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PERSICARIA PERFOLIATA (POLYGONACEAE) REACHES NORTH CAROLINA

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ABSTRACT

Persicaria perfoliata is documented as established for the first time in North Carolina. This taxon is a state-listed Class A noxious weed that has very aggressive naturalizing tendencies. At least three distinct populations have been discovered in north central Alleghany County. Plants in all localities are fruiting rampantly and spreading to adjacent disturbed areas. A key is provided to help differentiate similar congeners in North America and color photos show features of the habitats and plants.

KEY WORDS: *Persicaria perfoliata*, *Polygonum*, Polygonaceae, Mile-a-minute, North Carolina

Persicaria perfoliata (L.) H. Gross. Mile-a-minute-vine, Asiatic Tearthumb

North Carolina. Alleghany Co.: Piney Creek Township, Amelia. Located off of Elk Creek Church Rd. (SR 1344), ca. 0.3 km from the Virginia State Line and ca. 2.9 km north of Amelia at 36°34'10.6"N, 81°12'23.8"W, elev. 826 m. Growing in a roadside drainage area, along Elk Creek,. Infrequent (30+ individuals); 3 Sep 2008, *D.B. Poindexter 08-1149* (BOON, NCU).

Piney Creek Township, Amelia. Located along Reeves Ridge Rd. (SR 1346), ca. 1.7 km sw of the NC 93 jct. at 36°31'57.4"N, 81°12'41.8"W, elev. 800 m. Growing in disturbed areas along the road/fence line adjacent to a mowed pasture. Occasional (50-100 individuals); 19 Jul 2010, *D.B. Poindexter 10-417* (BOON).

Prathers Creek Township, Stratford. Located along US Hwy 221, ca. 5.5 km east of the NC Hwy 113 jct. at 36°30'09.2"N, 81°14'16.0"W, elev. 827 m. Growing on a highly disturbed embankment on the northwest side of the road. Abundant (1000+ individuals); 9 Jul 2010, *D.B. Poindexter 10-409* (BEREA, BOON, NCU).

Mile-a-minute-vine is a member of *Persicaria* sect. *Echinocaulon* (Hinds and Freeman 2005). It is native to a broad area of eastern Asia, and exhibits an annual growth duration, a vinaceous habit, and a broad ecological tolerance. Despite its adaptive ability, this invasive species has a preference for sun-exposed, disturbed mesic sites and is not very tolerant of excessive heavy shade (Oliver 1996). Common habitats include roadsides, pastures, cleared forests, croplands, nurseries, and natural areas such as bottomland riparian corridors (Oliver 1996). This plant has become a problematic agrestal weed in east Asia but has shown only a limited such tendency in North America, perhaps due to our more intensive agricultural practices (Kumar & DiTommaso 2005).

As with most annuals, its reproductive success is inferred to be dependent upon mass fruit production, in concurrence with high rates of seedling recruitment (Oliver 1996). This biological strategy is likely responsible for its ease of colonization and subsequent range expansion. Natural animal vectors include birds and rodents, but anthropogenic dispersal is the most pragmatic explanation for its rapid spread. Contaminated nursery stock and hydrochory (dispersal of the buoyant fruits by water) have been traced as the initial culprits for dispersal in the eastern United States (Cusick & Ortt 1987). Mile-a-minute-vine's propensity to outcompete native vegetation and

cultivated crops makes it a formidable early successional invasive of major concern to both agriculturalists and conservation agencies over its range of naturalization. The plant's dense retrorse prickles, along with its rapid growth rate (hence the name Mile-a-minute-vine) of up to 15 cm per day (Kumar & DiTommaso 2005), allow *Persicaria perfoliata* to overtop surrounding vegetation and climb into neighboring forest subcanopies (Figs. 1–2). It is for this reason that Mile-a-minute-vine has been considered a severe threat to forest regeneration (Wu et al. 2002).

Taxonomy.

