

# *Linum intercursum*

**Sandplain Flax**

**Linaceae**



*Linum intercursum* by Margaret Curtin, 2021

## ***Linum intercursum* Rare Plant Profile**

New Jersey Department of Environmental Protection  
State Parks, Forests & Historic Sites  
State Forest Fire Service & Forestry  
Office of Natural Lands Management  
New Jersey Natural Heritage Program

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## Life History

*Linum intercursum* (Sandplain Flax) is an erect perennial herb with smooth, slender stems that are usually unbranched below the inflorescence or few-branched at the base. The pale green leaves are entire and narrowly elliptic to oblanceolate, with the lowest arranged in pairs and the upper alternate along the stem. The inflorescence is a branching panicle of five-parted flowers that measure 8–12 mm when fully open. The fruits are greenish-purple capsules that are obturbinate (shaped like upside-down tops) and longer than they are wide. The capsules readily split into ten carpels with pointed tips that persist on the plants (Bicknell 1912, Fernald 1950, Gleason and Cronquist 1991, Morin 2020). While *L. intercursum* may bloom between June and October (Weakley 2015), records from New Jersey specimens show flowering from late June to late August and fruiting from mid-July to mid-September (Hough 1983).



Scan courtesy of Harvard University Herbaria. Dried fruiting stems by Margaret Curtin, 2022.

*Linum intercursum* is one of six *Linum* species that have been documented in New Jersey. *L. usitatissimum* is a non-native, blue-flowered species that is widely cultivated for food and fiber and sometimes escapes. New Jersey's native *Linum* species are all yellow-flowered and visually similar, with overlapping characteristics that can make identification somewhat challenging even for experienced botanists (Bicknell 1912). The elongate fruiting capsules of *L. intercursum* are the best way to reliably distinguish it from other native flaxes in New Jersey which have capsules that are more or less spherical (Gleason and Cronquist 1991, Morin 2020).

Because there are so many species in the genus *Linum* (~180), much of the effort put into studying the group has focused on taxonomy and particularly on sorting the species into meaningful groups. The primary division forms three sections, generally defined by petal color, and *Linum intercursum* is in section Linopsis (Morin 2020). The yellow-flowered group is still quite large with 36 species in North America alone, so Rogers (1969) further identified five complexes within that section using morphological features. He placed *Linum intercursum* in the Virginianum complex along with six more species—three of those are the other New Jersey species with which Sandplain Flax is most likely to be confused in the field (*L. medium* var. *texanum*, *L. striatum*, and *L. virginianum*). Also included in the complex and perhaps the closest relation to *Linum intercursum* is *L. floridanum*, which it strongly resembles in both pollen structure (Xavier and Rogers 1963) and overall appearance (Bicknell 1912, Weatherby 1916). The close relationship among the species in Rogers' Virginianum complex has been further supported by molecular studies (McDill 2009).

### **Pollinator Dynamics**

No reports of pollinators for *Linum intercursum* were found. Murray (1986) observed that the genus *Linum* includes both self-compatible and self-incompatible species, but none of the species closely affiliated with *L. intercursum* were included in his study. Robertson (1971) asserted that all species of *Linum* indigenous to North America are homostylous, and that flowers having all styles of the same length are largely self-fertile. All of the *Linum* species in the Virginianum complex were also confirmed as homostylous by McDill (2009). Although insect associations have been identified for some of our native flaxes, the reports often included unspecified activity or nectar collection without confirmed pollination (Hilty 2020). Adams et al. (2010) listed several species of *Linum* known to be visited by a soft-winged flower beetle (*Listrus* sp.), but their account was based on published records of both pollinators and visitors so it is not clear whether the beetle plays an important role in fertilization of the flowers.

### **Seed Dispersal**

*Linum intercursum* has been referred to as a short-lived perennial plant (Clarke and Patterson 2007), and other members of the genus have also been characterized as short-lived including the closely related *L. floridanum* (Hinman and Brewer 2007). Despite the importance of regeneration strategies to short-lived species, no studies of seed dispersal, persistence, or establishment were found for *L. intercursum* or any of its near relatives. While the reproductive ecology of the cultivated flax *L. usitatissimum* has been well-researched (e.g. CFIA 2019), similarity between the two species cannot be presumed due to the broad range of morphological and ecological variation reported within the large genus.

