MN NWAC Risk Assessment Worksheet (04-2011)	Common Name	*Latin Name*
	Japanese hops	***Humulus japonicus* Sieb. & Zucc. Synonym *Humulus scandens***
Reviewer	**Affiliation/Organization**	**Date (mm/dd/yyyy)**
Original Reviewer: Monika Chandler	**Minnesota Department of Agriculture**	**05/15/2011**
Current Reviewer: Laura Van Riper	**Minnesota Department of Natural Resources**	**07/26/16**

Species Description from the Minnesota Department of Agriculture Japanese hops website [accessed 8 July 2016]:

Background

Japanese hops are native to eastern Asia and were introduced to North America as an ornamental in the mid-to-late 1880s. They have escaped cultivation and are displacing desirable species and impeding forest regeneration. Unlike common hops, which is a related species, Japanese hops are not utilized for beer production. Fortunately, there are only a few infestations in Minnesota. The goal is to eradicate infestations before Japanese hops vines spread and become a serious weed issue in Minnesota.

Description

- Japanese hops are herbaceous annual vines that can grow up to 35 feet in a single growing season. They twine to climb adjacent vegetation and structures and sprawl across open ground to form dense mats several feet deep.
- Leaves have toothed edges and 5-7 lobes arranged palmately. They are opposite and approximately 2-6 inches long. Stems and leaves have hooked hairs. There are distinct bracts where the leaf petioles attach to the stem.
- There are separate male and female plants. Both are greenish and produce flowers with five petals. Male flowers are arranged in airy cone-shaped clusters (panicles). Female flowers are arranged in short spikes. Japanese hops flowers in mid-late summer followed by seed production.
- Common hops (*H. lupulus*) is similar but has more rounded leaves with 0-5 lobes and is perennial. Sometimes bur cucumber (*Sicyos angulatus*) and wild cucumber (*Echinocystis lobata)* are mistaken for Japanese hops, but can be distinguished because they do not have hooked, downward-pointing hairs on the leaves and stems and have tendrils on the stem.
- For more information on identification, please see University of Wisconsin Extension's helpful YouTube video Japanese Hop, identification of the Wisconsin invasive species *Humulus japonicus*.

Risk Assessment Current Summary (2016): Japanese hops have escaped cultivation and are displacing desirable species and impeding forest regeneration. Unlike common hops, which is a related species, Japanese hops are not utilized for beer production. There are limited infestations in Minnesota and infestations are responsive to treatments by herbicide application. Listing as a Prohibited Noxious Weed on the Eradicate list supports the goal to eradicate infestations before Japanese hops vines spread and become a serious weed issue in Minnesota.

Box	Question	Answer	Outcome
1	Is the plant species or genotype non-native?	Yes	Go to box 3
3	Is the plant species, or a related species, documented as being a problem elsewhere?	Yes, *H. japonicus* is a noxious weed in Connecticut and Massachusetts (1). Wisconsin lists *H.japonicus* as a restricted invasive species in 15 counties and a prohibited invasive species in all other counties (2). The Midwest Invasive Plant Network lists *H. japonicus* as an early detection and rapid response target (3). It is considered a problem in Maryland (4) and Indiana (5). The Indiana Invasive Plant Council ranks it as a high invasive risk (11, 12). New York gave this species a high invasiveness rank (6). Michigan has it on its list of Invasive Species (11). It is on the Missouri Department of Conservation's invasive plant list (11).	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. There is an established population in southeastern Minnesota along the Mississippi River. There is also an established population along the Root River from Preston to the Mississippi River. Extensive mapping efforts from 2013-2015 documented 370 points with Japanese hops along the Root River. Isolated Japanese hops were found in Winona and Rochester. Those plants were treated. Data are from EDDMaps (10). Root River mapping was a cooperative effort by the MN Department of Agriculture (MDA), MN Department of Natural Resources (DNR), Conservation Corps, U of MN Extension, and other partners.	Go to box 7

