

MN NWAC Risk Assessment Worksheet (04-2011)	Common Name	Latin Name
	Palmer Amaranth	<i>Amaranthus palmeri</i>
Reviewer	Affiliation/Organization	Date (mm/dd/yyyy)
Roger Becker	University of Minnesota	8/08/2014

Box	Question	Answer	Outcome
1	Is the plant species or genotype non-native to Minnesota?	Yes, non-native in Minnesota. Is native to the southern U.S. and Mexico; native to North America.	Yes. Go to box 3.
2	Does the plant species pose significant human or livestock concerns or has the potential to significantly harm agricultural production?		
	A. Does the plant have toxic qualities that pose a significant risk to livestock, wildlife, or people?		
	B. Does the plant cause significant financial losses associated with decreased yields, reduced quality, or increased production costs?		
3	Is the plant species, or a related species, documented as being a problem elsewhere?	Yes. Palmer amaranth is a severe problem in summer climates similar to Minnesota. (see Hager 2013; Hartzler 2014a; and Legleiter and Johnson 2013). It has not been documented as a problem in states with winter climates similar to Minnesota, but it is anticipated it will do very well since it is an annual with a seedbank and seedlings that have performed well in states with freezing winter temperatures, and portions of the growing season in Minnesota are similar to locations further south where Palmer amaranth is a severe problem.	Yes. Go to Box 6.
4	Is the plant species' life history & Growth requirements understood?	<i>Yes, documented in disparate articles, but oddly no classic biology of Palmer amaranth review article could be found.</i>	<i>Blue text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
5	Gather and evaluate further information:	(Comments/Notes)	

Box	Question	Answer	Outcome
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. Palmer amaranth is not established in MN but a close relative, tall waterhemp, is. Tall waterhemp (<i>Amaranthus tuberculatus</i> (Moq.) Sauer), is common in Minnesota, and is similar to Palmer amaranth in that tall waterhemp is competitive, diecious, and resistant to several mode of action herbicide groups. Competitiveness of Palmer amaranth here is not known. We anticipate it would be very competitive similar to, or exceeding that of tall waterhemp (Bensch et al. 2003). Note: <i>Amaranthus rudis</i> and <i>A. tuberculatus</i> are now considered a single species, <i>A. tuberculatus</i> , common name, waterhemp (Pratt and Clark 2001).	Yes. Go to Box 7
	B. Has the plant become established in areas having a climate and growing conditions similar to those found in Minnesota?	<i>Palmer amaranth occurs at problematic levels in southern Indiana, Illinois, Missouri, and Nebraska. It has recently been found in South Dakota, in five locations in Iowa (Hartzler 2014b), and in one location in Wisconsin (Davis and Recker 2014).</i>	<i>Blue text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
7	Does the plant species have the potential to reproduce and spread in Minnesota?		
	A. Does the plant reproduce by asexual/vegetative means?	No.	No. Go to Box 7c.
	B. Are the asexual propagules effectively dispersed to new areas?		
	C. Does the plant produce large amounts of viable, cold-hardy seeds?	Yes. Sexual, diecious reproductive system. Produces up to 460,000 seeds per plant with competition, 1 million seeds per plant when grown without competition (Sosnoskie et al. 2014).	Yes. Go to Box 7f.
	D. If this species produces low numbers of viable seeds, does it have a high level of seed/seedling vigor or do the seeds remain viable for an extended period?		
	E. Is this species self-fertile?		

Box	Question	Answer	Outcome
	F. Are sexual propagules – viable seeds – effectively dispersed to new areas?	Yes. Palmer amaranth seed are readily dispersed locally and over long distances, moved with farm equipment, feed stocks, and livestock. It is rapidly dispersed across agricultural landscapes where it has become problematic. Dispersal has been documented in cotton meal used in livestock feed rations (Davis and Recker 2014).	Yes. Go to Box 7i.
	G. Can the species hybridize with native species (or other introduced species) and produce viable seed and fertile offspring in the absence of human intervention?	<i>Palmer amaranth has been shown to hybridize with tall water hemp (Franssen et al. 2001).</i>	<i>Blue text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
	H. If the species is a woody (trees, shrubs, and woody vines) is the juvenile period less than or equal to 5 years for tree species or 3 years for shrubs and vines?		
	I. Do natural controls exist, species native to Minnesota, that are documented to effectively prevent the spread of the plant in question?	No.	No. 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?		

