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*Conservation Assessment*  
*for*  
Whorled Rosinweed (*Silphium trifoliatum* L.)



*USDA Forest Service, Eastern Region*

October 1, 2004

Shawnee National Forest  
Hoosier National Forest

Brenda Molano-Flores  
Illinois Natural History Survey  
Center for Wildlife and Plant Ecology  
607 E. Peabody Dr.  
Champaign, IL 61820

Technical Report 2005(4)



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*This document is undergoing peer review, comments welcome*

This Conservation Assessment was prepared to compile the published and unpublished information on the subject taxon or community; or this document was prepared by another organization and provides information to serve as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject taxon, please contact the Eastern Region of the Forest Service - Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.

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## EXECUTIVE SUMMARY

The National Forest Management Act and U. S. Forest Service policy require that Forest Service lands be managed to maintain viable populations of all native plant and animal species. A viable population is one that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its range within a given planning area (FSM 2670.5.22).

In addition to the above mandate the Forest Service has to protect species listed as endangered or threatened under the Endangered Species Act (ESA), species of Concern by U.S. Fish and Wildlife Service, and species designated as Regional Forester's Sensitive Species (RFSS) based on Global/National ranks and/or risk evaluation. The Eastern Region of the Forest Service (R9) updated its Sensitive Species list on February 29, 2000 (list maintained as of October 20, 2003). Part of that process included identification of priority species for further study by the development of Conservation Assessments and Strategies.

*Silphium trifoliatum*, one of these RFSS, occurs within the proclamation boundaries of the Eastern Region (R9) National Forests, which includes 20 states and 15 National Forests. The states included are Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, and Wisconsin. The National Forests included are the Allegheny, Chequamegon/Nicolet, Chippewa, Green Mountain/Finger Lakes, Hiawatha, Hoosier, Huron-Manistee, Mark Twain, Midewin (National Tallgrass Prairie), Monongahela, Ottawa, Shawnee, Superior, Wayne, and White Mountain. This conservation assessment will concentrate on these states and National Forests, but particular emphasis will be given to Illinois and Indiana where the Shawnee and Hoosier National Forests are found. It should be mentioned that the RFSS does not distinguish between the two varieties of this species. In this report, information will be given for the species and the varieties when applicable.

The main objective of this conservation assessment is to present information on the taxonomy, life history, habitat, distribution, global and national status, population viability, and potential threats for *Silphium trifoliatum*. All the information presented here is the result of literature searches and reviews, examination of herbarium specimens, and personal and written communication with botanists from universities, herbaria, and state/federal agencies. The ultimate goal of this conservation assessment is to provide the available background information needed to prepare a subsequent conservation strategy for *Silphium trifoliatum*.



## **ACKNOWLEDGEMENTS**

I would like to thank Steve Hill for his advice in the preparation of this document and for providing contact information, John Taft for gathering the Shawnee National Forest Herbarium data, and Mary Ann Feist, John Taft, and Laura Roberts for editorial comments. Also, I want to thank the State Natural Heritage and Forest Service biologists for species information.

I would like to give special thanks to all the herbarium curators (see list of contact people) for the information that they provided about the species. Without their contributions, this report would be lacking a lot of habitat and state distribution information. Their contributions to this report should be a reminder of why herbaria should be supported.

Finally, many photos and maps have been used in this report to describe the species and to provide species distribution information, among other things. Web pages have been cited at the end of the report to acknowledge their use and the name of the photographers.

## NOMENCLATURE AND TAXONOMY

**Family:** Asteraceae

**Scientific name:** *Silphium trifoliatum* L.

**Varieties:** *Silphium trifoliatum* var. *trifoliatum*, *Silphium trifoliatum* var. *latifolium*

**Common names:** Rosinweed, Whorled Rosinweed, Three-leaved Rosinweed  
**Varieties:** *Silphium trifoliatum* var. *latifolium* Gray -Whorled Rosinweed,  
Smooth Rosinweed (AL)

*Silphium trifoliatum* var. *trifoliatum*- Whorled Rosinweed

**Synonymy:** *Silphium asteriscus* L. ssp. *trifoliatum*<sup>1</sup> (R. Hellmich, pers. comm.,  
IN Natural Heritage Data Center)

**Varieties:** *Silphium trifoliatum* var. *latifolium*<sup>1</sup> Gray  
*Silphium confertifolium*<sup>2</sup> Small  
*Silphium glabrum* Eggert ex Small  
*Silphium trifoliatum* var. *trifoliatum*<sup>1</sup>  
*Silphium atropurpureum* Retz. ex Willd.  
*Silphium laevigatum* Ell., non Pursh

**USDA Plants code:** SITR7

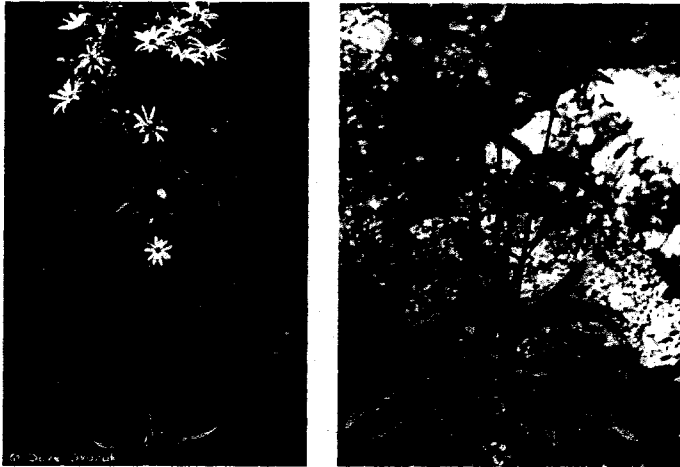
**USDA Plants code Varieties:** SITRL *Silphium trifoliatum* var. *latifolium* Gray,  
SITRT *Silphium trifoliatum* var. *trifoliatum*

The genus *Silphium* L., commonly known as rosinweed, is in the Asteraceae within the tribe Heliantheae and subtribe Engelmanniinae. This genus is easily recognized by its perennial habit, large flower heads with yellow ray and disc flowers. The sterile disc flowers have undivided stigmas. The achenes are flattened seeds.

