

Status of Fraser's Loosestrife (*Lysimchia fraseri* Duby) in Illinois

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ABSTRACT

Fraser's loosestrife, *Lysimachia fraseri*, in Illinois is known only to occur in Pope County in the extreme southeast corner of the state. The species was collected along Lusk Creek in 1966 and was observed growing along Burke Branch in 1968. The Burke Branch population has not been observed since. The Lusk Creek population has experienced a drastic decline in Pope County from 100 plants in 1991 to 3 plants in 1998. This survey noted the reduction in the Lusk Creek population from 1 plant in 1999 to no plants in 2000. Additional searches in suitable habitat located no new populations. It is assumed that *Lysimachia fraseri* is extirpated from the Illinois flora.

INTRODUCTION

Lysimachia fraseri is considered a species of special concern with a G3 global rank, which means that it is very rare or local throughout its range (Federal Register 1997). This species is listed in Georgia (S1, rare), Kentucky (S1, endangered), North Carolina (S2, endangered), South Carolina (S1, regional concern), and Tennessee (S2, endangered). This species is not listed in Alabama where it has a S1 rank (Bates 1998). *Lysimachia fraseri* is state endangered in Illinois (Herkert 1991).

Lysimachia fraseri, Fraser's loosestrife, was first discovered in Illinois in 1966 by Hopkins (1968) while working at Lusk Creek in Pope County. John Schwegman subsequently located this species along Burke Branch, also in Pope County, in 1968. This population has not been observed since.

The Lusk Creek population has been monitored for over 10 years. A survey of the population in 1991 by John Schwegman recorded 100 plants: 5 were flowering and 95 were sterile. The population began to decline after 1991 and numbered just 3 plants in 1998 when surveyed by Bates (1998).

The objectives of the present study were to determine the existence of additional populations of *L. fraseri*, the demographic characteristics of each population, the habitat characteristics of each population, and the associated plant species at each population.

GENUS AND SPECIES DESCRIPTION

Lysimachia fraseri Duby, Fraser's loosestrife, is a member of the Primulaceae or primrose family (Gleason and Cronquist 1991; Watson and Dallwitz 1992). *Lysimachia fraseri* was first collected by John Fraser in South Carolina and was first described in the publication Prodromus Systematis Naturalis Regni Vegetabilis (de Candolle 1823; Kartesz 1994; Bates 1998). The genus name *Lysimachia* is from the ancient King of Thrace, Lysimachia, whose name comes from the Greek *lysis*, "to loose from", and *mache*, "strife". The King of Thrace was remembered for pacifying a charging bull by grabbing a loosestrife plant and waving it at him (Bates 1998). John Fraser was an important early plant collector in the southern Appalachians and the species is named for him (Radford et al. 1968; Bates 1998).

Lysimachia fraseri is an erect, multi-stemmed, herbaceous perennial developed from creeping underground rhizomes. Stems are 1-1.5 m tall, terete, and glandular-pubescent. The lowermost leaves are much reduced in size and are often scale-like. The upper leaves occur in whorls of three to five, or are opposite. Leaf shape varies from elliptic to lanceolate. Blade length is 4-15 cm and width 1.5-6 cm. The surfaces of the leaf blades are punctate with round or elongate dark purple or black glands, which are much paler beneath than above. Blade margins are darkened and finely stipitate-glandular (Fernald 1950; Ray 1956; Radford et al. 1968; Gleason and Cronquist 1991; Bates 1998).

Lysimachia fraseri has a leafy, stipitate-glandular panicle from 5-25 cm in length. Pedicels are from 5-9 mm long and are abundantly stipitate-glandular. The stipitate-glandular calyx has five lanceolate lobes that are 3-5 mm long, acute to acuminate at the tip, and purple to maroon on the margins. Calyx tube length averages 5 mm. The rotate corolla consists of five yellow petals that are 1.5-1.6 cm across with elliptic to oblong lobes. The petals are 6-9 mm long, several times longer than the tube, with rounded apices that are occasionally notched. Petal margins are entire to erose. The filaments are glandular, unequal in length, united from $\frac{1}{2}$ to $\frac{1}{3}$ of their length, and form a cup at the base. The five anthers are yellow and have longitudinal dehiscence. The unilocular ovary is inferior. The style is slender and topped by a slightly expanded stigma. The fruit is a globose to subglobose capsule 3-4 mm in diameter. The several seeds that occur within each capsule are angular, dark brown to black, and have a finely pitted surface. Seed length averages 1.6 to 2.3 mm. Bates (1998) found the seeds to float on water and predicted that this characteristic might be one mode of seed dispersal in riparian habitats. Flowers are usually produced in June and July, and capsules are mature in September and October (Fernald 1950; Ray 1956; Radford et al. 1968; Gleason and Cronquist 1991; Bates 1998).