Gravity dispersal has been surmised for some other native northeastern flaxes (Coastal Plain Plants 2021, The Echinacea Project 2022). The lack of any specialized structures on *L. intercursum* seeds indicates that they are likely to fall near the parent plant or to be carried a short distance by the wind, but either way dispersal is limited. A broader range of local seed dispersal is likely to occur in open habitats than in dense vegetation (Verkaar et al. 1983).

The New England Wildflower Society conducted some experiments with *Linum intercursum* and achieved successful germination following cold treatments (Zaremba 2003), but the extent of seed viability was not reported. Although *L. intercursum* and *L. floridanum* benefit from disturbances that maintain open habitats (Clarke and Patterson 2007, Hinman and Brewer 2007) the flaxes' success in those situations has not been directly attributed to regeneration from dormant seed.

### **Habitat**

*Linum intercursum* is primarily—but not exclusively—associated with the Atlantic coastal plain. Although it frequently occurs in dry, sandy places the species has been documented in habitats with a variety of soil types and moisture regimes. Elevations range from 0–800 meters (Morin 2020). Substrates may include sand, clay, or hardpan, and soils may be xeric, moist, wet, or alternately wet and dry (Snyder 1994, Rhoads and Block 2007, MANHESP 2015, Morin 2020). Indiana's disjunct population occupies a wet sand/muck flat community that includes "a remarkable assemblage of plants with coastal plain affinities" (Homoya et al. 1985).

Sandplain Flax is typically found in sites with an open canopy such as grasslands, moors, barrens, meadows, open thickets or pine scrub (Snyder 1994, Rhoads and Block 2007, MANHESP 2015). When *L. intercursum* does occur in a forested area it is often situated along a well-worn trail (Clarke 2006). The species may thrive in disturbed sites such as mown fields, firelanes, or utility right-of-ways (Clark and Patterson 2007, MANHESP 2015). Snyder (1994) reported it as abundant in drier portions of a recently burned Pitch Pine (*Pinus rigida*) lowland forest, and Clarke (2006) found that it was frequent in firelanes that were maintained and widened by harrowing. A study of microsite conditions within the firelanes found that the *L. intercursum* showed a significant preference for locations with low duff and low vegetative cover compared to the surrounding area. Clarke (2006) also identified a number of 'indicator species' that co-occurred with *Linum intercursum* at greater abundance or frequency than expected by chance, including *Aristida dichotoma*, *Hypericum gentianoides*, *Lechea minor*, *Polygala nuttallii*, *Viola pedata*, and *Aster spectabilis*.

### **Wetland Indicator Status**

*Linum intercursum* is a facultative upland species, meaning that it usually occurs in nonwetlands but may occur in wetlands (U. S. Army Corps of Engineers 2020).

### **USDA Plants Code (USDA, NRCS 2022)**

LIIN



### Coefficient of Conservatism (Walz et al., 2018)

CoC = 7. Criteria for a value of 6 to 8: Native with a narrow range of ecological tolerances and typically associated with a stable community (Faber-Langendoen 2018).

### Distribution and Range

The global range of *Linum intercursum* is limited to the eastern United States (POWO 2022). The map in Figure 1 depicts the extent of the species in the North America.