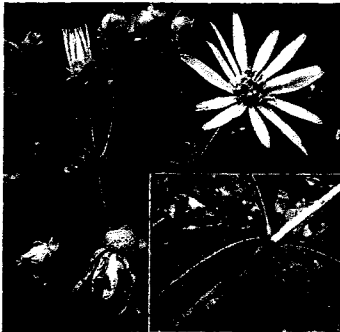
<sup>1</sup> Currently, J. A. Clevinger (pers. comm.; unpubl. document, [Clevinger 2004]) is treating *Silphium trifoliatum* as a variety of *Silphium asteriscus* (var. *trifoliatum*), which is the way that the species is listed in the Indiana Natural Heritage Data Center (R. Hellmich, pers. comm.). In addition, *Silphium trifoliatum* var. *latifolium* will be changed to *Silphium asteriscus* var. *latifolium* (Clevinger 2004).

<sup>2</sup> The US Fish and Wildlife Service and the Mississippi Heritage Programs recognized *Silphium confertifolium* as a separate species (NatureServe Explorer 2004).

## DESCRIPTION OF SPECIES



*Silphium trifoliatum* is a mostly glabrous perennial plant with fibrous roots from a short rhizome. The plant can reach between 1-2.7 m tall and has a smooth, usually purple stem (Elliott 1971). The rough, lance-shaped, toothed leaves are sessile (upper) or have short stalks (middle/lower) about 9-20 cm long and 2-6 cm wide. The leaves are whorled with usually three leaves per whorl, but sometimes up to five. The upper leaves are often opposite and rarely alternate. These leaves are generally lanceolate to ovate with short petioles. The leaf margins are entire or toothed with a rough or smooth surface in some varieties. *Silphium trifoliatum* var. *latifolium* leaves tend to be opposite and wider with longer petioles (right photo). *Silphium trifoliatum* var. *trifoliatum* has three whorled leaves (left photo). The leaves of *Silphium trifoliatum* have different types of phenolic acids (e.g., ferulic acid, salicylic acid; Kowalski and Wiercinski 2003), which can have commercial value.



*Silphium trifoliatum* has several to numerous flower heads in an open inflorescence. Flower heads are rather small, between 2.5-6.4 cm. The flowers have from 8 to 21 long (2- 3 cm), narrow (3-5 mm wide), rather widely separated bright yellow rays and 35-150 yellow disk flowers depending upon the variety (Clevinger unpubl. document [var. *trifoliatum*: ray flowers 11-16 and disk flowers 35-90; var. *latifolium*: ray flowers 12-17 and disk flowers 35-130]). The disk flowers are sterile and the ray flowers are fertile forming achenes (Gleason and Cronquist 1991). The thick involucre bracts have spreading tips and are glabrous except for the hairy margins. Blooms first appear in early summer and continue into early fall (July-October). Each flower opens gradually then quickly wilts. Fruits are obovoid achenes 8-9 mm long and

5-6 mm broad. The chromosome number for *Silphium trifoliatum* is 14 (2n) (Gleason and Cronquist 1991).

This species can be confused with some specimens of *Silphium integrifolium* that may have whorled leaves (Jody Shimp - ILDNR Natural Heritage biologist; John Schwegman – retired IL state botanist, pers. comms.). The flowers of *Silphium integrifolium* are similar to *Silphium trifoliatum*, however *S. integrifolium* plants are scabrous.

## LIFE HISTORY

Research has been conducted on the reproduction biology, ecology, and dispersal of other *Silphium* spp. such as *S. laciniatum*, *S. perfoliatum* and *S. terebinthinaceum*. However, limited to no information is available regarding the reproductive biology, ecology, and seed dispersal of *Silphium trifoliatum*. In general, as with many Asteraceae, this species can be self-incompatible (Mani and Saravanan 1999, Richards 1997). *Silphium trifoliatum* flowers, as with other *Silphium* spp., are likely visited by a wide variety of pollinators (W1, see Appendix 1) that collect and feed on pollen or nectar.

Because *Silphium trifoliatum* produces achenes, most likely, they will fall and stay under the maternal plant due to size and lack of wind-dispersal structures associated with the achenes. This is supported by a study conducted on *Silphium laciniatum* (Compass plant), a very similar species, which found that distance between seedlings and the nearest flowering stem was about 1.0 m (Pleasants and Jurik 1992).

Seed germination may be easy, since other *Silphium* spp. (*S. laciniatum*, *S. integrifolium*, and *S. perfoliatum*) have been germinated without problems, though these *Silphium* spp. require stratification (33-38°F, 30-60 days; Shirley 1994). Seedling survivorship is unknown for *Silphium trifoliatum*; however, Pleasants and Jurik (1992), based on total seed production for *Silphium laciniatum*, estimated that about 1% of seeds became seedlings in each year and that plants with multiple inflorescences had a significantly higher density of seedlings around them.

## HABITAT

*Silphium trifoliatum* is found in prairies, glades, barrens and savannas of the southeastern United States. This species reaches its northwestern range limit in a single location at a limestone glade in southern Illinois. In addition, *Silphium trifoliatum* can be found in open woods, disturbed open places (e.g., pastures, old fields, railway rights-of-way), and meadows (Gleason and Cronquist 1991, Radford et al. 1968, Smith 1998, J. A. Clevinger, pers. comm. and unpubl. document).

In Michigan, this species has been collected at the edge of woods and in Ohio, *Silphium trifoliatum* is somewhat common in fens and prairies (Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia; Greg Schneider, Manager, Ohio Natural Heritage Program, pers. comm.).

In Maryland, *Silphium trifoliatum* has been collected in dry banks and edges of woods. Also, Shreve (1910) reported that the species was found in open areas within the Floristic Midland (which included Ecological Lower/Upper District) and Mountain (which included Ecological Garrett-Allegany District) Zones of Maryland. However, these zones are not formally recognized any more. Also, in North Carolina this species can be found in roadsides, wooded bank openings, and weedy areas (Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia, pers. comm.).

