

**SPREAD OF THE INVASIVE RAVENNA GRASS
(*TRIPIDIUM RAVENNAE*, POACEAE)
IN OHIO**

MICHAEL A. VINCENT
Department of Biology
Miami University
Oxford, Ohio 45056
vincenma@miamioh.edu

RICHARD L. GARDNER
Ohio Department of Natural Resources
Division of Natural Areas & Preserves
Columbus Ohio 43229
Richard.Gardner@dnr.state.oh.us

ABSTRACT

Ravenna grass, *Tripidium ravennae*, an introduced ornamental grass from the Mediterranean region, is documented from 30 counties in Ohio. The species was first found in the state as an escape in Cuyahoga County in 2000, with further documentation from Hocking County in 2008, Butler County in 2009, and Greene County and Ross County in 2010. The species is being found with increasing frequency in recent years. It seems likely that the species will become problematic in marginal areas and grasslands in the near future.

Ravenna grass (also known as Plume-grass, *Tripidium ravennae* (L.) H. Scholz, Poaceae) is a very large popular ornamental species that is hardy through USDA Zone 6. Ravenna grass forms large clumps that are similar in appearance to Pampas grass (*Cortaderia sellloana* (Schultes & Schultes f.) Ascherson & Gräbner, which is hardy only to about USDA zone 8) and is grown in much the same setting (Bailey 1924; Darke 1999; Holmes 1997). Ravenna grass may also be utilized for erosion control and as a forage crop (Wiersema & León 2013).

Ravenna grass appears to be native to a broad swath of the Eastern Hemisphere, from the Mediterranean region of southern Europe, northern Africa, and western Asia, east into Asia through Afghanistan as far east as Xinjiang Province in China, south to Yemen and northern India, and north to the Republic of Georgia, Uzbekistan, and Kazakhstan (Chen & Phillips 2006; Pasiiecznik 2015). In the Mediterranean region of northern Africa and southern Europe, it can form tall cane beds with other grasses along water courses and in damp depressions and behind dunes (Clayton 1980).

The nomenclatural history of Ravenna grass is complex. The species was first described by Linnaeus (1763) as *Andropogon ravennae* L.; the specific epithet refers to the town of Ravenna, Province of Ravenna, Emilia-Romagna region, northern Italy. He subsequently moved the species to the genus *Saccharum*, as *Saccharum ravennae* (L.) L. (Linnaeus 1774), a name which has been in common use since. Palisot de Beauvois (1812) made a new combination, *Erianthus ravennae* (L.) P. Beauv., followed soon after by a new combination in *Ripidium* (an illegitimate name, since it is a later homonym of *Ripidium Bernhardtii*, published in 1800) by Trinius (1820), *Ripidium ravennae* (L.) Trin. Most recently, Scholz made the new combination *Tripidium ravennae* (L.) H. Scholz, since Old World species of *Erianthus* are distinct from New World species in chemical and molecular markers and in having three stamens instead of two (Valdés & Scholz 2006). The separation of *Tripidium* from *Saccharum* is supported by molecular phylogenetic studies of *Saccharum s. lat.* conducted by Welker et al. (2015).



Figure 1. Characteristic specimen of Ravenna grass.

Ravenna grass (Fig. 1). is a tall, erect, clump-forming herb that can reach ca. 4 m in height. The stems, nodes, and leaf sheaths and blades are glabrous. Obvious ligules of capillary bristles about 1 cm long can be seen in the junction of the blade and sheath. Leaf blades range from 50 to 120 by 5 to 18 mm wide, and have scabrous surfaces and margins, and a whitish midvein. The plumose inflorescences are borne on peduncles 40 to 80 cm long. The inflorescences are large, lanceolate, much-branched, villous panicles from 30 to 70 cm long and 10 to 20 cm wide. Spikelets are subtended by long hairs on the callus and are 3 to 6 mm long, with purplish to straw-colored glumes and 2 to 5 mm-long awns. The spikelets disarticulate from the rachis at maturity and are easily blown about by wind.

