MN NWAC Risk Assessment Worksheet (04-2011)	Common Name	*Latin Name*
	Japanese Knotweed (Mexican Bamboo, Japanese Bamboo, Japanese fleece flower, American bamboo, fleece flower, elephant ears, pea shooters, donkey/gypsy/sally/wild rhubarb, Renoutria, crimson beauty, monkey weed, Hancock's curse, itadori, and others)	***Polygonum cuspidatum* Seib. & Zucc. (Synonyms: *Fallopia japonica, Pleuropterus cuspidatus/zuccarinii, Polygonum zucarrinii, Reynoutria japonica, Tiniaria cuspidata/japonica*)**
Reviewer	**Affiliation/Organization**	**Date (mm/dd/yyyy)**
Jim Calkins	**Minnehaha Creek Watershed District Minnesota Nursery & Landscape Association**	**05/24/2011**
Updated by Monika Chandler	**Minnesota Department of Agriculture**	**07/10/2018**

There are two non-native knotweed species and their hybrid in the upper Midwest. Japanese knotweed (*Polygonum cuspidatum*) and giant knotweeds (*Polygonum sachalinense*) can hybridize resulting in Bohemian knotweed (*Polygonum* x *bohemicum*). Knotweeds are gynodioecious with either female or hermaphroditic plants (Beerling et al. 1994). There are differences in ploidy levels within and between taxa (Japanese 2n=44, 52, 88; giant 2n=44, 66, 102; Bohemian 2n=44, 66, 88) (Bailey and Stace 1992, Bailey et al. 1996). There is a dwarf variant from mountainous areas called *P. cuspidatum* var. *compacta* and it is a tetraploid (2n=4x=44) (Mandák et al. 2003). It rarely naturalizes (Mandák et al. 2005) but has provided pollen resulting in tetraploid offspring *P*. x *bohemicum* (Bailey et al. 2009). There are horticultural varieties of *P. cuspidatum* var. *compacta* such as 'Crimson beauty'. In Great Britain and Europe, a male sterile clone of *P. cuspidatum* var. *japonica* was widely distributed (Bailey et al. 1996). An octoploid (2n=8x=88) female clone occurs in Europe (Bailey and Stace 1992, Mandák et al. 2003). Japanese knotweed can cross with *P. baldschuanicum* with the common name of silver lace vine resulting in *P*. x *conollyana* (Bailey et al. 2009), a hybrid species that would require chromosomal doubling to be fertile.

Native to Asia, knotweeds were first planted in North America in the late 1800s as ornamental garden plants. They escaped cultivation and have spread to most states. In their native range, knotweeds are early colonizers after volcanoes with shoots pushing through volcanic rock (Adachi et al. 1996). Similarly, shoots can grow through pavement and building foundations necessitating costly removal and repairs.

Knotweeds are herbaceous perennials with shrub like forms that can exceed 10 feet tall. Multiple, hollow shoots form a clump that resembles bamboo. Shoots die back to the ground in the fall after a hard frost and new stems emerge in the spring. Knotweeds are fast growing and can form dense thickets. Established plants develop a woody stalk with a vertical taproot (Pashley et al. 2007). The stalk produces lateral rhizomes (underground stems) within the first year (Beerling et al. 1994). Between fall and winter, buds form on the stock and rhizomes. Vertical shoots arise from the buds in the spring (Pashley et al. 2007)). Leaves are alternate, simple and broadly ovate with pointed tips. Plants produce flowers in white clusters in the late summer in Minnesota.

Box	Question	Answer	Outcome
1	Is the plant species or genotype non-native?	Yes; native to eastern Asia – Japan, China, Korea, and Taiwan (Gillies et al 2016).	Go to Box 3
3	Is the plant species, or a related species, documented as being a problem elsewhere?	Yes; *P. cuspidatum* was first introduced in Europe in the mid 1840's and in North America in the late 1800's, before 1890 (Shaw 2002 and Gillies et al 2016). A female clone (2n = 8x = 88) was brought to North America as an ornamental (Gillies et al 2016). *Polygonum cuspidatum* is regulated as a problem weed in at least 18 states including AL, CA, CT, IA, ID, IL, MA, MN, MT, NE, NH, OH, OR, VT, WA, WI, WV, and WY (USDA, NRCS 2017 and National Plant Board) Great Britain has anti-social behavior laws with fines for not controlling knotweeds if an order was received (Home Office). By 1966, it was considered "one of the most persistent and aggressive of all perennial weeds" (Southeast Exotic Pest Plant Council) and has been ranked as one of the Top 100 invasive plants (International Union for Conservation of Nature Species Survival Commission)	Go to Box 6
6	Does the plant species have the capacity to establish and survive in Minnesota?		
	A. Is the plant, or a close relative, currently established in Minnesota?	Yes; *P. cuspidatum* is widely distributed in the United States (41 states), including Minnesota, and Canada (USDA, NRCS 2017 and EDDMapS 2018).	Go to Box 7
7	Does the plant species have the potential to reproduce and spread in Minnesota?		
	A. Does the plant reproduce by asexual/vegetative means?	Yes; plants are rhizomatous and colony-forming and spread through the growth and fragmentation of rhizomes and stem fragments (Colleran and Goodall 2014). Colleran and Goodall (2014) found that 70% of new plants originated from rhizome and 30% from stem fragments.	Go to Question B
	B. Are the asexual propagules – vegetative	Yes; rhizomes including very small rhizome sections;	Go to Question I

