

BROADENED CONCEPT OF *LIATRIS HELLERI* (ASTERACEAE: EUPATORIEAE)

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ABSTRACT

Liatris helleri T.C. Porter (1891) previously has been regarded as a rare, narrowly distributed endemic of North Carolina. The present investigation, in the context of a study of the whole genus, presents a broadened concept of *L. helleri*, including plants in West Virginia, Virginia, and North Carolina previously identified as *L. turgida* Gaiser (1946) and many from the same region misidentified as *L. graminifolia* var. *smallii*. A lectotype (NY) is selected for *L. helleri*. The diagnostic feature of *L. helleri* sensu stricto, a shortened pappus, has been the primary distinction between it and *L. turgida*, but pappus length varies among populations in the small region of *L. helleri* sensu stricto and a short pappus also occurs in some populations of *L. turgida*. If this broadened concept is followed, it may have the effect of lessening legal protections for *L. helleri*, but some of the North Carolina populations occur with other rare species in a rare natural community, and the species and habitat are a focus of continuing conservation concerns.

RESUMEN

Liatris helleri T.C. Porter (1891) ha sido vista previamente como un endemismo raro escasamente distribuido en Carolina del Norte. En la presente investigación, en el contexto de un estudio de todo el género, se presenta un concepto más amplio de *L. helleri*, incluyendo plantas del Oeste de Virginia, Virginia, y Carolina del Norte identificadas previamente como *L. turgida* Gaiser (1946) y muchas de la misma región identificadas incorrectamente como *L. graminifolia* var. *smallii*. Se ha seleccionado un lectotipo (NY) para *L. helleri*. El carácter diagnóstico de *L. helleri* sensu stricto, un vilano corto, ha sido la diferencia principal entre éste y *L. turgida*, pero la longitud del vilano varía entre poblaciones de la pequeña región de *L. helleri* sensu stricto y un vilano corto se da también en algunas poblaciones de *L. turgida*. Si se sigue este concepto ampliado, puede tener como efecto la pérdida de protecciones legales de *L. helleri*, pero algunas de las poblaciones de Carolina del Norte conviven con otras especies en una comunidad natural rara, y tanto las especies como el hábitat tienen implicaciones permanentes en la conservación.

Liatris helleri T.C. Porter previously has been regarded as a endemic of montane habitats in North Carolina, restricted to a few populations in Avery, Burke, Caldwell, Mitchell, and Watauga (the type) counties. It has been said to be characterized by high-elevation habitats, although within its restricted range, it occurs over a range of 1020–1750 meters elevation. Because of its perceived rarity, *L. helleri* is federally listed as a threatened species (G1, critically imperiled), and a recovery plan (USF&WS 1989, 1999 First Revision) is available. It is listed as threatened in North Carolina (NCDA&CS 2005). Comprehensive information on the species (sensu stricto), including conservation and management

summaries, protective rankings, and references and technical reports, is provided on the Center for Plant Conservation website (CPC 2005). Studies of the mating system (Godt & Hamrick 1995) and genetic diversity (Godt & Hamrick 1996) of *L. helleri* have been published. Photographs and illustrations of the species can be found on the CPC website and others.

A markedly shortened pappus has been used as the primary diagnostic feature of *Liatris helleri* to distinguish it from taxa of the *L. pilosa* (Ait.) Willd. (synonym = *L. graminifolia* Willd.; Nesom & Stucky 2004) group. Pappus bristles of typical *L. helleri* are about half to two-thirds the length of the corolla tube, compared to the characteristic condition in the *L. pilosa* group and most of the rest of the genus, where the bristles are as long or slightly longer than the corolla tube.

Pappus length, however, is variable in *Liatris helleri*. In conservation-oriented surveys of the species, Sutter and Murdock (1984) observed that pappus length was not consistent among populations, and they subsequently undertook a more detailed taxonomic analysis to compare various features of *L. helleri* (3 native populations) with *L. pilosa* (4 native populations, localities noted only as “across North Carolina,” identified as *L. graminifolia*). Data were taken from field measurements and common garden studies, augmented by specimens from four herbaria. They found that for stem height, number of leaves, capitulescence length, and number of heads per plant, *L. helleri* (all populations) differed from *L. pilosa*. In pappus length and pappus/corolla length ratios, however, Linville and Blowing Rock populations of *L. helleri* had significantly shorter pappus, while the Grandfather Mountain population of *L. helleri* was not different from *L. pilosa*. Sutter and Murdock (1984, p. 8) concluded that “the Grandfather Mountain population of *L. helleri* should be considered an infraspecific taxon within *L. graminifolia*.” Neither their taxonomic study or its conclusion, however, is cited or mentioned in recovery plans written by the same authors (USF&WS 1999, 1989), which is surprising, since the Grandfather Mountain plants have continued to be recognized within *L. helleri*.