Ravenna grass has escaped in several countries where it has been grown as an ornamental, including Australia (Pasicznik 2015), Japan (Shimura et al. 1973), and the USA (Barkworth et al. 2007; Webster 2003). In the USA, Ravenna grass has been reported as escaped or naturalized in at least 22 states and DC: Arizona (Kearney & Peebles 1960), California (Hickman 1993), Colorado (USDA NRCS 2016), Delaware (Tatnall 1946), District of Columbia (Steury 2004), Florida (Wunderlin & Hansen 2008), Georgia (Jones & Coile 1988), Illinois (Mohlenbrock 2001), Indiana (personal obs. RLG, MAV, K. Yatskievych), Kansas (McGregor et al. 1976), Kentucky (Jones 2005), Maryland (Terrell & Peterson 2009), Michigan (Reznicek et al. 2011), Missouri (Yatskievych 1999), New York (Lamont et al. 2014), New Mexico (Warrick 2000), Ohio (Wilder & McCombs 2002), Oklahoma (Taylor & Taylor 19889), Pennsylvania (specimen at MU), Tennessee (Chester 2009), Texas (Singhurst et al. 2010), Utah (Welsh et al. 1987), and Washington (Weinmann et al. 2002+); it is very likely also spreading in other regions of the country. In the USA, Ravenna grass is establishing in riparian wetland zones (Burgess & Hoagland 2006; Lambert et al. 2010; Winston et al. 2014) and also in drier areas, including rocky slopes, grasslands, fields, and roadsides (Winston et al. 2014). The species is considered a noxious weed in California (https://www.cdffa.ca.gov/plant/ipc/encycloweedia/weedinfo/winfo_table-sciname.html), New Mexico (http://www.nmda.nmsu.edu/wp-content/uploads/2012/01/weed_memo_list.pdf), Oregon (<http://www.oregon.gov/ODA/shared/Documents/Publications/Weeds/NoxiousWeedPolicyClassification.pdf>), and Washington (http://www.nwcb.wa.gov/pdf/Noxious%20weed%20list%202016_scientific%20name.pdf), and invasive in Pennsylvania (http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_010233.pdf) and Utah (Thomas 2012), and by the National Park Service (Briefel 2012).

Potential ecological impacts of Ravenna grass are likely to be similar to those of other large grasses, such as *Arundo donax* L. and non-native populations of *Phragmites australis* (Cav.) Trin. ex Steud. (Lambert et al. 2010), especially in wetland areas where these grasses might outcompete native wetland plants, and change water flow patterns. Populations of Ravenna grass may become large in wetland habitats, as has been seen in Arizona, especially along the Colorado River (Penn 2001), California (DiTomaso & Healy 2007), and Oklahoma, as can be seen along the Canadian River (Burgess & Hoagland 2006). It also spreads to drier, open sites, such as roadsides and fields (Swearingen et al. 2010).

Ravenna grass is very widely planted as an ornamental in Ohio, especially in newer housing developments. As a consequence, it is also escaping from cultivation with greater frequency and is establishing large populations in some areas. The first documented report of Ravenna grass as an escape in Ohio was from Cuyahoga County in 2000 by Wilder and McCombs (2002). It was subsequently documented from Greene, Hocking, and Ross counties by Vincent et al. (2011). The purpose of this study is to examine how widely Ravenna grass has escaped in Ohio.

Methods

Field surveys for Ravenna grass were conducted randomly throughout the state of Ohio, especially in the vicinity of planted populations of the grass. Each population discovered was documented either by a voucher specimen or as a visual record. Specimens were deposited in

herbaria indicated with each specimen record, and additional specimens were examined from Ohio herbarium collections (see Specimens Examined).