Mile-a-minute-vine shares some morphological semblance to its other scandent, native eastern North America counterparts, *Persicaria arifolia* (L.) Harolds. (Halberd-leaf Tearthumb), *P. meisneriana* (Cham. & Schltdl.) Meisn. var. *beyrichiana* (Cham. & Schltdl.) C.C. Freeman (Mexican Tearthumb), and *P. sagittata* (L.) Gross. (Arrowleaf Tearthumb) (Figs. 3–6).

Like these native species, *Persicaria perfoliata* has retrorse prickles on the stems and abaxial leaf midveins. In contrast, these four taxa are markedly different from each other with respect to leaf shape, the sheathing connate stipules (ocreae), and flower and fruit morphology. The following key is provided to help differentiate these entities and is adapted from Hinds and Freeman (2005) and Weakley (2010). The only other member of sect. *Echinocaulon* known from North America north of Mexico, *P. bungeana* (Turcz.) Nakai ex T. Mori (Prickly Smartweed), is excluded. This taxon is an exotic introduction in soybean fields, known from Iowa, Illinois, and Minnesota. It differs primarily from the climbing species of this section in its ascending to erect habit and truncate ocreae margins with cilia to 4 mm (Hinds & Freeman 2005).

1. Ocreae foliaceous, perfoliate and flared around the nodes; leaves petiolate, peltate, deltoid, bases truncate to cordate; tepals 5, fleshy and bright blue in fruit; mature achenes spheroidal [exotic] ..... ***P. perfoliata***
1. Ocreae chartaceous, cylindric and encircling the stem; leaves not peltate, varying in shape (but not promintently deltoid); tepals 4–5, not fleshy or blue in fruit; mature achenes not spheroidal [native].

    2. Mid-stem leaves mostly sessile (rarely short petiolate), linear-lanceolate, usually cuneate (rarely rounded to cordate) at the base; inflorescence branches stipitate-glandular; tepals 5; mature achenes trigonous ..... ***P. meisneriana* var. *beyrichiana***
    2. Mid-stem leaves petiolate, sagittate-auriculate or hastate.

        3. Leaves hastate, basal lobes spreading; inflorescence branches stellate pubescent and stipitate-glandular; tepals 4; mature achenes biconvex ..... ***P. arifolia***
        3. Leaves sagittate-auriculate, basal lobes often extending around the stem where petioles are short; inflorescence branches glabrous; tepals 5; mature achene trigonous ..... ***P. sagittata***

To address the nomenclatural history of this taxon, a brief synopsis of the synonomy of Mile-a-minute-vine is given below derived from MBG (2010).

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Echinocaulon perfoliatum (L.) Meisn. ex Hassk., Flora 25(2): 20. 1842.
Fagopyrum perfoliatum (L.) Raf., Fl. Tellur. 3: 10. 1836 [1837].
Polygonum arifolium L. var. *perfoliatum* L., Systema Naturae, Editio Decima 2: 1006. 1759.
Polygonum perfoliatum (L.) L., Systema Naturae, Editio Decima 2: 1006. 1759.
Tracaulon perfoliatum (L.) Greene, Leafl. Bot. Observ. Crit. 1: 22. 1904.
Truellum perfoliatum (L.) Soják, Preslia 46(2): 148. 1974.

History and Distribution.

Persicaria perfoliata first appeared in North America around 1890, based on an herbarium specimen collected from ballast in Oregon. A second western North American collection was reported from British Columbia in 1954. Neither of the two populations were documented as established and both are presumed to have been based on ephemeral adventives (Cusick & Ortt 1987; Oliver 1996; Wu et al. 2002). Likewise, the colder climates of the Pacific Northwest were likely non-conducive to the naturalization of this taxon. The first records for eastern North America were from Maryland and Pennsylvania in the late 1930's. One of the oldest specimens was documented from a York County, Pennsylvania orchard in 1946, but it and others likely originated from contaminated nursery stock (Oliver 1996; Wu et al. 2002). Mile-a-minute-vine has subsequently spread from this point of origin to surrounding states.

