

***BOLTONIA ASTEROIDES*, *B. MONTANA*, AND *B. CAROLINIANA*
(ASTERACEAE: ASTEREAE)**

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ABSTRACT

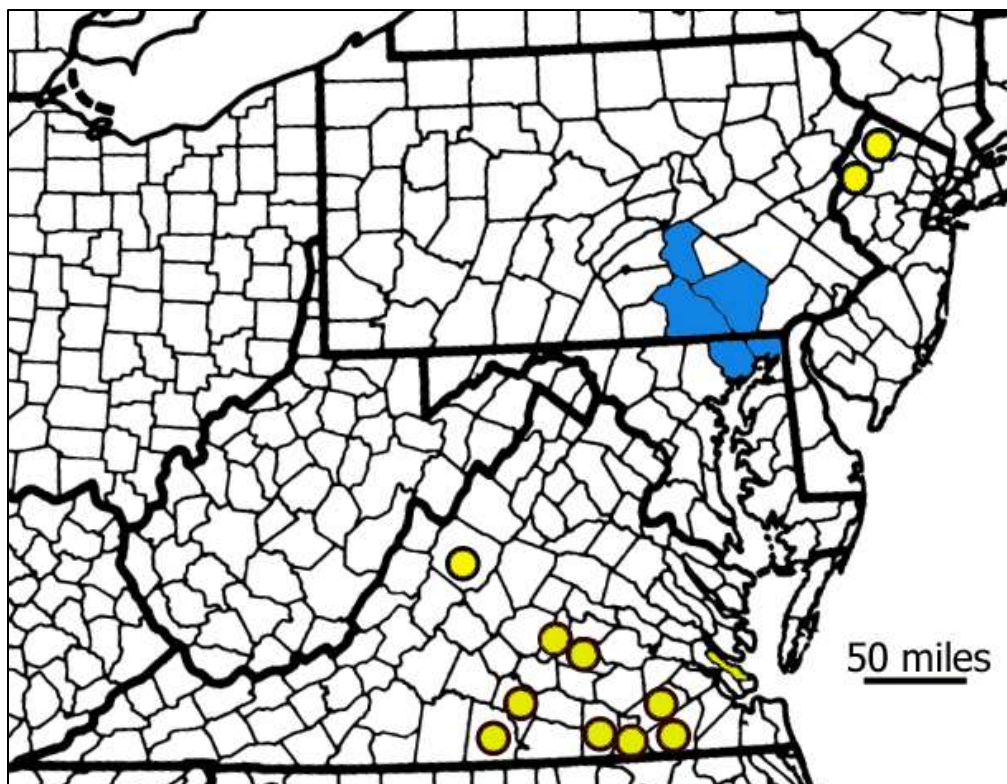
Boltonia asteroides sensu stricto, *B. montana*, and *B. caroliniana* are hypothesized to constitute a natural group, based on shared features — lack of rhizomes, production of basal offsets, few-bracteate peduncles, steeply conical receptacles, narrow phyllaries, and wingless or very narrowly winged achenes with reduced pappus. The range of *B. montana* is expanded to include 9 counties in southeastern Virginia. Each species is described, mapped, and illustrated by photos of representative specimens.

The circumscription and geography of typical *Boltonia asteroides* (L.) L'Herit. was clarified by Townsend (2013) — it is now understood to be endemic to the immediate vicinity of the Susquehanna River in southwestern Pennsylvania and adjacent Maryland (Maps 1, 2). Townsend distinguished it from the recently described *B. montana* Townsend & Kar.-Castro and from *B. asteroides* var. *glastifolia* (Hill) Fernald but maintained the latter at varietal rank within *B. asteroides*. Although var. *glastifolia* is discrete in morphology and separate in geography, it and other geographically separate varietal taxa of *B. asteroides* perhaps have been considered conspecific because morphological differences are subtle and variability in the genus is wide and parallel.

Fernald (1940, and in 1950) treated some *Boltonia* taxa at specific rank, some at varietal, but he did not indicate his rationale for making the distinction. In treating *B. latisquama* as a variety, Cronquist (1947) apparently followed Fernald's precedent, without comment on rank. Morgan (1967) considered the whole genus to comprise a single species with varieties, at least in one instance reckoning that putative (but unsubstantiated) hybridization indicated that the entities involved were conspecific. Townsend did not give a rationale for assignment of rank. In this and other *Boltonia* studies of the present set, morphologically and geographically discontinuous entities are treated at specific rank (all are treated as species). Especially significant in these studies has been detailed mapping that shows discrete distributions.

This study agrees with Townsend and Karaman-Castro (2006) that *Boltonia asteroides* sensu stricto and *B. montana* are closely similar and also that the addition of *B. caroliniana* to this group is justified — the group is characterized by lack of rhizomes, production of basal offsets, few-bracteate peduncles, steeply conical receptacles, narrow phyllaries, and wingless or very narrowly winged achenes with reduced pappus. *Boltonia glastifolia* is out of place here.

Townsend and Karaman-Castro (2006) noted that unpublished ITS and ETS data (of Karaman-Castro) "suggested sister relationship of *Boltonia montana* and *B. caroliniana*, while only distant relationship with *B. asteroides*." They speculated that *B. montana* might have arisen through "ancient hybridization" between *B. asteroides* and *B. caroliniana*, but evidence for that was not provided.



Map 1. Distribution of *Boltonia asteroides* (blue) and *B. montana* (yellow).

1. BOLTONIA ASTEROIDES (L.) L'Hérit., Sert. Angl. 27. 1788. *Matricaria asteroides* L., Mant. Pl. 116. 1767. **LECTOTYPE** (Fernald 1940, p. 465): **Pennsylvania**. Without data (LINN 1013.6). Figure 1). **Protologue**: "Habitat in Pennsylvania. Barthram. 4." ... "Semina compressa, coronata margine quinquedentato."

In early July 1743, in prelude to his longer expedition northward up the Susquehanna to New York state, John Bartram traveled from Philadelphia to Swatara, Mohony, and Shamokin, localities near Harris's Ferry (now Harrisburg) on the Susquehanna River in Dauphin County (Bartram 1751). In a letter to Hans Sloane (23 September 1743), Bartram said that from "a long journey this summer" he had "filled ye 2 quires [bundles] of specimens of plants in their perfect bloom and am collecting a fine variety of mosses to send with them ..." (Berkeley & Berkeley 1992). The LINN specimen presumably was collected in Dauphin County.

Herbaceous perennials, glabrous, fibrous-rooted, without rhizomes, sometimes with sessile basal offsets. **Stems** mostly 25–75 cm, single from the base, not fistulose, erect to ascending-erect, rarely decumbent-ascending. **Leaves**: basal usually deciduous by flowering; lower and mid cauline narrowly oblong to narrowly elliptic-oblong, 5–12 cm long, mostly 4–8(–12) mm wide, relatively even-sized or slightly reduced up to the heads. **Inflorescence** corymboid, few-headed, peduncles mostly 2–6 cm long, ebracteate or with 1 minute bract. **Involucres** 5.5–7 mm wide (pressed); phyllaries narrowly oblong-lanceolate in 3–4 series of equal to subequal length, margins without a scarious outer region, not reflexing, inner 2.5 mm long, midzone linear-oblong, dark-resinous (oil tubes), extending to the phyllary apex, apex lance-acute. **Receptacles** sharply conic. **Ray florets** 30–34, corollas 10–12 mm long, white to pale bluish. **Disc corollas** mostly 1.8–2 mm long. **Achenes** obovate, 1.3–1.5 mm long, faces minutely strigose, narrowly winged, outer rarely with a third nerve and short face, completely margined by narrow oil tubes, pappus a crown of a few short bristles and usually 2 longer awns variable in length (0.3–1.0 mm), one often longer than the other, or all the outer achenes completely lacking awns.