Results and discussion

Escapes or populations were documented (or observed*) from 30 counties in Ohio (Fig. 2; see Specimens Examined): Adams, Athens, Butler, Champaign, Clark, Clermont, Cuyahoga, Delaware, Erie, Fairfield, Franklin, Greene, Hamilton, Hancock, Hocking, Lucas, Madison, Medina, Miami*, Montgomery, Ottawa, Pickaway, Pike, Ross, Scioto, Stark, Summit, Union, Warren, and Wayne. The grass occurs on roadside lawns, steep, grassy road banks, abandoned limestone quarries, railroad ballast, old fields, prairie plantings, marshy areas, and waste places. Currently, all sites are disturbed secondary habitats, but Ravenna grass also may invade natural habitats such as tall grass prairies, xeric limestone prairies, alvars, savannahs, and wet meadows. Populations in the Columbus metropolitan area (Delaware, Fairfield, Franklin, Madison, and Union counties) appear to be increasing numbers in the last 5 years, with at least 18 sites documented (Fig. 3).

Ravenna grass has great invasive potential in Ohio. Since it is widely and commonly planted as a landscape plant, and since it produces a large number of fruits on each plant, it will be found more and more commonly as an escape in Ohio. Wild plants are capable of setting large numbers of fruits, thus increasing the spread of the species. Continued monitoring of the spread of Ravenna grass is warranted, as is removal of the species in wild populations where it is found.

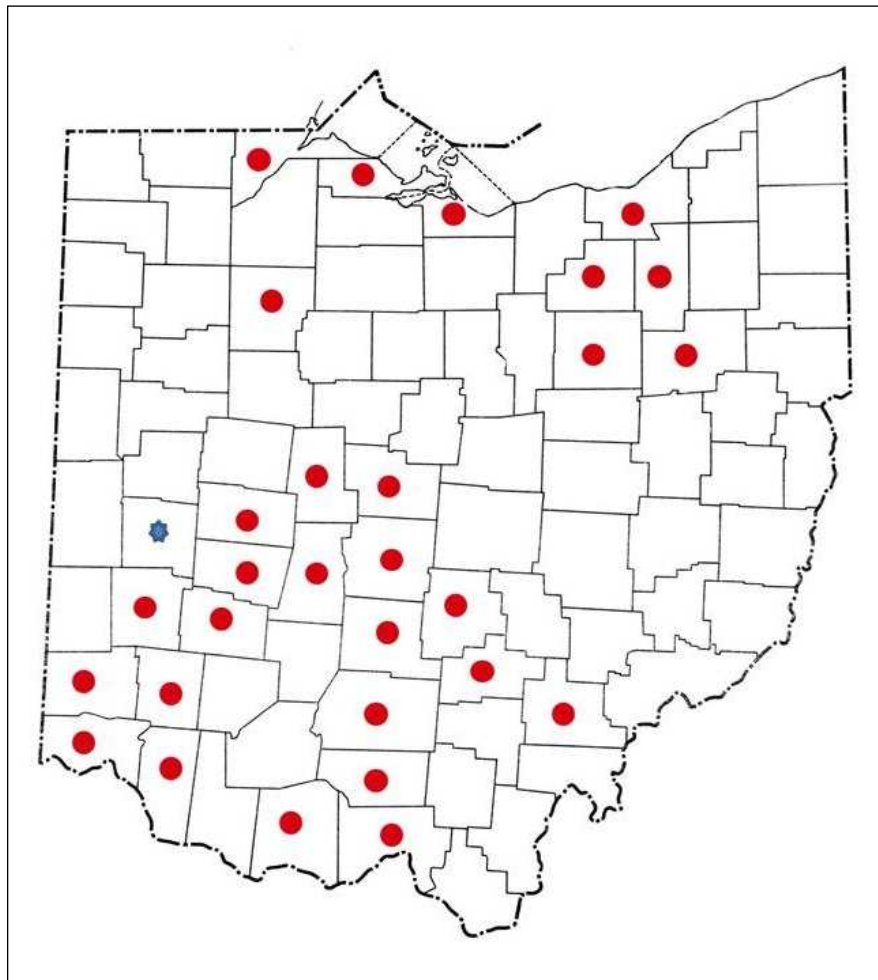


Figure 2. County-level distribution of Ravenna grass in Ohio.