Pappus variation in *Liatris helleri* also was observed in the genetic study by Godt and Hamrick (1996), who noted (p. 467) that the populations sampled in their work were “recognized by the U.S. Fish and Wildlife Service and by the North Carolina Heritage programme as populations of *L. helleri*, although they cannot all be keyed to *L. helleri* on the basis of pappus length.” Observations of the present study, corroborating Kral (1983), indicate that pappus length varies from about half to two-thirds the corolla tube length among populations of typical *L. helleri*, apart from the longer pappus in the Grandfather Mountain series.

***Liatris turgida* and *L. helleri* compared**

Liatris turgida Gaiser has been considered to be an Appalachian species primarily at low elevations in montane Virginia and West Virginia (e.g., Johnson

1971; Strausbaugh & Core 1977), with rare populations in North Carolina (Godfrey 1948; Ahles 1968) and perhaps in northern Alabama and Georgia (Cronquist 1980; Duncan & Kartesz 1981; Gleason & Cronquist 1994). In a taxonomic study of the whole genus (Nesom 2005a), the only difference between *L. turgida* and *L. helleri* is one of pappus length. Over most of the geographic range of *L. turgida*, pappus bristles equal or slightly surpass the corolla tubes in length. In several areas of Virginia, however, the pappus sometimes is shortened to a length approaching typical populations of *L. helleri* (e.g., Amherst Co., Freer 2007; Bedford Co., Freer 12226; Roanoke Co., Uttal 10883; full citations below). The Grandfather Mountain population series (Avery Co., North Carolina) of *Liatris helleri*, as included in the study by Sutter and Murdock (1984), technically would be identified as *L. turgida*.

Gaiser (1946, p. 263) noted that *Liatris helleri* (sensu stricto) was distinguished from *L. turgida* by “the short pappus, the few, though closely spaced heads, and usually quite glabrous leaves” (the same contrast repeated almost identically on p. 259). Species descriptions by Cronquist (1980) contrast *L. helleri* with *L. turgida* by shorter pappus and otherwise only by several, strongly overlapping features: stems shorter, vestiture consistently glabrous, leaves shorter and narrower and eciliate, heads fewer, and florets fewer per head. Length of pappus was the only difference noted by Ahles (1968, p. 1049, 1050). In the present study, I find that no character or combination of characters is able to separate the two taxa. As variability of the single character defining *L. helleri* (pappus length) has become apparent, recent practice has been to continue to recognize the species primarily on the basis of its short stature and its occurrence in exposed rock outcrop situations at high elevations in northwestern North Carolina, in association with other narrow endemics and arctic-alpine disjuncts, notably *Geum radiatum*, *Huperzia appalachiana*, *Trichophorum caespitosum*, *Houstonia montana*, *Hudsonia montana*, *Juncus trifidus*, *Carex misera*, and *Solidago spithamaea* (Weakley pers. comm.). This distinctive assemblage of species has been described as a rare plant community, called High Elevation Rocky Summit by Schafale and Weakley (1990) and studied in detail by Wiser (Wiser 1994; Wiser et al. 1996).

While ecological and distributional considerations can help make the case for the taxonomic distinction of two entities when morphological characters are weak, *Liatris helleri* and *L. turgida* are not separable by any reliable characters. I am simply unable to recognize more than a single entity, as documented by the technical description below. Plants of *L. turgida* may be relatively short and the heads few and distantly spaced or taller with up to 40 heads borne in a relatively dense spike. Leaves of *L. turgida* vary from sparsely pilose to glabrous. Other features, including leaf morphology, head size, and floret number, also are broadly or completely overlapping.

Gaiser’s direct and repeated comparisons (1946) of *Liatris helleri* and *L.*

turgida imply that she regarded these two taxa as most similar to each other. Comparison of species descriptions by Cronquist (1980) also indicate that he found *L. helleri* and *L. turgida* most similar between themselves. Ahles (1968, p. 1050) observed that *L. helleri* is "Similar to no. 5 [*L. turgida*] and perhaps not specifically distinct from it." Sutter and Murdock (1984) and Godt and Hamrick (1996) encountered difficulties in the definition of *L. helleri*, but the taxonomic study by Sutter and Murdock compared *L. helleri* with *L. pilosa*, noting (without other comment) that *L. turgida* was "obviously unrelated to the *L. helleri* complex."

Godt and Hamrick (1996) found that local populations of *Liatris helleri* sensu stricto are genetically isolated and significantly differentiated among themselves. Common garden experiments suggested to Sutter and Murdock (1984, p. 6) that "strong selection for short stature and size" in the Grandfather Mountain and Linville area plants may be effected by the "exposed nature of the habitats ... and the intensity of wind at these elevations." They also noted (p. 8) that "many of the characters that relate *L. helleri*—Grandfather to *L. helleri*—Linville appear to have a genetic basis but also may have arisen several times under the selective forces of the environment at high elevations."