Fleming et al. (2001) reported that in Virginia *Silphium trifoliatum* (var. *trifoliatum*) can be found in Coastal Plain Dry Calcareous Forests and Woodlands which are a group of rare and localized, deciduous or occasionally mixed forests and woodlands of subxeric to xeric, fertile habitats over unconsolidated, calcareous deposits. Within these forests localized in the inner coastal plain from southeastern Virginia north to Stafford County and the Peninsula near Williamsburg, *Silphium trifoliatum* can be associated with the following tree species: Chinkapin oak (*Quercus muhlenbergii*), southern sugar maple (*Acer barbatum*), white oak (*Q. alba*), northern red oak (*Q. rubra*), bitternut hickory (*Carya cordiformis*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), eastern red cedar (*Juniperus virginiana* var. *virginiana*) and eastern redbud (*Cercis canadensis* var. *canadensis*); and herbaceous plants such as robin's-plantain (*Erigeron pulchellus* var. *pulchellus*), Bosc's panic-grass (*Dichanthelium boscii*), white crownbeard (*Verbesina virginica* var. *virginica*), American bellflower (*Campanulastrum americanum*), bear's-foot (*Smallanthus uvedalius*), few-flowered tick-trefoil (*Desmodium pauciflorum*), crested coralroot (*Hexalectris spicata*), and eastern needlegrass (*Piptochaetium avenaceum*).

In Virginia this species can be found in the Riverside Prairies another rare community, which are temporarily flooded, sparse shrub and dense grassland vegetation of stabilized outcrop or boulder bars along the shores of major mountain and Piedmont rivers (Fleming et al. 2001). In Virginia, most of the few known occurrences are located in the Potomac River gorge west of Washington, D.C. and along the James River near the Blue Ridge. Within this plant community *Silphium trifoliatum* (var. *trifoliatum*) can be associated with a lush assemblage of warm-season grasses and forbs, with scattered woody scrub such as stunted green ash (*Fraxinus pennsylvanica*), silky dogwood (*Cornus amomum* ssp. *amomum* and ssp. *obliqua*), and willows (*Salix* spp.). Dominant grasses are usually big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*). Other characteristic plants include blue wild indigo (*Baptisia australis* var. *australis*), freshwater cordgrass (*Spartina pectinata*), eastern Sampson's snakeroot (*Orbexilum pedunculatum* var. *psoralioides*), northern obedient-plant (*Physostegia virginiana* ssp. *virginiana*), violet bushclover (*Lespedeza violacea*), Culver's-root (*Veronicastrum virginicum*), western sunflower (*Helianthus occidentalis* ssp. *occidentalis*), American purple vetch (*Vicia americana* ssp. *americana*), narrow-leaved mountain-mint (*Pycnanthemum tenuifolium*), flattened spikerush (*Eleocharis compressa*), clasping-leaved dogbane (*Apocynum sibiricum*), smooth veiny peavine (*Lathyrus venosus*), and heart-leaved golden-alexanders (*Zizia aurea*).

From herbarium specimens in Kentucky, *Silphium trifoliatum* has been collected in thickets, edge of woodlands, prairie strips, and immature mixed mesophytic forests over calcareous substrates (Mark Fishbein Director, Mississippi State University Herbarium; Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia pers. comm.). Also, from herbarium specimens this species has been collected in disturbed secondary hardwood forest, edge of lake, chalk bluff, prairie remnant, prairie over chalk in Mississippi (Mark Fishbein Director, Mississippi State University Herbarium, pers. comm.).

In Alabama, this species has been collected in low swampy woods, the margin of mesic woods, exposed limestones, and roadsides. *Silphium trifoliatum* can also be found in areas with chalky soil, associated with *Myrica cerifera*, *Juniperus virginiana*, *Lespedeza procumbens*, and *Asclepias viridiflora*. In the Black Belt prairie (i.e., term for the low, prairie region of the southern United States) this species is found associated with *Schizachyrium scoparium*, *Sorghastrum nutans*, *Sabatia angularis*, *Solidago nemoralis*, *Juniperus virginiana*, *Dalea candida*, and *Ratibida pinnata* (Steve Ginzburg, Assistant Curator, University of Alabama Herbarium, pers. comm.). In addition, in Alabama this species can be found in sandy clay swale in oak-pine, dry oak woods, and sandy field (Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia, pers. comm.). In Georgia, *Silphium trifoliatum* can be found in moist shaded places and acid bog-meadows (Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia, pers. comm.).

In Tennessee, *Silphium trifoliatum* has been collected in open woods, barrens and disturbed open places (Carman 2001). From herbarium specimens this species can be found in low shaded wet areas, marsh meadows, sandy creek bluffs, gravel bars (with shrub-herb community), sandstone woods, and dolomite ledges (Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia, pers. comm.).

In Illinois, from an element of occurrence recorded in 1986 *Silphium trifoliatum* was found in a shaded limestone glade opening in dry upland forest associated with *Quercus prinoides*, *Q. stellata*, *Juniperus virginiana*, *Robinia pseudoacacia*, *Schizachyrium scoparium*, *Sorghastrum nutans*, *Euphorbia corollata*, *Dalea candidum*, *Lithospermum canescens*, and *Physostegia virginiana* (Illinois Natural Heritage Database, Olson 1989). In Indiana, this species has been found in dry woods, roadside fencerows, clearing of rocky-wooded hillsides to prairie patches (Friesner Herbarium and Illinois Natural History Survey Herbarium specimens; Yatskievych 2000).

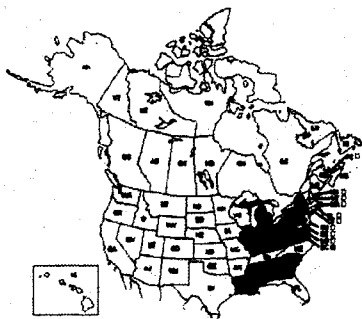
At the Shawnee National Forest, one herbarium specimen collected in 1993 *Silphium trifoliatum* (var. *trifoliatum*) indicates that the species can be found in limestone barrens in dry upland oak-hickory woodlands. Barrens are characterized by species of canopy trees tolerant of xeric conditions that have a stunted open-growth appearance, and the dominance of native warm-season grasses and prairie forbs (Olson 2002).