Box	Question	Answer	Outcome
	A. Does the plant have toxic qualities, or other detrimental qualities, that pose a significant risk to livestock, wildlife, or people?	No, with one notable exception. Nitrate poisoning in livestock from consumption <i>Amaranthus</i> species or common lambsquarters has occurred when both of the following occur: a.) conditions exist that promote excessive N accumulation and b.) pigweeds comprise a significant portion of the forage available. For example, this has occurred in field corn where high levels of nitrogen fertilizer have been applied but the crop subsequently fails such as following hail, out or in a drought where silage is harvested rather than taking the crop to yield grain. High percentages of the forage harvested are often pigweeds due to excessive growth due to low crop competition coupled with high nitrogen nutrient levels.	No. Go to Box 8b.
	B. Does, or could, the plant cause significant financial losses associated with decreased yields, reduced crop quality, or increased production costs?	Yes. Up to 91 % yield loss in corn (Massinga and Currie 2002; Massinga et al, 2001), and 79 % in soybean (Bensch et al. 2003). Palmer amaranth is one of the most aggressive weeds in cropping systems in the south, southeast, and lower Midwest. It is threatening the ability to use conservation tillage (Price et al. 2001), is very competitive, is tolerant of shading (Jha et al. 2008), and has been shown to be allelopathic (Menges 1987 and 1988). Is not a host of arbuscular mycorrhizae fungi (Moyer-Henry et al. 2003).	Yes. Go to Box 9.
	C. Can the plant aggressively displace native species through competition (including allelopathic effects)?		
	D. Can the plant hybridize with native species resulting in a modified gene pool and potentially negative impacts on native populations?		
	E. Does the plant have the potential to change native ecosystems (adds a vegetative layer, affects ground or surface water levels, etc.)?		

Box	Question	Answer	Outcome
	F. Does the plant have the potential to introduce or harbor another pest or serve as an alternate host?		
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.	No. Go to box 10.
	B. Is the plant an introduced species and can its spread be effectively and easily prevented or controlled, or its negative impacts minimized through carefully designed and executed management practices?		
	C. Is the plant native to Minnesota?		
	D. Is a non-invasive, alternative plant material commercially available that could serve the same purpose as the plant of concern?		
	E. Does the plant benefit Minnesota to a greater extent than the negative impacts identified at Box #8?		
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?	No.	No. List as a prohibited/eradicate noxious weed.

Box	Question	Answer	Outcome
	B. Does the plant pose a serious human health threat?	No.	<i>No. Go to 10c. Blue text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
	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?	<p><i>If Yes – List as a prohibited/eradicate noxious weed. Yes when first discovered in MN, if scout and take action on satellite populations since is not established in MN (yet - to our knowledge) eradication would be possible and reasonable. If becomes more widely dispersed before eradication steps taken, eradication would no longer be feasible, classify as a prohibited noxious weed. In these scenarios, the answer to 10a would be YES, 10b would be no, and 10c would be YES. Then this risk assessment would direct to list as a prohibited/eradicate noxious weed.</i></p> <p><i>If No - list as a restricted noxious weed. Once present in MN and a few new infestations are allowed to escape, it may be difficult to control if introduced populations are resistant to multiple modes of action of herbicides used in major commodity crops. In that case it would spread rapidly through excessive seed production. If that occurs, the answer to 10a would be YES, 10b would be no, and 10c would be NO. Then this risk assessment would direct to list as a restricted noxious weed – but that is not an acceptable designation for an agricultural row-crop weed where dispersal could not be prevented.</i></p>	<p><i>Yes – List as a prohibited/eradicate noxious weed.</i></p> <p><i>No - list as a restricted noxious weed.</i></p> <p><i>Blue text is provided as additional information not directed through the decision tree process for this particular risk assessment..</i></p>
11	Should the plant species be allowed in Minnesota via a species-specific management plan; designate as specially regulated?		