Broadened concept of *Liatris helleri* to include *L. turgida*

In view of the lack of distinction between the two taxa, the concept of *Liatris helleri* (described in 1891) is expanded here morphologically and geographically (Fig. 1) to include plants in West Virginia, Virginia, and North Carolina identified as *L. turgida* (described in 1946). Details regarding the nomenclatural priority of *L. helleri* are given below. Additionally, a number of collections previously identified by the misapplied names *L. graminifolia* Willd. (= *L. pilosa*) and *L. graminifolia* var. *smallii* (Britton) Fern. & Grisc. (= *L. virgata* Nutt.) also have been recognized as *L. helleri* in the present study.

A study of allozymic variation of *Liatris helleri* sensu stricto (Godt & Hamrick 1996) supports the broadened concept of the species. Based on samples from nine North Carolina populations occurring within a 30 kilometer radius, Godt and Hamrick found relatively high levels of genetic diversity in *L. helleri*, in exception to a general trend for reduced diversity in geographically restricted species. The diversity in *L. helleri* is "about three times the mean genetic diversity found for endemic plants" (p. 466) and is comparable to that found in the widespread *Liatris cylindracea* (Schall 1975, 1976). In the present interpretation of broadened geographic range and greater abundance of *L. helleri*, the allozymic variability observed by Godt and Hamrick no longer appears unusual.

Taxonomic rank and relationships of *Liatris helleri* sensu lato

Quantitative variation in a single character (pappus length, in this case) might justify recognition of a varietal taxon if the variant feature were consistent and geographically coherent. In *Liatris helleri*, however, these conditions do not hold

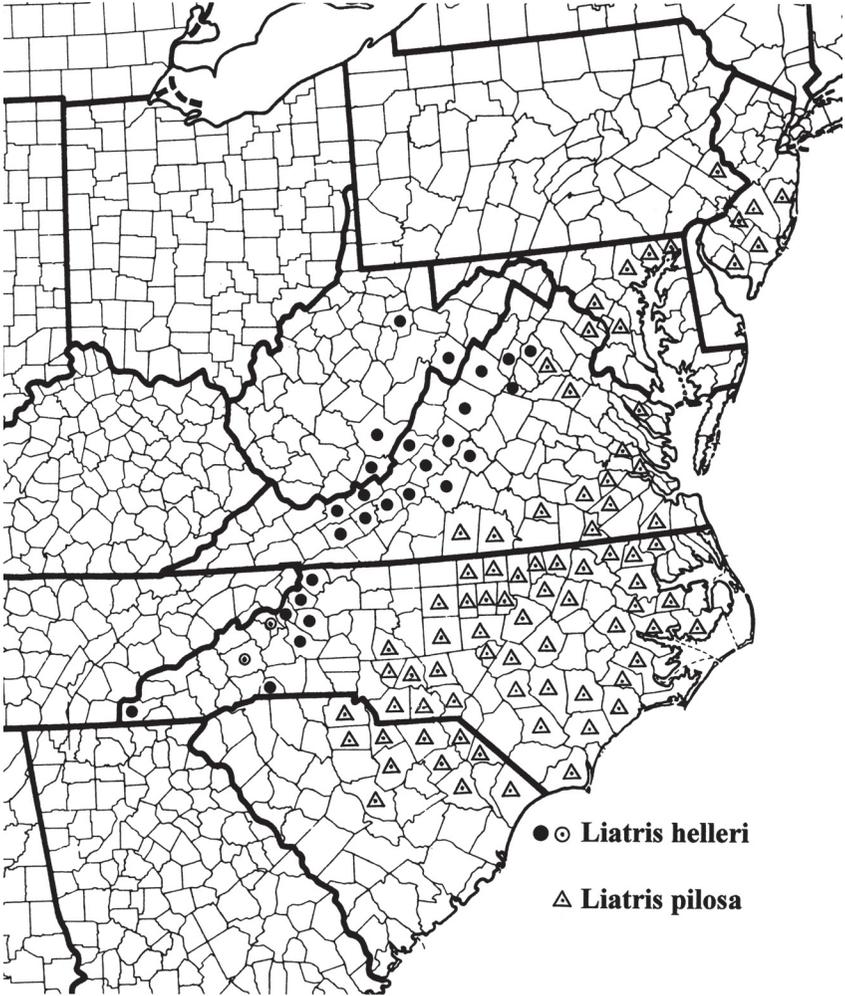


FIG. 1. Geographic distribution of *Liatris helleri* and *L. pilosa*. Localities for *L. pilosa* are from Nesom and Stucky (2004). Open circles represent collections cited by Gaiser (1946) but not seen in the present study.

and it is more consistent with taxonomic practice to informally recognize the North Carolina cluster of short-pappus populations. In fact, in view of the close similarity and presumed relationship of *L. helleri* sensu lato with *L. pilosa*, it would not be unreasonable to treat *L. helleri* sensu lato at varietal rank within *L. pilosa*.