At the Hoosier National Forest from a plant monitoring study in a barren community and within one of the designated special areas *Silphium trifoliatum* was found growing with *Sassafras albidum*, *Amphicarpaea bracteata*, *Phryma leptostachya*, *Parthenocissus*

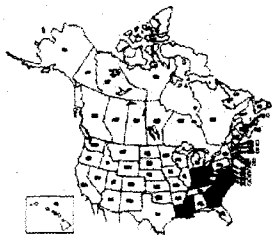
*quinquefolia*, *Rhus radicans*, *Panicum dichotomum*, *Panicum boscii*, *Carex complanata*, *Solidago ulmifolia*, *Solidago altissima*, *Geranium maculatum*, *Galium concinnum*, *Helianthus microcephalus*, and *Quercus alba* (Kirk W. Larson, Botanist-Hoosier National Forest, pers. comm.).

In West Virginia, *Silphium trifoliatum* is found scattered across the state, on hillsides, river bottoms and open fields (Strausbaugh and Core 1978; Paul J. Harmon, Natural Heritage Botanist West Virginia Natural Heritage Program; Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia, pers. comms.). No information is available from the Monongahela National Forest (Melissa Thomas-Van Gundy, Forest Botanist Monongahela National Forest, pers. comm.).

## DISTRIBUTION AND ABUNDANCE



*Silphium trifoliatum* can be found in Alabama, District of Columbia, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maryland, Michigan, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia (NatureServe Explorer 2004, USDA-NRCS 2004, see Appendix 2 for color codes). Only var. *trifoliatum* has been reported in Illinois. Appendix 3 shows the county distributions for Georgia, Kentucky, North Carolina, Ohio, South Carolina, Virginia, and West Virginia. The United States National Herbarium in Washington DC (as of January 2004) has a total of 46 specimens of *Silphium trifoliatum* collected in Alabama, District of Columbia, Kentucky, Maryland, North Carolina, Ohio, Tennessee, Virginia, West Virginia between 1871-1985.



var. *latifolium*



var. *trifoliatum*

Distribution maps for varieties

Voss (1996) did not include this species a part of the Michigan Flora. However, a specimen collected in Lee County (1969), can be found at the University of Georgia herbarium (Kelly A. Bettinger, Collections Manager-Herbarium, The University of

Georgia, pers. comm.). In Ohio, *Silphium trifoliatum*, has been collected in most of the central eastern portion of the state (Fisher 1988). Several of the counties where this species has been collected in Ohio are: Hamilton (1905), Portage (1978), Richland (1892), Scioto (1934), and Warren (1935) (United States National Herbarium in Washington DC).

The North Carolina Natural Heritage Program (W2) has no element of occurrence for this species. However, herbarium specimens show that the species has been collected in Cabarrus (1992) Chatham (1956), Craven (1966), Madison (1924), McDowell (1948), and Orange (1961) counties (Freeman Herbarium Database at Auburn University; Illinois Natural History Survey Herbarium Database; United States National Herbarium, Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia, pers. comm.). In South Carolina, this species has been collected at least in Cherokee County (Appendix 3).

In Maryland, this species was reported in Allegany and Baltimore counties and considered infrequent during the early 20<sup>th</sup> century (Shreve 1910). However, recent collections have been found in Maryland as well (Montgomery County [1985], United States National Herbarium in Washington DC). In Virginia, *Silphium trifoliatum* is found in most of the state and has been collected as early as 1871 (Bedford County), 1883 (Greenville County) and 1889 (Princess Anne County- not formally recognized any more) (United States National Herbarium in Washington DC). Recently this species has been collected in Louisa (1991), Montgomery (1971), and Richmond (1991) counties, although specimens from 1935 (Shenandoah) 1940 (Green County) and 1941 (Dinwiddie County) can be found as well in several herbaria (Freeman Herbarium Database at Auburn University; United States National Herbarium in Washington DC, Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia, pers. comm.).

In Kentucky, *Silphium trifoliatum* has been collected in multiple counties such as Campbell (1942), Hart (1953), Logan (1953), Nelson (1940), Powell (1991), Rockcastle (1937), and Rowan (1937, 1950) (United States National Herbarium in Washington DC; Mark Fishbein Director, Mississippi State University Herbarium; Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia, pers. comms.). In Mississippi, *Silphium trifoliatum*, has been collected in Chickasaw (2003), Lee (1996), and Oktibbeha (1971 and 2004) counties (Mark Fishbein Director, Mississippi State University Herbarium, pers. comm.).

In Alabama, this species has been collected in the following counties: Autauga (1982), Barbour (1980, 1997), Bibb (1976), Blount (1998), Cullman (1886), Cherokee (1969), Fayette (1975), Florence (1953), Franklin (1980), Greene (1998), Lauderdale (1970), Macon (1970), Marshall (1998), Montgomery (1880, 1997), Pickens (1969), Shelby (1997), Sumter (1997), Tuscaloosa (1970) and Wilcox (1982) (Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia; The Freeman Herbarium at Auburn University, Database; Steve Ginzburg, Assistant Curator, University of Alabama Herbarium, pers. comms.).



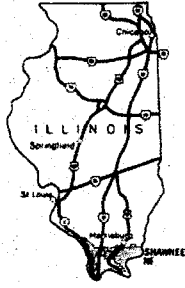
In Georgia, *Silphium trifoliatum* has been collected in Catoosa (1948), Douglas (1948), Floyd (1996), Towns (1971), and Union (1948) counties (Freeman Herbarium Database at Auburn University; Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia, pers. comms.).

*Silphium trifoliatum* is quite common in Tennessee (Kirstin Condict, Data Manager, Tennessee Department of Environment and Conservation, Division of Natural Heritage, pers. comm.). From herbarium specimens this species has been collected in Anderson (1961), Bledsoe (1970), Blount (1960), Clay (1970), Coffee (1897), Cumberland (1973, 1983), Franklin (1899), Grundy (1900), Hardin (1969), Humphreys (1969), Morgan (1980), Overton (1970), Sequatchie (1970), Stewart (1969), and Warren (1900) counties (Freeman Herbarium Database at Auburn University; Illinois Natural History Survey Herbarium; United States National Herbarium in Washington DC; Kelly A. Bettinger, Collections Manager-Herbarium, The University of Georgia, pers. comm.).