Box	Question	Answer	Outcome
7	Does the plant species have the potential to reproduce and spread in Minnesota?		
	A. Does the plant reproduce by asexual/vegetative means?	No (7).	Go to question C
	C. Does the plant produce large amounts of viable, cold-hardy seeds?	Yes (7).	Go to question F
	F. Are sexual propagules – viable seeds – effectively dispersed to new areas?	Yes. Seeds are dispersed by animals, machinery, and water (7).	Go to question I
	I. Do natural controls exist, species native to Minnesota, that are documented to effectively prevent the spread of the plant in question?	No (7). While no species have been documented to control *H. japonicus*, the MDA has documented a native flea beetle feeding on *H. japonicus*. Hop flea beetles, *Psylliodes punctulta* Melsheimer, were found on invasive Japanese hops, *H. japonicus*, on June 6, 2015 in Rushford, Minnesota by Monika Chandler (MDA). Japanese hops were dense and spanned approximately an acre. Dr. John Luhman with the University of Minnesota determined the species. The flea beetles were abundant and appeared to be feeding on Japanese hops. There appeared to be damage as a result of feeding. The hop flea beetle is polyphagous and feeds on our native hops, *Humulus lupulus* (common hops), and other hosts. It appears that it will also feed on non-native Japanese hops.	Go 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?		
	A. Does the plant have toxic qualities, or other detrimental qualities, that pose a significant risk to livestock, wildlife, or people?	Stems and leaves have rough, hooked hairs that can cause dermatitis and blistering (8). Some people are allergic to the pollen (9).	If this meets the criteria of "significant risk", go to box 9 If not, go to question B

Box	Question	Answer	Outcome
	B. Does, or could, the plant cause significant financial losses associated with decreased yields, reduced crop quality, or increased production costs?	Unknown. University of Minnesota plant pathologists Joshua Havill and Angela Orshinsky are studying hops diseases. They are working in both MN and WI. They found powdery mildew on Japanese hops in MN. Having a reservoir of powdery mildew that contains both mating types will increase the genetic diversity of powdery mildew and that could help the fungus overcome currently employed resistance genes and fungicides used in commercial common hops (*H. lupulus*) production. Downy mildew (*Pseudoperonospora humuli*) can infect Japanese hop, but the sporulation is so low that the potential for spread from infected Japanese hops is pretty low. The concern is that Japanese hops can be a reservoir for diseases that impact the varieties of native hops (*H. lupulus*) in production for beer. The potential economic impact of powdery and downy mildew from Japanese hops on beer hops production in Minnesota is unknown. The researchers are assessing wild *H. lupulus* to see if there is resistance to powdery mildew.	Go to question C

Box	Question	Answer	Outcome
	C. Can the plant aggressively displace native species through competition (including allelopathic effects)?	Yes. Vines grow rapidly up to 10 ft and form mats up to 4 ft thick. The vines shade and smother grasses, forbs, shrubs, and small trees (4). Indiana's risk assessment indicates that *H. japonicus* is impacting one state threatened species at a single site and another site had more than 10 acres with greater than 50% cover of *H. japonicus* (12). Observations in Minnesota show that *H. japonicus* infestations can be dense (observations from MDA, MN DNR). Impacts to native hops species through the powdery and downy mildew are not understood (see box 8B).	Go to box 9
	D. Can the plant hybridize with native species resulting in a modified gene pool and potentially negative impacts on native populations?	**Native *H. lupulus* and non-native *H. japonicus* co-occur in Minnesota. These two species have different chromosome numbers and there are no reports of successful crossing between them (13).**	**Text is provided as additional information not directed through the decision tree process for this particular risk assessment.**
	E. Does the plant have the potential to change native ecosystems (adds a vegetative layer, affects ground or surface water levels, etc.)?	**Japanaese hops is commonly found along riparian areas and has the potential to affect erosion near rivers, but no data was found on this.**	**Text is provided as additional information not directed through the decision tree process for this particular risk assessment.**
	F. Does the plant have the potential to introduce or harbor another pest or serve as an alternate host?	**University of Minnesota plant pathologists Joshua Havill and Angela Orshinsky are studying hops diseases. They found powdery mildew on Japanese hops in MN. They think that downy mildew can sporulate on Japanese hops but appear asymptomatic. The concern is that Japanese hops can be a reservoir for diseases that impact native hops (*Humulus lupulus*).**	**Text is provided as additional information not directed through the decision tree process for this particular risk assessment.**

