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A New Species in *Trillium* subgen. *Delostylium* (Melanthiaceae, Parideae)

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The *Trillium pusillum* Michaux (1803: 215) species complex exhibits a complicated pattern of morphological variability and geographic distributions in southeastern North America (Farmer 2007). In contrast to earlier studies based on isozymes (Cabe and Werth 1995; Timmerman-Erskine *et al.* 2003), analyses of DNA sequence variability provide evidence of clear boundaries that correspond with morphological and habitat differences to suggest that the group is best recognized as a series of distinct species (Farmer 2007). Species names have been proposed for some of these, and they are recognized as varieties in some taxonomic treatments (e.g. Weakley 2015), but several still are known only from informal designations. One of the rarest, and perhaps most threatened, is the sole representative of the complex in Georgia that is known from only a single creek drainage system in an area being developed for industrial usage. In the current study we provide formal recognition for it, both to emphasize the need to preserve this unique entity, as well as to stimulate searches for further populations of it.

The recognition of a new species from the southeastern United States also highlights the importance of this region as a biodiversity hotspot (Noss *et al.* 2015). Careful analyses of both morphology and habitat, now often combined with new data available from molecular approaches, have resulted in recent recognition of several novelties from this area (Estes and Beck 2011; Weakley *et al.* 2011; Weakley and Poindexter 2012; Sorrie *et al.* 2013; Campbell and Seymour 2013; Boufford *et al.* 2014; Turner 2015; Schilling *et al.* 2015). In particular, several new species of *Trillium*, which has the majority of its species in the region, have been discovered (Gaddy 2008; Schilling *et al.* 2013; Schilling *et al.* unpublished). The documentation of the alpha taxonomic diversity of the region is an important step in facilitating synthetic studies of species interactions (Leitão *et al.* 2016) and of the biogeographic history of the region.

Description of the new species

Trillium georgianum S.B. Farmer *sp. nov.* (Fig. 1–2)

Similar to *Trillium texanum* in the presence of stomata on the upper leaf surfaces, high proportion of sterile leaves, and a thin branching rhizome; but differing from *T. texanum* and all other members of the *Trillium pusillum* Complex in the long narrow leaves.

Type:—USA. Georgia: Whitfield County*, Floden, Schilling, and Lampley 2884*, 17 March 2016 (Holotype, TENN!; isotypes, BRIT!, GA!, MO!, NCU!, US!).

Perennial from long, thin rhizomes, 98–116(–137) mm tall. Stems single, with either a single leaf or with a single whorl of 3 bracts, 6-angled near bracts. Bracts (Leaves) 35–48.5 (–56) mm × 7–10(–11) mm, 3.9–5.9(–6) times longer than wide, numerous stomata evenly distributed in upper surface, blade dark green with maroon undertones especially when young, not mottled, 3 primary veins, linear to linear-lanceolate. Pedicel 13–24(–29) mm. Flower above leaves, ascending to erect; sepals 15–17(–19) mm × 5–7 mm, 2.4–3(–3.8) times longer than wide, conspicuous, spreading to same plane as petals, dark green with maroon undertones when young; petals 15–19 mm × 5–9 mm, 1.7–2.7(–3.2) times longer than wide, of short duration, spreading-ascending, exposing stamens and ovary, weakly recurved in distal half, white, aging to deep rosy pink, veins not engraved but major petal veins clearly visible, thin-textured, widest above base, margins strongly undulate, quite variable in petal width and degree of undulation between individuals

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and populations; stamens 7–8(–8.2) mm, erect-spreading; filaments 3–3.5(–4) mm, shorter than anthers, greenish-white, slender; anthers 4–4.5(–5.2) mm, ± straight, yellow, thicker than filaments, dehiscence introrse; connectives not extended beyond anther sacs, pinkish-purple; ovary 2.7–3.5 mm tall, conspicuous, green, ovoid, obscurely 6-angled; style 1.5–3(–3.7) mm, green; stigmas 3, 1.5–2.2 mm, confluent with style, green, long-spreading, uniformly thin and threadlike. Fruits white or pale greenish, ovate. Flowering: late March to early April.

Additional specimens examined (paratypes):—USA, Georgia, Whitfield Co., 5 April 2002, *Farmer s.n.* (TENN!); *ibidem*, 26 March 1996, *Allison and Dickman 9096* (GA!); *ibidem*, 21 March 1996, *Dickman s.n.* (GA!).