Box	Question	Answer	Outcome
Final Results of Risk Assessment			
	Review Entity	Comments	Outcome
	NWAC Listing Subcommittee		List as Prohibited Eradicate
	NWAC Full-group		List as Prohibited Eradicate – Send to the Commissioner for an emergency 2015 listing.
	MDA Commissioner	Approved 3/03/15 – Prohibited Noxious Weed – Eradicate List	Prohibited Noxious Weed – Eradicate List
	File #: MDARA00036PALM_8_08_2014	Prohibited-Eradicate Noxious Weed	

References cited in this risk assessment:

(List any literature, websites, and other publications)

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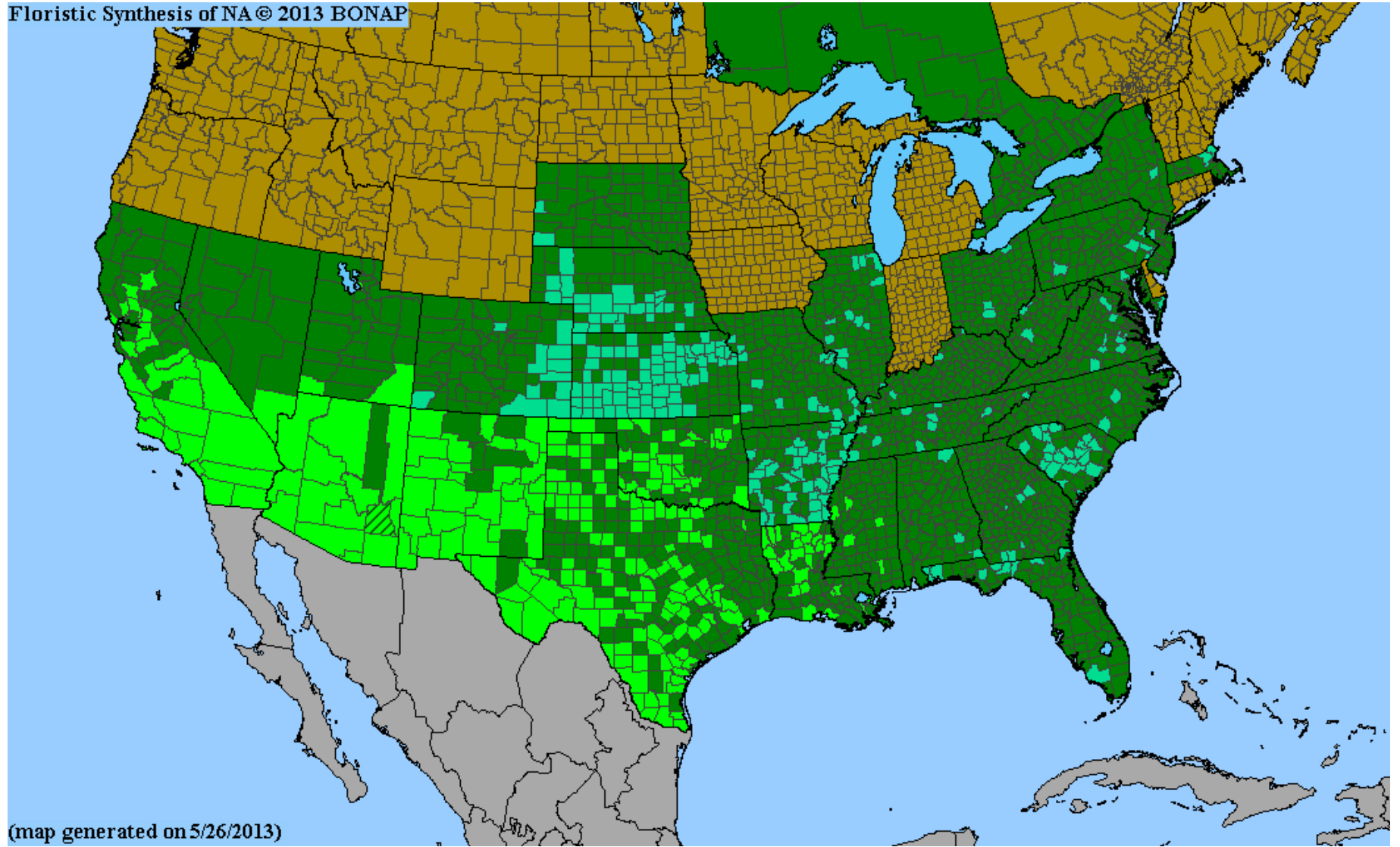
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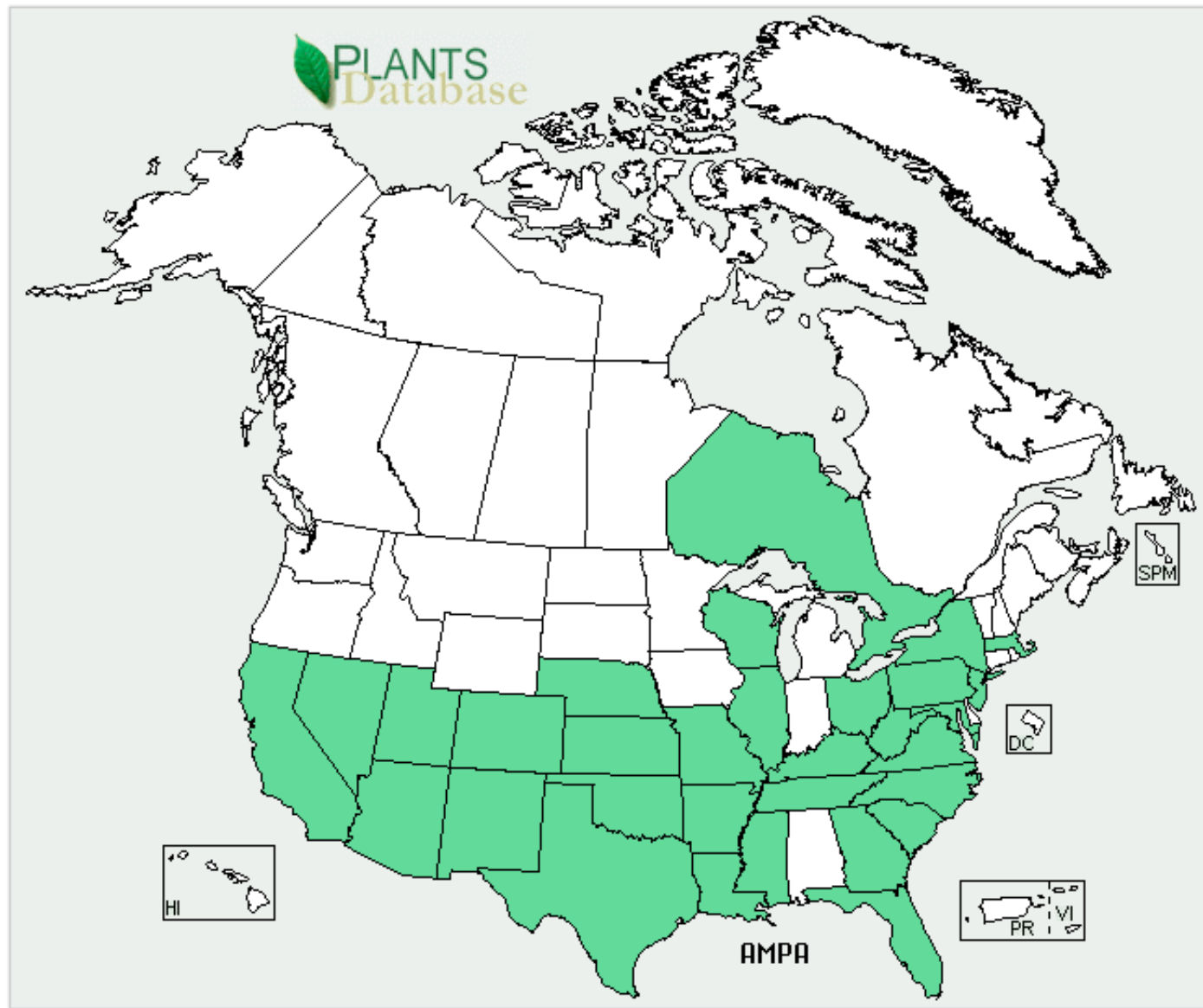
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Floristic Synthesis of NA © 2013 BONAP



(map generated on 5/26/2013)

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Present
 Absent/Unreported

USDA, NRCS. 2014. The PLANTS Database (<http://plants.usda.gov>, 22 July 2014). National Plant Data Team, Greensboro, NC 27401-4901 USA. (Note: No EDDR maps shown. EDRR Maps does not show any U.S. data for Palmer amaranth)