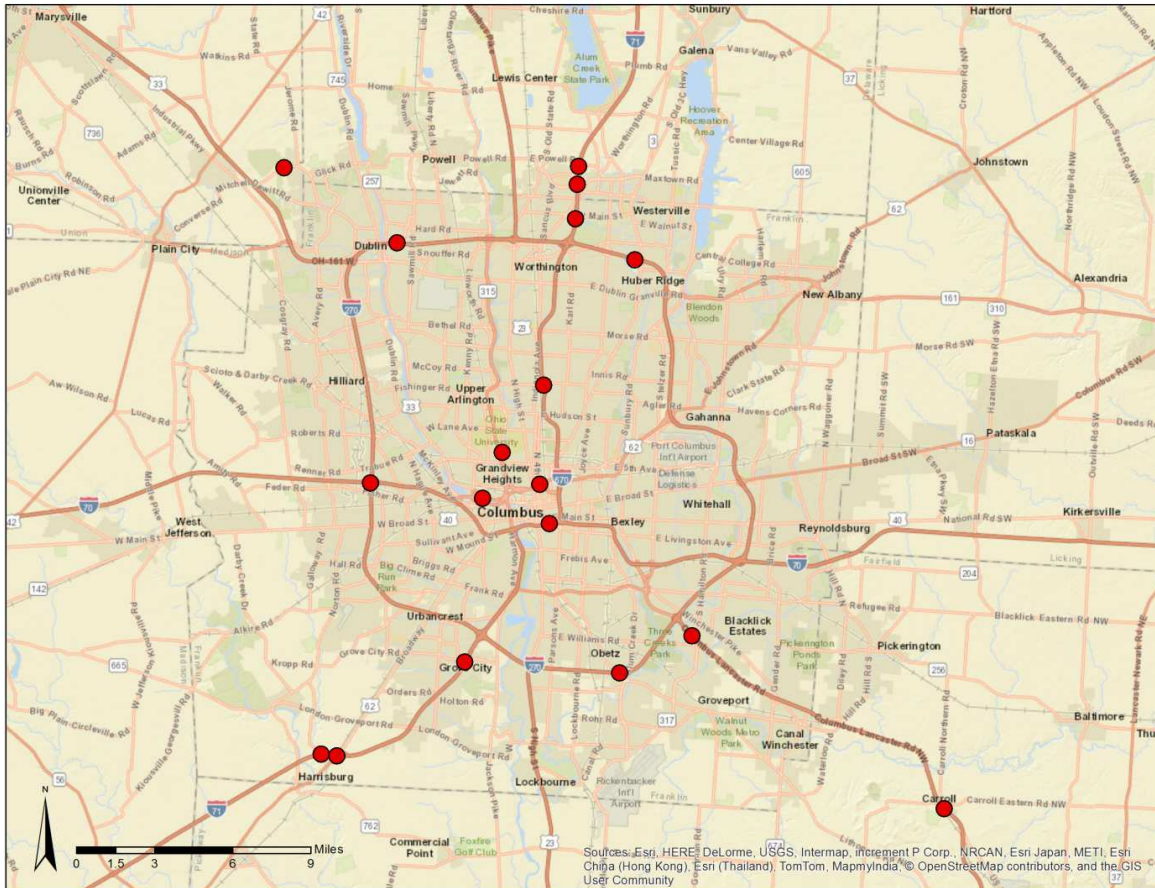


Figure 3. Distribution of Ravenna grass in the Columbus metropolitan area (Delaware, Fairfield, Franklin, Madison, and Union counties).