Box	Question	Answer	Outcome
9	Does the plant species have clearly defined benefits that outweigh associated negative impacts?		
	A. Is the plant currently being used or produced and/or sold in Minnesota or native to Minnesota?	No. *Humulus japonicus* was introduced as an ornamental. There are some cultivars, but the species and cultivars are not sold widely, if at all, in MN as of 2011. *H. japonicus* was regulated as a prohibited noxious weed in 2012 thus prohibiting sale. Since that time MDA has not been contacted by industry asking to overturn that decision. Unlike its relative *H. lupulus*, *H. japonicus* cannot be used to make beer (9).	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?		
	A. Is the plant currently established in Minnesota?	Yes. It is established in southeastern MN and the tri-state area. It is established along the Root River.	Go to question B
	B. Does the plant pose a serious human health threat?	Maybe – see Box 8, question A	If yes, list as a prohibited/ control noxious weed. If no, go to question C.
	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. Large populations can be controlled with appropriate and repeated applications of products with glyphosate as the active ingredient (4). *H. japonicus* has a short-lived seed bank (3 years) which facilitates control (8). State mapping and treatment efforts lead by the MDA have made considerable progress in mapping *H. japonicus* and initiating treatments. It is recommend that *H. japonicus* continue to be a priority for early detection and rapid response on a statewide level.	List the plant as a Prohibited Noxious Weed on the Eradicate List
Final Results of Risk Assessment			
	Review Entity	**Comments**	**Outcome**
	NWAC Listing Subcommittee **2011**	Recommended to list as a Prohibited Eradicate Species	Possible Eradicate Listing

Box	Question	Answer	Outcome
	NWAC Full-group **2011**	Voted to accept the Listing Subcommittees recommendation.	List as a Prohibited – Eradicate Species
	MDA Commissioner **2011**	Approved and Listed as a Prohibited-Eradicate Species (Approved 12/15/2011 and added to the list in 2012)	Listed as a Prohibited Noxious Weed - Eradicate List
	NWAC Listing Subcommittee Review **2016**	Recommend Japanese hops remain as a Prohibited – Eradicate List species	List as Prohibited Eradicate
	NWAC Full-group **2016**	Voted 14 – 0 to accept the Listing Subcommittee's recommendation.	List as Prohibited Eradicate
	MDA Commissioner **2016**	Accepted NWAC's recommendation (02/06/2017)	**PROHIBITED NOXIOUS WEED – ERADICATE LIST**
	File # **MDARA00002JAHP_11_30_2011**		

