	BM; GH; Chapman, 1860:51, 1883:51; Britton and Brown, 1897:10; Mohr, 1901:94; Britton, 1907:390; Britton and Brown, 1913:65; Hitchcock and Maguire, 1947:53; Gleason 1952:142; Gleason and Cronquist, 1963:299.	Tippecanoe	DUKE; IND; OWU; PH; PUR; Deam, 1940:448.
Bibb	US; Mohr, 1901:497.	Vermillion	BUT; GH; IND; MICH; ND and NDG; NY; OKLA; SMU; VPI; Deam, 1940:448.
Butler	Mohr, 1901:497.	Vigo	IND; MICH; PH; US; WAB; Deam, 1940:448.
Dallas	GH.	Wayne	Deam, 1940:448.
Montgomery	US; Kral, 1980, personal communication.	<b>Kansas</b>	
Wilcox	Mohr, 1901:497.	County not specified	McGregor et al., 1976:19.
<b>Arkansas</b>		Cherokee	KANU; Barkley, 1968:144; McGregor and Barkley, 1977:560; McGregor, 1977:6.
Benton	APCR; F; GH; ISC; MICH; MO; NCU; NY; OKLA; SDU; SMU; UARK; US; WIS; Tucker, 1974:50; Smith, 1978:44.	<b>Kentucky</b>	
Boone	Hendrix College; Smith 1978:44.	County not specified	K; NY; PH; Riddell, 1834:365; Torrey and Gray, 1838-1840:193; Rafinesque, 1840:18-19; Gray, 1858:56, 1859:56; McFarland, 1942:89; Fernald, 1944; Hitchcock and Maguire, 1947:53.
Hot Spring	FSU; GA; GH; NCU; NO; SMU; Smith, 1978:44.	Christian	PH.
Newton	UARK; Tucker, 1974:50; Smith, 1978:44.	Edmonson	ILL.
Sharp	UARK; Tucker, 1974:50; Smith, 1978:44.	Hardin	Medley, 1980, personal communication.
Washington	APCR; SMU; UARK; WIS; Tucker, 1974:40; Smith, 1978:44.	Hart	GH; US; Braun, 1943:55.
<b>Florida</b>		Warren	MO.
Jackson	ISC; MIN. (Specimens from both herbaria verified by Charles C. King, 1980).	<b>Missouri</b>	
<b>Georgia</b>		County not specified	BKL; BM; F; GH; K; NY; US; Sims, 1815; Nuttall, 1818:288; Tracy, 1886:15; Gray, 1887:76, 1889:84; Britton and Brown, 1897:10; Small, 1903:427; Britton, 1907:390; Robinson and Fernald, 1908:386; Britton and Brown, 1913:65; Small, 1933:507; Hitchcock and Maguire, 1947:53; Fernald, 1950:634; Gleason, 1952:142; Gleason and Cronquist, 1963:299.
Floyd	AUA; MO; US.	Barry	GH; MIN; NY; PENN; US; Steyermark, 1963:660-661.
Polk	MO.	Camden	FSU; UMKC; VDB; Henderson, 1980:35.
Randolph	CU; GEO.	Carter	Steyermark, 1963:660-661.
<b>Illinois</b>		Cedar	GA; MISS; Steyermark, 1963:660-661.
County not specified	GH; K; US; Gray, 1857:89, 1867:89; Hitchcock and Maguire, 1947:53; Fernald, 1950:634; Jones, 1963:85; Steyermark, 1963:660.	Christian	ISC; PH; Steyermark, 1963:660-661.
Clark	ILLS; Mohlenbrock and Ladd, 1978.	Cole	Steyermark, 1963:660-661.
Cook	Mohlenbrock and Ladd, 1978; Swink and Wilhelm, 1979:706.	Crawford	MIN; Steyermark, 1963:660-661.
Lawrence	ILL; ILLS; ISM; ND AND NDG; Jones and Fuller, 1955:202; Mohlenbrock and Ladd, 1978.	Dade	OS; UMKC; UMO; VDB; Steyermark, 1963:660-661.
Madison	GH; MIN.	Dallas	FSU; UMKC; VDB; Henderson, 1980:35.
St. Clair	GH; ILLS; Jones and Fuller, 1955:202; Mohlenbrock and Ladd, 1978.	Dent	MO; Steyermark, 1963:660-661.
Wabash	ILL; Jones and Fuller, 1955:202; Mohlenbrock and Ladd, 1978.	Douglas	F; Steyermark, 1963:660-661.
White	Mohlenbrock and Ladd, 1978.	Franklin	Steyermark, 1963:660-661.
Will	F; WIS; Mohlenbrock and Ladd, 1978; Swink and Wilhelm, 1979:706.	Greene	GH; MIN; MO; SIU; SMS; US; Bush, 1931:490; Steyermark, 1963:660-661.
Winnebago	Mohlenbrock and Ladd, 1978.	Howell	MO; Steyermark, 1963:660-661.
<b>Indiana</b>		Iron	MO.
County not specified	ILL; K; Fernald, 1950:634.	Jasper	CM; CU; F; GH; ILL; K; MIN; MSC; NY; SMU; UMO; US; Steyermark, 1963:660-661; McGregor and Barkley, 1977:560.
Delaware	BUT; IND; NY.	Jefferson	MIN; MO; Steyermark, 1963:660-661.
Floyd	PH.	Laclede	F; Steyermark, 1963:660-661.
Hamilton	Deam, 1940:448.	Lawrence	SIU; UMO; Steyermark, 1963:660-661.
Harrison	Deam, 1940:448.	Madison	MO.
Knox	IND; Deam, 1940:448.	Maries	Steyermark, 1963:660-661.
LaPorte	MOR; Kurz, 1979, personal communication.	McDonald	MIN; MO; NY; Steyermark, 1963:660-661.
Parke	IND; Deam, 1940:448.		