Recognition of *Liatris helleri* at specific rank, apart from *L. pilosa*, emphasizes their distinct geography and habitat and their generally consistent, though

small, differences in morphology (see key below). The two varieties of *L. spicata* (L.) Willd. have an essentially allopatric distribution (coastal plain and montane/inland) nearly analogous to that of *L. helleri* and *L. pilosa*, but the morphological overlap between the varieties of *L. spicata* is greater than between *L. helleri* and *L. pilosa*.

Liatris helleri is a member of *Liatris* ser. *Graminifoliae* (sensu Gaiser 1946; sect. *Graminifolium* ser. *Graminifoliae* sensu Nesom 2005b)—this species would have been appropriately treated by Nesom and Stucky (2004) as a member the *L. pilosa* group. In fact, *L. pilosa* and *L. helleri* (sensu lato) are more similar to each other than *L. pilosa* is to *L. elegantula* (Greene) K. Schum. (the latter two were regarded as most closely related to each other by Nesom and Stucky 2004). *Liatris microcephala* (Small) K. Schum. also is treated as a member of ser. *Graminifoliae* (Nesom 2005b); it is the only other species of *Liatris* with short pappus, but in contrast to *L. helleri*, bristle length in *L. microcephala* is relatively consistent over the range of the species.

Distinctions among these closely related taxa of ser. *Graminifoliae* are given in the key and comments below.

1. Stems glabrous; heads loosely arranged, on internodes (2–)5–10(–14) mm; peduncles 0–2(–7) mm; involucre 6–8 mm; phyllaries in 3–4(–5) series _____ ***Liatris elegantula***
1. Stems glabrous to sparsely or moderately pilose; heads densely arranged, on internodes (1–)2–5(–7) mm; peduncles 0–10(–17, –80 in proximal part of capitulescence) mm; involucre (7–)8–10 mm, phyllaries in (3–)4–5(–6) series.
 2. Stems 15–55 cm; leaves and phyllaries not at all punctate-glandular or weakly so, the punctations evident only as tiny black dots (no glandular hairs evident); involucre 6–8(–10) mm wide; pappus bristles 1/2–2/3 to equal the corolla tube length; montane, 650–1600(–1850) m _____ ***Liatris helleri***
 2. Stems 40–120 cm; leaves and phyllaries usually weakly punctate-glandular, phyllaries sometimes eglandular or the glands weakly developed and superficial; involucre 5–6 mm wide; pappus bristles equal the corolla tube length; coastal plain and piedmont, ca. (0–)10–500 m _____ ***Liatris pilosa***

Also, compared to *L. pilosa*, stems of *L. helleri* are shorter, basal leaves average larger and cauline leaves tend to be more abruptly reduced distally, heads tend to be slightly more separated, and cypselae are slightly larger (Nesom 2005a). It would be useful to study these taxa in detail where their ranges closely approach each other in northern Virginia and Maryland (Fig. 1). Rare plants in the northernmost geographic range of *Liatris pilosa* might be identified as *L. helleri* (e.g., DELAWARE, Newcastle Co., Saint Georges, no collector or date, DOV; NEW JERSEY, Cape May Co., Belleplain, dry sandy pinewoods, 20 Sep 1974, *Moldenke* 29024, MO). Presumably, this could be interpreted as incomplete differentiation or as the result of gene flow in this area where the mountains closely approach the coastal plain.

Liatris helleri T.C. Porter, Bull. Torrey Bot. Club 18:147. 1891. *Lacinaria helleri* (T.C. Porter) T.C. Porter ex Heller, Muhlenbergia 1:6. 1900. TYPE: U.S.A. NORTH CAROLINA. Watauga

Co.: Blowing Rock Mt., 18 Aug 1890, A.A. Heller 81 (LECTOTYPE, designated here: NY 180685; ISOLECTOTYPES: MO! ND, NY 180687!). Porter (1891) did not specify the herbarium of deposition for the type; Gaiser (1946) noted that the "type" was at NY, but neither of the NY sheets cited here was annotated by her. Both of the NY sheets have recently been annotated as isotypes.

Liatris turgida Gaiser, Rhodora 48:261. 1946. TYPE: U.S.A. VIRGINIA. Nelson Co.: vicinity of Afton in the Blue Ridge Mts., road to Royal Orchard, rocky woods, 600 m, 31 Aug 1912, E.S. Steele 24 (HOLOTYPE: US internet image!).