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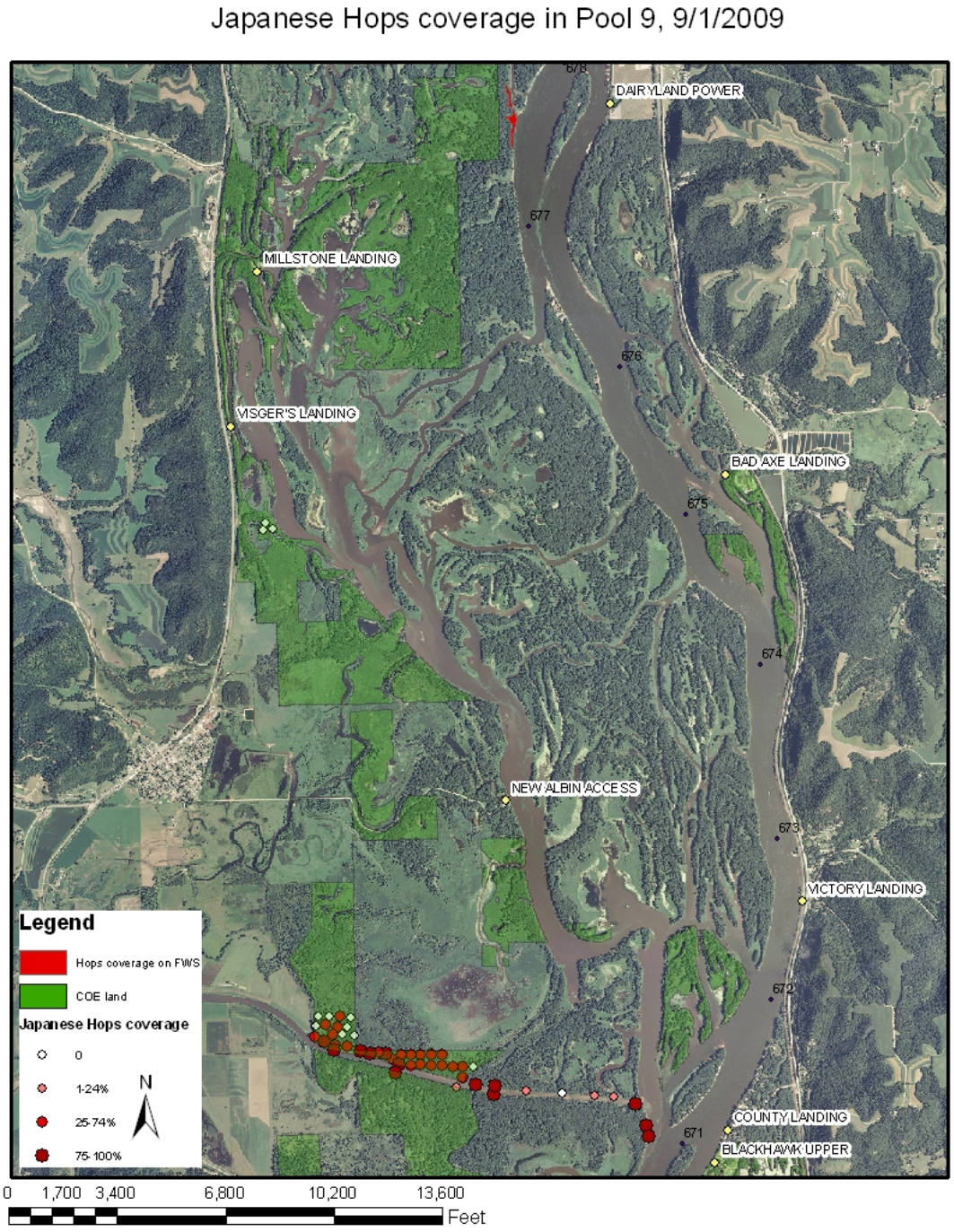
2. Wisconsin State Legislature. Chapter NR 40 Invasive Species Identification, Classification and Control (https://docs.legis.wisconsin.gov/code/admin_code/nr/001/40 29 March 2016).
3. Midwest Invasive Plants Network. Japanese Hops (*Humulus japonicus*) fact sheet (http://bugwoodcloud.org/mura/mipn/assets/File/Midwest%20Invasives%20Fact%20Sheets/PDF/jhops.pdf 25 March 2016).
4. Pannill, P. and A. Cook. 2008. Management of Japanese Hops on Forest Regeneration Sites. Maryland Department of Natural Resources Forest Service (http://www.watershed-alliance.com/mcwa_study19.html 12 July 2016).
5. Nice, G. 2006. Japanese Hops (*Humulus japonicus*) – One of Indiana's Rising Problematic Weeds (http://www.ppdl.purdue.edu/PPDL/weeklypics/2-13-06.html 17 May 2011).
6. Glenn, S. and G. Moore. 2009. *Humulus japonicus* (http://nyis.info/PlantAssessments/Humulus.japonicus.NYS.pdf 17 May 2011).
7. Plant Conservation Alliance' Alien Plant Working Group. Japanese hop fact sheet (http://www.nps.gov/plants/alien/fact/pdf/huja1.pdf 17 May 2011).
8. Meyers-Rice, B. 1999. Weed Notes: *Humulus japonicus* Siebold & Zucc. The Nature Conservancy, Wildland Weeds Management and Research (http://www.invasive.org/gist/moredocs/humjap01.pdf 17 May 2011).
9. Kaufmann, S.R. and W. Kaufmann. 2007. Japanese Hop *In* Invasive Plants: Guide to Identification and the Impacts and Control of Common North American Species. Stackpole Books, pp 233-235.
10. EDDMaps. 2016. Japanese hop distribution by points (http://www.eddmaps.org/distribution/viewmap.cfm?sub=10091 25 March 2016).

11. Midwest Invasive Plant Network. 2016. Midwest Invasive Plant Network's Midwest Invasive Plant List (http://www.mipn.org/plantlist/ 25 March 2016).
12. Clements, A., David, M., Lee, D., Krebs, J., and E. Jacquart. 2012. Assessment of Invasive Species in Indiana's Natural Areas: Official Japanese hops (*Humulus japonicus*) Assessment (https://www.entm.purdue.edu/iisc/pdf/plants/Humulus_japonica.pdf 26 July 2016).
13. USDA Agricultural Resource Service. 2005. *Humulus* Genetic Resources (http://www.ars-grin.gov/cor/humulus/huminfo.html 25 March 2016).

Notes on *Humulus japonicus* distribution

Humulus japonicus is reported in Minnesota along the Mississippi in the tri-state area across from Dairyland Power (pictured below). The US Fish and Wildlife Service and Army Corps of Engineers jointly manage this area and are trying to control this infestation with glyphosate, but the infestation rebounds quickly after treatment. Most of the *H. japonicus* populations are in Iowa across the river from Blackhawk. Some of these infestations are on private land. The level of infestation control in Iowa is unknown at this time and these infestations could be a seed source for additional introductions in Minnesota. *Humulus japonicus* has been reported along the Root River as well. The extent of *H. japonicus* populations in Minnesota has not been assessed.



EDDMaps distribution of Japanese hops, March 25, 2016
http://www.eddmaps.org/distribution/viewmap.cfm?sub=10091