**Table 2.** (cont.). Distribution of royal catchfly (*Silene regia*) by states and counties as determined from credible herbarium and published records, and personal communications. Herbaria are abbreviated as indicated in Table 1.

Miller	MO; UMO; US; Steyermark, 1963:660-661.		1968:101, 1971:101; Ohio Division Natural Areas and Preserves, 1980:11.
Moniteau	UMO.	Champaign	MICH; KE; OS; Jones, 1943a:104, 1943b:189; King, 1981.
Newton	UMO.		
Oregon	Steyermark, 1963:660-661.	Clark	BM; GH; JHWU; OS; Kellerman and Werner, 1895:178; Williams, 1913:183; Schaffner, 1914:179, 1932:147; Jones, 1943a:104; Jaworski, 1979, personal communication; Ramey, 1981, personal communication; Mahony, 1981, personal communication.
Ozark	F; MO; SOTO; Steyermark, 1963:660-661.		
Perry	UMO.		
Phelps	F; MIN; SIU; UMO; Steyermark, 1963:660-661.		
Polk	SMS; UMO; Steyermark, 1963:660-661.	Fairfield	Bigelow, 1841.
Pulaski	MO; UMO; Steyermark, 1963:660-661.	Franklin	Riddell, 1834:120; Sullivant, 1840:15; Selby and Craig, 1890:10; Kellerman and Werner, 1895:178.
Reynolds	MIN.		
St. Louis	BKL; F; ISC; K; MICH; MIN; MSC; MUS; NY; PH; US; Steyermark, 1963:660-661.	Hamilton	Clark, 1852; Bodley, 1865:10; Beardslee, 1874:2; Kellerman and Werner, 1895:178.
Shannon	F; GH; ILL; K; MIN; MO; ND and NDG; SMS; SMU; UMO; US; Steyermark, 1963:660-661.		
Stone	F; SOTO; Steyermark, 1963:660-661.	Madison	OS; KE; Kellerman and Werner, 1895:178; Williams, 1913:183; Schaffner, 1914:179, 1932:147; Jones, 1943a:104; Thomas, 1963, 1975, 1979; Cusick and Troutman, 1978:30; Carr, 1981; McDowell, 1981, personal communication; King, 1981.
Taney	F; SOTO; Steyermark, 1963:660-661.		
Texas	MO; UMO; Steyermark, 1963:660-661.	Marion	OS; DeSelm, 1978, personal communication.
Washington	MO; Beck, 1826:182; Steyermark, 1963:660-661.	Montgomery	CINC; DMNH; PH; WIS; Schaffner, 1931:303, 1932:147.
Webster	CM; F; ISC; MIN; MO; NY; OS; TENN; WIS; Steyermark, 1963:660-661.	Union	KE; MU; OS; Thomas, 1977; Cusick and Troutman, 1978:42; King, 1981.
Wright	F; MO; Steyermark, 1963:660-661.		
<b>Ohio</b>		<b>Oklahoma</b>	
County not specified	BGSU; NY; PH; Urbana College; Nuttall, 1818:288; Riddell, 1835:365; Torrey and Gray, 1838-1840:193; Sullivant, 1840:15; Gray, 1848:59, 1857:89, 1858:56, 1859:56; Newberry, 1860:13; Gray, 1867:89, 1868:66; Beardslee, 1874:2; Gray, 1887:76; Britton and Brown, 1897:10; Kellerman, 1899:22; Small, 1903:427; Britton, 1907:390; Robinson and Fernald, 1908:386; Britton and Brown, 1913:65; Schaffner, 1928:273; Small, 1933:507; Dobbins, 1937:127; Deam, 1940:448; Hitchcock and Maguire, 1947:53; Fernald, 1950:634; Gleason, 1952:142; Gleason and Cronquist, 1963:299; Stuckey, 1966:189, 193; Weishaupt, 1960:114,	County not specified	Small, 1903:427; Jeffs and Little, 1930:61; Small, 1933:507; Fernald, 1950:634; Steyermark, 1963:660.
		Adair	OKLA; Waterfall, 1969:97.
		Delaware	OKLA; Waterfall, 1969:97.
		<b>Tennessee</b>	
		County not specified	PH; Britton, 1907:390; Britton and Brown, 1913:65; Hitchcock and Maguire, 1947:53.
		Knox	CINC; GH; MIN; NCU; NY; OS; Gattinger, 1901:76.
		Marion	FSU; MISS.