Box	Question	Answer	Outcome
	parts having the capacity to develop into new plants – effectively dispersed to new areas?	dispersed by human activities and rhizome fragments from existing colonies can be deposited and establish new infestations downstream in riparian communities (Colleran and Goodall 2014).	
	C. Does the plant produce large amounts of viable, cold-hardy seeds?	Yes. Hollingsworth and Bailey (2000) found that *P. cuspidatum* is effectively dioecious and male-sterile and derived from a single female plant and, thus, comprise a single female clone in Britain. Therefore it had no capacity to produce seed (Hollingsworth and Bailey 2000) unless it obtained pollen from other knotweed species (Bailey 1989). This is not the case in North America and Europe. Forman and Kesseli (2003) collected large quantities of seed from field sites and greenhouse-grown cultivars then determined high germinability. Bram and McNair (2004) found germinability of 90% at two sites and 50% at one site in Pennsylvania. Male-sterile Japanese knotweed can produce seed with pollen from giant knotweed or the far more abundant Bohemian knotweed (Gillies et al 2016). In fall 2016, the city of Duluth and 1854 Treaty Authority collected seed from plants identified as Japanese knotweed then the Minnesota Department of Agriculture ran germination tests in winter 2017. Germination rates of seed collected from four plants were 10%, 62%, 70% and 78%.	**This text is provided as additional information not directed through the decision tree process for this particular risk assessment.**
	F. Are sexual propagules – viable seeds – effectively dispersed to new areas?	Yes. Gaskin et al (2014) found evidence of hybrid knotweed plants produced from seed. There was a distinct genotype for shoots collected every five meters along a transect indicating reproduction by seed.	**This text is provided as additional information not directed through the decision tree process for this particular risk assessment.**

Box	Question	Answer	Outcome
	I. Do natural controls exist, species native to Minnesota, that are documented to effectively prevent the spread of the plant in question?	No (Clements et al 2016).	Got to Box 8
8	Does the plant species pose significant human or livestock concerns or has the potential to significantly harm agricultural production, native ecosystems, or managed landscapes?	Forms dense thickets that shade out and displace native vegetation, degrade fish/wildlife habitat, alter waterways facilitating erosion and flooding, interfere with landscaping, and damage pavements. Knotweeds can grow into and damage structures. In Great Britain this has resulted in significant losses to property values (Knight 2015 and Middleton 2014). Knotweed was documented growing into a house basement in Red Wing, into a new annex at the Sun Ray Library in St. Paul and damaging siding on a house in Clear Lake. Failure to control small populations will be very costly. For example, cleaning up the Japanese knotweed to build the 2012 London Olympic Park cost £70 million which is $120 million (Middleton 2014).	
	A. Does the plant have toxic qualities, or other detrimental qualities, that pose a significant risk to livestock, wildlife, or people?	No, the plant is edible and eaten by humans and livestock (Parkinson and Mangold 2017).	Go to Question B
	B. Does, or could, the plant cause significant financial losses associated with decreased yields, reduced crop quality, or increased production costs?	No, it is unlikely that Japanese knotweed will become established in row crop fields. No documentation was found of knotweeds in row crops.	Go to Question C
	C. Can the plant aggressively displace native species through competition (including allelopathic effects)?	Yes; colonies can outcompete and displace native grasses, forbs, shrubs, and young trees (Clements et al 2016, Gillies et al 2016 and Duquette et al 2015). *Polygonum cuspidatum* has been shown to be allelopathic which may influence its ability to outcompete natives (Clements et al 2016). Knotweeds are particularly problematic in riparian systems (Clements et al 2016, Colleran and Goodall 2014,	Go to Box 9

Box	Question	Answer	Outcome
		Duquette et al 2015 and Gillies et al 2016).	
9	The plant has clearly defined benefits that outweigh associated negative impacts?	No. Benefits: young shoots are edible and a good source of vitamins and minerals (Wikipedia); also an excellent source of resveratrol (Wikipedia) which may lower LDL cholesterol (resveratrol), delay or slow alzheimer's disease, Lyme disease, and have anti-cancer and viral properties (Japanese Knotweed Alliance, Bartlow et al 2009 and Buhner 2005); a concentrated source of emodin (laxative) (Wikipedia); extracts may have potential as an organic fungicide (biopesticide; powdery mildew, botrytis, & others; bacterial blight) (American Chemical Society 2008); considered an excellent nectar source for honeybees when little else is flowering (monofloral, bamboo honey) (Wikipedia).	
	A. Is the plant currently being used or produced and/or sold in Minnesota or native to Minnesota?	No, there is no longer significant production and sale of *P. cuspidatum.* It was initially introduced as a landscape plant and for erosion control along roadways and embankments (Gillies et al 2016, Southeast Exotic Pest Plant Council) and the species and several cultivars are common in Minnesota landscapes and are currently produced and sold in the United States including MN; locally produced by Bailey Nurseries (Newport, MN; 'Variegata', Cook Water Farms (Askov, MN). In a 2017 Noxious Weed Advisory Committee survey of nursery certificate holders and Minnesota Nursery and Landscape Association members, nobody responded that they sell Japanese knotweed and 60% responded that the species is invasive and 55% responded that it should be regulated.	Go to Box 10
10	Should the plant species be enforced as a noxious weed to prevent introduction &/or dispersal; designate as prohibited or restricted?		