Map 2. Distribution of *Boltonia asteroides* sensu stricto. All localities are close to the Susquhanna River. York County is outlined in red.

Additional collections. Maryland. Cecil Co.: Havre de Grace, sandy shore of Susquehanna River, 17 Sep 1926, *Blake 9704* (GH); Conowingo, rocky islands of Susquehanna River, 29–31 Jul 1924, *Crawford s.n.* (GH); Conowingo, rocky islands, Susquehanna River, 29 Jul 1931, *Crawford s.n.* (PH); Havre de Grace, 1 Sep 1906, *Long s.n.* (PH); S of Conowingo Dam, alluvium among rocks on edge of the Susquehanna River river, 27 Jul 1987, *Redman 4405* (BALT); 1/4 mi S of Havre de Grace, near high tide line, 19 Jul 1902, *Shull 75* (GH, US); 0.75 mi. SE of the Conowingo Dam, bank of the Susquehanna River, 11 Aug 1941, *Tanger 4621* (PH-2). Harford Co.: See Maryland Biodiversity Project. **Pennsylvania.** Dauphin Co.: Harrisburg, in the Susquehanna, in the water, 28 Jul 1828, *Anon s.n.* (PH); Harrisburg, Jul 1864, *Martindale s.n.* (PH); banks of the Susquehanna, near Dauphin, 28 Aug 1865, *Parker s.n.* (NY); Harrisburg, Forster's Island, 10 Aug 1888, *Porter s.n.* (PH); Harrisburg, island in the Susquehanna, 11 Aug 1888, *Porter s.n.* (PH); Harrisburg, shore of the Susquehanna, 11 Aug 1888, *Porter s.n.* (PH); Harrisburg, 9 Jul 1888, *Small s.n.* (PH); vicinity of Harrisburg, 9 Jul 1888, *Small s.n.* (NY, US). Lancaster Co.: Peach Bottom, July 1863, *Carter s.n.* (PH); Columbia, 24 Jul 1883, *Carter s.n.* (PH); Peach Bottom, 23 Aug 1859, *Carter 945* (PH); mouth of Tucquan Creek, 10 Sep 1892, *Heller 575* (PH, US); near E shore of the Susquehanna River, S of Three Mile Island, Conewago Falls, ca. 0.25 air mi SW of Falmouth, 21 Aug 2001, *Kunsmann 15793* (PH); Bair's Island, in pools of water, 30 Aug 1899, *MacElwee 1185* (PH); Chickies, rocky banks of the Susquehanna, 19 Sep 1859, *Porter s.n.* (NY, US); Susquehanna River, N side of Peavine Islands, near the Hwy 372 bridge, below Holtwood Dam, 3 Oct 1984, *Rare Plant Survey Team s.n.* (PH); vicinity of the mouth of Tucquan Creek, 7 Aug 1890, *Small s.n.* (PH); Susquehanna River, Upper Bear Island, 24 Aug 1938, *Tanger s.n.* (PH); 0.25 mi NW of Upper Bear Island, 12 Jul 1939, *Tanger 3368* (PH). York Co.: McCalls Ferry, 5 Sep 1892, *Brown 4478* (PH-2); McCalls Ferry, 17 Jul 1903, *Brown s.n.* (PH); McCalls Ferry, 18 Jul 1903, *Brown 508411* (PH); McCalls Ferry, 3 Aug 1903, *Carter s.n.* (PH); York Furnace, 3 Sep 1892, *Crawford s.n.* (PH); York Furnace, 5 Sep 1892, *Crawford s.n.* (PH); York Furnace, 9 Sep 1892, *Crawford s.n.* (PH); York Furnace, 15 Sep 1892, *Crawford s.n.* (PH); York Furnace, 4 Sep 1892, *Keller s.n.* (PH); York Furnace, 5 Sep 1892, *Lippincott s.n.* (PH); York Furnace, 18 Jun 1896, *MacElwee s.n.* (PH); lower Susquehanna, around York Furnace, rocky pools of water, 27 Jun 1899, *MacElwee 734* (GA, PH); York Furnace, 10 Aug 1901, *Stone 2178* (PH).

Boltonia asteroides and *B. montana* are similar in aspect (no rhizomes, unreduced leaves, few and relatively large heads on long, ebracteate peduncles) and they have similarly narrow phyllaries, but the difference is unambiguous, not even considering their difference in ecology.

1. Stems not decumbent or rooting at nodes; leaves mostly 4–8(–12) mm wide; phyllaries without scarious margins, not reflexing; achenes obovate, 1.3–1.5 mm long, narrowly winged, faces minutely strigose, pappus a corona of minute bristles and 2 longer awns ***Boltonia asteroides***
1. Stems often decumbent and rooting at nodes; leaves (8–)10–20 mm wide; phyllaries with broad, scarious margins, reflexing at fruit maturity and release; achenes oblong to oblong-elliptic or elliptic, 1.5–2 mm long, without wings, faces glabrous, pappus a crown of minute scales, without awns ***Boltonia montana***

Two collections from Dauphin Co., Pennsylvania, were cited as *Boltonia montana* by Townsend and Karaman-Castro (2006) — *Parker s.n.* (NY) and *Martindale s.n.* (PH). Both are from Harrisburg and the Parker label notes "banks of the Susquehanna." Collections of typical *B. asteroides* have been made from the immediate vicinity of Harrisburg (cited below, including John Bartram's collection, which is the Linnaean type) and the Parker and Martindale specimens match them in nearly every respect. The Martindale plant (Fig. 7) has obovate, winged achenes but a pappus with awns reduced to ca. 0.2 mm long — as noted in the description (above), however, awn length is variable in *B. asteroides* and distinctively short awns occur elsewhere in its range (e.g., *Tanger s.n.* from Lancaster County in 1938, with awns 0.2–0.3 mm long).

2. **BOLTONIA MONTANA** Townsend & Kar.-Castro, Sida 22: 874. 2006. **TYPE: New Jersey.** Sussex Co.: 3.2 km SW of Newton and 1.4 km W of Hwy 206, muckshaw pond complex, nearly dry, herb-dominated sinkhole pond, 3 Oct 2005, *J.F. Townsend 3570* (holotype: US; isotypes: MO, NY, VPI).

Herbaceous perennials, fibrous-rooted, without rhizomes, often with basal offsets, glabrous. **Stems** (20–) 40–90 (–150) cm, single from the base, sometimes slightly fistulose, erect to ascending or decumbent-erect, the proximal portion sometimes prostrate and rooting at the nodes and producing rosettes, sometimes with erect flowering branches emerging at the nodes. **Leaves**: basal persistent or deciduous by flowering; cauline narrowly elliptic to narrowly elliptic-oblong, 4–13 cm long, (8–)10–20 mm wide, slightly reduced or not at all up to the heads. **Inflorescence** corymboid, sparsely headed (1–25) or sometimes more densely so, peduncles mostly 1–6 cm long. **Involucres** 5.5–7 mm wide (pressed); phyllaries narrowly oblong-lanceolate in 3–4 series of equal to subequal length, margins with a broad scarious outer region, reflexing at and after fruit maturation and release, inner 3–4 mm long, midzone linear-oblong, dark-resinous (oil tubes), extending to the phyllary apex, apex lance-acute. **Receptacles** sharply conic. **Ray florets** 27–40, corollas 8–12 mm long, pale lavender. **Disc corollas** mostly 1.5–2 mm long. **Achenes** oblong to oblong-elliptic or elliptic, 1.5–2 mm long, faces glabrous, rarely with a third nerve and short face, without wings (or narrow wings in se Virginia), pappus a crown of minute scales, without awns.