- Another undated specimen at PH was collected by Rev. Lewis David von Schwienitz, a Moravian clergyman and botanist, either in 1823 or 1831 as determined by Stuckey (1977, personal communication). The herbarium sheet bears the name "Muskingum" which probably refers to the Moravian Church lands at Gnadenhutten, Tuscarawas County, Ohio (Stuckey, 1979:50). However, interpretation of Schweinitz's cryptic notes is very difficult (Stuckey, 1979:14), and the translation of "Muskingum" into a valid locality record for Tuscarawas County is probably not appropriate (Stuckey, 1980, personal communication). I have chosen to cite this record in Table 2 under "Ohio, County not specified."
- Another undated specimen at PH bears only the information "Columbus, Ohio." Rather than representing the collection locality, this notation could be the address of the collector (Stuckey, 1976, personal communication). I have cited this fragmentary record in Table 2 under "Ohio, County not specified."
- A specimen in the herbarium of Urbana College, Urbana, Ohio, was collected by Milo G. Williams, a botanist and also a former president of the school (Stuckey, 1966:7). A brief notation on the

herbarium sheet records only "Fields and fences. 25 August. 2-3 ft." Schaffner (1931:303, 1932:147) ascribed the locality of this specimen to Montgomery County, Ohio, although such information is not directly evident from the herbarium sheet. Two other specimens collected by Milo G. Williams, one housed at CINC and the other at WIS, do list Dayton, Ohio, Montgomery County) as the collection locality. I have chosen to cite this record in Table 2 under "Ohio, County not specified," although I cite Schaffner's published references to in under "Montgomery County."

- A specimen in full bloom at BSGU (No. 438) bears a label from the herbarium of Sandusky High School with the following information: "Name, *Silene regia* Sims; Locality, Lakeville, Ohio; Date, May 15, 1897; Collector Leslie D. Stair?" The label was handwritten by Edwin L. Moseley, former curator of both herbaria (Easterly, 1977, personal communication). Leslie D. Stair was a reputable collector of northeastern Ohio plants, and he deposited numerous specimens (none of *Silene regia*) with the Herbarium at The Ohio State University (Kellerman, 1899:4, 1900:4-5; Kellerman and Tyler, 1902:4). However, the "question-mark" after Stair's name indicates Moseley was not

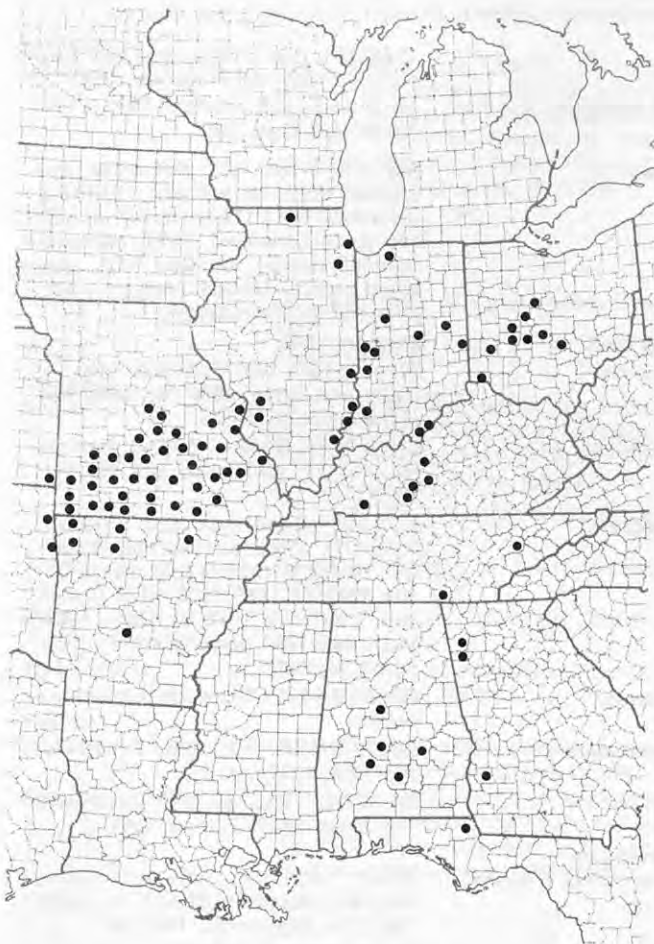


Figure 3. Distribution of royal catchfly (*Silene regia*) by county as determined from credible herbarium and published records, and personal communications as recorded in Table 2.