Mile-a-minute-vine is currently known from Connecticut, Delaware, the District of Columbia, Maryland, Massachusetts, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Virginia, and West Virginia (Hinds & Freeman 2005; Hough-Goldstein et al. 2008; Kartesz 2010; USDA, NRCS 2010; Weakley 2010). Hinds and Freeman (2005) listed an additional record from Mississippi; however, this is likely an error based on a misunderstanding of a paper by Cusick and Ortt (1987), which described a new locality of Mile-a-minute-vine in West Virginia, within the Mississippi Drainage. Its center of distribution is the Mid-Atlantic States, with only a few aforementioned adventive outliers (Fig. 7). However, this species has become a noxious weed in these Atlantic states and is rapidly expanding its range southward. Oliver's (1996) prognostication that "The southward direction of spread suggests that this plant will probably proliferate in a number of southern states, unless it is actively controlled." This expansion in geographical range seems to have been an accurate prediction in light of the recent discovery reported here for North Carolina.

The only previous detection of *Persicaria perfoliata* in North Carolina was on June 12, 2000, in Wake County, where two plants were found growing in pots containing Hostas (*Hosta* sp.) inside a contained greenhouse (NCDA & CS 2010a). Prior to the population found in Alleghany County, *P. perfoliata* had not yet been documented as naturalized in the state. It was found in three separate populations, with the largest engulfing a disturbed roadside embankment (Fig. 1).

This report represents the southernmost distribution record in the United States. It is impractical to target the exact mode of transportation that allowed this plant to enter North Carolina. However, it could be speculated that the large import of hay from various northern states during the 2007 drought year may have been responsible for its introduction (Rick Iverson, pers. comm. 2010).

The North Carolina Department of Agriculture considers this taxon to be a Class A noxious weed (NCDA & CS 2010b), a category reserved primarily for plants that are federally-listed species, which have or show potential for broad ecological and agricultural/economic impact. The likelihood for future range extension of this taxon is great, as indicated by its history of expansion and close affiliation with cultivation and other anthropogenic activities.

Prompt management practices are imperative to impede the further spread of this taxon. Plans to eradicate these newly discovered populations are underway by the North Carolina Department of Agriculture and Consumer Services, Plant Industry Division (Rick Iverson, pers. comm. 2010). The most obvious control methods rely on mechanical removal. However, biological control studies utilizing the Asian weevil *Rhinoncomimus latipes* Korotyaev have demonstrated a negative impact on the growth and reproduction of *Persicaria perfoliata*, thus reducing its competitive capacity (Hough-Goldstein et al. 2008). Ultimately, success will be dependent upon annual monitoring, but if the Mid-Atlantic States are a true testament of this plant's ability to proliferate, complete eradication may be a futile effort.

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Figure 1. Disturbed habitat and adjacent woodland ecotone enveloped by *Persicaria perfoliata.*

Figure 2. *Persicaria perfoliata* climbing over vegetation and into surrounding canopy trees (e.g., *Robinia pseudoacacia* L.).

Figure 3. (A) Bright blue, 5-parted mature tepals of *Persicaria perfoliata,* (B) developing fruits, and (C) partially exposed, mature spheroidal achenes.

Figure 4. Infructescence and deltoid stem leaves of *Persicaria perfoliata*. Note the leafy ocreae subtending the fruit and at the nodes of the stem.

Figure 5. Stem and petioles of *Persicaria perfoliata* exhibiting retrose prickles. Note that the petiole attachment is peltate (on the abaxial leaf surface) and not at the margin of the leaf.