Flowering (July–) August–October. Edges and flats around sinkhole ponds and bottoms of dried ponds. See Townsend and Karaman-Castro (2006) for details of habitat and citation of collections from New Jersey and Augusta Co., Virginia. Observations in the present study indicate that *Boltonia montana* is most abundant in southeastern Virginia, where it has not been previously recorded.

***Boltonia montana* in southeastern Virginia**

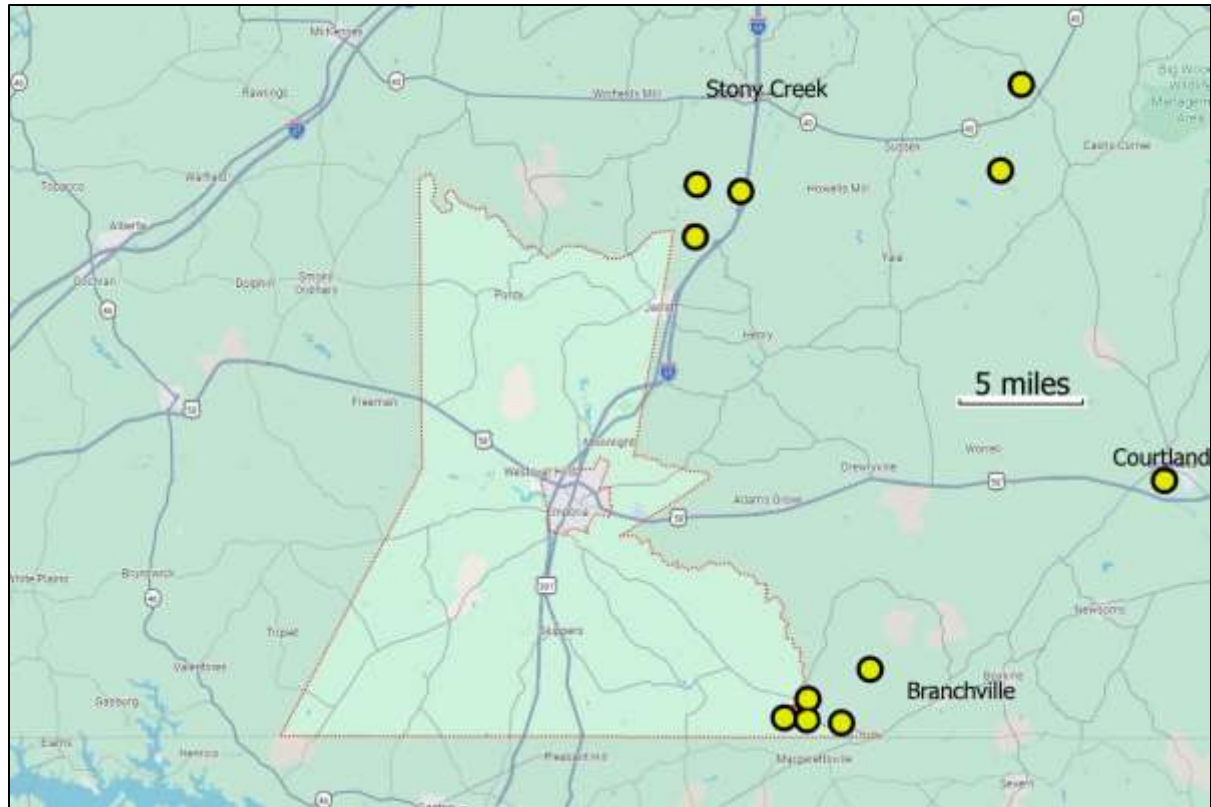
The distinction of these plants has been noticed before.

- a) Fernald cited his own 14049 (Sussex Co.) as one of two paratypes of *Boltonia ravenelii* (the type from South Carolina).
- b) Fernald noted on the label of his 7716A (Sussex Co., GH-2215178) that it was from the same locality as his 7716[b] (= *B. caroliniana*, DOV, GH-2215184), apparently aware that they were different entities, even though the label of each identifies them as *B. caroliniana*.
- c) Fleming noted on the label of his 14379 (Halifax Co.) that it was growing with 14375 *B. caroliniana*, directly implying that 14379 was a different species --- the label of each identifies them as *B. caroliniana*.

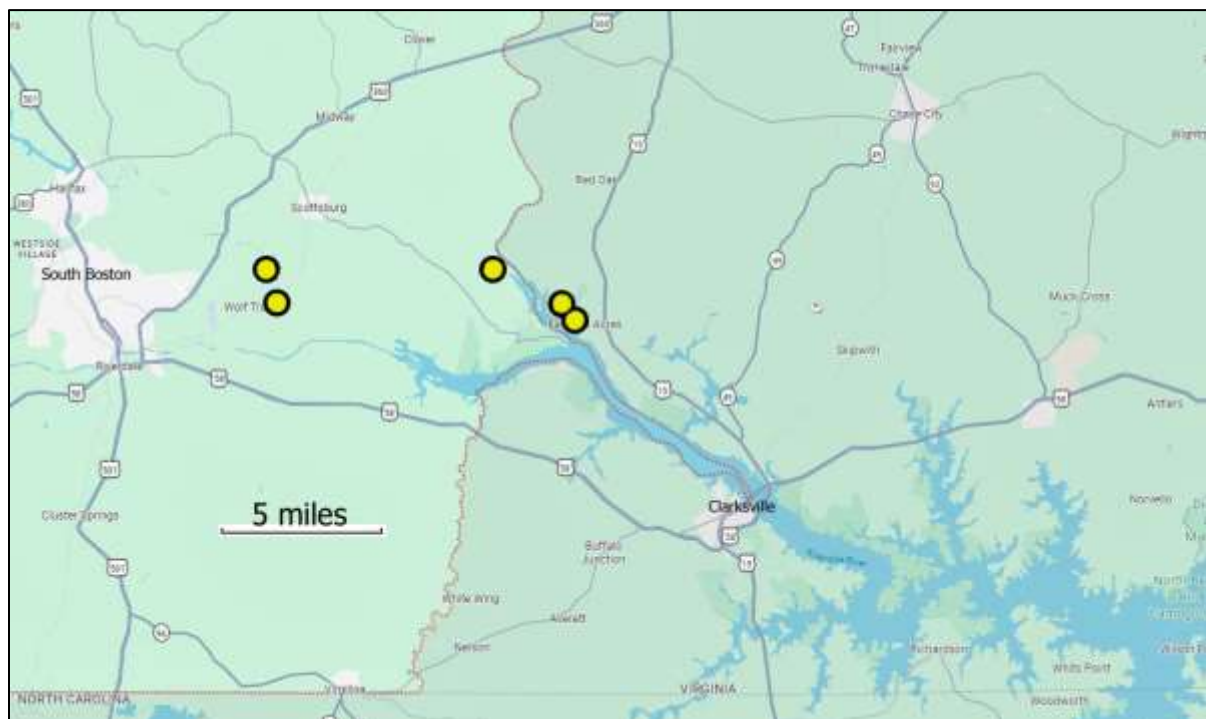
These southeastern Virginia plants are confidently identified here as a different species from *Boltonia caroliniana*, even though they have been identified as the latter, perhaps in large part because of the reduced pappus. Botanists with opportunity for more detailed study will be able to further evaluate the taxonomy. The southeastern Virginia plants contrast with *B. caroliniana* in features characteristic of *B. montana*:

- * larger and more even-sized leaves up to the heads
- * profuse production of prominent basal offsets and production of offsets even along the stems, which sometimes become prostrate with erect branches emerging from nodes
- * thicker stems with a tendency even to become proximally fistulose
- * fewer heads on thicker peduncles
- * achenes faces glabrous (*Fernald 14049*, *Fernald 14512*; observations by Dave Boufford)

Sinkholes, draw-down pools, dried-up claypan pools and depressions. and swales are noted by the collectors, similar to the typical habitat of *B. montana*



Map 3. Distribution of *Boltonia montana* in Greensville, Sussex, and Southampton cos., Virginia. Greensville Co. is outlined in red.