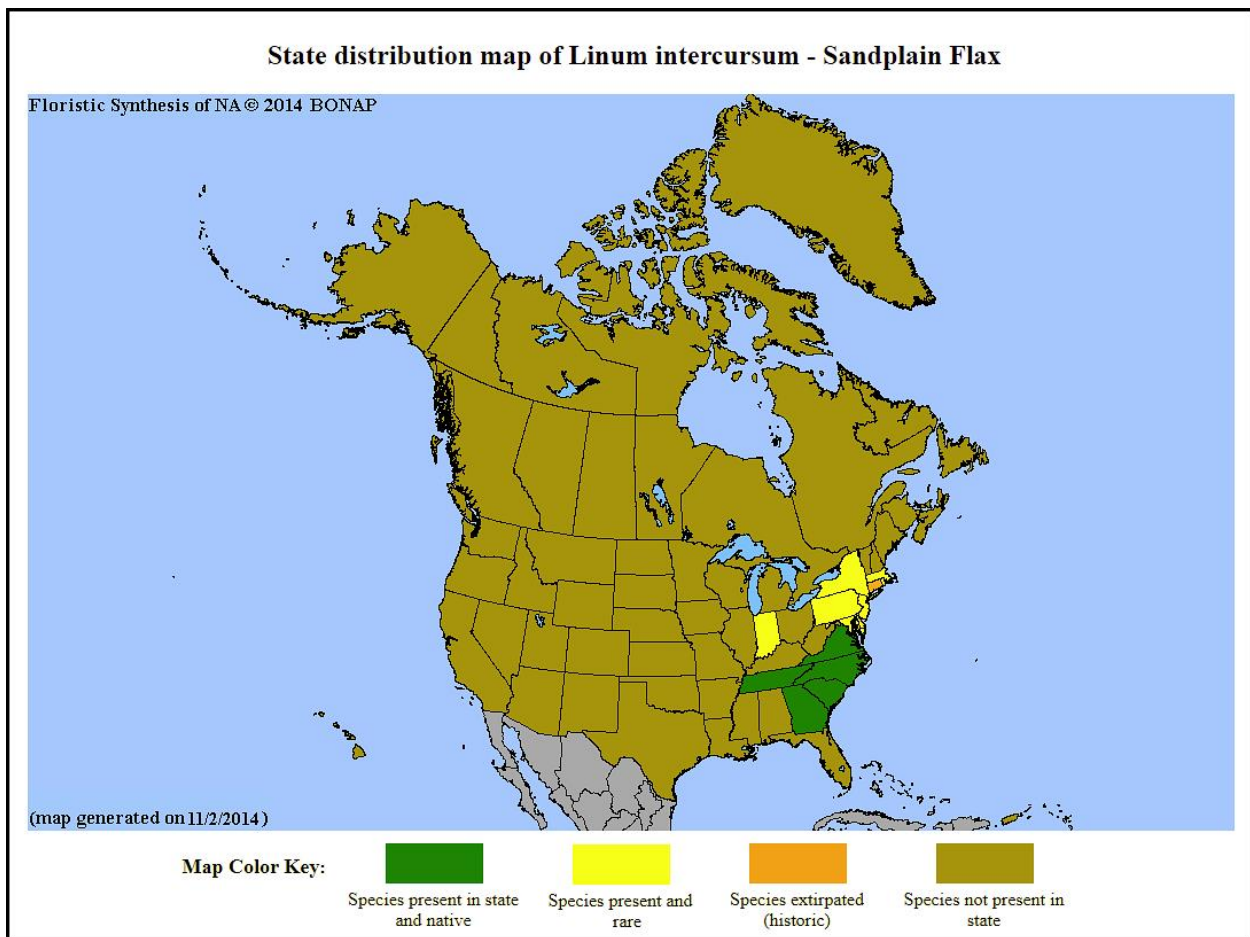


Figure 1. Distribution of *L. intercursum* in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2022) shows records of *Linum intercursum* in ten New Jersey counties: Atlantic, Burlington, Camden, Cape May, Cumberland, Essex, Monmouth, Ocean, Salem, and Somerset (Figure 2). The data include historic observations and do not reflect the current distribution of the species.

