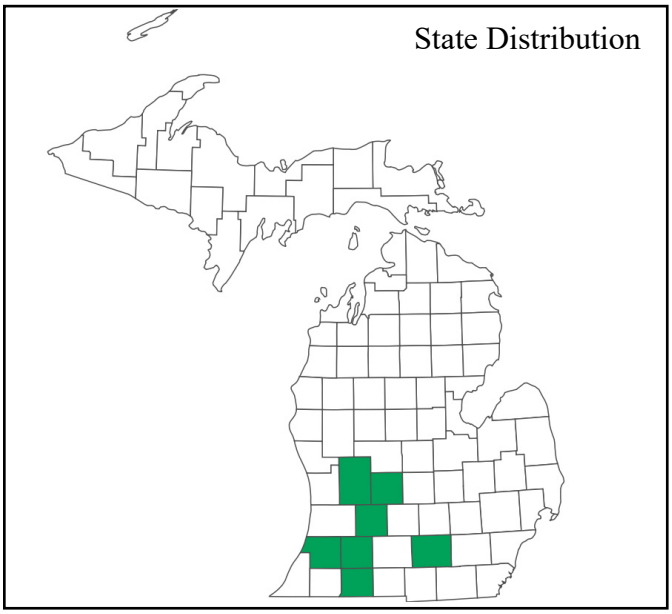
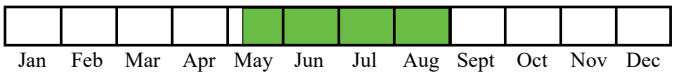
Synthyris bullii (Eaton) A. Heller — Kitten-tails



Best Survey Period



Common name: Kitten-tails

Legal status: State Endangered

Global and state rank: G3 (Globally Vulnerable) / S1 (State Critically Imperiled)

Other common names: Kitten-tail, kitten tails, coraldrops, Bull's coraldrops

Family: Plantaginaceae (plantain family)

Synonyms: *Besseya bullii* (Eaton) Rydb., *Veronica bullii* (Eaton) M. M. Mart. Ort. & Albach, *Wulfenia bullii* (Eaton) Barnhart, *Gymnandra bullii* Eaton, *Wulfenia houghtoniana* (Benth.) Greene, *Synthyris houghtoniana* Benth

Taxonomy: This species' genus has been the subject of ongoing revision. Long known as *Besseya bullii*, *Besseya* is now known to be nested within the related taxon *Synthyris*. Some authors prefer *Synthyris* to be recognized as a genus, in which case the name *S. bullii* applies (Hufford 2019), while others prefer *Synthyris* to be a subgenus of *Veronica*, in which case *V. bullii* applies (Albach et al. 2004). Others prefer ongoing recognition of *Besseya* until a consensus is reached (Reznicek et al. 2025). We follow NatureServe (2025) in using *Synthyris*. Whatever taxonomic rank is preferred for *Synthyris*, *Besseya*, and *Veronica*, these taxa are embedded within the Plantaginaceae, rather than the Scrophulariaceae in which they were long recognized (Tank et al. 2006). The specific epithet *bullii* honors George Bull, botanical assistant to Douglass Houghton during the First Geologic Survey of Michigan (Reznicek et al. 2025).

Total Range: The global range of *S. bullii* is limited to a small group of Midwest states: Illinois (S2; State Imperiled), Indiana (S1; State Critically Imperiled), Iowa (S3; State Vulnerable), Michigan (S1), Minnesota (S2), and Wisconsin (S3). It is protected in every state in which it occurs. *Synthyris bullii* is known only from historical records in Ohio, where it is ranked SX (Presumed Extirpated). iNaturalist (2025) observations and herbarium records suggest two central population hubs across its range, one in southeastern

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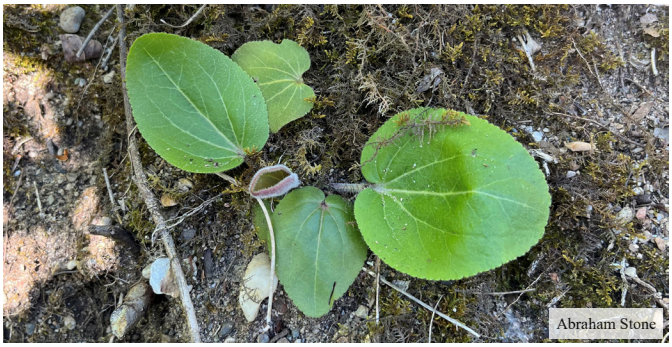
Wisconsin/northern Illinois and one south and east of the Minneapolis-St. Paul metro area in Minnesota and western Wisconsin.