completely certain of the source of the specimen. Also, the collection date of 15 May precedes the normal flowering date of *Silene regia* in Ohio by about six weeks. "Lakeville" might refer to Lakeville in Holmes County or to the southeastern portion of Conneaut in Ashtabula County which formerly was known as Lakeville. The uncertainties associated with the collector and the date of collection tend to cloud the credibility of other data on the label. I do not consider the specimen to be a valid record for either Holmes or Ashtabula County. However, I do consider it to be an Ohio record and have cited it in Table 2 under "Ohio, County not specified."

10. A specimen at NY which was received from BM bears no data except the designation of "Ohio" and an uninterpretable figure (Maguire, 1976, personal communication). I have cited it in Table 2 under "Ohio, County not specified."

## THE LITERATURE

Most of the distributional data provided by the literature were extracted from regional and state manuals and floras for areas in the United States east of the Rocky Mountains. Some additional data were supplied by a variety of other publications. I made an intensive literature search for Ohio records, but I investigated only the major works for most of the other states. When possible, state and county-of-record were determined and listed with the appropriate reference in Table 2. When determination of county-of-record was not possible, but state of record was, the reference was cited under "County not specified" for the appropriate state. Counties-of-record as deter-

mined from the literature were also included in the distributional map presented in Figure 3.

## Problematic Records

Five published records as listed below were determined to be problematic and are not included in Table 2 or Figure 3 unless specified:

1. Nuttall (1818:288) described the range of *Silene regia* as "Throughout the western states sparingly from Ohio to Lower Louisiana." In 1818 "the western states" were those states west of the Appalachian Mountains and "Lower Louisiana" was that portion of the Louisiana Territory south of the Missouri River. As indicated by Ewan (1971:xxvii), Nuttall's St. Louis, Louisiana is now St. Louis, Missouri. In Table 2, I have cited Nuttall (1818:288) under "Missouri, County not specified." Nuttall's "Lower Louisiana" has been inaccurately interpreted to infer the state of Louisiana by some authors when describing the range of *Silene regia* (Torrey and Gray, 1838-1840:193; Steyermark, 1963:660; Tucker, 1974:50). No valid records for Louisiana were detected in this study, and *Silene regia* is unknown for the state of Louisiana (Ewan, 1976, personal communication; Rhodes, 1976, personal communication). Moreover, no valid records are known for Mississippi (Watson, 1976, personal communication).
2. Torrey and Gray (1838-1840:193) published a questionable record of Dr. Holmes of Quebec, Canada, based on a problematic herbarium specimen as described above.
3. In an obscure publication, Mansfield (1903:85) listed "*Silene regia* — Royal Champion" as a member of the flora of Beaver County, Pennsylvania. The species has neither been reported in major works for Pennsylvania (Porter, 1903; Wherry, Fogg, and Wahl, 1979), nor by curators associated with three major herbaria in the state (Fogarasi, The Academy of Natural Sciences, 1980, personal communication; Ward and Buker, Carnegie Museum of Natural History, 1980, personal communication; and Keener, The Pennsylvania State University, 1980, personal communication). Mansfield had many interests including a greenhouse and collecting plants from the area (Fatula, 1980, personal communication). He may have misidentified *Silene virginica* which he did not list in his flora but which does occur in Beaver County (Wherry, Fogg, and Wahl, 1979:155). Unfortunately, the current location of the Mansfield herbarium, which Mansfield (1903:5-6) developed from 1865 to 1903, is unknown. In the absence of a voucher specimen, inclusion of Beaver County, Pennsylvania, within the range of *Silene regia* based solely on Mansfield's publication, is not warranted.
4. Sharp (1913:132) when listing some of the wild flowers which grew in Madison County, Ohio, included "silene." She had collected *Silene regia* from the area in 1892 as recorded in the Herbarium of The Ohio State University (OS 17561), and probably the "silene" in her book, was, in fact, royal catchfly.
5. As recorded by Brown (1883:342), Dr. Jeremiah Converse of Plain City, Ohio, while describing some of the original prairie flowers in Madison County, listed among others, "wild pink." Although the name "wild pink" is ambiguous, it is one of the common names of *Silene regia* (Gleason, 1952, 2:142; Gleason and Cronquist, 1963:299). Conceivably, Converse was including royal catchfly in his list.