Map 4. Distribution of *Boltonia montana* in Halifax and Charlotte cos., Virginia. Halifax Co. is outlined in red.

The coherent geography of these plants (Maps 3,4) suggests that a single entity is represented, rather than a populational variant of *B. caroliniana*. The sympatry of the two species points to reproductive isolation — putative intermediacy, especially in sympatric *B. caroliniana* more often producing basal offsets, perhaps is in the range of variability of *B. montana*.

Southeastern Virginia. Amelia Co.: 2.2 mi. WNW of Genito, Amelia State Wildlife Management Area, along the Appomattox River, ca. 0.1 mi NW of the mouth of Rocky Ford Creek, 37.472958 N, 77.897261 W, in large, drawn-down depression in forested swamp, several scattered colonies of robust plants, 28 Sep 2021, *Fleming 18906* (GMUF). Brunswick Co.: S of Edgerton, Meherrin River, bottomland woods above Western Bridge, 13 Oct 1942, *Fernald & Lewis 14512* (GH, NY, US); SW of Ebony, bottomland woods along Poplar Creek, 21 Jun 1944, *Fernald 14668* (GH). Charlotte Co.: 3.8 mi ESE of Dryburg, Kerr Reservoir/Hogan Creek Wildlife Management Area, 0.3 mi SE of the terminus of Hwy 640, thin *Salix nigra* woodland in drawn-down bottomland at extreme upper end of Kerr Reservoir, occasional, 9 Oct 1997, *Fleming 14349* (GMUF); Kerr Reservoir, ca. 1 km NW of Hogan Creek and 13 km NW of Clarksville, low, thinly wooded lakeshore edge back of drawdown zone, 9 Oct 1997, *Wieboldt 9860* (VPI). Cumberland Co.: 0.9 mi. SE of Trenton Mills, Cumberland State Forest, along the Willis River, 0.45 mi SE of the Hwy 608 bridge, extensive, seasonally flooded backswamp, locally common, 9 Aug 2011, *Fleming 15591* (VPI); ca. 1 mi SE of Trenton Mills, Cumberland State Forest, along the Willis River, ca. 0.5 mi SE of the Hwy 608 bridge, 37.620553 N, 78.213920 W, drawn-down, seasonally flooded, wooded swamp, scattered, robust colonies, plants up to 1.7 m tall, but usually fallen over from top-heavy branching and flowering, 27 Sep 2021, *Fleming 18895* (GMUF). Greensville Co.: SW of Haley's Bridge, Fontaine Creek, wooded bottomland, 11 Oct 1938, *Fernald & Long 9642* (GH); Meherrin River; over several miles of river between Haley's Bridge and Hugo, W of Branchville (in Southampton Co.), wooded riverbanks, individuals or a few together at widely scattered localities, 7 Sep 1988, *Wieboldt 6786* (VPI, WILLI). Halifax Co.: Ca. 1.2 km SSW of the mouth of Difficult Creek, drawn-down, seasonally flooded forested swale within the floodplain of the Roanoke River (W side), 11 Sep 1997, *Belden 1614* (GMUF); ca. 2.0 mi NE of Wolf Trap, Kerr Reservoir lands, open, dried-up claypan pools and depressions along the Southen Railroad, west of Gibson Creek, occasional; growing with *Boltonia caroliniana*, 10 Oct 1997, *Fleming 14379* (GMUF); near Five Forks, Banister River Wildlife Area, floodplain of Banister River, scattered on edge of swamp in openings (roads etc.), without date, *Stevens 23976* (FARM, perhaps hybrid with *B. caroliniana*). Sussex Co.: 4 mi S of Stony Creek, swale at border of woods, same station as 6716 [= *B. caroliniana*], 18 Oct 1936, *Fernald & Long 6716a* (GH 2215178); NW of Owen's Store, Nottoway River, Green Church Bridge, alluvial woods along river, selected small plant, 14 Oct 1941, *Fernald & Long 14049* (BUT, GA, GH, TENN, US); W of Homeville, bottomlands along Nottoway River, 1 Jul 1942, *Fernald & Long 14438* (GH); 4.0 mi SW of Littleton along W side of the Nottoway River, 0.1 mi N of Peters Bridge on Hwy 631, muddy, drawn-down pools and riverbank along W side of the river, common, 1 Oct 1994, *Fleming 8761* (VPI, WILLI); just N of Huske, open swale, 29 Sep 1973, *Harvill 30086* (FARM). Southampton Co.: Branchville, 0.3 mi SW of Haleys Bridge over Meherrin River, slough, 31 Aug 1970, *Churchill 70-8313* (VDB); near Courtland, bottomland of Nottoway River, argillaceous and siliceous alluvium, 23 Jun 1936, *Fernald et al. 5936* (GH-3 sheets); near Haley's Bridge, wooded alluvial bottomland of Meherrin River, 2 meters high, 19 Aug 1938, *Fernald & Long 9186* (GH-2 sheets); 6 mi W of Branchville, along Hwy 730 just E of Meherrin River and 2.2 mi S of Little Texas, wet roadside ditch and powerline clearing, 7 Sep 1988, *Wieboldt 6791* (VPI, hybrid with *B. caroliniana*?). York Co.: S of Harris Grove roadside, from jct of Hwy 105 and Hwy 17, SE to powerline and E to Hwy 634, roadside, dried sink hole and fields, 28 Jul 1997, *Bradley 29100* (GMUF).