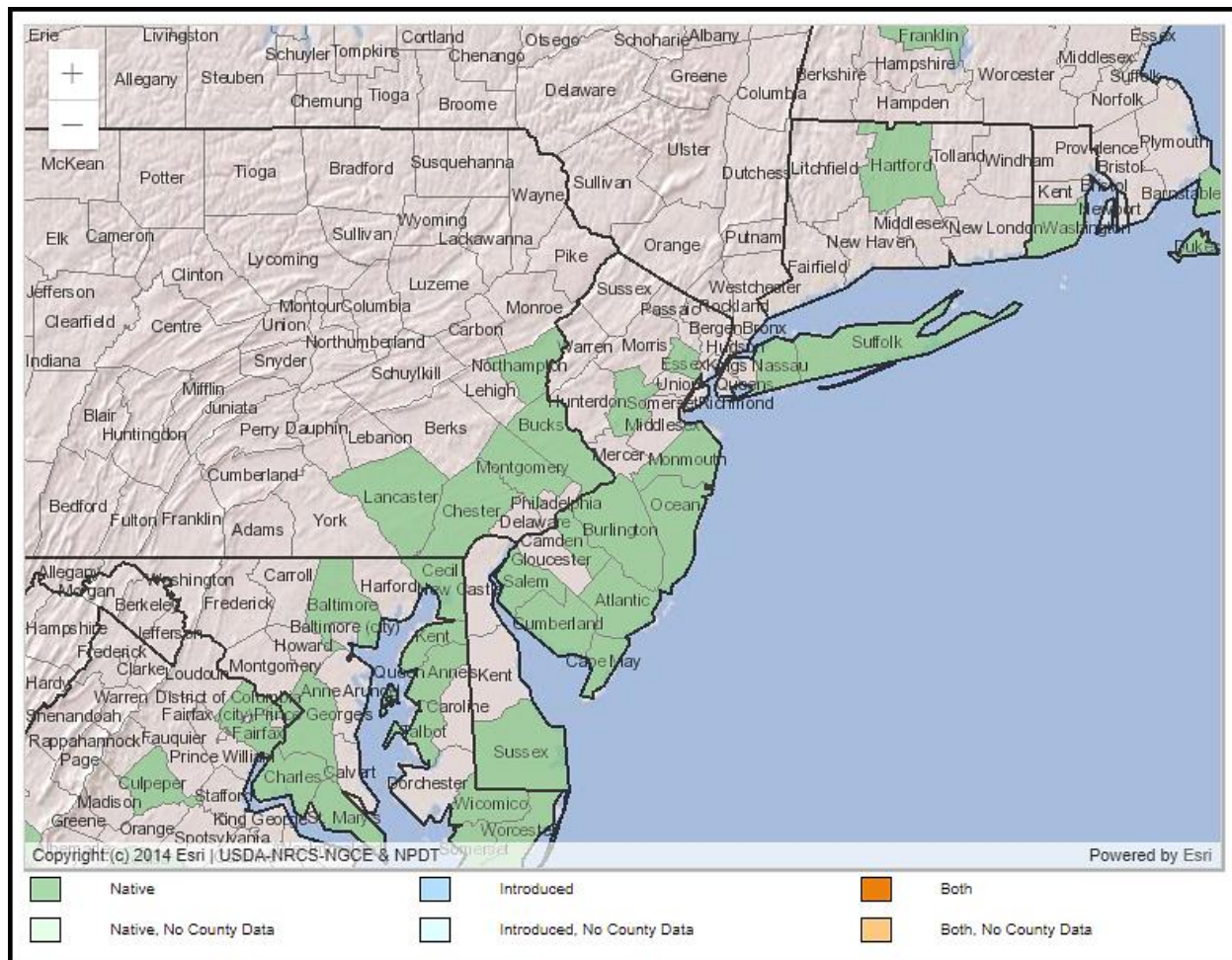


Figure 2. County records of *L. intercursum* in New Jersey and vicinity (USDA NRCS 2022).

### Conservation Status

*Linum intercursum* is apparently secure at a global scale. The G4 rank means the species is at fairly low risk of extinction or collapse due to an extensive range and/or many populations or occurrences, although there is some cause for concern as a result of local recent declines, threats, or other factors (NatureServe 2022). In North America, *L. intercursum* has been identified as a plant species of highest conservation priority for the North Atlantic region, which includes four Canadian provinces and twelve U. S. states. The species has a regional rank of R3 (vulnerable), signifying a moderate risk of extinction (Frances 2017).