## FIELD RECONNAISSANCE IN OHIO

In conjunction with the Prairie Survey Project of the Ohio Biological Survey (Cusick and Troutman, 1978:1-3), I initiated in September 1976 a continuing field reconnaissance effort to locate extant populations of *Silene regia* in Ohio. I examined herbarium records and relevant references in the literature in an attempt to locate possible sites of recorded populations. These sites are listed in Table 3. Unfortunately, except for records of the known populations at Bigelow Cemetery State Nature Preserve in Madison County, all but one of the sources provided only generalized information regarding former collection localities. The single exception was a 1952 Marion County record provided by H.R. DeSelm from a railroad prairie remnant in

**Table 3.** Possible collection localities of *Silene regia* in Ohio as indicated by herbarium records from specimens collected prior to September 1976 and by relevant references in the literature. Herbaria are abbreviated as indicated in Table 1, and collectors and dates of collection are indicated when known. All the herbarium records detected in this study for Ohio prior to 1976 are included except the Nuttall specimen at PH as discussed under "Original Description" and a problematic record at NY as discussed under "Herbarium Records—Problematic Records No. 9."

<b>Champaign County</b>	Jones, 1943a:104.
Salem Township	MICH, <i>John Samples</i> 575, 11 Aug 1838; OS 17565, <i>Jane Roller</i> , 13 July 1941; Jones, 1943b:189.
<b>Clark County</b>	Williams, 1913:183; Schaffner, 1914:179, 1932:147; Jones 1943a:104.
Clifton area	JHWU, <i>Harvey Martin</i> , 26 July 1888.
Pleasant Township	OS 17562, <i>Clyde H. Jones</i> , 1 Sept. 1938.
Springfield area	BM, <i>E. Doubleday</i> from J.G. Lea, 24 July; GH, <i>Milo G. Williams</i> , undated; OS 17563, <i>E. Jane Spence</i> , 15 Aug 1883; OS 17564, <i>E. Jane Spence</i> , July 1884; Kellerman and Werner, 1895:178.
<b>Fairfield County</b>	Bigelow, 1841.
<b>Franklin County</b>	Riddell, 1834:120; Sullivant, 1840:15; Kellerman and Werner, 1895:178.
Columbus area	PH, undated (A questionable record as discussed under "Herbarium Records, Problematic Records No. 7," which see).
<b>Hamilton County</b>	
Cincinnati area	Clark, 1852; Bodley, 1865:10; Beardslee, 1874:19; Kellerman and Werner, 1895:178.
<b>Holmes County</b>	
Lakeville area	BGSU 438, <i>Leslie D. Stair?</i> 15 May 1897. (A questionable record as discussed under "Herbarium Records, Problematic Records No. 9," which see).
<b>Madison County</b>	Kellerman and Werner, 1895:178; Williams, 1913:183; Schaffner, 1914:179, 1932:147; Jones, 1943a:104.
Bigelow Cemetery State Nature Preserve	KE 37815, <i>Allison W. Cusick</i> , 2 Aug 1976; OS 17558, <i>Robert B. Gordon</i> , Summer 1932; OS 17559, <i>Robert B. Gordon</i> , 9 Aug 1931; OS 17560, <i>Lawrence E. Hicks</i> , 23 July 1932; OS 84314, <i>Lawrence E. Hicks</i> , 23 July 1932; Thomas, 1963, 1975.
Darby Plains London area	ILL, <i>Johnathan R. Paddock</i> , 1835. OS 17561, <i>Katherine D. Sharp</i> , July 1892; Kellerman and Werner, 1895:178.
<b>Marion County</b>	OS 49323, <i>H.R. DeSelm</i> , 5 Aug 1952 (on a railroad prairie remnant).

#### Montgomery County

Dayton area

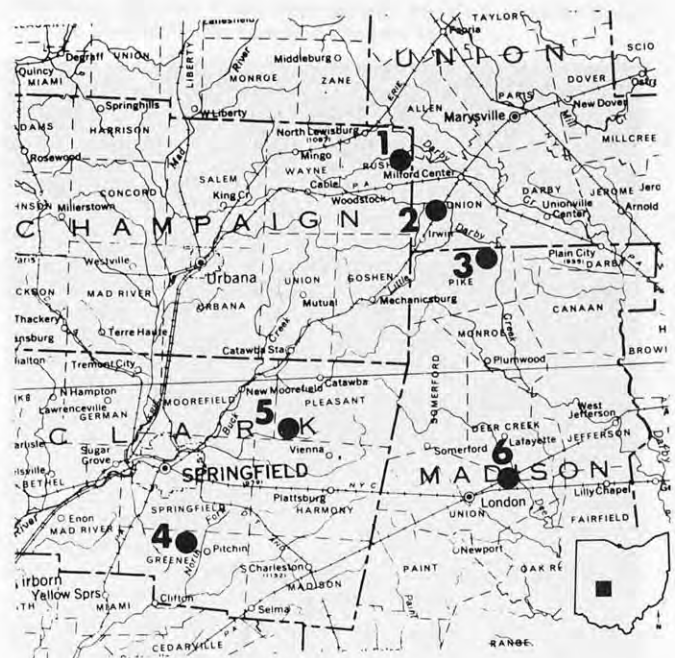
Schaffner, 1931:303, 1932:147.