Etymology:—The species is named for the state of Georgia which is the location of the only known site for it. As a common name we suggest Georgia Dwarf Trillium.

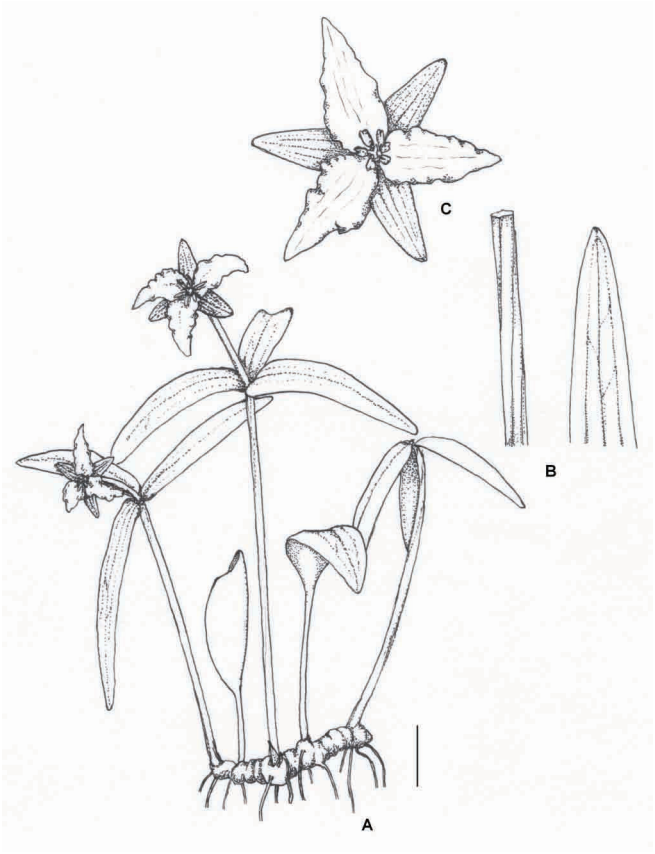

FIGURE 1. A–C. *Trillium georgianum*. A. Habit, showing flowering stems and single sterile leaves arising from a single rhizome; B, Vegetative, left, stem showing angles, right, leaf venation; C. Flower. Scale bar: A = 1 cm, B and C = 0.5 cm. Illustration by A. Floden.

Habitat and distribution:—The single known locality for *Trillium georgianum* (Fig. 2) is a perched calcareous flatwoods (200–225 m elevation) with the following herbaceous associates: *Arisaema pusillum* (Peck) Nash, *Claytonia virginica* L. var. *acutiflora* DC., *Galium tinctorium* L. var. *tinctorium, Gratiola floridana* Nutt., *Lilium michiganense* Farw., *Luzula acuminata* Raf. var. *carolinae* (S.Watson) Fernald, *Mitchella repens* L., *Platanthera flava* (L.) Lindl. var. *flava, Ranunculus hispidus* Michx., and *Ranunculus pusillus* Poir. Plants of *T. georgianum* are clustered upon and around the edges of mounded islets inhabited also by abundant mosses (especially American tree-moss, *Climacium americanum* Brid. and *Sphagnum* sp.). These microhabitats are scattered among seasonally wet, shallow depressions. The exposed soils shrink and swell and by summer usually appear parched and cracked. Nearby, at slightly lower elevations, small streams meander lined with plants more typical of streamside banks, seepage swamps, and floodplains. These other wetland habitats and adjacent streambanks harbor other species, such as *Lobelia cardinalis* L., *Primula meadia* (L.) A.R.Mast & Reveal, *Rudbeckia laciniata* L., *Samolus parviflorus* Raf., *Trillium lancifolium* Raf., and *Xanthorhiza simplicissima* Marshall, but the *Trillium georgianum* habitat is not a floodplain. Unlike most trilliums, *Trillium georgianum* proliferates by rhizome branching and typically forms tight clusters of vegetative clones with a few flowering stems intermixed. Plants occur under a dense canopy that includes an overstory of *Acer rubrum* L., *Fraxinus pennsylvanica* Marshall, *Nyssa sylvatica* Marshall, *Quercus michauxii* Nutt., *Quercus nigra* L., *Quercus phellos* L., and *Quercus shumardii* Buckley. The understory is variable from open to closed and in addition to saplings from canopy trees, has the following dominants: *Cercis canadensis* L., *Cornus florida* L., *Crataegus marshallii* Eggl.,

