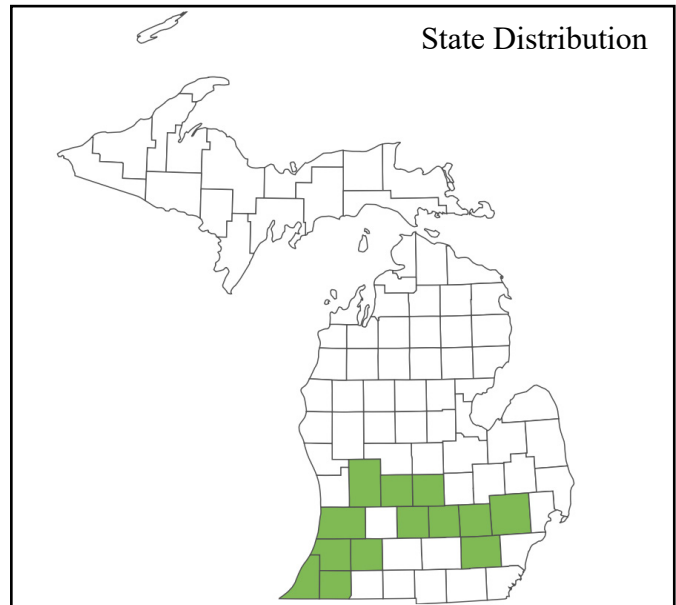
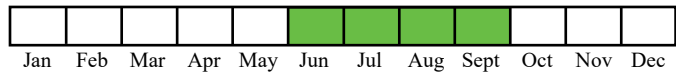




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Best Survey Period



Common name: slender yellow flax

Legal status: State Threatened

Global and state rank: G4G5 (Apparently Secure to Secure) / S2 (Imperiled)

Other common name(s): woodland flax, Virginia yellow flax, wild flax

Family: Linaceae (flax family)

Synonyms: *Cathartolinum virginianum* (L.) Rchb.; *Nezera virginiana* (L.) Nieuwl.

Taxonomy: The genus *Linum* is believed to have arisen in Eurasia and then spread to other continents: North America, South America, Africa, and Australasia (McDill et al. 2009). *Linum* is separated into several sections, best visually segregated by petal color, but they are also distinguished by range, glands, chromosome number, style morphology, fruit morphology, and pollen shape among other characteristics. *Linum virginianum* is in series Virginiana. In taxonomy, series is a subdivision of genus, narrower than

section but broader than species. Series Virginiana consists of *L. virginianum* plus six other yellow-petaled *Linum* species of eastern North America. All seven of these species have identical, separate styles; capsules with false septa partially or completely sectioning the fruit; pollen with three or fewer furrows (i.e., tricolpate, few-porate); and base number of chromosomes, $n=18$.

Total Range: The native range of *Linum virginianum* is eastern North America, occurring from Ontario and southern Maine in the north to Alabama and Georgia in the south and Iowa and Missouri in the west to the Atlantic coast in the east. Updated floras across the range of *L. virginianum* have noted its absence or reduced abundance in recent years.

Linum virginianum has been introduced in Japan and the Korean peninsula, but it is not considered a weed in Japan (Nishida et al. 2009).

State Distribution: Natural populations of *L. virginianum* have been found only in the southern half of Michigan's Lower Peninsula, below the climatic tension zone. There is documentation of 24



populations of *L. virginianum* in Michigan across 12 counties, with a concentration in Kalamazoo County (10). Most Michigan populations have not been observed since the late 1800s or early to mid-1900s. The few populations believed to be extant are in Kalamazoo County.