CINC, *Milo G. Williams*, undated; DMNH B741, *Julia M. Deuel*, undated; DMNH B742, *Julia M. Deuel*, undated; DMNH B743, *Julia M. Deuel*, undated; DMNH, *John W. Van Cleve*, July (Collected between 1830 and 1850 as determined by Covert, 1976, personal communication.); PH, *John W. Van Cleve*, undated (Collected in the 1830's as determined by Stuckey, 1977, personal communication.); Urbana College, *Milo G. Williams*, 25 Aug (A questionable record as discussed under "Herbarium Records, Problematic Records No. 8, which see"; WIS, *Milo G. Williams*, undated.

#### Tuscarawas County

Gnadenhutten area

PH, *Lewis David von Schweinitz*, undated. (Collected either in 1823 or 1831 as determined by Stuckey, 1977, personal communication; a questionable record as discussed under "Herbarium Records, Problematic Records No. 6," which see).



**Figure 4.** Locations of the known extant populations of royal catchfly (*Silene regia*) in Ohio: (1) Martin Cemetery, (2) Milford Center Prairie, (3) Bigelow Cemetery State Nature Preserve, (4) Mills Road Roadside, (5) Clark Lake Wildlife Area, and (6) Conrail Right-of-way.

Marion Township. The Holmes County and Tuscarawas County localities as listed are especially problematic as previously discussed.

I have surveyed very intensively two of the localities: (1) the Darby Plains in Madison, Franklin, Union, and Champaign Counties (King, 1981), and (2) the Marion County railroad prairie remnant in Marion Township. I have surveyed less intensively all the other possible collection localities as listed in Table 3, in addition to many other areas throughout the state. Also, I have requested other contributors to the Prairie Survey Project to report any occurrence of *Silene regia* which they may have located by their survey activities.

I could not locate, with repeated visits during 1977-1980, the Marion County population as recorded by DeSelm in 1952. Cusick (1980, personal communication), Troutman (1980, personal communication) and Yoder (1980, personal communication) also intensively surveyed this site and found no trace of royal catchfly. Up to 57 species of Ohio prairie plants persist at this disturbed site (Cusick and Troutman, 1978:33), but *Silene regia* apparently does not. It may have been eliminated by the disturbances associated with the recurring railroad maintenance activities in the area. The most recent disturbance occurred in 1976 (Cusick and Troutman, 1978:33).

In addition to the previously known population at Bigelow Cemetery State Nature Preserve, where on 2 August 1981 I counted 227 flowering stems, only five additional extant populations of *Silene regia*, as indicated in Figure 4, have been found in Ohio: Martin Cemetery, Milford Center Prairie (Fig. 5), Mills Road roadside, Clark Lake Wildlife Area, and Conrail right-of-way near London. All five populations were previously unknown to the scientific community.

Martin Cemetery is located about 1.6 km (1 mile) north of Woodstock in Rush Township, Champaign County, 0.15 km (0.1 mile) north of the junction of Ohio Route 559 and Martin Road (Champaign County Road T-210). While conducting a survey of prairie plants in the cemeteries of the Darby Plains, I investigated this small, unmowed cemetery on 31 May 1980 and observed many vigorous stems of *Silene regia* not yet in bloom. This population is the most densely concentrated in Ohio, and when I revisited the site on 11 July 1980, the royal catchfly was in full bloom and presented a striking display. On 2 August 1981, I counted 508 flowering stems here. Surprisingly, no other Ohio prairie species have been observed at Martin Cemetery.



Figure 5. *Silene regia* cyme with seed-bearing capsules collected at Milford Center Prairie, Union County, Ohio. (Photograph by Charles C. King, 1977-78.)