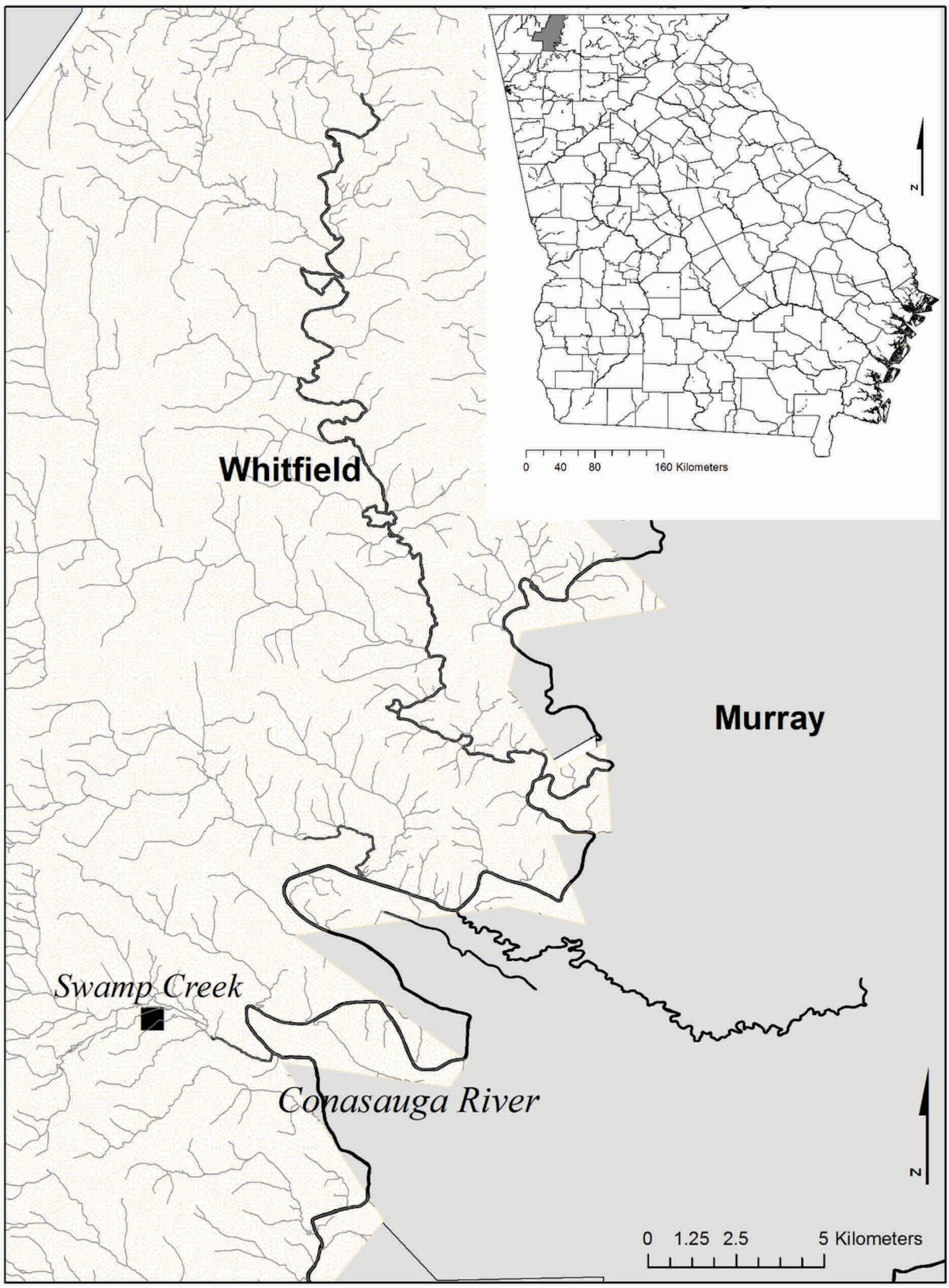

FIGURE 2. Geographic distribution of *Trillium georgianum*. County level distribution in one of the northernmost counties in the state of Georgia highlighted (inset), and approximate location of the sole population in Whitfield County along Swamp Creek (solid square).