The map below (Figure 3) illustrates the conservation status of Sandplain Flax throughout its range. The species is ranked as critically imperiled (very high risk of extinction) in five states, imperiled (high risk of extinction) in three states, vulnerable (moderate risk of extinction) in one state, and possibly extirpated in Connecticut. It is apparently secure or unranked in five other states (NatureServe 2022), although it does not seem to be common anywhere (Russell and Morse 1995). The two herbarium records documenting the disjunct Indiana occurrence were collected at a single location (Dolan and Moore 2022).

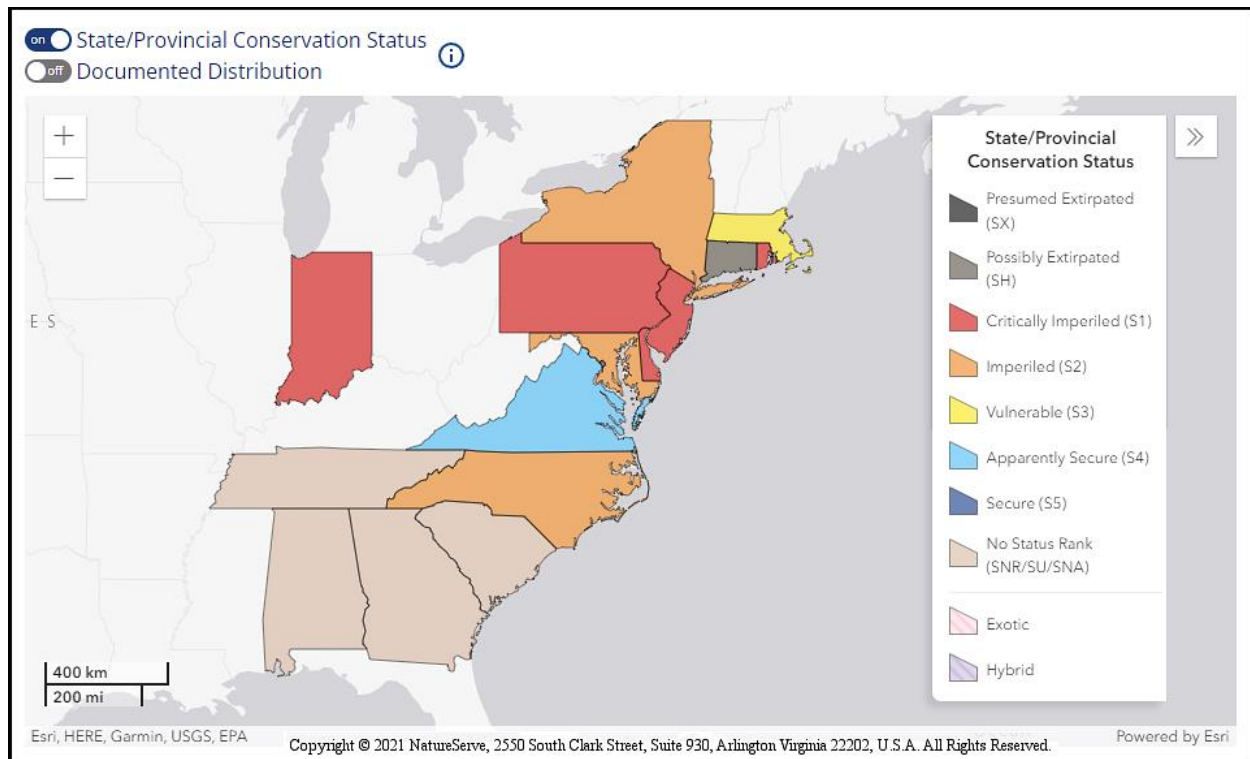


Figure 3. Conservation status of *L. intercursum* in North America (NatureServe 2022).

*Linum intercursum* is critically imperiled (S1) in New Jersey (NJNHP 2022). The rank signifies five or fewer occurrences in the state. A species with an S1 rank is typically either restricted to specialized habitats, geographically limited to a small area of the state, or significantly reduced in number from its previous status. *L. intercursum* is also listed as an endangered species (E) in New Jersey, meaning that without intervention it has a high likelihood of extinction in the state. Although the presence of endangered flora may restrict development in certain communities, being listed does not currently provide broad statewide protection for plants. Additional regional status codes assigned to the flax signify that the species is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and in the New Jersey Pinelands (LP) (NJNHP 2010).