Milford Center Prairie is located about 3 km (2 miles) southwest of Milford Center in Union Township, Union County. It occupies about 2 km (1.3 miles) of a former railroad right-of-way with most of the prairie species occurring between Connor Road (Union County Road 81) on the north and U.S. Route 36 on the south (Thomas, 1977; King 1981:122). The right-of-way is now used for an electric power line by the Dayton Power and Light Company, Dayton, Ohio 45401. I found several royal catchfly plants in seed at this site on 24 October 1976, and on August 1981, I counted 810 flowering stems here. This vigorous population is the largest known in Ohio and possesses more flowering stems than the other five sites combined. A small extension of this population, with about four flowering stems, occurs on the north side of Connor Road 0.5 km (0.3 mile) west of the power line right-of-way. Frequently these plants are mowed during routine roadside maintenance activities.

Mills Road roadside possesses a small population of royal catchfly. The site is located near the north bend of Mills Road (Clark County Road Twp 71) virtually in the center of Section 24, Green Township, Clark County, about 1.9 km (1.2 miles) northwest of Pitchin. This population was brought to the attention of Terry Jaworski (1979, personal communication) by a participant on a field trip which Jaworski was conducting to Bigelow Cemetery State Nature Preserve. Upon seeing royal catchfly in bloom in the cemetery, the participant informed Jaworski of this Clark County population. On 3 August 1981, Ralph Ramey (1981, personal communication) counted 62 flowering stems here.

A small population of royal catchfly occurs in the Clark Lake Wildlife Area in Section 19, Pleasant Township, Clark County. This station near the east side of Clark Lake was discovered by Vince Mahony (1981, personal communication), and on 26 July 1981 he counted 11 flowering stems. On the Conrail right-of-way in Deer Creek Township, Madison County, Jack H. McDowell (1981, personal communication) discovered another small population. This station is located in a fence row on the north side of the railroad about 0.1 km west of Deer Creek. On 29 July 1981, Jack McDowell counted eight flowering stems here. The right-of-way is described briefly by King (1981:123).

The population and habitat at Bigelow Cemetery State Nature Preserve is protected by the Division of Natural Areas and Preserves, Ohio Department of Natural Resources, and the population of royal catchfly at this site has increased substantially since 1978 when management of the area was assumed by the Division. Also, the population and habitat at Milford Center Prairie is protected by the Dayton Power and Light Company since the area is managed in such a manner to protect the extant prairie species (Harper, 1980). The Clark Lake Wildlife Area is managed and protected by the Division of Wildlife, Ohio Department of Natural Resources.

In contrast, Martin Cemetery, the Mills Road roadside, and the Conrail right-of-way have no protective management plans for royal catchfly, and the habitats and populations there could be eliminated if subjected to inappropriate management procedures. *Silene regia* has been designated as an endangered species in Ohio (Ohio Division of Natural Areas and Preserves, 1980:11) and thereby is afforded a measure of legal protection from commercial exploitation and over collecting, but destruction of habitat is still the primary threat to survival of the species.

With the possible exception of the population recorded for Hamilton County, all the documented populations of *Silene regia* in Ohio are from areas of Wisconsinan glaciation. This situation indicates post-glacial migration into Ohio. As suggested by the distributional data presented in Figure 3, post-Wisconsinan migration into Ohio might have originated from pre-Wisconsinan populations along the lower Wabash River in Indiana and Illinois and proceeded eastward into Ohio via the Wabash River corridor. Once established in west-central Ohio, royal catchfly might have migrated to Hamilton County via the Great Miami River or the Little Miami River corridors. In the absence of records from northern Kentucky, a northeastern migration route from the unglaciated barrens of western Kentucky appears to be less likely.

## CONCLUSIONS

Nuttall's (1818:288) description of the distribution of *Silene regia* as "sparingly from Ohio to Lower Louisiana [the Louisiana Territory south of the Missouri River]" is basically accurate. Documentation



by herbarium specimens (Table 2) identifies portions of twelve states as constituting the range of the species: Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Missouri, Ohio, Oklahoma, and Tennessee. Previous to this study, Florida was not recognized as being within the range limits.

Deam's (1940:488) description of royal catchfly in Indiana as "A very local plant" also applies, with the possible exception of Missouri, to all the other states within its range. In Missouri, royal catchfly is recorded for nearly every county in the Ozark region south of the Missouri River (Fig. 3). James M. Sullivan in a letter to Alice A. Nightingale (1976, personal communication) indicates that *Silene regia* in the Ozark region occurs "infrequently but consistently." Elsewhere, the species is rare and widely dispersed, if not extirpated: Alabama (Thomas, 1976, personal communication; Kral, 1980, personal communication); Arkansas (Tucker, 1974:50, 1976, personal communication; Smith, 1976, personal communication); Florida (Ward, 1977, personal communication); Georgia (Faircloth, 1976, personal communication; Drapalik, 1980, personal communication); Illinois (Mohlenbrock, 1976, personal communication; Kurz, 1978, personal communication); Indiana (Pelton, 1980, personal communication); Kansas (McGregor, 1976, personal communication: 1977:6); Kentucky (Medley, 1980, personal communication); Ohio (see "Field Reconnaissance in Ohio" above); Oklahoma, (Taylor, 1976, personal communication; Tyrl, 1976, personal communication); and Tennessee (DeSelm, 1978, personal communication; Kral, 1980, personal communication).