Ilex decidua Walter, and tangles of *Smilax laurifolia* L. Plants of *Trillium georgianum* were first observed in March 1995 by a consultant, Brian Dickman, who was looking for wetland mitigation sites. The area was being developed as an industrial complex despite the nature of the seasonally wet, shrink and swell clayey soils. By April 1996, state botanists verified the specimens as Dwarf Trillium, *Trillium pusillum*. Portions of the flatwoods had already been ditched;

large tracts were being clearcut and leveled, some were being filled with soil from nearby uplands. The flatwoods occupied by *T. georgianum* continues to be degraded in bits and pieces, but some protection efforts are underway. The Tennessee Valley Authority and Dalton Utilities, a unit of the Whitfield County government, both hold tracts harboring *T. georgianum* that, hopefully, will remain perpetually intact. Formal agreements with various governmental agencies must be negotiated to protect permanently the type locality. In addition, the Georgia Plant Conservation Alliance, including various botanical gardens, maintains cultivated stock used to establish additional flatwoods populations on permanently protected lands. Nevertheless, *T. georgianum* occurs only in scattered subpopulations within this single flatwoods habitat despite attempts to locate additional plants in the watershed. Truly, this taxon of the *Trillium pusillum* Complex remains highly threatened and may deserve listing under provisions of the federal U.S. Endangered Species Act. *Trillium georgianum* must be considered a rare species. It is currently known from only a single extended site along the drainage of Swamp Creek, a tributary of the Conasauga River (Fig. 2). The population numbers in the hundreds of individuals, but the location near or in an industrial park means that they are potentially threatened by development. Part of the site where *T. georgianum* occurs was, in fact, slated for development and a subsequent rescue operation removed many plants and significantly decreased the population. Based on its rarity, it is recommended that it be considered for state and even federal government protection.

Taxonomic relationships:—Jacobs & Jacobs (1997) recognized this taxon as being distinct and informally proposed the name *Trillium pusillum* var. *georgianum* for it. Information including images and illustrations of the species (listed as *T. pusillum*) are provided by Chafin (2007). It is the only member of the *Trillium pusillum* Complex that occurs in Georgia. *Trillium georgianum* shares the rare trait of adaxial stomatal openings on the leaves with *T. texanum* (Buckley 1860: 443). These give the leaves a farinose, granular, or mealy appearance. The two species are also characterized by producing both single-leaved and three-leaved stems from a single rhizome (Fig. 1A), a trait that may be restricted within *Trillium* to these two species; thus single-leaved individuals are common and conspicuous in populations of them. In other species of *Trillium*, single-leaved stems are produced only in young, immature plants. In addition, the leaves of *T. georgianum* are lanceolate and very narrow (3.9–5.9 times longer than wide), much more so than any of the other species in the *Trillium pusillum* group. The combination of these three characters makes this an easily identifiable species. The most similar species of the *Trillium pusillum* group is *T. texanum*, and the two species can be differentiated by leaf shape, which is ovate to lance-ovate and less than 3.9 times as long as wide in *T. texanum*; by the horizontal or slightly declining leaf position in *T. georgianum*, compared to ascending in *T. texanum*; by petal shape, which in *T. georgianum* is broadly ovate and 1.7–2.7 times as long as wide, compared to narrowly ovate and 2.8–3.8 times as long as wide in *T. texanum*. In addition, although plants of both species are found in wet areas, those of *T. texanum* are typically found on elevated areas around the bases of trees, whereas plants of *T. georgianum* are not associated with tree hummocks. The blooming period of *T. texanum*, late February to early March, is earlier than that of *T. georgianum*. The two species are widely separated geographically, with the nearest occurrence of *T. texanum* (Miller Co., AR) over 800 km to the west of the locality for *Trillium georgianum*.

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References

Boufford, D.E., Kartesz, J.T., Shi, S. & Zhou, R. (2014) *Packera serpenticola* (Asteraceae; Senecioneae), a new species from North Carolina, U.S.A. *Systematic Botany* 39: 1027–1030.
https://doi.org/10.1600/036364414X682274

Buckley, S.B. (1860) Descriptions of several new species of plants. *Proceedings of the Academy of Natural Sciences of Philadelphia* 12: 443–445.

