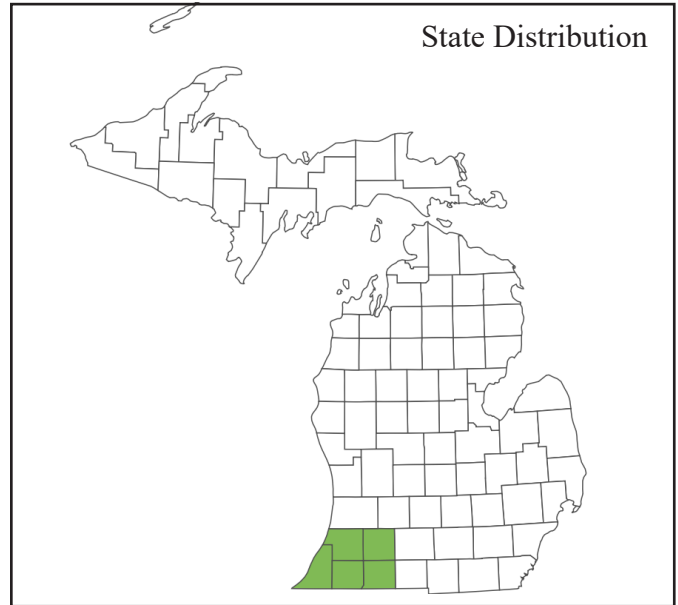




Photo by Brad Slaughter



Best Survey Period



Status: State threatened

Global and state rank: G5/S2

Other common names: whole-leaf rosinweed, entire-leaf rosinweed, prairie rosinweed

Family: Asteraceae (sunflower family)

Taxonomy: *Silphium* is a New World genus represented by 12 species north of Mexico (Clevinger 2006). Rosinweed is one of four species of *Silphium* native to Michigan. The genus name *Silphium* comes from the Greek name *silphion*, used to refer to a resin-bearing plant found on ancient coins from northern Africa (Clevinger 2006). The specific epithet means “with entire or uncut leaves” (Missouri Botanical Garden 2023). Genetic investigations have determined that *S. integrifolium* is most closely related to the common prairie cup plant (*S. perfoliatum*, State Threatened), and Appalachian rosinweed (*S. wasiotense*) (Clevinger and Panero 2000).

Multiple theories have been put forward as to the genetic and geographic origins of this species. Settle and Fisher (1972) split the species into three varieties: *S. var. integrifolium*, *S. var. neglectum*,

and *S. var. deamii*. More recent sources include two varieties, *S. integrifolium var. integrifolium* (which encompasses the previous *S. var. deamii*), and *S. integrifolium var. laeve*, which includes the outdated species *S. speciosum* (Gleason and Cronquist 1991; Clevinger 2006; Yatskievych 2006). *Silphium integrifolium var. integrifolium* can be distinguished from *S. integrifolium var. laeve* by its pubescent to scabrous phyllaries (vs. glabrous) and its 12-22 ray florets per head (vs. 20-36+). Plants in Michigan fall under *S. integrifolium var. integrifolium*, though *S. integrifolium var. laeve* is known as an exotic element from adjacent Ontario (Clevinger 2006; NatureServe 2023).

Raduski et al. (2021) identified three distinct genetic groups (East, South, and West), and proposed that one ancestral population was forced to split into two lineages (East and South/West), and that the latter population split again to produce three total taxa. The authors place the eastern clade within *S. integrifolium var. integrifolium* and the south/west clade within *S. integrifolium var. laeve*. This study did not include Michigan plants, but based on the populations in Illinois and Wisconsin, Michigan would fall into the eastern lineage (Raduski et al. 2021).



Settle and Fisher (1972) believed that *S. integrifolium* originated within the tallgrass prairie region. However, Raduski et al. (2021) propose that rosinweed most likely originated from the southeast US, and radiated outwards to the Midwest prairies, including Michigan, after the last glaciation. They suggest that this species did not originate within Midwest prairie habitats, but rather in the southeast (e.g. Mississippi and Texas), perhaps in a disjunct prairie habitat. However, more research is needed to definitively say the habitat from which rosinweed originated.

Total range: Michigan is at the northeastern edge of the natural range of *S. integrifolium*, which is found south to Alabama and west to New Mexico (Clevinger 2006). It is listed as SH (Possibly Extirpated) in Colorado, S1 (Critically Imperiled) in South Dakota and Wyoming, S2 (Imperiled) in Michigan, S3 (Vulnerable) in Kentucky, and secure or unranked in Alabama, Arkansas, Illinois, Indiana, Iowa, Kansas, Louisiana, Mississippi, Missouri, Nebraska, New Mexico, Ohio, Oklahoma, Tennessee, Texas, and Wisconsin. In Canada it is considered an exotic species (NatureServe 2023).