Special protective procedures are probably necessary to insure the survival of this "splendid species" in states other than Missouri, and possibly even there.

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- McDowell, Jack H.**, superintendent, Battelle-Darby Metro Park, Columbus, Ohio 43229.
- McGregor, Ronald L.**, director of State Biological Survey of Kans., Lawrence, Kans. 66044.
- Medley, Max**, naturalist, Ky. Nat. Preserves Comm., Frankfort, Ky. 40601.
- Mohlenbrock, Robert H.**, professor of botany, Southern Ill. Univ. Carbondale, Ill. 62901.
- Nightingale, Alice A.**, curator of herbarium, The School of the Ozarks, Point Lookout, Mo. 65726.
- Pelton, John**, professor of botany, Butler Univ., Indianapolis, Indiana 46208.
- Ramey, Ralph E.**, director of Glen Helen, Yellow Springs, Ohio 45387.
- Rhodes, Donald G.**, professor of botany, Louisiana Tech Univ. Ruston, La. 71270.
- Smith, Edwin B.**, director of herbarium, Univ. Ark., Fayetteville, Ark. 72701.
- Stuckey, Ronald L.**, professor of botany, The Ohio State Univ., Columbus, Ohio 43210.
- Taylor, John**, curator of herbarium, Southeastern State Univ., Durant, Okla. 74701.
- Thomas, Joab L.**, chancellor, N.C. State Univ., Raleigh, N.C. 27607.
- Troutman, K. Roger**, naturalist, Mansfield, Ohio 44904.
- Tucker, Gary E.**, curator of herbarium, Ark. Polytechnic College, Russellville, Ark. 72801.
- Tyrl, Ronald J.**, curator of herbarium, Okla. State Univ., Stillwater, Okla. 74074.
- Voss, Edward G.**, professor of botany, Univ. Mich., Ann Arbor, Mich. 48109.
- Ward, Daniel B.**, curator of herbarium, Univ. Fla., Gainesville, Fla. 32611.
- Watson, J.R.**, professor of botany, Miss. State Univ., Mississippi State, Miss. 39762.
- Wood, Emily W.**, curatorial assistant, Carnegie Mus. Nat. Hist., Pittsburgh, Pa. 15213.
- Yoder, Larry R.**, associate professor of botany, The Ohio State Univ., Marion, Ohio 43302.

### Personal Communications Cited

- Buker, Werner**, research associate, Carnegie Mus. Nat. Hist., Pittsburgh, Pa. 15213.
- Coovert, Gary**, curator of biology, Dayton Mus. Nat. Hist., Dayton, Ohio 45414.
- Croat, Thomas P.**, curator of botany, Mo. Bot. Gard., St. Louis, Mo. 63166.
- Cusick, Allison W.**, field botanist, Ohio Dept. Nat. Resources, Columbus, Ohio 43224.
- DeSelm, H. R.**, professor of botany, The Univ. Tenn., Knoxville, Tenn. 37916.
- Drapalik, Donald J.**, curator of herbarium, Ga. Southern Coll., Statesboro, Ga. 30458.
- Easterly, N. William**, curator of herbarium, Bowling Green State Univ. Bowling Green, Ohio 43403.
- Ewan, Joseph**, professor of botany, Tulane Univ., New Orleans, La. 70118.
- Fatula, Rudolph P.**, associate professor of biology, Geneva Coll., Beaver Falls, Pa. 15010.
- Fogarasi, Kasia**, herbarium supervisor, The Acad. Natural Sciences, Philadelphia, Pa. 19103.
- Jaworski, Terry**, preserve manager, The Ohio Hist. Soc., Urbana, Ohio 43078.
- Keener, Carl S.**, curator of herbarium, The Pa. State Univ., Univ. Park, Pa. 16802.
- Kral, Robert**, curator of herbarium, Vanderbilt Univ., Nashville, Tenn. 37235.
- Kurz, Donald R.**, field ecologist, Nat. Land Inst., Carbondale, Ill. 62901.
- Maguire, Bassett**, director emeritus, The N.Y. Bot. Gard., N.Y., N.Y. 10458.
- Mahony, Vince**, naturalist, Springfield, Ohio 45503.



At the Stillwater Prairie Preserve

Clara G. Weishaupt (right) and Scott L. Huston on the bank of the Stillwater River, Miami County, Ohio. (Photograph by Charles C. King, 1981.)