In Illinois, at the Illinois Natural History Survey Herbarium, (as of June 2003) two specimens of *Silphium trifoliatum* are available, one of them from Hardin County collected in September 25, 1986 by Steven D. Olson and Max Hutchison at Barker Bluff Research Natural Area (Olson 1989). The other specimen of *Silphium trifoliatum* was collected in Champaign County (1991), however this specimen was identified as cultivated. The Southern Illinois University Herbarium does not have any records for this species (Michael Mibb, Assistant Curator, pers. comm.).

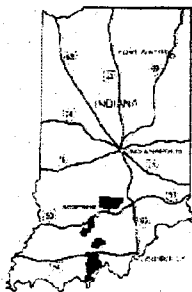
An element of occurrence for *Silphium trifoliatum* (var. *trifoliatum*) is reported from Hardin County in the Lower Ohio-Bay Watershed in Barker Bluff, NE of Cave-in-Rock (i.e., city), September 25, 1986 (Illinois Natural Heritage Database). It should be noted that Barker Bluff is a 125 acres Illinois Natural Areas Inventory site within the Shawnee Hills Resource Rich Area and is on land managed by the Shawnee National Forest (Olson 1989, Suloway et al. 1996). Four stems of *Silphium trifoliatum* were found in this location in a shaded site near the edge of a dry upland forest near limestone glade habitat. However, Shimp (1996) conducted a floristic study at the site in the early-mid 90's and did not find *Silphium trifoliatum*. In addition, he pointed out that whorled *S. integrifolium* is found at the site (Jody Shimp, ILDNR Natural Heritage biologist, pers. comm.).



From the Shawnee National Forest herbarium one specimen of *Silphium trifoliatum* var. *trifoliatum* collected in 1993 by L.R. Stritch and J.P. Shimp is available (Elizabethtown Ranger District, Compartment 52). This specimen was collected at the Whoopie Cat Ecological Area. However, Mark A. Basinger annotated this specimen to be most likely *S. integrifolium*.

In Indiana, *Silphium trifoliatum* has been recorded in 22 counties, many of them in the southern 1/3 of the state, plus a few counties in the northeast corner of the state (Allen, Clark, Crawford, Decatur, DeKalb, Dubois, Floyd, Franklin, Greene, Harrison, Jefferson, Jennings, Lagrange, Lawrence, Martin, Monroe, Noble, Perry, Steuben, Warrick, Washington, and Whitley; Indiana Natural Heritage Database Center-September 2003 and Kirk W. Larson, Botanist-Hoosier National Forest, pers. comm., Yatskievych 2000).

The Indiana University Herbarium has 22 county records from 1896-1945 (Eric Knox, Curator, pers. comm.; Allen: 1905, 1914, 1934; Clark: 1910, 1920; Crawford: 1899, 1902, 1932, 1934; Decatur: 1911; DeKalb: 1908; Floyd: 1911, 1934; Franklin: 1927, 1937; Harrison: 1915, 1932; Jefferson: 1876, 1929, 1931, 1933-1934; Jennings: 1911; Lagrange: 1914, 1930, 1932-1935; Lawrence: 1912; Martin: 1919, 1915; Monroe: 1930; Noble: 1914, 1932, 1934; Orange: 1945; Perry: 1912; Posey: 1919; Steuben: 1931; Warrick: 1919; Washington: 1922, 1926, 1930; and Whitley: 1896, 1914, 1933). Also, at the Friesner Herbarium four counties records from 1932-1949 (Crawford: 1932-two specimens; Franklin: 1937-two specimens; Harrison: 1932, 1937; Jefferson: 1949) can be found for *Silphium trifoliatum* (Rebecca Dolan, Director, pers. comm.). Finally, the Illinois Natural History Survey Herbarium has one specimen collected in Orange County (1990).



Out of the nine counties that make the Hoosier National Forest *Silphium trifoliatum* can be found in eight of them (Brown, Crawford, Dubois, Lawrence, Martin, Monroe, Orange, and Perry). Based on the risk evaluation assessment conducted by Steve Olson (USFS-Natural Resource Specialist) in 1999, *Silphium trifoliatum* is



**State Status:** Alabama (SNR), District of Columbia (S1), Georgia (SNR), Illinois (S1)\*, Indiana (SNR), Kentucky (SNR), Louisiana (SNR), Maryland (S3), Michigan (SNR), Mississippi (S4), New York (SNR), North Carolina (S3), Ohio (SNR), Pennsylvania (SNR), South Carolina (SNR), Tennessee (S3S4), Virginia (SNR), West Virginia (SNR). In Ohio, New York, Tennessee, and West Virginia the Natural Heritage Programs do not have data on the species since it is not considered rare (Greg Schneider, Ohio Natural Heritage Program; Steve Young, New York Natural Heritage Program, Kirstin Condict, Data Manager, Tennessee Department of Environment and Conservation, Division of Natural Heritage, Paul J. Harmon, West Virginia Natural Heritage Program, pers. comms.). (NatureServe Explorer 2004; S1 - Critically Imperiled: Critically imperiled in a state because of extreme rarity [often 5 or fewer occurrences] or because of some factor[s] such as very steep declines making it especially vulnerable to extirpation from the state; S3 - Vulnerable: Vulnerable in a state due to a restricted range, relatively few populations [often 80 or fewer], recent and widespread declines, or other factors making it vulnerable to extirpation; S4 - Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors; S? - Inexact or Uncertain: Denotes inexact or uncertain numeric rank; S#S# - Range Rank: A numeric range rank [e.g., S3S4] is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank [i.e., S3S4]; SNR - Unranked: State conservation status not yet assessed; see Appendix 2).

\*Although *Silphium trifoliatum* was listed as an endangered species in Illinois until 2003, the IL Endangered Species Protection Board has decided to remove the species from the 2004 Illinois Threatened and Endangered List (ILESPB 2003, Dolbeare 2004). One of the justifications given for such action is that Mohlenbrock (2002) did not include *Silphium trifoliatum* in his latest revision of Guide to the Vascular Flora of Illinois.