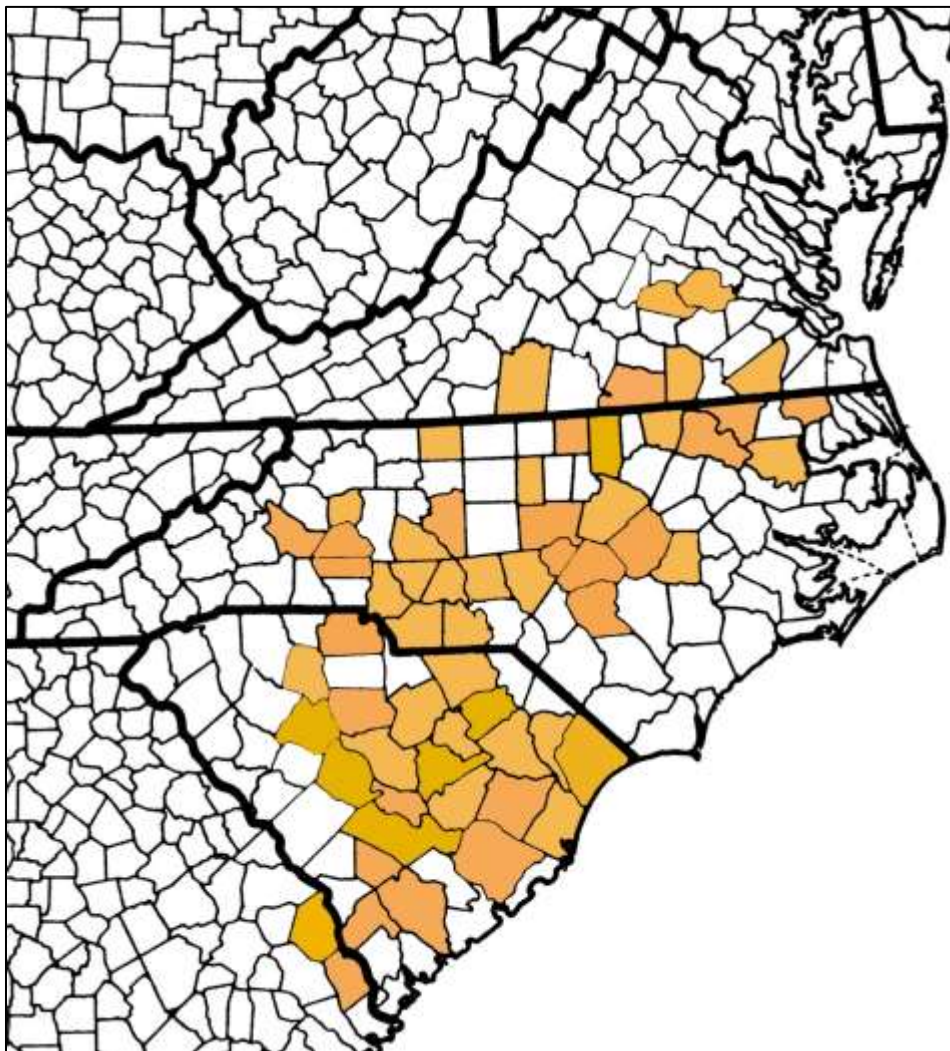
3. BOLTONIA CAROLINIANA (Walter) Fernald, *Rhodora* 42: 487. 1940. *Chrysanthemum carolinianum* Walter, Fl. Carol. 204. 1788. Protologue: "foliis lanceolatis utrisque acuminatis laevibus, caule 5 ad 6-pedali ramosissimo, floribus radio albis disc luteis." **NEOTYPE** (Ward 2007): **South Carolina.** Berkeley Co.: Along the Santee River, 3 mi NE of Pineville, 11 Sep 1939, R.K. Godfrey 8155 (GH; iso-neotypes: CAS, US).

Herbaceous perennials, glabrous, fibrous-rooted, without rhizomes but sometimes producing sessile basal offsets. **Stems** usually erect but to decumbent-ascending, 40–200 cm, single from the

base. **Leaves:** basal usually absent at flowering, except for production of basal offsets; cauline elliptic-lanceolate to narrowly oblanceolate or linear-obovate, (2–)5–20(–28, or –33 in young plants) cm long, 3.5–7(–10) mm wide. **Inflorescence** paniculate to corymboid-paniculate; peduncles mostly 1–2.5(–3.5) cm long, filiform, with 0 or usually 1–3(–4) minute bracts. **Receptacle** steeply conic. **Involucres** 3.5–4 mm wide (pressed); phyllaries linear-oblong, in 2–3 series of equal to subequal length, inner 1.8–2 mm long, dark midregion linear, apex narrowly attenuate. **Ray florets** 25–36, corollas 6–9 mm long, white to lilac. **Disc corollas** 1.5–2 mm long. **Achenes** narrowly obovate, glabrous, sometimes with a third nerve, 1.4–1.7 mm long, very narrowly winged, a filiform oil tube around the distal 1/2–2/3, awns 0 or 1(–2) and ca. 0.1–0.2 mm long, crown absent or a barely perceptible ring.

Flowering August–October. Wooded bottomland, riverbanks, swales, ditches, roadsides.

A distinctive species and usually correctly identified, perhaps because of the gestalt conveyed by the divaricate branching of the inflorescence (see Figs. 21 and 22), small heads on short filiform peduncles, and the narrowly winged achenes with greatly reduced pappus.



Map 3. Distribution of *Boltonia caroliniana*.

ACKNOWLEDGEMENTS

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Figure 1. *Boltonia asteroides*. LINN 1013.6, holotype, collected by John Bartram near Harrisburg.



Figure 2. *Boltonia asteroides*. York Co., Pennsylvania, MacElwee s.n. (PH).



Figure 3. *Boltonia asteroides*. York Co., Pennsylvania, Brinton s.n. (PH).



Figure 4. *Boltonia asteroides*. Dauphin Co., Pennsylvania, Porter s.n. (PH).



Figure 5. *Boltonia asteroides*. Lancaster Co., Pennsylvania, Heller 575 (PH).

Figure 6. *Boltonia asteroides*. Lancaster Co., Pennsylvania, Heller 575 (PH).



Figure 7. *Boltonia asteroides*. Dauphin Co., Pennsylvania, Martindale s.n. (PH).



Figure 8. *Boltonia asteroides*. Lancaster Co., Pennsylvania, Small s.n. (PH).



Figure 9. *Boltonia asteroides*. York Co., Pennsylvania, Brown s.n. (PH).

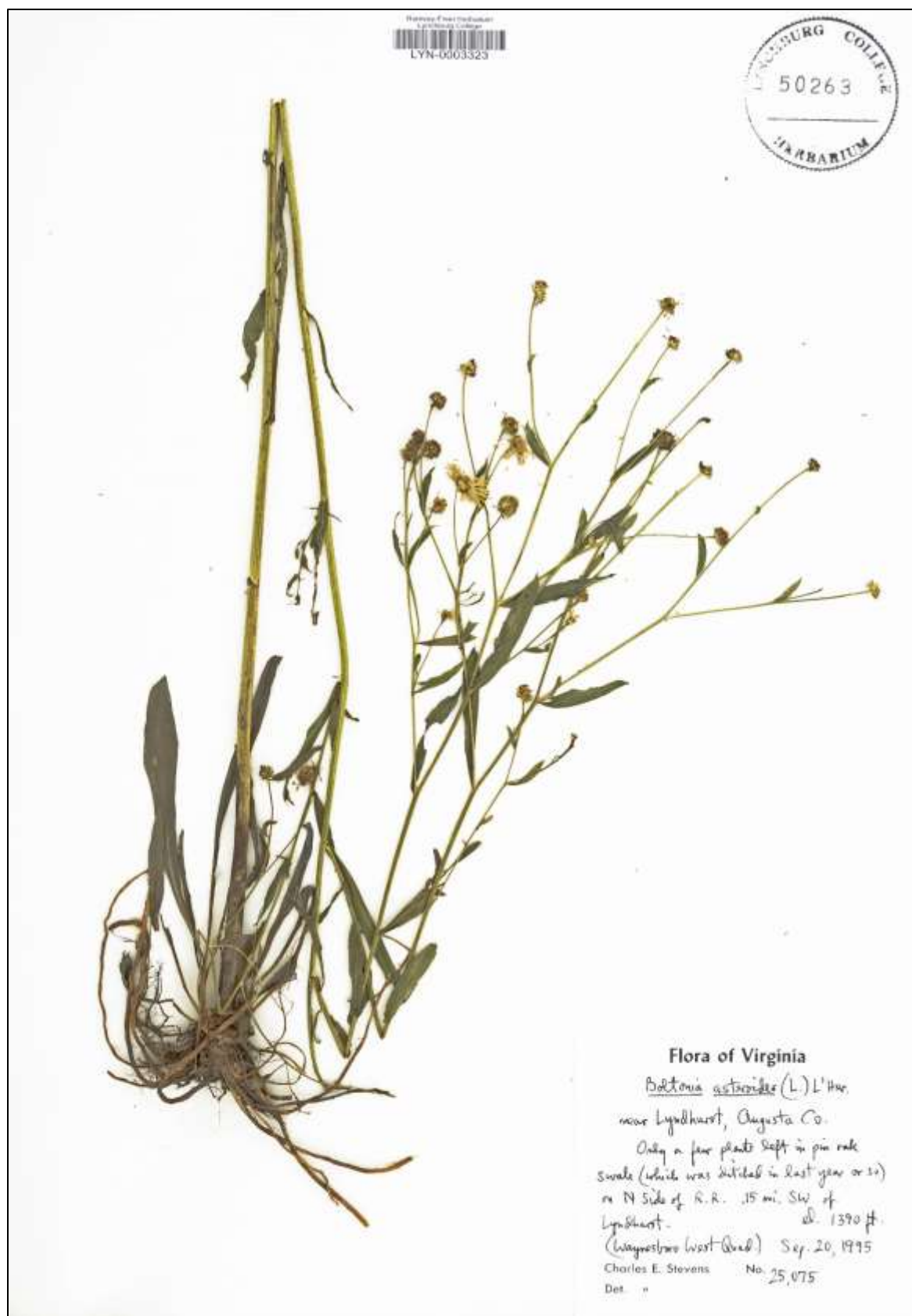


Figure 10. *Boltonia montana*. Augusta Co., Virginia, Stevens 25075 (LYN).