Corms globose, sometimes knotty. **Stems** 15–55 cm tall, glabrous. **Leaves:** basal and lower cauline spatulate-oblongate to narrowly lanceolate or linear-oblongate, 1-nerved, (5–)6–10(–18, –22) cm long (usually at least reaching the level of the heads), 3–8(–15) mm wide, usually quickly to gradually reduced in size above midstem, glabrous to sparsely pilose abaxially (especially in Va.), not glandular-punctate or only weakly so and without evident glandular hairs. **Heads** sessile to subsessile, peduncles rarely to 12 mm long, usually in a densely to loosely spiciform arrangement. **Involucre**s turbinate-campanulate, 7–10 mm long, 6–8(–10) mm wide; phyllaries in 3–4(–5) graduate series, oblong, apically rounded, margins with a hyaline border, ciliolate, otherwise glabrous, without glandular punctations. **Florets** 7–13(–17) per head; corolla tubes sparsely pilose within in the region of filament insertion. **Cypselae** (2.5–)3.5–5 mm long, hairy; pappus bristles 1/2–2/3 or equaling the corolla tube length, barbellate. Chromosome number, $2n = 20$.

Flowering July through mid September. Rock outcrops (often shale in Virginia and West Virginia), cliff faces and ledges, ridges, shallow soil pockets, rocky openings in heath balds, roadside banks, oak, dry pine-oak, and pitch pine woods; 650–1600(–1850) m. North Carolina, Virginia, and West Virginia. Reported from Alabama and Georgia as *L. turgida* (Cronquist 1980; Duncan & Kartesz 1981; Gleason & Cronquist 1994) but not confirmed in this study; more intensive study of collections may corroborate the reports.

Additional collections examined: **NORTH CAROLINA. Ashe Co.:** summit of Paddy Mountain, E of Bluff Mountain, 22 May 1994, *Sorrie 7971* (NCU); summit of Paddy Mountain, E of Bluff Mountain, 22 May 1994, *Weakley s.n.* (NCU). **Avery Co.:** seepage area on bluffs of Big Lost Cove Cliffs, 3400 ft, 1 Aug 1986, *Bradshaw s.n.* (SMU); summit of Grandfather Mountain, 25 Sep 1898, *Canby 70* (MO); soil pockets in granitic summit of Grandfather Mt., by observatory, 3 Aug 1977, *Kral 60747* (VDB); summit of Four Diamond Ridge, grass-forb bald, 4800 ft, 25 Jul 1978, *Rohrer 2188* (NCU); Grandfather Mt., NW corner of swinging bridge away from visitor's center, upper slope of rock outcrop, meta-arkose, bordering Spruce-Fir Forest, 30 degree slope facing NNW, 1611 m, 10 Sep 1989, *Wiser 89-2* (NCU); Hanging Rock, NW-facing slope of highest peak, lower slope of rock outcrop, meta-basalt, 1562 m, 27 Jun 1989, *Wiser 89-30* (NCU); 20 m ESE of highest peak of Ship Rocks, Rough Ridge, adjacent to Tanawha trail, top of rock outcrop, 1426 m, 15 Sep 1990, *Wiser 90-175* (NCU); Grandfather Mt., Linville Bluffs, mid slope of rock outcrop, on 42 degree slope facing NNW, 1427 m, 18 Sep 1990, *Wiser 90-180* (NCU). **Burke Co.:** Hawk's Bill Mountain, 11 Sep 1982, *Frizzell 229* (NCU); vicinity of Table Rock Mountain, 3 Aug 1890, *Heller 81* (MO); gneissic summit of Table Rock Mt., above Linville gorge, 2 Aug 1977, *Kral 60704* (VDB); Shortoff Mt., dry pine-oak woods, 18 Aug 1949, *Radford 4888* (NCU); bald on Table Rock, 24 Aug 1952, *Radford 6515* (NCU); Table Rock, 29 Aug 1936, *Wherry s.n.* (LL).