## POPULATION BIOLOGY AND VIABILITY

Based on the global and state status (see above) few populations have been reported or the species seems to be secured across its range. For example, in Tennessee this species is considered very common (Kirstin Condict, Data Manager, Tennessee Department of Environment and Conservation, Division of Natural Heritage, pers. comm.). In Illinois, an element of occurrence from Hardin County reported that a population of approximately six plants was found (September 25, 1986, Illinois Natural Heritage Database, Olson 1989), but a publication by Olson (1989) about the same population only reported four individuals. However, *Silphium trifoliatum* is now believed to be extirpated from Illinois.

In Indiana, based on a risk evaluation assessment conducted by Steve Olson (USFS-Natural Resource Specialist) at the Hoosier National Forest in 1999, *Silphium trifoliatum* appears stable, increasing or within natural population fluctuations. In addition, the populations seem to be adaptable and resilient (Kirk W Larson, Botanist-Hoosier National Forest, pers. comm.).

The potential threats listed below can have negative impacts on the structure and viability of *Silphium trifoliatum* populations, since most of them can lead to reduction in population size or plant recruitment.

## POTENTIAL THREATS

Because in most of its range this species is common or the Natural Heritage programs have not gathered information on the species, it is difficult to determine the main threats for *Silphium trifoliatum*. However, as with any other threatened, endangered, and sensitive species habitat loss and habitat changes (e.g., woody vegetation encroachment, invasion by exotic plant species) could be threats associated with *Silphium trifoliatum*.

In the Hoosier National Forest, habitat integrity is not considered a threat since where the species has been found, the habitat has been protected or special management is conducted. Nonetheless, Steve Olson's 1999 risk evaluation points out that the woodland habitats may need some management and barrens, old fields, and roadsides should be kept open, suggesting that vegetation encroachment may be a problem for the species (Kirk W Larson, Botanist-Hoosier National Forest, pers. comm.). However, management practices such as occasional mowing to maintain some of these open areas may result in the mowing of *Silphium trifoliatum* individuals, but this species appears to be tolerant of such disturbances. In the case of the Shawnee National Forest and Monongahela National Forest no information is available regarding this subject. It should be noted that *Silphium trifoliatum* can respond favorably to fire (Olson 2002).

Insect attacks in particular gall-insects, may be a threat for *Silphium trifoliatum*. Research conducted on other *Silphium* species have shown that gall-insect attacks can have negative impacts. Fay and Hartnett (1991) and Fay et al. (1996) reported that galled shoots of *S. integrifolium* had reduced shoot growth, leaf and flower head production, and delayed flowering compared to gall-free control shoots, but individual flower head weight, the numbers of achenes per flower head or achene weight was not reduced. If plants have a high proportion of galled shoots their response will be to have lower total biomass, a lower proportion of total biomass allocated to flower heads, higher allocation to leaves, but no change in allocation to stems or rhizome.

In addition, as with most species of *Silphium*, *Silphium trifoliatum* can hybridize with closely related species. For example, Allison and Stevens (2001) found that *Silphium trifoliatum* var. *latifolium* could hybridize with *S. glutinosum* near the Ketona Glades, Bibb County Alabama. These hybridization events can result in a hybrid zone, hybrid swarm, and a hybrid taxon. All of them have the potential of stressing the genetic integrity or viability of *Silphium trifoliatum* populations.

Besides the above potential threats, collection of *Silphium trifoliatum* seeds for commercial use may become a problem, especially when used outside the range of the species. Many catalogs such as the Pine Ridge Gardens in Arkansas (W3) and Goodwin Creek Gardens in Oregon (W4) are selling *Silphium trifoliatum*. However, on a positive

note within the species range environmental consulting firms such as Envirotech in Ohio are using this species in habitat restoration (W5).

## RESEARCH AND MONITORING

Botanists from the Shawnee, Monongahela, and Hoosier National Forests are actively looking for new populations of *Silphium trifoliatum*, since Forest Service policy dictates that forest areas proposed for any type of management activity are first inventoried (ground or map surveys of known occurrences) to determine if and how the habitat for this species may be affected (Shimp 2001). Systematic inventories are needed to determine new locations for this species in Illinois, Indiana, West Virginia, and the rest of its range. As with many threatened, endangered, and sensitive species no known monitoring programs are currently taking place. A long-term monitoring program must be developed to be able to determine demographics and population size.

Research to gather information on natural history, reproductive biology, genetic diversity, and the impact of management techniques may have on the species are needed. In addition, research should be conducted to determine if *Silphium trifoliatum* is attacked by gall-insects and how this attack can affect seed production, since this has been shown in other *Silphium* spp. Also, it will be interesting to determine if this *Silphium* species has an endophytic insect community as has been shown with *S. laciniatum* and *S. terebinthinaceum* (Tooker and Hanks 2004a,b). All this information is needed to develop the best conservation and management strategies.

## SUMMARY

*Silphium trifoliatum* is a perennial plant with two varieties (var. *trifoliatum* and var. *latifolium*) that occurs in Alabama, District of Columbia, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maryland, Michigan, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia. *Silphium trifoliatum* can be found in prairies, glades (e.g., limestone), barrens, savannas, disturbed open places (e.g., pastures, old fields, railway right-of-way), and meadows. Across its range *S. trifoliatum* is believed to be critically imperiled to apparently secure, but limited information is available regarding its abundance. In Illinois, this species is believed to be extirpated. *Silphium trifoliatum* has been designated as a Regional Forester's Sensitive species at the Shawnee National Forest. In the Hoosier National Forest and the Monongahela National Forest *Silphium trifoliatum* has been reported present within the boundaries, but is not designated as a Regional Forester's Sensitive species because it is believed that it is not at risk. Hybridization, insect attack, and commercial uses can be potential threats for this species, in addition to habitat loss.