When Bicknell first described *Linum intercursum* in 1912, he noted that a number of earlier collectors had mistaken it for *L. floridanum*, a more southern species. Records reported as *L. floridanum* in Stone (1911) were almost certainly *L. intercursum*, as the former is a southern species that has not been confirmed in New Jersey (Kartesz 2015) and the other similar *Linum* spp. that occur in southern New Jersey were all accounted for separately in Stone's compendium. Stone noted that the flax was "rather frequent" on dry ground in the Pine Barrens and coast strip. Unfortunately, the quantity did not last. Following a collection made in 1939, *Linum intercursum* was not documented in the state for another half century until Snyder relocated a previous occurrence and found the species at two new sites (Snyder 1993, 2000). At present, three New Jersey populations are considered extant. Two have an estimated viability rank of 'Fair' and the third is ranked as 'Poor' (NJNHP 2022).



## **Threats**

The main threat identified for *Linum intercursum* is loss of habitat. The open and generally dry locations typically preferred by the species are frequently targeted for development. Russell and Morse (1995) remarked that all habitat in the northeast is being rapidly developed, and at least one New Jersey occurrence was severely damaged during the course of a road construction project (NJNHP 2022). Even when the land supporting a rare plant population is spared, a high level of regional development can increase human activities such as foot or vehicular traffic, dumping, and ground fires that result in the loss of sensitive species (Drayton and Primack 1996).

Open habitat may also be lost via natural processes, and succession from herb-dominated communities to woody vegetation has been cited as a threat to *Linum intercursum* (MANHESP 2015). In a review of the life history traits of rare plants, Farnsworth (2007) inferred a requirement for periodic disturbance for species that were categorized by authors as 'early successional,' 'fire-adapted,' or 'open-canopy'. Clarke (2006) discussed ways in which coastal sandplain plants, including *L. intercursum*, have adapted to periodic fires. The closely related *L. floridanum* has shown a positive response to fire, significantly increasing its flowering rate two years post-burn (Hinman and Brewer 2007). In the absence of natural disturbances, many rare plant species of New England's coastal sandplains have become dependent on mechanical disturbance to maintain their open habitats (Clarke and Patterson 2007).

## **Management Summary and Recommendations**

More information about the life history of *Linum intercursum* is needed in order to plan for the long-term conservation of the species in a meaningful way. With the exception of the non-indigenous commercial flax, many of the *Linum* species found in the northeastern U. S. are woefully understudied. Research is needed in numerous areas including reproduction, dispersal, establishment, mycorrhizal associations, response to competition, and faunal relationships.

Meanwhile, management plans for extant occurrences should focus on community preservation. Maintenance of an open canopy should be a high priority, as periodic disturbance is important for *L. intercursum* (Clarke and Patterson 2007) and minimization of competition has been recommended for a suite of rare species including Sandplain Flax (Farnsworth 2007). In higher quality habitats additional strategies could include land protection and limitation of human activities that directly impact plants. For smaller roadside occurrences, actions might include protecting the plants from vehicular damage and establishing a mowing regime that is compatible with the life cycle of the rare flax.

Given its limited global range and vulnerable status throughout much of the area where *Linum intercursum* occurs, regular monitoring of extant populations is recommended in order to identify concerns and address threats. Surveys in the vicinity of historic occurrences where suitable habitat exists are also suggested for a more thorough understanding of the species present status.

## **Synonyms**

The accepted botanical name of the species is *Linum intercursum* E. P. Bicknell. Orthographic variants, synonyms, and common names are listed below (ITIS 2021, Rogers 1963, Gleason and Cronquist 1991).

### **Botanical Synonyms**

*Cathartolinum intercursum* (E.P. Bicknell) Small  
*Linum floridanum* var. *intercursum* Weath.

### **Common Names**

Sandplain Flax  
Bicknell's Yellow Flax

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