State distribution: Rosinweed has been documented in over 40 occurrences from seven counties in southern Lower Michigan, with most sites in Berrien, Cass, and Kalamazoo counties in southwest Michigan (MNFI 2023). It occurs primarily in the Southern Lower Peninsula Hills and Plains ecoregion, which is a heterogeneous mix of glacial hilly and rolling landscapes associated with the Saginaw, Lake Michigan, and Huron-Erie lobes of the Laurentide ice sheet (Albert 1995). Several restoration plantings have resulted in additional populations throughout southern Lower Michigan, as this species is common in prairie seed mixes and plantings (Reznicek et al. 2011, Prairie Moon Nursery 2023, Wildtype Native Plant Nursery 2023). These populations, which often occur outside of the counties listed, are not considered native.

Recognition: Rosinweed is a stout forb (40-200

cm tall) of wet to dry-mesic prairies, savannas, and fens. The hairy stem is sparsely clad with opposite, sessile (often clasping), broad-based, and lanceolate to ovate or elliptic leaves (to 15 cm long), with smooth or finely serrated margins and a rough upper surface. The inflorescence is compact with several large, sunflower-like heads (4-8 cm across) with 12-36+ yellow rays (2-5 cm long) and a yellow center disk (1.5-2.5 cm wide), which appear in mid-summer (Gleason and Cronquist 1998; Clevinger 2006). Heads are subtended by an involucre of phyllaries (bracts) with reflexed tips. It has a deep central taproot (Reznicek et al. 2011, Missouri Botanical Garden 2023).

This *Silphium* differs from three other native *Silphium* species in its opposite leaves and sessile leaf bases (Reznicek et al. 2011). Some *Silphium* resemble *Helianthus* but differ in their functionally staminate (vs. perfect) disc florets, pistillate (vs. sterile) ray florets, and frequently in their relatively large, broad outer involucral bracts (Yatskievych 2006). It could also be mistaken for false sunflower (*Heliopsis helianthoides*), but *Silphium* can be differentiated by having entire and sessile upper leaves, while *Heliopsis* has toothed and petioled leaves (Reznicek et al. 2011).

Best survey time/phenology: This species flowers from late June to late September, which is the optimal survey period.

Habitat: Rosinweed occurs in prairie remnants along roads and railroad tracks or in cemeteries, in wet-mesic prairies and fens on sapric peat and loams, and on dry-mesic to mesic loams and sandy loams. Preferred habitat is prairie fen and dry-mesic prairie, but rosinweed occasionally occurs in both drier and wetter natural communities (MNFI 2023). It can persist after some disturbance and can be found growing among a suite of non-native species or in formerly open communities that have succeeded to shrubland (Swink and Wilhelm 1994, MNFI 2023)

Open habitat is required for long-term persistence of this species, which occurs in a variety of prairie



and savanna natural communities, including bur oak plains, mesic prairie, mesic sand prairie, oak barrens, oak openings, prairie fen, wet prairie, wet-mesic prairie, and wet-mesic sand prairie. Many of these natural communities have been reduced to less than 1% of their historical range (Kost 2004). As these communities experience succession via shrub and tree invasion, available habitat for this species decreases, causing population declines. Many of the remnant habitats for this species are described as being degraded through shrub and tree invasion, invasive species, and improper management including lack of fire, mowing, and pesticide use along powerline and railroad rights-of-way (MNFI 2023).

Populations outside of the historical range of rosinweed are not treated as native occurrences. These occurrences are often the result of prairie restoration seeding. The same is true of populations within the historical range that are clearly planted (e.g., occurring in locations that never supported suitable habitat, in locations that were severely degraded followed by restoration efforts, or occurring with prairie-planting indicator species such as purple coneflower [*Echinacea purpurea*, State Extirpated]).

Associated plants include *Allium cernuum* (nodding wild onion), *Andropogon gerardii* (big bluestem), *Asclepias tuberosa* (butterfly-weed), *Carex stricta* (tussock sedge), *Coreopsis tripteris* (tall tickseed), *Cornus foemina* (gray dogwood), *Dasiphora fruticosa* (shrubby cinquefoil), *Desmodium canadense* (showy tick-trefoil), *Euphorbia corollata* (flowering spurge), *Eutrochium maculatum* (Joe-Pye-weed), *Helianthus divaricatus* (woodland sunflower), *Monarda fistulosa* (wild-bergamot), *Ratibida pinnata* (yellow coneflower), *Rubus flagellaris* (northern dewberry), *Schizachyrium scoparium* (little bluestem), *Silphium terebinthinaceum* (prairie-dock), *Solidago altissima* (tall goldenrod), *Solidago rigida* (stiff goldenrod), *Spartina pectinata* (cordgrass), *Thalictrum dasycarpum* (purple meadow-rue), *Thelypteris palustris* (marsh fern), *Tradescantia*

ohiensis (common spiderwort), *Vernonia missurica* (Missouri ironweed), *Veronicastrum virginicum* (Culver's-root), and *Zizia aurea* (golden Alexanders) (MNFI 2023).