Due to insufficient data on several aspects of the species biology it is very difficult to assess the effects that environmental, demographic, and genetic stochasticity, natural catastrophes, and anthropogenic activities may have upon *Silphium trifoliatum*. Searchers for new populations and research on life history, habitat requirements, and

threats should be conducted. All of this information is needed if a best conservation and management strategies are desired for this species in National Forest lands.

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Clevinger, J.A. *Silphium*. Submitted to Flora of North America December 2002.

#### **Web pages cited**

W1- Insect Visitors of Prairie Wildflowers in Illinois: <http://www.shout.net/~jhilty/>

W2- The North Carolina Natural Heritage Program  
<http://www.ncsparks.net/nhp/county.html>

W3- Pine Ridge Gardens in Arkansas: [http://www.pineridgegardens.com/2003\\_Per3.htm](http://www.pineridgegardens.com/2003_Per3.htm).

W4- Goodwin Creek Gardens in Oregon: <http://www.goodwincreekgardens.com>.

W5- Envirotech in Ohio: <http://www.envirotechcon.com/>.

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*Illinois Natural Heritage Database*  
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*Freeman Herbarium Database at Auburn University.* Currently this online database is unavailable, for information contact:

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*United States National Herbarium*  
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#### **Photos**

Cover page of *Silphium trifoliatum* var. *latifolium* taken from A botanical lost world in Bibb County Alabama by James Allison and photo by James Allison:  
<http://www.mindspring.com/~jallison/lostworld.htm>

Pages 7 photos taken by Dave Dvorak (reddish flowering stem, *Silphium trifoliatum* var. *trifoliatum*), James Allison (*Silphium trifoliatum* var. *latifolium*), and Daniel Reed (inflorescence, www.2bnthewild.com).

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## APPENDIX 1 - Insect visitors of *Silphium* spp. in Illinois

(From Insect Visitors of Prairie Wildflowers in Illinois: <http://www.shout.net/~jhilty/>)

### ***Silphium integrifolium* (Rosinweed)**

**Bees** (long-tongued): Apidae (Apinae): *Apis mellifera*; Apidae (Bombini): *Bombus impatiens*, *Bombus vagans*; Anthophoridae (Ceratinini): *Ceratina dupla dupla*; Anthophoridae (Epeolini): *Triepeolus concavus*, *Triepeolus remigatus*, *Triepeolus simplex*; Anthophoridae (Eucerini): *Melissodes agilis*, *Melissodes coloradensis*, *Melissodes trinodis*, *Svastra obliqua obliqua*; Anthophoridae (Xylocopini): *Xylocopa virginica*; Megachilidae (Megachilini): *Megachile brevis brevis*, *Megachile inimica sayi*, *Megachile mendica*, *Megachile montivaga*, *Megachile petulans*, *Megachile policularis*, *Megachile pugnatus*

**Bees** (short-tongued): Halictidae (Halictinae): *Agapostemon sericea*, *Halictus ligatus*; Andrenidae (Andreninae): *Andrena accepta*

**Flies**: Bombyliidae: *Systoechus vulgaris*; Conopidae: *Physocephala tibialis*; Tachinidae: *Gymnoclytia occidua*

**Butterflies**: Nymphalidae: *Danaus plexippes*, *Vanessa cardui*; Pieridae: *Colias eurytheme*, *Pieris rapae*

**Moths**: Ctenuchidae: *Cisseps fulvicollis*

**Beetles**: Cantharidae: *Chauliognathus pennsylvanicus*

### ***Silphium laciniatum* (Compass Plant)**

**Bees** (long-tongued): Apidae (Apinae): *Apis mellifera*; Apidae (Bombini): *Bombus bimaculatus*, *Bombus fervidus*, *Bombus griseocallis*, *Bombus pennsylvanicus*, *Bombus vagans*; Anthophoridae (Ceratinini): *Ceratina dupla dupla*; Anthophoridae (Epeolini): *Triepeolus concavus*, *Triepeolus lunatus concolor*; Anthophoridae (Eucerini): *Melissodes agilis*, *Melissodes bimaculata bimaculata*, *Melissodes coloradensis*, *Svastra obliqua obliqua*; Megachilidae (Megachilini): *Megachile brevis brevis*, *Megachile parallela parallela*, *Megachile pugnata pugnata*

**Bees** (short-tongued): Halictidae (Halictinae): *Agapostemon texanus texanus*, *Agapostemon virescens*, *Halictus ligatus*, *Lasioglossum imitatus*, *Lasioglossum pilosus pilosus*

**Flies**: Syrphidae: *Allograpta obliqua*, *Eristalis stipator*, *Eristalis transversus*, *Tropidia mamillata*; Bombyliidae: *Systoechus vulgaris*, *Villa alternata*; Conopidae: *Zodion fulvifrons*, *Zodion obliquefasciatum*

Butterflies: Nymphalidae: *Danaus plexippes*; Pieridae: *Colias philodice*

***Silphium perfoliatum* (Cup Plant)**

Bees (long-tongued): Apidae (Apinae): *Apis mellifera*; Apidae (Bombini): *Bombus fraternus*, *Bombus griseocallis*, *Bombus impatiens*, *Bombus pensylvanica*, *Bombus vagans*; Anthophoridae (Ceratinini): *Ceratina dupla dupla*; Anthophoridae (Epeolini): *Triepeolus concavus*, *Triepeolus lunatus concolor*, *Triepeolus lunatus lunatus*, *Triepeolus remigata*, *Triepeolus simplex*; Anthophoridae (Eucerini): *Melissodes agilis*, *Melissodes bimaculata bimaculata*, *Melissodes coloradensis*, *Melissodes denticulata*, *Melissodes rustica*, *Melissodes trinodis*, *Melissodes vernoniae*, *Svastra obliqua obliqua*; Megachilidae (Coelioxini): *Coelioxys germana*; Megachilidae (Megachilini): *Megachile brevis brevis*, *Megachile inimica sayi*, *Megachile mendica*, *Megachile petulans*, *Megachile pugnatus*