Caldwell Co.: E of Blowing Rock, 3500–4000 ft, 24 Aug 1893, *Heller s.n.* (VDB); Blowing Rock observ. area, locally abundant on granitic ledges, 3 Aug 1977, *Kral 60759* (VDB); Blowing Rock, 17 Aug 1891, *Seymour 91-8-17-30* (MO, SMU, TEX); ledges of Blowing Rock, 4200 ft, 6 Aug 1891, *Small and Heller 344* (DOV, MO, NCU, SMU, TEX, WVU). **Cherokee Co.:** Tipton, edge of woods, 29 Aug 1947, *Moldenke 19293* (SMU). **Polk Co.:** Melrose Mt., 14 Oct 1936, *Blake s.n.* (NCU); Melrose Mt., 14 Oct 1936, *Peattie TR147* (NCU). **VIRGINIA. Alleghany Co.:** shaly, W-facing slope of ridge above Smith Creek, McGraw's Gap, 6 Aug 1959, *Kral 9310* (NCU, VDB). **Amherst Co.:** along road between Pera and Robinson's Gap, between Brown's Creek and Beverleytown, 5 Sep 1949, *Freer 2007* (NCU). **Augusta Co.:** top of Big Bald Knob, 4500 ft, 3 Sep 1933, *Allard s.n.* (LL); Little Bald Knob, 2500 ft, 3–4 Sep 1933, *Allard s.n.* (LL); Big Bald Knob, 4400 ft, 27 Aug 1934, *Allard s.n.* (LL); Augusta Springs, steep, rocky/shaley bank off road to Deerfield, ca. 300 m on W side of crest of Elliot Knob, S of knob proper, 29 Sep 1991, *Churchill 91-250* (VDB); Mt. Rogers (Elliot's Knob), 9 Aug 1893, *Heller and Halbach 1179* (DOV, MO, NCU, VDB, WVU). **Bedford Co.:** Blue Ridge Fire Trail 4900 to Curry Gap, dry roadside bank, in Hampton shale, 27 Aug 1968, *Freer 12226* (NCU, SMU); Hwy 24 at the Otter River bridge, roadsides, 23 Sep 1967, *Ramsey et al. 16106* (SMU). **Bland Co.:** Brushy Mountain, 1 Sep 1931, *Core 3860* (WVU); Brushy Mt., dry rocky soil, 1 Sep 1931, *Sharp 3860* (LL). **Botetourt Co.:** Blue Ridge Parkway at Iron Mine Hollow, milepost 96.2, 9 Sep 1964, *Freer 2831* (NCU); Craig's, 600 m, 30 Aug 1903, *Steele 166* (MO). **Giles Co.:** Summit of Bald Knob, 5 Aug 1940, *Fox s.n.* (WVU); Salt Pond Mt., top of Bald Knob, 3/4 mi S of Mt. Lake P.O., dry, open, exposed, rocky soil, 4363 ft, 1 Aug 1943, *Iltis 2005* (SMU); Salt Pond Mt., 19 Aug 1876, *Redfield 5593* (MO). **Greene Co.:** Shenandoah Natl. Park, Skyline Drive, NW of Pine Fields leanto, rocky road cut, 19 Aug 1945, *Fosberg 23821* (MO). **Montgomery Co.:** ca. 5 mi NW of Blacksburg, shaley SW slopes of Brush Mt., 5 Sep 1961, *Kral 14038* (SMU, VDB); 3.5 mi W of Blacksburg, Brush Mt., immediately N of Rd 777 (old Hwy 460), *Quercus alba*, *Q. velutina*, *Castanea pumila*, Muskingham soil, very low pH, 21 Sep 1974, *Musselman 4820* (NCU); Brushy Mountain, Va. 777, 1 mi W of US 460, 30 Sep 1969, *Uttal 6800* (NCU). **Page Co.:** Stony Man Mountain, near Luray, 3500 ft, 28 Aug 1901, *Steele 241* (MO). **Pulaski Co.:** 4 mi S of Poplar Hill, shaley, open woods, 31 Aug 1961, *Kral 13972* (SMU). **Rappahannock Co.:** Shenandoah Natl. Park, Crescent Rocks, rock ledges, 24 Oct 1996, *Fosberg 23797a* (MO). **Roanoke Co.:** S of Roanoke, near top of Poor Mountain, 5 Sep 1967, *Harvill 17679* (NCU); Poor Mountain, Rd 612, common on shaly banks in thin oak-pine woods, ca. 3000–4000 ft, 3 Sep 1968, *Uttal 6529* (WVU); Rte 612, 2 mi S of 639, Poor Mt., road bank at edge of dry woods, ca. 2800 ft, 28 Aug 1974, *Uttal 10883* (NCU); Poor Mt., ca. 3 1/4 mi S of Wabun, dryish shaly woods, 10 Jul 1942, *Wood 3812* (TEX). **Rockbridge Co.:** North Mountain, near Lexington, 26 Aug 1924, *Churchill 786* (MO-2 sheets); shale bank near S boundary of county, 10 Aug 1966, *Crooks 469* (VDB); Forest Service Road 76 below Whites Gap on Blue Ridge Pkwy, MP 44.2, roadside, on Hampton shale, 30 Aug 1966, *Freer 4468* (NCU). **Rockingham Co.:** Hone Quarry Mt., 3000 ft, 7 Sep 1935, *Allard s.n.* (LL); Manganese Mountain, vicinity of Elkton, rocky slope, 1600 ft, 23 Aug 1918, *Steele 28* (WVU) and 27 Aug 1918, *Steele 50* (WVU). **Wythe Co.:** Walker Mountain, 1 Sep 1931, *Core 3872* (WVU); 8 mi w of Wytheville, sunny, shaley SW slope, 28 Jul 1960, *Kral 10833* (NCU); Walker Mt., 1 Sep 1931, *Sharp 3872* (LL, MO). **County unknown:** no locality data, 1868, *Curtiss 1179* (NCU); Skyline Drive, near Crescent Ridge, old field, 6 Sep 1955, *Hicks 2165* (BRIT). **WEST VIRGINIA. Barbour Co.:** Arden, 15 Aug 1972, *Bush s.n.* (WVU). **Greenbrier Co.:** Monongahela Natl Forest, 1959, *Clarkson 2789* (WVU); White Sulphur Springs, Kate's Mt., dry shaley soil, 6 Aug 1953, *Hunnewell 20.067* (WVU); near White Sulphur Springs, dry woods, 27 Aug 1903, *Mackenzie 359* (MO); Cole's Knob, Alvon, 2500 ft, 24 Jul 1947, *Smith s.n.* (WVU); Neola, North Fork of Anthony Creek 2200 ft, 1 Aug 1947, *Smith s.n.* (WVU); Neola, 2300 ft, 13 Aug 1947, *Smith s.n.* (WVU). **Monroe Co.:** Chocolate Drop, 25 Jul 1930, *Berkley 1291* (MO); Slaty Mountain, 29 Jul 1927, *Strausbaugh and Core 988* (WVU). **Pendleton Co.:** Panther Knob, 11 Aug 1964, *Duppstadt s.n.* (WVU); Panther Knob, 11 Aug 1964, *Clarkson s.n.* (WVU).