Specimens examined

Ohio. Adams Co.: Tiffin Twp., 1 fruiting clump in disturbed field, W of St. Rte. 125, ca. 0.25 mi S of entrance to Adams Lake State Park, 20 Sep 2013, *Gardner 7300* (MU). Athens Co.: York Twp., one 3-stemmed fruiting clump on roadside, St. Rte. 78, ca. 500 ft N of Monday Creek, 12 Nov 2015, *Gardner 7373* (MU); York Twp., 21-30 plants along roadside ditch, St. Rte. 78, 50 ft W of 12th St., 12 Nov 2015, *Gardner 7372* (MU). Butler Co.: Liberty Twp., 1 plant on steep, dry road bank E-bound St. Rte. 129, 31 Aug 2013, *Gardner 7282* (MU); Middletown, weedy marshy area near 4900 Roosevelt Blvd., 14 Nov 2012, *Vincent 16010* (MO, MU, NY); Oxford, Miami University campus, weedy in a clump of *Miscanthus sinensis* planted by Upham Hall greenhouse, 27 Aug 2009, *Vincent 14558* (MU). Champaign Co.: Mad River Twp., NE ¼ Sec. 35, 1 clump on roadside across from Myrtle Tree Baptist Church, U.S. Rte. 36 E of St. Paris, Sep 2013, *Boone s.n.* (MU). Clark Co.: Harmony Twp., Section 18, 1 flowering plant, dry roadside bank on west bound I-70, 30 Aug 2013, *Gardner 7280* (MU). Clermont Co.: Union Twp., roadside, St. Rte. 32, 1.6 mi E of Newtown, 2 Sep 2013, *Boone s.n.* (MU); Withamsville, weedy in wet ditch along Rte. 125 E of Glen-Este-Withamsville Rd., 2 Sep 2013, *Vincent & M.W. Vincent 16590* (MU). Cuyahoga Co.: Cleveland, along RR tracks, Cleveland Metroparks Zoo, 18 Sep 2000, *Wilder & McCombs 14062* (SWF). Delaware Co.: Liberty Twp., S of Winter Road, 75-100 plants in planted prairie, ca. 0.25 mi W of U.S. Rte. 23, 14 Sep 2013, *Gardner 7298* (MU); Orange Twp., 2 multiple stem fruiting clumps, roadside, S-bound I-71 ca. 250 feet N of Gemini Place exit ramp, 5 Sep 2013, *Gardner 7286* (MU); Troy Twp., U.S. Rte. 23, N of Delaware, 1 fruiting clump in area where topsoil was removed, 7 Sep