The reproductive biology of the genus *Lysimachia* has been well-studied (Vuilleumier 1967; Simpson et al. 1983). *Lysimachia fraseri* can reproduce asexually by rhizomes or infrequent production of bulbils (Ray 1956), a common means of reproduction in plants that are heavily shaded. Sexual reproduction in this species is either by outcrossing or autogamy (selfing). Holarctic bees of the genus *Macropis* are known to collect pollen

from *Lysimachia* anthers (Malyshev 1929) whereas female *Macropis* have been observed collecting fluids secreted by glandular tissue of the corolla and androecium (Vogel 1976). The genus *Macropis* contains 5 or 6 species and is a widespread genus throughout Canada and the United States (Michener 1981). Simpson et al. (1983) noted that *Macropis ciliata*, *M. patellata*, and *M. steironimata* were potential pollinators of *Lysimachia fraseri*.

Lysimachia fraseri is most similar to the Eurasian *Lysimachia vulgaris* L. (garden loosestrife), and is known to escape from cultivation in the eastern United States (Mohlenbrock 1986, Gleason and Cronquist 1991). *Lysimachia fraseri* has a glandular-pubescent stem on the upper half and stipitate-glandular leaf margins, while *Lysimachia vulgaris* has a viscid-pilose stem above and ciliate leaf margins. *Lysimachia punctata* (spotted loosestrife) is another Eurasian species with whorled, punctate leaves similar in appearance to *Lysimachia fraseri*. It differs in lacking the red-purple margin along the sepals and the margins of the corolla lobes are glandular-ciliate. *Lysimachia punctata* has primarily escaped from cultivation in the northeastern United States, whereas *Lysimachia vulgaris* may be found throughout the eastern United States (Gleason and Cronquist 1991).

Lysimachia fraseri occurs in the southeastern United States from North Carolina southwest to Alabama and northwest to southern Illinois (Radford et al. 1968; Gleason and Cronquist 1991; Bates 1998). *Lysimachia fraseri* is currently known from 7 states and 21 counties. Bates (1998) confirmed 86 extant populations in 11 counties and 42 extirpated, historical, or unconfirmed populations in 18 counties.

Bates (1998) noted that 86% of all extant populations occur in a contiguous six-county area of Georgia, North Carolina, and South Carolina, which is the center of this species distribution in the southern Appalachian Mountains. The majority of extant populations occur in a four county region of northeast Georgia (Rabun County, 10 populations), southwest North Carolina (Jackson County, 13 populations), northwest South Carolina (Oconee County, 40 populations), and southeast Tennessee (Polk County, 10 populations). A second disjunct group of populations occurs in Tennessee along the Ocoee River and southward into Georgia and Alabama. A third disjunct group of northern populations occurs in Illinois (Pope County), Kentucky (Marshall County), and Tennessee (Stewart County; Bates 1998).

Lysimachia fraseri has been found in a variety of natural and human-disturbed habitats from rock outcrop edges, stream terraces, forested slopes, roadsides, powerlines, old logging roads, old homesites, clearcut forests, and hiking trails. Bates (1998) found that 56% of the extant populations of this species occurred in human-disturbed habitats. *Lysimachia fraseri* is referred to as a disturbance-adapted species that requires either natural or artificial disturbances for its survival.

METHODS

The Lusk Creek population of *Lysimachia fraseri* was surveyed in 1999 and 2000 during three separate visits. Searches for additional populations were conducted during 1999 and

2000 in suitable habitats in the Greater Shawnee Hills and Cretaceous Hills of Pope County (Schwegman et al. 1973).