Two collections cited by Gaiser (1946) probably represent additional North Carolina counties for *Liatris helleri*. These are mapped on Figure 1 with open symbols.

North Carolina. Buncombe Co.: near Black Mt., rocky roadside banks, 23 Aug 1927, *Wiegand & Manning 3176* (GH, cited by Gaiser as *Liatristurgida*, not seen in present study). **Mitchell Co.:** Roan Mt., mountain meadows, 10 Jul 1894, *Mohr s.n.* (US, cited by Gaiser as *L. helleri*, not seen in present study). It is likely that at least some collections cited by her as *L. graminifolia* var. *dubia* (W.P.G. Barton) Gray from Avery, Buncombe, Burke, and McDowell counties, North Carolina, also are *L. helleri*.

CONSERVATION IMPLICATIONS

The taxonomic hypothesis forwarded here presumably may have the effect of lessening legal protections for *Liatris helleri*. In this broadened concept, the species probably will not call for such urgent conservation measures (e.g., Kral 1983; Massey et al. 1983; USF&WS 1999) as might be accorded more threatened taxa. I have not taken this lightly, especially in view of the good will and generosity of many in efforts to conserve and restore populations of this beautiful species. The biological and taxonomic realities, however, seem unequivocal, and it is possible to see the wider distribution of the species and its conceptual escape from threat and endangerment as a happy consequence. Even so, *L. helleri* apparently is nowhere common and it remains a rare species within North Carolina. Commercial and recreational development, and especially trampling by outdoor enthusiasts, pose immediate threats to the species and the natural communities in which it occurs. Efforts toward ensuring its continued existence are critical. As mentioned above, some of the North Carolina populations of *L. helleri* occur with other rare species in a rare natural community, and the species and habitat remain a focus of conservation concern and activity.

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REFERENCES

- AHLES, H.E. 1968. Asteraceae. In Radford, A.E., H.E. Ahles, and C.R. Bell. Manual of the vascular flora of the Carolinas. Univ. of North Carolina Press, Chapel Hill. Pp. 1009–1139.
- CPC. 2005. *Liatris helleri*. Center for Plant Conservation National Collection Plant Profile. www.centerforplantconservation.org Accessed January 2005.
- CRONQUIST, A. 1980. Vascular flora of the southeastern United States, Vol. I. Asteraceae. Univ. of North Carolina Press, Chapel Hill.
- DUNCAN, W.H. and J.T. KARTESZ. 1981. Vascular flora of Georgia. Univ. of Georgia Press, Athens.