Biology: Rosinweed is a deep-rooted, long-lived, perennial herbaceous flowering plant. It is dependent on pollinators due to mechanical barriers and self-incompatibility. This species is attractive to bees, most commonly large apids (*Apis mellifera*, *Svastra obliqua*, *Melissodes* spp.) and small-bodied halictids (*Lasioglossum* spp.), and its seeds are wind dispersed (Prasifka et al. 2017). Insect herbivory by the cynipid gall wasp (*Antistrophus silphii*), which is the most abundant herbivore of rosinweed, has been shown to reduce shoot growth and leaf and flower production, and delayed flowering compared with gall-free plants (Fay and Hartnett 1991). White-tail deer (*Odocoileus virginianus*) occasionally feed on this species, but it is not a preferential food source and most herbivory comes the cynipid gall wasp (Anderson et al. 2001).

Conservation/management: *Silphium integrifolium* populations thrive best in prairie habitat with full sun. All Michigan records are occurrences within small patches of prairie and prairie fen, and remnants of oak barrens and other savannas. This species was much more common and wide-ranging prior to European colonization and has suffered severe impacts as Michigan's grassland communities have been converted to agriculture and fragmented by development and encroached on by woody plants and/or invasive species due to fire exclusion. Through these processes, prairie habitat acreage has been reduced to less than 1% of historic prairie habitat (Kost 2004). There are currently 42 extant populations and 7 populations designated as historical or extirpated; however, 17 of the known extant populations have not been surveyed since 1990 (MNFI 2023).

In addition, the loss of landscape and anthropogenic processes that maintained these communities,



such as natural wildfires, train-caused fires along railroad tracks, and the use of fire as a management tool by Native Americans, has ultimately led to canopy closure where habitat was not converted or destroyed. Rosinweed has thus been restricted to relatively small remnants in former prairie-savanna regions, including disturbed grasslands and openings along roadsides and other types of rights-of-way where it is unlikely to be viable over the long term.

Known activities that have led to extirpated populations include mowing, commercial and residential development, drain construction, conversion to agriculture, ORV traffic, grazing, herbicide, and road widening. Specifically, railroad and roadside management activities have had a significant impact on this and other prairie species, either through abandonment, which allows for shrub encroachment, or intensified management, especially mowing combined with herbicide. However, railroads with minimal management have acted as refugia for this and other prairie species. This is often the case for prairie plants because railroad rights-of-way were never plowed for agriculture, and experienced occasional wildfires caused by sparks from trains (Harrington and Leach 1989).

Land development is a threat to this and other prairie species. Impacts to populations should be avoided if at all possible. If projects are anticipated to impact populations, mitigation measures should be taken such as transplanting, re-seeding, or habitat improvements elsewhere. Several populations are surrounded by incompatible land uses such as farm fields, residential home construction and industrial development. Eighteen extant populations are within current or abandoned railroad, utility, or road rights-of-way. Management practices such as prescribed fire would help to maintain open conditions required by rosinweed.

Permanent conservation of habitat containing extant populations is important for species viability. Only five known populations have been permanently protected, one on a county park,

three on land conservancy properties, and one on a state game area. These populations and those on MDOT rights-of-way are good candidates for management in the form of prescribed fire and invasive species treatment. A large proportion of extant populations are found only on narrow railroad or utility rights-of-way which are bordered by private lands. Conservation of this species will require working with private and public landowners on management and protection.

Comments: Rosinweed is a common component of prairie seed mixes, and as such has expanded outside of its native range via prairie and savanna restorations. Land managers, especially those working within the native range, should keep detailed records including seed mix ingredients in order to track these plantings in the long term.

The common name refers to a gummy resin exuded from damaged tissue that Native Americans chewed as a gum. *Silphium* species were also used by the Meskwaki tribe to treat urinary tract infections, pain, kidney and orthopedic issues (Moerman 2003, Yatskievych 2006).

There has recently been interest in developing rosinweed (also known as silflower in agricultural contexts) for oilseed crops due to its fatty acids which are similar in composition to sunflowers (Reinert et al. 2019). It has also been proposed as a forage crop for livestock (Vilela et al. 2020).

Research needs: Older records with extant populations should be re-surveyed to document trends and management activities; where possible, document instances of introduction via prairie restoration seeding. *Silphium integrifolium* is also being grown as a domesticated plant for oil seeds (Vilela et al. 2020). This may provide an opportunity for further research into genetic differences between native and cultivated populations.

Research is needed on conservation options with private landowners and public utilities to protect and manage populations on these lands.



Related abstracts: bur oak plains, dry-mesic prairie, hillside prairie, mesic prairie, mesic sand prairie, oak openings, prairie fen, southern wet meadow, wet prairie, wet-mesic prairie, wet-mesic sand prairie, blue-eyed-grass, broad-leaved mountain mint, downy sunflower, Leiberg's panic-grass, rattlesnake-master, shooting star, violet wood-sorrel, white gentian, barn owl, black rat snake, Blanding's turtle, blazing star borer, dickcissel, dusted skipper, eastern box turtle, eastern massasauga, grasshopper sparrow, Henslow's sparrow, Kirtland's snake, migrant loggerhead shrike, northern harrier, Persius duskywing, phlox moth, prairie vole, short-eared owl, spartina moth, spotted turtle, Sprague's pygarcia.

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