Cabe, P.R. & Werth, C. (1995) The *Trillium pusillum* Michaux (Liliaceae) complex in Virginia. II. Isozyme evidence. *Castanea* 60: 15–29.
http://www.jstor.org/stable/4033833

Campbell, J.J. & Seymour, W.R., Jr. (2013) Towards a revision of the *Rudbeckia fulgida* complex (Asteraceae) with description of a new

species from the blacklands of southern USA. *Phytoneuron* 90: 1–27.

Chafin, L.G. (2007) *Field guide to the rare plants of Georgia*. Athens GA: State Botanical Garden of Georgia, 526 pp.

Estes, D. & Beck, J. (2011) A new species of *Polymnia* (Asteraceae: tribe Polymnieae) from Tennessee. *Systematic Botany* 36: 481–486. https://doi.org/10.1600/036364411X569660

Farmer, S.B. (2007) *Systematics of Trillium subgenus Delostylis.* PhD Dissertation, University of Tennessee, Knoxville TN.

Gaddy, L.L. (2008) A new sessile-flowered *Trillium* (Liliaceae: subgenus *Phyllantherum*) from South Carolina. *Phytologia* 90: 382–390.

Jacobs D.L. & Jacobs, R.L. (1997) Trilliums in woodland and garden. Decatur GA: Eco-Gardens, 152 pp.

Leitão, R.P., Zuanon, J., Villéger, S., Williams, S.E., Baraloto, C., Fortunel, C., Mendonça, F. P. & Mouillot, D. (2016) Rare species contribute disproportionately to the functional structure of species assemblages. *Proceedings of the Royal Society B* 283: 20160084. https://doi.org/10.1098/rspb.2016.0084

Michaux, A. (1803) *Flora Boreali-Americana 1*. Parisiis et Argentorati: apud fratres Levrault, 330 pp.

Noss, R.F., Platt, W.J., Sorrie, B.A., Weakley, A.S., Means, D.B., Costanza, J. & Peet, R.K. (2015) How global biodiversity hotspots may go unrecognized: lessons from the North American coastal plain. *Diversity and Distributions* 21: 236–244. https://doi.org/10.1111/ddi.12278

Schilling E.E, Floden, A. & Farmer, S.B. (2013) A new sessile-flowered *Trillium* species from Tennessee. *Castanea* 78: 140–147. https://doi.org/10.2179/12-043

Schilling E.E, Johnson, A.F. & Iacona, G.D. (2015) *Coreopsis bakeri* (Asteraceae; Coreopsideae), a new species from Florida, USA. *Phytotaxa* 231: 175–181. https://doi.org/10.11646/phytotaxa.231.2.6

Sorrie, B., LeBlond R. J. & Weakley, A.S. (2013) Identification, distribution, and habitat of *Coreopsis* section *Eublepharis* (Asteraceae) and description of a new species. *Journal of the Botanical Research Institute of Texas* 7: 299–310.

Timmerman-Erskine, M., Ballenger, J., Dute, R.R., & Boyd, R.S. (2003) Allozyme investigation of the *Trillium pusillum* Michaux complex (Trilliaceae): taxonomic and conservation implications. *Journal of the Torrey Botanical Society* 130: 1–10. https://doi.org/10.2307/3557519

Turner, B.L. (2015) *Hymenopappus carrii*, a new species from the gulf coastal prairie of south-central Texas. *Phytologia* 97: 132–136.

Weakley, A.S. (2015) *Flora of the Carolinas, Virginia, Georgia, and surrounding areas*. Working draft of 21 May 2015. University of North Carolina Herbarium (NCU), Chapel Hill. Available from: http://www.herbarium.unc.edu/flora.htm (accessed 15 May 2016)

Weakley, A.S. & Poindexter, D.B. (2012) A new species of *Marshallia* (Asteraceae, Helenieae, Marshalliinae) from mafic woodlands and barrens of North Carolina and Virginia. *Phytoneuron* 105: 1–17.

Weakley, A.S., LeBlond, R.J., Sorrie, B.A., Witsell, C.T., Estes, L.D., Gandhi, K., Mathews, K.G. & Ebihara, A. (2011) New combinations, rank changes, and nomenclatural and taxonomic comments in the vascular flora of the southeastern United States. *Journal of the Botanical Research Institute of Texas* 5: 437–455.