Box	Question	Answer	Outcome
	A. Is the plant currently established in Minnesota?	Yes. Japanese is in many Minnesota landscapes and there are numerous infestations in unmanaged landscapes documented in Minnesota in EDDMapS.	Go to Question B
	B. Does the plant pose a serious human health threat?	No.	Go to Question C.

Box	Question	Answer	Outcome
	C. Can the plant be reliably eradicated (entire plant) or controlled (top growth only to prevent pollen dispersal and seed production as appropriate) on a statewide basis using existing practices and available resources?	Yes. Small populations can be removed manually (grubbing) and large populations can be controlled with appropriate and repeated herbicide applications (Clements et al 2016); soil steaming and biocontrols involving a leafspot fungus (*Mycosphaerella polygoni-cuspidati*) and a Japanese psyllid (*Aphalara itadori*) may be possible (Clements et al 2016). Japanese knotweed is difficult to manage due to its extensive rhizome system where many of the rhizome buds can be dormant making them weak sinks for herbicides (Clements et al 2016). The most effective treatment is foliar application of imazapyr during the late summer before a killing frost (Clements et al 2016). Boyd et al. (2017) documented 83% - 100% control with applications at the following growth stages: Maximum shoot height, flowering, senescence, maximum height + flowering, maximum heights + senescence, flowering + senescence, and maximum height + flowering + senescence. They also found that the use of aminopyralid or multiple imazapyr applications did not provide more control than a single imazapyr application. Glyphosate is an option for treating near water and synthetic auxins such as aminopyralid can be applied to foliage in early summer to reduce growth (Clements et al 2016). Jones et al. (2018) found that a summer foliar application when plants are at maximum height then again at flowering or a single autumn stem injection or foliar application of glyphosate provided the best control compared to 2,4-D, picloram, aminopyralid, fluroxypyr, flazasulfuron and combinations. This study did not test imazapyr. Imazapyr and glyphosate are available in a range of formulations and can be readily purchased	Enforce control as a noxious weed – List the plant as a Prohibited/Control Noxious Weed (eradication is not possible or reasonable).

Final Results of Risk Assessment		
2014		
Review Entity	**Comments**	**Outcome**
NWAC Listing Subcommittee May 24, 2011	Japanese knotweed (*Polygonum cuspidatum*) is distributed widely in Minnesota landscapes; requiring eradication and may be met with resistance or simple non-compliance - Not thought to be a good candidate enforcement as a Prohibited Noxious Weed because it is a very hard species to control or eradicate and it would be difficult for landowners to comply with the law.	List Japanese knotweed as a Specially Regulated Plant or as a Prohibited/Eradicate or Prohibited/Control Noxious Weed
NWAC Full Committee	11/30/2011 - Tony and Tim will work in 2012 to determine if MNLA would be in favor of providing information at the time of sale indicating that "This plant is listed under the MN Noxious Weed Law as a Specially Regulated Plant. Planting in a riparian area, wetland, stream side, lake shore, or other landscape subjected to flooding or high water is prohibited". 5/10/2013 – Tim reported that MNLA would be supportive of the Specially Regulated category where the regulation would be that anyone selling or transferring this species to another person must include information with the plant materials stating it is not advisable to plant in a designated flood plain as defined by MN DNR. 12/18/2013 - The official regulation/management plan being recommended: "***Any person, corporation, business or other retail entity distributing giant knotweed for sale within the state, must have information directly affixed to the plant or container***	11/30/2011 – Voted to be placed on the Specially Regulated Plants List - Pending discussions with MNLA in 2012 12/18/2013 – Vote 13 – 0 to recommend to the commissioner as a Specially Regulated Plant with the agreed upon management plan.

	packaging that it is being sold with, indicating that it is unadvisable to plant this species within 100 feet of a water body or its designated flood plain as defined by Minnesota Statute 103F.111, Subdivision 4."	
MDA Commissioner	2/24/2014	Approved as a Specially Regulated Plant and approved the recommended management plan.

2018		
Review Entity	**Comments**	**Outcome**
NWAC Listing Subcommittee	07/11/18	Prohibited Control
NWAC Full Committee	Vote on 12/19/18 was 15:1 in favor of Prohibited Control.	Prohibited Control
MDA Commissioner	Commissioner order was signed 03/03/19.	Prohibited Control

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