Figure 11. *Boltonia montana*. Augusta Co., Virginia, Ramsey 7241 (ASC).

Figure 12. *Boltonia montana*. Augusta Co., Virginia, Rawlinson 58A (VDB).

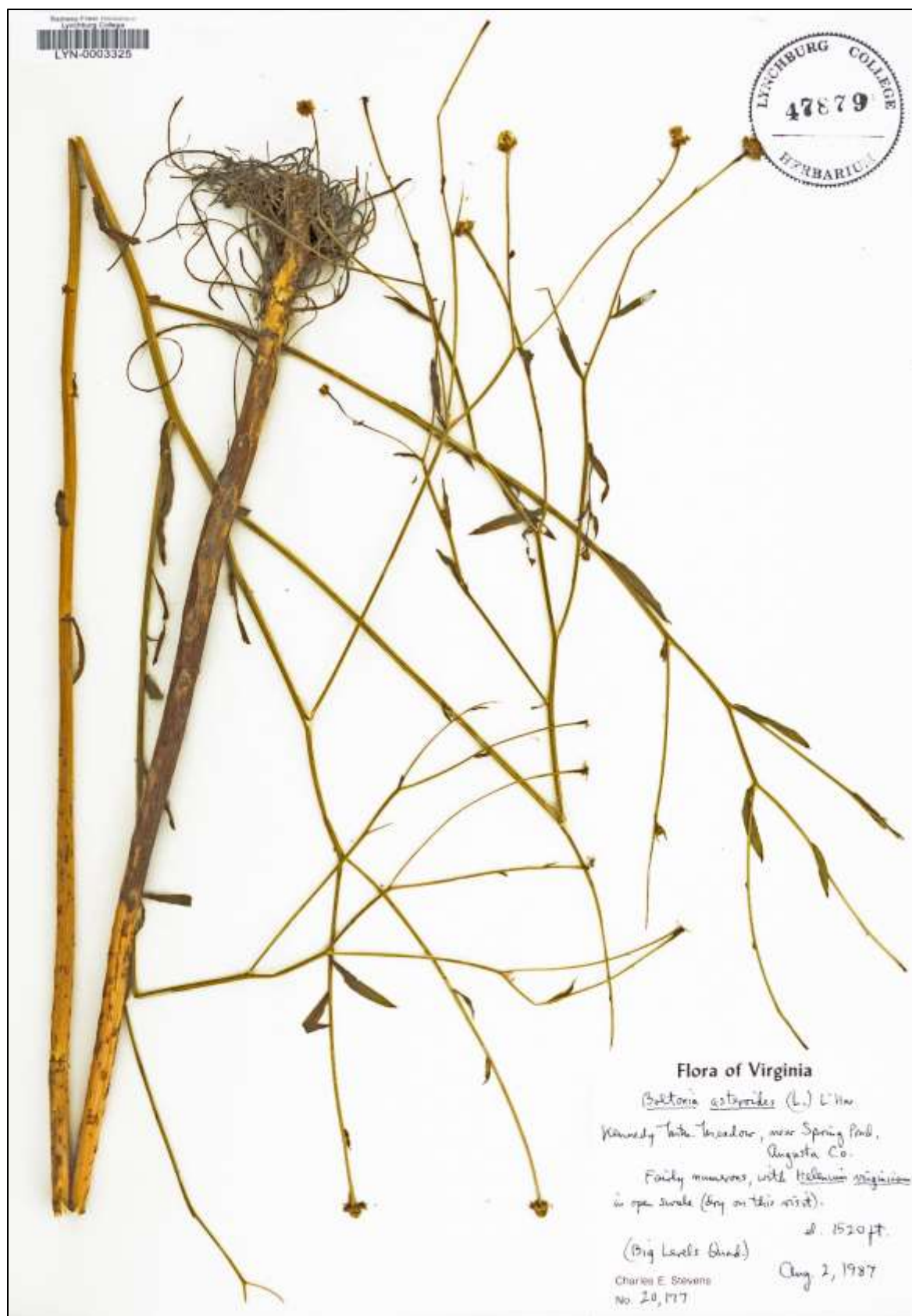


Figure 13. *Boltonia montana*. Augusta Co., Virginia, Stevens 20177 (LYN).