- GAISER, L.O. 1946. The genus *Liatris*. *Rhodora* 48:165–183, 216–263, 273–326, 331–382, 393–412.
- GLEASON, H.A. and A. CRONQUIST. 1994. Manual of vascular plants of northeastern United States and adjacent Canada (ed. 2). New York Botanical Garden, New York.
- GODFREY, R.K. 1948. Studies in the Compositae of North Carolina. I. *Liatris*. *J. Elisha Mitchell Sci. Soc.* 64:241–249.
- GODT, M.J.W. and J.L. HAMRICK. 1995. The mating system of *Liatris helleri* (Asteraceae), a threatened plant species. *Heredity* 75:398–404.
- GODT, M.J.W. and J.L. HAMRICK. 1996. Genetic diversity and morphological differentiation in *Liatris helleri* (Asteraceae), a threatened plant species. *Biodivers. and Conserv.* 5: 461–471.
- JOHNSON, M.J. 1971. The genus *Liatris* in Virginia. *Castanea* 36:137–147.
- KRAL, R. 1983. A report on some rare, threatened, or endangered forest-related vascular plants of the South. Vol. II. Aquifoliaceae through Asteraceae and Glossary. U.S. Dept. of Agriculture Forest Service, Southern Region, Techn. Publ. R8-TP2, Atlanta, GA.
- MASSEY, J.R., D.K.S. OTTE, T.A. ATKINSON and D.R. WHETSONE (illustrations by S. Sizemore). 1983. An atlas and illustrated guide to the threatened and endangered vascular plants of the mountains of North Carolina and Virginia. [*Liatris helleri* Porter (Heller's Blazing Star)]. U.S. Forest Service General Technical Report SE-20. Southeastern Forest Experiment Station, Asheville, N.C.
- NESOM, G.L. 2005a. *Liatris*. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 12+ vols. New York and Oxford. Vol. 21, in press.
- NESOM, G.L. 2005b. Infrageneric classification of *Liatris* (Asteraceae: Eupatorieae). *Sida* 21:1305–1321.
- NESOM, G.L. and J.M. STUCKY. 2004. Taxonomy of the *Liatris pilosa* (*graminifolia*) complex (Asteraceae: Eupatorieae). *Sida* 21:815–826.
- NCDA&CS. 2005. *Liatris helleri*. North Carolina Department of Agriculture & Consumer Services, Plant Industry Division, Plant Protection Section, Plant Conservation Program. www.agr.state.nc.us/plantind/plant/conserv/Blazstar.htm Accessed March 2005.
- PORTER, T.C. 1891. A new *Liatris* from North Carolina. *Bull. Torrey Bot. Club* 18:147–148.
- SCHAAL, B.A. 1975. Population structure and local differentiation in *Liatris cylindracea*. *Amer. Naturalist* 109:511–528.
- SCHAAL, B.A. 1976. Genetic diversity in *Liatris cylindracea*. *Syst. Bot.* 1:163–168.
- SCHAFALE, M.P. and A.S. WEAKLEY. 1990. Classification of the natural communities of North Carolina, third approximation. N.C. Dept. of Environment, Health, and Natural Resources, Raleigh.
- STRAUSBAUGH, P.D. and E.L. CORE. 1977. Flora of West Virginia (ed. 2). Part 4 (Rubiaceae through Compositae). Seneca Books Inc., Morgantown, W.VA.
- SUTTER, R.D. and N. MURDOCK. 1984. Taxonomic analysis of *Liatris helleri*, a North Carolina endemic. U.S. Fish & Wildlife Service Endangered Species Field Office, Asheville, North Carolina.
- U.S. FISH AND WILDLIFE SERVICE. 1999. Recovery Plan for *Liatris helleri* Porter (Heller's Blazing

Star). First Revision (N. Murdock; original by N. Murdock and R.D. Sutter, 1989). U.S. Fish and Wildlife Service. Atlanta, Ga. Available as pdf file: southeast.fws.gov Accessed January 2005.

WISER, S.K. 1994. High-elevation cliffs and outcrops of the Southern Appalachians: vascular plants and biogeography. *Castanea* 59:85–116.

WISER, S.K., R.K. PEET, and P.S. WHITE. 1996. High-elevation rock outcrop vegetation of the Southern Appalachian Mountains. *J. Veg. Sci.* 7:703–722.

MEETING ANNOUNCEMENT

To celebrate the 25th Anniversary of the herbarium CIIDIR and the starting of our graduate program, the CIIDIR Unidad Durango of the National Polytechnic Institute, in conjunction with the Sociedad Botánica de México, will present the Symposia:

- 1) The Role of the Botany in the Management and Conservation of Ecosystems
- 2) 2nd Botanical Symposium of Northern Mexico

The Symposia will be held on September 13–14, 2005 in Durango, México. The event includes a meeting of the Sociedad Botánica de México with Dra. Laura Arriaga Cabrera giving the keynote lecture.

On the 15th there is an optional field trip to the Sierra Madre Occidental, along the Durango-Mazatlán Hwy.

—Dr. Miguel Martínez Ramos, Presidente, Sociedad Botánica de México, A.C.

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