Recognition: *Linum virginianum* is a perennial herb with stems erect to 70 cm (26 in.) tall, glabrous, and often branching from the base. Leaves are arranged mostly opposite, with some alternate arrangement above the middle of the stem. Leaf shape can be spatulate, elliptic, oblanceolate, or obovate, length 15–25 mm (0.6–1 in.), width 3–7 mm (0.1–0.3 in.), apex acute to apiculate, and margins entire and not ciliate. **Leaves lack stipular glands** (glands found where the leaf meets the stem). Inflorescence consists of corymbs of a few long, slender, ascending-spreading branches on **pedicels terete or nearly so** that are 1–10 mm (0.04–0.4 in.) long. Both inner and outer sepals are persistent. Inner sepals are shorter, broader, and thinner than outer sepals, which are 2–4 mm (0.08–0.2 in.) long. Inner sepals often have a few small, sessile glands along the margin above the middle while outer sepals are entire with apex acute to acuminate. Petals are five, yellow, obovate, sometimes notched at the apex, and 3–5.5 mm (0.1–0.2 in.) long. Styles are separate, 1–2 mm (0.04–0.08 in.) long. Fruit is a capsule, 2–2.5 mm (0.08–0.1 in.) in diameter with complete or **nearly complete false septa and true septa with sparse appressed cilia**. Together, the false and true septa form 10 compartments. Seeds are 1–1.5 mm (0.04–0.06 in.) long and 0.6–0.9 mm (0.02–0.04 in.) wide.

Linum virginianum can be difficult to distinguish from other yellow-petaled *Linum* spp., especially those in series *Virginiana*. *Linum virginianum* can be distinguished from yellow-petaled *Linum* spp. outside of series *Virginiana*, like *L. sulcatum* (grooved yellow flax or furrowed flax), by its **lack of stipular glands and lack of glands and/or cilia on the margins of the outer sepals**. Within series *Virginiana*, *L. virginianum* can be distinguished



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easiest by the fruits: the carpels have **both traits of nearly complete to complete false septa and few appressed cilia along true septa margins**. Without the fruit, *L. virginianum* can be distinguished from *L. striatum* (stiff yellow flax) by its **wingless, terete upper stem** below the inflorescence and **inner sepals lacking prominent teeth** on the margin. *Linum virginianum* has **leaves nearly all opposite** and **capsules easily falling** while *L. medium* (small yellow flax) has all to nearly all leaves alternate and capsules persisting on the plant.

Best survey time/phenology: Flowers and more so the fruits are the best ways to distinguish *L. virginianum* from similar species. It is easiest to detect and identify when it flowers from June to August and fruits from July to September (MNFI 2024).

Habitat: The species is primarily documented in open woodlands, savannas, and prairies across its range, although it has been found infrequently in swamps and moist roadsides. Within the drier communities, records have described *L. virginianum* in mesic to moist microhabitats (e.g., depressions, riverbanks, shaded moist ground). Habitat in Michigan is difficult to define because most records are old and vague. Historic records frequently mention lakeshores and riverbanks (Cole 1901, Hanes and Hanes 1947, MNFI 2024). Recent documentation is generally from oak forests and openings, often on hillsides, and at transitional zones with wetlands (MNFI 2024).



This is consistent with its known habitat in the Chicago Region: black oak savannas, moist shores in interdunal swales, and mesic woodland (Wilhelm and Rehricha 2017).

Commonly associated trees and shrubs in Michigan include white oak (*Quercus alba*), black oak (*Q. velutina*), black cherry (*Prunus serotina*), pignut hickory (*Carya glabra*), shadbush (*Amelanchier* spp.), dogwoods (*Cornus florida*, *C. rugosa*), and sassafras (*Sassafras albidum*). Common ground and understory associates in Michigan include big bluestem (*Andropogon gerardii*), poverty grass (*Danthonia spicata*), panic grass (*Dichanthelium implicatum*, *D. sphaerocarpon*), slender satin grass (*Muhlenbergia tenuiflora*), black oatgrass (*Piptochaetium avenaceum*), Indian grass (*Sorghastrum nutans*), Pennsylvania sedge (*Carex pennsylvanica*), Swan's sedge (*C. swanii*), colic root (*Aletris farinosa*), smooth pussytoes (*Antennaria parlinii*), pale Indian plantain (*Arnoglossum atriplicifolium*), smooth false foxglove (*Aureolaria flava*), annual false foxglove (*A. pedicularia*), harebell (*Campanula rotundifolia*), New Jersey tea (*Ceanothus americanus*), flowering spurge (*Euphorbia corollata*), tick-trefoil (*Hylodesmum glutinosum*, *H. nudiflorum*) false dandelion (*Krigia biflora*), common wood rush (*Luzula multiflora*), rosin weed (*Silphium integrifolium*), goldenrods (*Solidago caesia*, *S. hispida*, *S. nemoralis*, *S. speciosa*, *S. rugosa*), prairie heart-leaved aster (*Symphotrichum oolentangiense*), and birdfoot violet (*Viola pedata*).