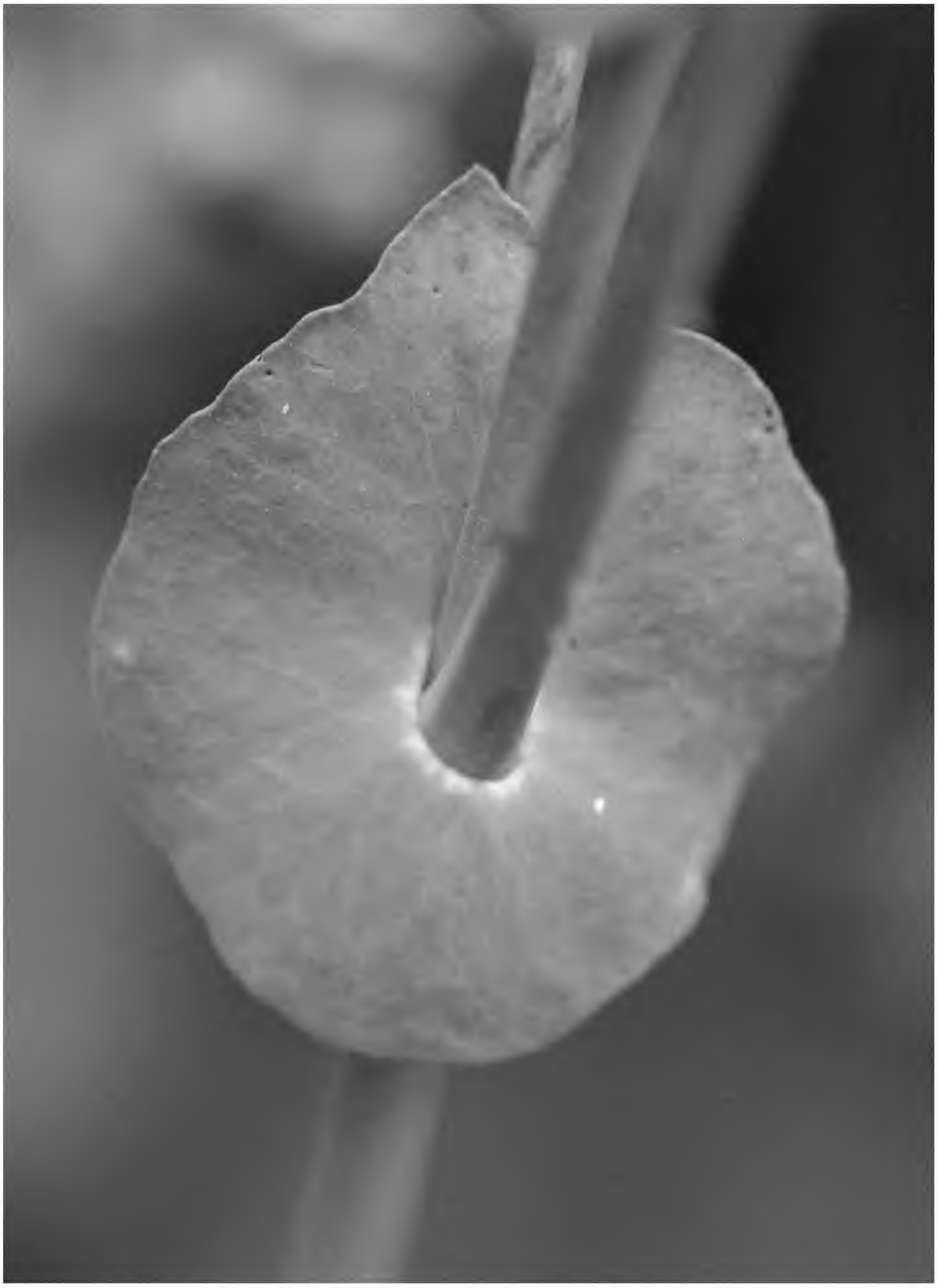

Figure 6. Close-up of a perfoliate ocrea.

Figure 7. Current distribution of *Persicaria perfoliata* in North America north of Mexico. Non-established states and provinces (black), and established states, including the District of Columbia, (gray). Areas of greatest concentration (dark gray).