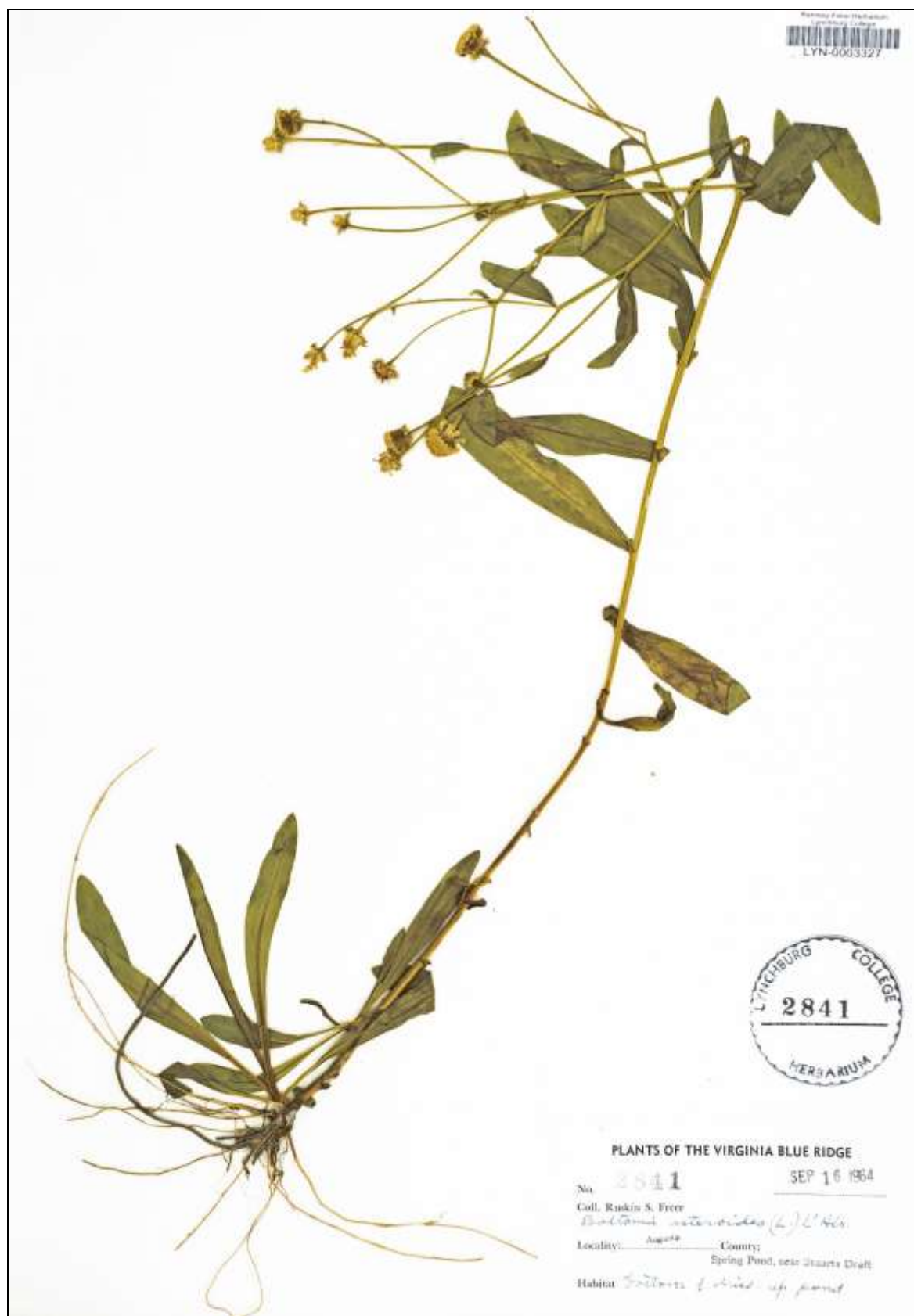


Figure 14. *Boltonia montana*. Augusta Co., Virginia, Freer 2841 (LYN).

Figure 15. *Boltonia montana*. Sussex Co., New Jersey, Townsend 3570 (US).

Figure 16. *Boltonia montana*. Sussex Co., New Jersey, Townsend 3557 (PH).

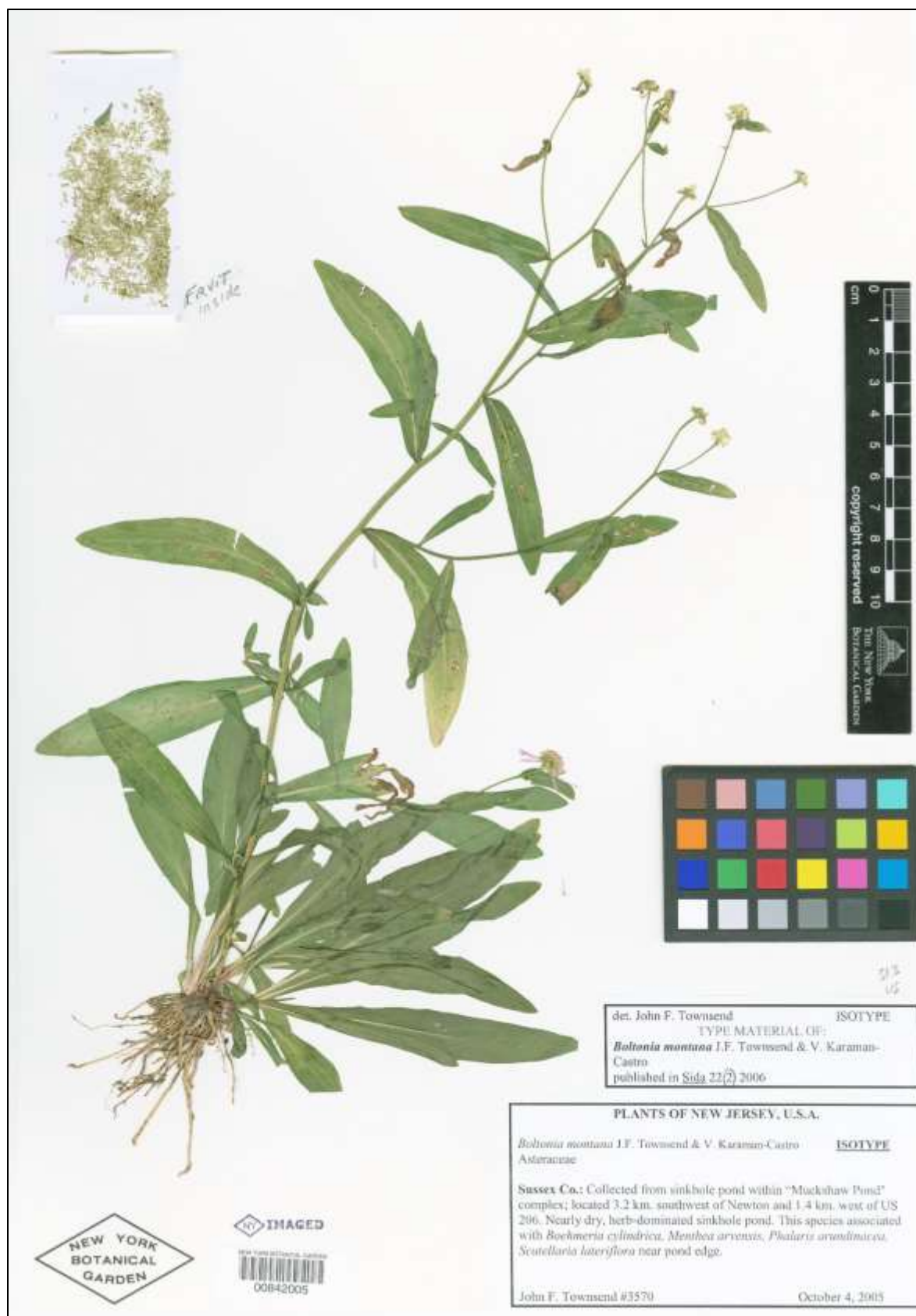
Figure 17. *Boltonia montana*. Sussex Co., New Jersey, Townsend 3570 (NY).



Figure 18. *Boltonia montana*. Sussex Co., New Jersey, Townsend 3566 (PH).



Figure 19. *Boltonia montana*. Amelia Co., Virginia, Fleming 18906 (GMUF).