2013, *Gardner 7288* (MU). Erie Co.: Groton Twp., 7 plants in old field, on E side of St. Rte. 4, ca. 0.2 mi N of Strecker Rd., 17 Sep 2013, *Gardner 7299* (MU). Fairfield Co.: Greenfield Twp., SE ¼ Section 7, 5 plants, 1 in flower, roadside E bound U.S. Rte. 33, 19 Sep 2016, *Gardner 7421* (MU). Franklin Co.: Clinton Twp., 3 plants on dry road bank, N. Broadway ca. 0.1 mi W of I-71, City of Columbus, 20 Sep 2013, *Gardner 7301* (MU); Hamilton Twp., 3 clumps on dry road bank, I-270 ca. 1 mi E from U.S. Rte. 23 interchange, Village of Obetz, 9 Sep 2013, *Gardner 7296* (MU); Jackson Twp., S bound entrance ramp from Stringtown Rd., ca. 75 plants on dry, WSW-facing road bank, 7 Sep 2013, *Gardner 7295* (MU); Sharon Twp., 1 fruiting clump, S-bound I-71 just N of I-270 interchange, 5 Sep 2013, *Gardner 7288* (MU). Greene Co.: Bath Twp., NE ¼ Section 28, occasional in dry, limestone field, Wright-Patterson Air Force Base, 7 Sep 2010, *Gardner 6987* with Becus & Helton (OS). Hamilton Co.: Cincinnati, weedy along N side of U.S. Rte. 50 at Collins Ave. bridge, 2 Sep 2013, *Vincent & M.W. Vincent 16589* (MICH, MU, NY); Whitewater Twp., 8 plants on steep, W-facing slope, St. Rte. 128/I-75 E bound entrance ramp, 30 Aug 2013, *Gardner 7281* (MU). Hancock Co.: Allen Twp., NE ¼ Section 1, local, 5 plants, disturbed soil near burrow pit pond few feet W of Business Park Drive (Twp. Rte. 114) & S. of St. Rte. 18, 12 Dec 2013, *Gardner 7315* (MU). Hocking Co.: Falls Twp., Section 13, rare, abandoned railroad yard, N. of U.S. Rte. 33, 10 Sep 2008, *Gardner 6055* (OS). Falls Twp., Section 15, E of N-bound U.S. Rte. 33, S of exit, rare, a few on a road cut, 18 Sep 2008, *Gardner 6061* (OS). Good Hope Twp., NW ¼ NW ¼ Section 23, 1 large multi-stem clump, planted prairie, N of U.S. Rte. 33, 6 Oct 2016, *Gardner 7425* (MU). Lucas Co.: Springfield Twp., a few clumps on both sides of I-475, 12 Dec 2013, *Gardner 7314* (MU). Madison Co.: Somerford Twp., 1 clump on N-facing roadbank, E-bound entrance ramp, I-70, St. Rte. 56 jct., 24 Oct 2016, *Gardner 7427* (MU). Medina Co.: Guilford Twp., ca. dozen clumps on dry road bank W-bound I-76, St. Rte. 3, 31 Oct 2013, *Gardner 7313* (MU). Montgomery Co.: Huber Heights, 20-30 clumps in weedy ditch along Interstate 70 westbound, 14 Sep 2013, *Vincent & M.W. Vincent 16591* (GH, MU, NY). Ottawa Co.: Danbury Twp., half dozen plants in planted prairie, N of Bay Shore Rd., Meadowbrook Park, 27 Sep 2016, *Gardner 7422* (MU). Pickaway Co.: Walnut Twp., Section 26, 3 plants (2 fruiting, 1 vegetative) in dry field adjacent to golf course, Hagerty Rd., 29 Aug 2013, *Gardner 7279* (MU); Washington Twp., SW ¼ Section 28, 1 fruiting clump on gravel bank above stream, St. Rte. 56 near Hitler Road #1 jct., 29 Aug 2013, *Gardner 7278* (MU). Pike Co.: Camp Creek Twp., 2 fruiting clumps in planted *Sorghastrum nutans* field, ca. 1000 ft N of Pike/Scioto Co. line, <250 ft W of St. Rte. 104, 7 Sep 2013, *Gardner 7291* (MU); Pee Pee Twp., SW of jct. of St. Rte. 104 & St. Rte. 552, 1 large clump with *Salix* sp. and *Solidago altissima* on rocky shore of Lake White, 7 Sep 2013, *Gardner 7292* (MU). Ross Co.: Scioto Twp., Section 20, local, a few clumps, roadside, U.S. Rte. 23 at U.S. 50 exit, City of Chillicothe, 28 Sep 2010, *Gardner 6998* (OS). Scioto Co.: Nile Twp., 1 fruiting clump in open meadow near golf course at Shawnee State Park, <100 ft S of U.S. Rte. 52, W. of Friendship, 7 Sep 2013, *Gardner 7293* (MU). Stark Co.: Perry Twp., 6 plants, 4 fruiting clumps, roadside/fence line W-bound U.S. Rte. 30, 29 Sep 2013, *Gardner 7312* (MU). Summit Co.: Richfield Twp., one 2-stemmed clump at base of road cut, edge of ditch, I-271 N-bound, ca. 0.5 mi S of St. Rte. 303 exit, 4 Sep 2013, *Gardner 7285* (MU). Union Co.: Jerome Twp., one 4-stemmed fruiting clump in prairie planting, Hyland-Croy Road at jct. with McKittrick Rd., 15 Nov 2015, *Gardner 7374* with Lapp (MU). Warren Co.: Clear Creek Twp., one several-stemmed fruiting clump, at fence line S of Austin Blvd., N-bound I-75, 31 Aug 2013, *Gardner 7283* (MU); Turkey Creek Twp., one fruiting clump, roadside ditch, St. Rte. 123 across from Red Bird Drive, 19 Oct 2014, *Gardner 7334* (MU). Wayne Co.: East Union Twp., 1 fruiting clump roadside E-bound U.S. Rte. 30 near Kansas Rd. exit ramp, 28 Sep 2013, *Gardner 7309* (MU).

ACKNOWLEDGEMENTS

We thank George Wilder for access to herbarium specimens at SWF and Dan Boone for providing specimens from Champaign and Clermont Counties.

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