Bees (short-tongued): Halictidae (Halictinae): *Agapostemon sericea*, *Agapostemon splendens*, *Agapostemon virescens*, *Augochlorella striata*, *Halictus ligatus*, *Halictus rubicunda*, *Lasioglossum imitatus*, *Lasioglossum pectoralis*, *Lasioglossum pilosus pilosus*, *Lasioglossum versatus*; Halictidae (Nomiinae): *Nomia triangulifera*; Andrenidae (Andreninae): *Andrena accepta*, *Andrena aliciae*; Andrenidae (Panurginae): *Heterosarus labrosiformis labrosiformis*, *Pseudopanurgus rugosus*

Wasps: Sphecidae (Sphecinae): *Ammophila procera*; Vespidae: *Polistes dorsalis*; Scoliidae: *Scolia bicincta*

Flies: Syrphidae: *Allograpta obliqua np*, *Eristalis tenax*, *Milesia virginensis np*; Bombyliidae: *Exoprosopa fasciata*, *Poecilanthrax alcyon*, *Sparnopolius confusus*, *Systoechus vulgaris*, *Villa alternata*; Conopidae: *Zodion obliquefasciatum*; Tachinidae: *Archytas aterrima*

Butterflies: Nymphalidae: *Chlosyne nycteis*, *Danaus plexippes*, *Limenitis archippus*, *Limenitis arthemis astyanax*, *Polygonia interrogationis*, *Vanessa atalanta*, *Vanessa cardui*, *Vanessa virginensis*; Lycaenidae: *Lycaena hyllus*; Pieridae: *Colias philodice*, *Pieris rapae*, *Pontia protodice*; Papilionidae: *Battus philenor*, *Papilio cressphontes*, *Papilio glaucus*, *Papilio troilus*

Skippers: Hesperidae: *Anatrytone logan*, *Epargyreus clarus*, *Pholisora catyllus*, *Poanes zabulon*, *Polites themistocles*

***Silphium terebinthinaceum* (Prairie Dock)**

Birds: Trochilidae: *Trochilus colubris*











Bees (long-tongued): Apidae (Apinae): *Apis mellifera fq*; Apidae (Bombini): *Bombus bimaculatus*, *Bombus impatiens*, *Bombus pensylvanica*; Anthophoridae (Ceratinini): *Ceratina dupla dupla*; Anthophoridae (Eucerini): *Melissodes agilis*, *Melissodes coloradensis*, *Svastra obliqua obliqua*; Megachilidae (Megachilini): *Megachile brevis brevis*

Bees (short-tongued): Halictidae (Halictinae): *Agapostemon sericea*, *Halictus ligatus*, *Halictus rubicunda*

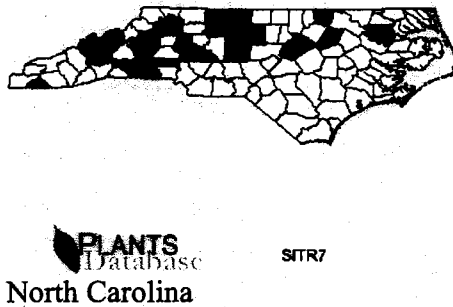
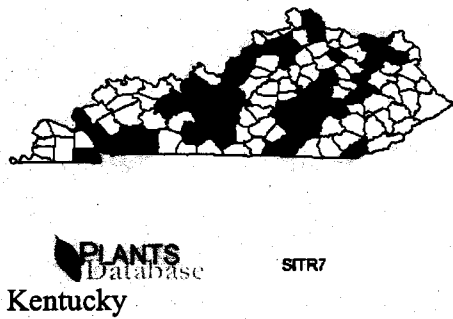
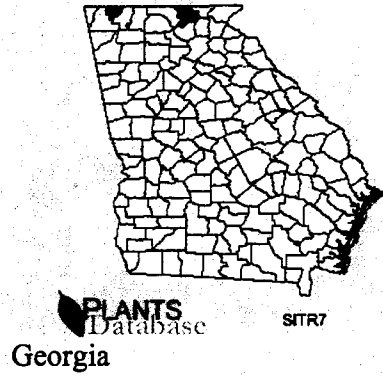
Wasps: Sphecidae (Sphecinae): *Ammophila procera*

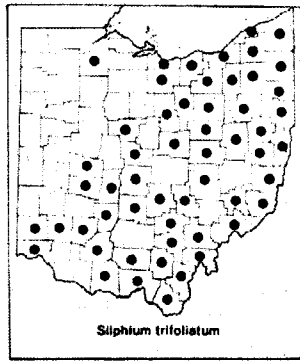
Flies: Bombyliidae: *Sparnopolius confusus*, *Systoechus vulgaris*

**APPENDIX 2 - Distribution map color codes for state conservation status**  
(NatureServe Explorer 2004).

	<b>SX:</b> Presumed Extirpated
	<b>SH:</b> Possibly Extirpated
	<b>S1:</b> Critically Imperiled
	<b>S2:</b> Imperiled
	<b>S3:</b> Vulnerable
	<b>S4:</b> Apparently Secure
	<b>S5:</b> Secure
	Not Ranked/Under Review

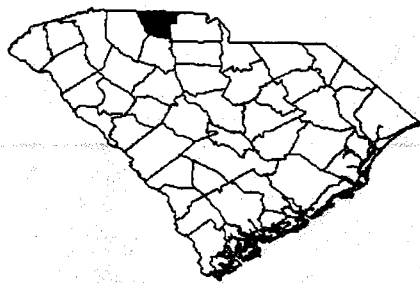
**APPENDIX 3 - State county distribution maps.** These maps may not show all the possible county records within a state. Maps were taken from the following online resources: the PLANTS Database (<http://plants.usda.gov/>).





*Silphium trifoliatum*

Ohio



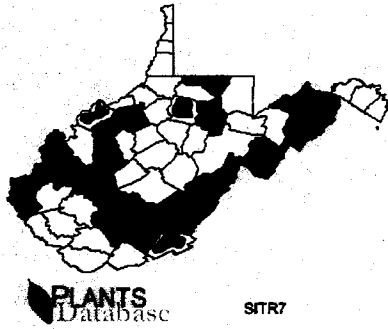
PLANTS Database  
South Carolina

SITR7



PLANTS Database  
Virginia

SITR7



West Virginia (black counties are new county records, Paul J. Harmon WVHP, pers. comm.)