Biology: *Linum virginianum* is a perennial forb. It begins flowering in June and can have fruits by July. It senesces in October and November. Most *Linum* spp. are capable of being self-fertile and self-pollinating with “heavy” pollen that is not easily transported by wind. The flat flower shape and yellow color support generalist insects like thrips, small bees and butterflies, which visit the flowers for nectar. Several tests have shown that when cultivated *Linum* spp. are bee pollinated, the seed yields are greater than under self-fertilization



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circumstances. Hybridization is rare but has been reported among the species in series *Virginiana* (Robertson 1971).

No information was found on the seed dispersal methods of *L. virginianum*. The seeds of cultivated flax, *Linum usitatissimum*, produce an adhesive mucilage after wetting which may be essential to its seed dispersal (e.g., sticking to animals, passing quickly through animal digestive tracts). There are also reports of small birds eating the seeds or capsules of the genus. Caterpillars of the polyphagous lesser black-letter dart moth (*Xestia c-nigrum*) use *Linum* spp. as larval host plants.

Conservation/management: Most records of *L. virginianum* in Michigan are vague and considered historical. Analysis of suspected areas and conducting surveys in suspected suitable habitat would improve statewide assessment of the species. The primary conservation strategy for this species currently is the protection of its habitats including savannas and oak forests in the southern Lower Peninsula of Michigan and restoration of management practices like prescribed burning and grazing and restricting clear cutting in forested habitats. There are additional threats of invasive species encroaching on extant populations in Michigan: glossy buckthorn (*Frangula alnus*), black locust (*Robinia pseudoacacia*), and multiflora rose (*Rosa multiflora*). Black locust invasion is of particular concern because of its allelopathic changes to the soil and rate of spread. Some extant



Michigan populations are near trails and may be affected by erosion.

Comments: *Linum* spp. have been used for strings, cords, dyes, and cloth dating back hundreds of years (Strickland Hussey 1974, Cornett 2009). “Linseed” is derived from members of this genus, although *L. usitatissimum* is the species usually cultivated for seeds and seed oil (e.g., linseed oil, flaxseed oil, flax oil, flax). Products from the seeds and oils have been used medicinally in fomentations and cataplasms for treatment of inflammation, tumors, and postumes (Strickland Hussey 1974). More recently seed extract from *Linum* spp. has been used in hand dishwashing solution, ecofriendly adhesives, and nanoparticle synthesis solutions.

Research needs: There is little biological research on this specific species of *Linum*, and most of the information presented is generalized for the genus. Research into pollination, seed set and viability, and faunal relationships are desirable for this species. Several studies have shown a positive response of the species to disturbances such as fire and grazing (Dupont-Morozoff et al. 2022, MNFI 2024), but further studies into frequency and fire intensity could contribute to its conservation. Studies into the relationship between *L. virginianum* and soil chemistry may prove important as invasive species that alter soil chemistry such as black locust (*Robinia pseudoacacia*) invade their habitat.

Related abstracts: Bur oak plains, dry southern forest, dry-mesic southern forest, hillside prairie, oak barrens, oak openings, furrowed flax

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