Demographic data recorded in May 1999 consisted of number of plants, number of stems per plant, stem height, and number of leaf whorls. Environmental data recorded in May 1999 consisted of soil depth, soil pH using a soil tester pH/moisture meter, aspect, percent slope using a clinometer, slope position, and percent canopy cover using a spherical densiometer. Habitat characteristics recorded were associated plant species and plant community using survey methods described by White and Madany (1978). Descriptive statistics were calculated using Statmost for Windows Version 3.5.

RESULTS AND DISCUSSION

During three visits to the Lusk Creek population only one plant was observed. This plant was located on 19 May 1999 but it was not observed during subsequent visits on 28 August 1999 and 16 May 2000. In 1999, the plant was growing adjacent to a large boulder in sandy soil of a stream terrace in mesic upland forest. The plant was 45.1 cm tall, had one stem, and had 5 whorls of leaves on the stem (3 leaves at each node) in May. The most frequent associated species were *Alnus serrulata* (smooth alder), *Andropogon gerardii* (big bluestem), *Athyrium angustum* (lady fern), *Cornus obliqua* (pale dogwood), *Dichanthelium yadkinense* (panic grass), *Eupatorium fistulosum* (hollow joe-pye-weed), *Solidago caesia* (woodland goldenrod), *Solidago patula* (spreading goldenrod), *Viburnum dentatum* (southern arrowwood), and *Zizia aurea* (golden alexanders). The mean soil pH was 6.3 ± 0.1 and soil depth was shallow averaging less than 10 cm. The site was east-northeast facing and had a very open canopy (39.7% canopy coverage). The percent slope from the edge of the population to the edge of Lusk Creek averaged 14%.

Lysimachia fraseri is currently not known to be from any extant population in Illinois. If this species is extirpated in Illinois, it is not due to human disturbance. It appears that the extirpation of the species in Illinois may be due to natural factors such as a recent treefall and associated microclimate changes at the historic site. A large *Nyssa sylvatica* (black gum), approximately 57 cm in diameter, fell into the center of the population during the mid-1990's (Beth Shimp, pers. comm.). This same area was overgrown and heavily shaded by *Alnus serrulata*, *Athyrium angustum*, and *Cornus obliqua* when surveyed in 1999 and 2000. McNeil (1992) thought that timbering would be a threat to this species, as it would allow too much light to penetrate to the forest floor. This scenario might be responsible for the demise of the Lusk Creek population. The treefall may have also altered the flow and velocity of Lusk Creek in this specific area, which could also contribute to the disturbance regime necessary for the survival of *L. fraseri* at this site. Bates (1998) noted that the greatest threats to this species were shading and competition from successional growth, disturbance of hydrological processes in riparian corridors, and human disturbances to populations along roadsides and powerlines. John Ebinger (pers. comm.) indicated that a disturbance event such as a treefall to an isolated, single population of a species would likely cause a local extinction event. Bates (1998) noted that the southern Illinois population was the only one remaining in the northern disjunct group that includes western Kentucky and Tennessee.

The biggest threat to the small numbers of *Lysimachia fraseri* in Illinois appears to be its inability to persist or recover from natural disturbance. There remains an abundance of potential habitat along Lusk Creek, Burke Branch, and other creeks in Pope County, so this species may still be present in Illinois. Additional searches were conducted along Burke, Cooney, and Little Lusk Creeks in Pope County but no plants were located.

Bates (1998) surveyed the Lusk Creek population and noted the decline from 100 plants in 1991 to three plants in 1998. She suggested the use of canopy clearing to help maintain this population. It is more likely that removal of the competing shrubs and herbs would have been beneficial since the population was within an open canopy. It would be interesting to clear the *Nyssa* trunk and competing shrubs and herbs from the known site at Lusk Creek and determine if this species has been dormant, as either rhizomes or seeds, for several years waiting for the return of proper environmental conditions to the site.

ACKNOWLEDGEMENTS

Mr. Jody Shimp provided assistance with the survey and with acquisition of a grant through the Wildlife Preservation Fund, Illinois Department of Natural Resources. Ms. Beth Shimp provided knowledge about the Lusk Creek population. Three anonymous reviewers provided many constructive comments that greatly improved the content of the manuscript.

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