State Distribution: As in most of its range, *S. bullii* has a sparse Michigan distribution, occurring locally in a handful of counties in south-central and southwest Michigan. Of the 19 known localities in Michigan, only six populations have been confirmed extant since 1990, with three occurrences in Jackson County, two in Kent County, and one each in St. Joseph and Barry Counties.

Recognition: *Synthyris bullii* is a perennial forb limited to sandy grasslands, hillside prairie remnants and adjacent oak savannas. Basal leaves are borne on petioles in a loose rosette, although the center of this rosette may be buried in soil. The hairy, leathery basal leaves are at least 25 mm broad, elliptic to broadly ovate in outline, often with a slight taper towards the tip, with crenate (rounded-teeth) margins and cordate (heart-shaped) bases (Hufford 2019, Reznicek et al. 2025). Leaves are deeply veined. Rosettes senesce each fall with new leaves produced each spring, typically by early April (Hufford 2019).

Synthyris bullii is most easily identified from late April to late May when it is in flower. The hairy unbranched stalk which bears the flowers and cauline leaves can reach 40 cm and supports up to 100 or more small yellow flowers tightly clustered throughout the spike-like raceme but especially dense towards the terminus. Flowers consist of three green sepals, a bilabiate (two-lipped) cream to yellow corolla with three to four petals, two stamens inserted on the petals, and a pistil with two carpels. Below the flowers, the raceme bears small, pointed cauline leaves (attached to the stem, not basal) placed alternately below the flowers. The fruit is a capsule (dry fruit that splits open apically to release the seeds) (Hufford 2019, Reznicek et al. 2025).

The combination of habitat preference, basal leaves in a loose rosette, and distinct inflorescence make *S. bullii* unlikely to be confused with any lookalikes



in Michigan.

Best survey time/phenology: *Synthyris bullii* is best observed between early May and late June, during which its erect inflorescence or infructesence is most likely to be visible. Outside of this period, *S. bullii* can be identified by its persistent basal rosette, which is visible throughout the growing season.

Habitat: In Michigan, *S. bullii* is strongly associated with hillside prairies, whether sites that remain open-canopied or in former hillside prairies that have converted to shrubland or forest due to fire suppression (Cohen et al. 2015). Hillside prairie is an open to sparsely canopied natural community occurring on steep south- and west-facing slopes, often at the ecotone between elevated oak savanna or oak forest and bodies of water, and has largely been extirpated from the state (Cohen et al. 2015). Nearly all Michigan occurrences of *S. bullii* are on hillsides facing water bodies (Hanes and Hanes 1947, MNFI 2025). *Synthyris bullii* also has similar habitat affinities in other states throughout its range (Post et al. 1984, Wilhelm and Rericha 2017).

Quercus alba (white oak), *Q. macrocarpa* (bur oak), and *Q. velutina* (black oak) are common overstory components where *S. bullii* has been located, with *Cornus* spp. (dogwoods), *Hamamelis virginiana* (witch-hazel), and *Sassafras albidum* (sassafras) frequently seen in the shrub layer. Herbaceous associates commonly include *Andropogon gerardii* (big bluestem), *Antennaria* spp. (pussytoes), *Carex pensylvanica* (Pennsylvania sedge), *Euphorbia corollata* (flowering spurge), *Eurybia macrophylla* (large-leaved aster), *Helianthus divaricatus* (woodland sunflower),

Hepatica americana (round-lobed hepatica), *Heuchera* spp. (alum roots), *Liatris* spp. (blazing stars), *Lithospermum canescens* (hoary puccoon), *Penstemon hirsutus* (hairy beard-tongue), and *Phlox pilosa* (prairie phlox). Several rare species have been recorded with *S. bullii* including *Bouteloua curtipendula* (side-oats grama, State Endangered), *Draba reptans* (common whitlow-grass, State Threatened), *Geum virginianum* (pale avens, State Threatened), and *Scutellaria parvula* (small skullcap, State Threatened).