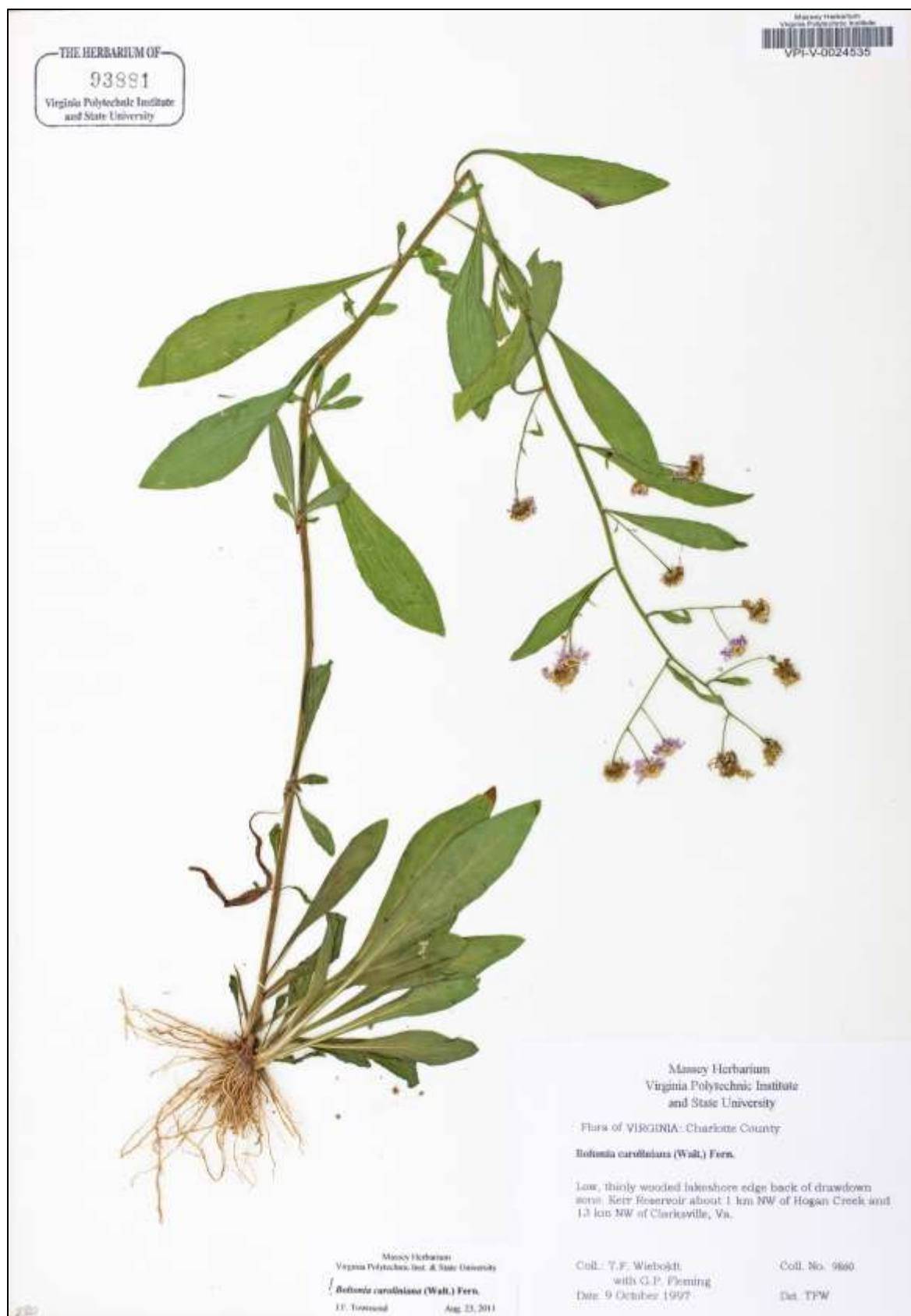


Figure 20. *Boltonia montana*. Charlotte Co., Virginia, Wieboldt 9860 (VPI).



Figure 21. *Boltonia montana*. Halifax Co., Virginia, Fleming 14379 (GMUF).



Figure 22. *Boltonia montana*. Sussex Co., Virginia, Fleming 8761 (GMUF).

Figure 23. *Boltonia montana*. Sussex Co., Virginia, Fleming 8761 (VPI).



Figure 24. *Boltonia montana*. Sussex Co., Virginia, Fleming 8761 (WILLI).

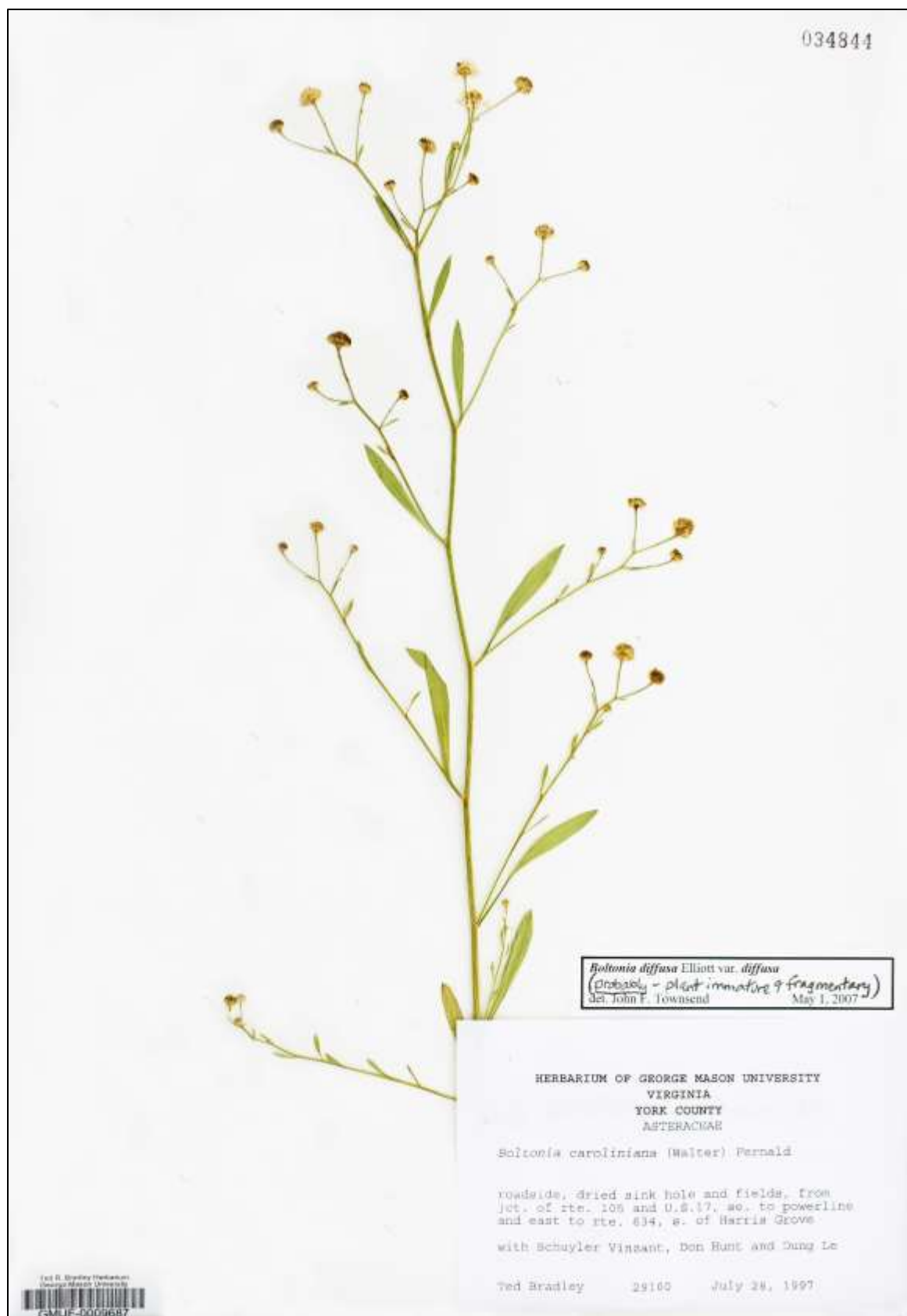


Figure 25. *Boltonia montana*. York Co., Virginia, Bradley 29100 (GMUF).



Figure 26. *Boltonia caroliniana*. Halifax Co., Virginia, Wieboldt 11711 (VPI).



Figure 27. *Boltonia caroliniana*. Halifax Co., Virginia, Fleming 18209 (WILLI).



Figure 28. *Boltonia caroliniana*. Halifax Co., Virginia, Fleming 14016 (GMUF). Small basal offset.



Figure 29. *Boltonia caroliniana* inflorescence from Figure 28 (Fleming 14016). Angles of divergence in inflorescence branches. Townsend (2013) noted that the divaricate aspect of the inflorescence is a distinct gestalt feature of the species — angles quantified here in agreement with his observation.



Figure 30. *Boltonia caroliniana*. Halifax Co., Virginia, Stevens 23976 (FARM). Large basal leaves from sessile offsets, suggestive of *B. montana*, which occurs in Halifax County.



Figure 31. *Boltonia caroliniana*. Pittsylvania Co., Virginia, Wieboldt 12761 (VPI).