Biology: *Synthyris bullii* is self-compatible and can reproduce both by outcrossing and self-pollination, although outcrossing yields a significantly higher seed set (McKone et al. 1995). Pollinators observed include multiple species of generalist bees in the family Halictidae (McKone et al. 1995). *Synthyris bullii* cannot be relied upon to flower every year, especially in shady conditions.

Studies focusing on the reproductive ecology of *S. bullii* have identified presence of full sun exposure as a driving factor in the production of viable seeds, with plants in shaded conditions having significantly fewer flowers, lower rates of fruit set, and lower seed viability (Chi and Milano-Flores 2016, Janssen et al. 2020). Furthermore, greenhouse studies of seed viability found that germination decreases precipitously more than two years after collection (Curtis et al. 2013, Janssen et al. 2020). Seed longevity in nature is less clear, though this suggests *S. bullii* may not establish a viable long-term seedbank.

Conservation/management: Due to a lack of recent survey data, it is difficult to characterize the status of *S. bullii* in Michigan, but the overall trend seems to be a decline in population sizes. This is likely due to the widespread loss of hillside prairie. Remaining hillside prairies are threatened by development, conversion to agriculture, habitat fragmentation, quarrying, and suppression of the natural disturbance regimes (i.e., fire and soil erosion) that maintain open canopy conditions. Invasive species, such as *Rhamnus cathartica* (common buckthorn), *Lonicera* spp. (non-native

honeysuckles), and *Elaeagnus umbellata* (autumn olive) threaten known populations through woody encroachment onto prairie and oak savanna.

Although many extant populations are limited to just a few individuals, historical documentation suggests that *S. bullii* was formerly a significant component of the hillside prairie community. Population estimates of 8 element occurrences (EOs) recorded in the 1980s ranged from 11 to more than 1000 individuals, with an average of 525 plants per EO. Among EOs with data after 2000, averages are significantly lower, with an average of 5.25 plants per EO (n = 5, range of 0 to 23 plants). An account of a Jackson County population estimated 2000 to more than 3000 individuals on a high-quality remnant hillside prairie in 1981. The same population, last observed in 2011, supported eight individuals in the same area, with the decline likely the result of woody species encroachment throughout the hillside (MNFI 2025).

Plants suffer under shady conditions, and the

decline of populations is often connected to loss of direct sun exposure (MNFI 2025). Furthermore, as mentioned in the Biology section, not only are populations physically stressed under full shade, but they are likely unable to successfully recruit individuals at a meaningful rate that would counteract population decline.

The future of *S. bullii* in Michigan likely depends upon active management of oak savanna and hillside prairies. Preservation of surviving S. bullii populations should focus on conservation of suitable habitat and maintenance of natural disturbance regimes. Prescribed fires to reduce shrub encroachment should be applied in March and early April before *S. bullii* leaves are above ground (Smith 2021). When prescribed fire is infeasible, mowing can be an effective tool for reducing shrub encroachment (Van Dyke et al. 2004). When feasible, hand-removal and chemical treatment of unwanted woody plants should supplement burning and mowing. Prairie remnants on hillsides, especially those on south- and west-facing slopes, should be thoroughly surveyed for relict populations. As many of the remaining sites are located on private property, communication with landowners is important for providing long-term stability for *S. bullii* in Michigan.

Comments: *Synthyris bullii* was considered for national protected status in the 1980s, citing habitat loss across its range as a driving influence in its decline (Chi and Molano-Flores 2012).

Research needs: A large-scale status survey is needed to determine the presence and potential viability of remaining *S. bullii* populations, many of which have not been surveyed since 1990 (MNFI 2025). Although efforts have been made to understand the reproductive biology of *S. bullii* (McKone et al. 1995, Curtis et al. 2013, Chi and Molano-Flores 2016, Janssen et al. 2020), few studies, if any, have investigated the long-term response of *S. bullii* to the savanna and prairie restoration attempts the species now relies upon. Research on *S. bullii*'s response to fire and canopy opening could provide insight into its general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ecology and physiology, which would provide land managers with more information on its proper stewardship.

Related abstracts: hillside prairie, side-oats grama

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