

MN NWAC Risk Assessment Worksheet (04-2011)	Common Name	Latin Name
Reviewer	Affiliation/Organization	Date (mm/dd/yyyy)
Ken Graeve	Minnesota Department of Transportation	08-07-2013



Summary:

Musk and plumeless thistles are two non-native biennial weeds that have long been a problem in disturbed sites and heavily grazed pastures. Both are widespread in Minnesota and North America. Historically, musk thistle has been more common in the southern half of Minnesota and plumeless thistle more prevalent in the northern half of the state (Cortilet). Currently plumeless thistle may be spreading into more of the state and possibly displacing musk thistle in some areas. These species are much too widespread for any hope of eradication or containment. Both are impacted by a non-native weevil called *Rhinocyllus conicus*, but this insect does not sufficiently limit their spread, and it also feeds on several native species (Gassmann and Kok). These thistles are not seen as a serious ecological threat in Minnesota, with most ecological restoration practitioners seeing them as a symptom of disturbance that diminishes as a plant community is restored (Graeve). Musk and Plumeless thistles are problematic in overgrazed pastures, but are a result of that disturbance rather than a primary problem, and are easily managed with herbicides or improved pasture management (Hartzler, Becker). Although these



thistles are probably of concern for some livestock producers and have some economic impact, it is difficult to quantify the significance of that impact. Of the two, Plumeless thistle is believed to be a more serious threat because it appears to be better able to invade less degraded pastures (Chandler). This risk assessment recommends removing musk and plumeless thistle from the noxious weed list for the following reasons:

- It is difficult to show that the agricultural impact of these thistles is significant as defined in box 8
- Musk and plumeless thistle become problems as a result of overgrazing or other disturbance and are not the ultimate cause of decreased forage yields or increased production costs
- Musk and plumeless thistle are easily controlled through improved pasture management or herbicide treatment
- The widespread distribution of both species prevents any meaningful chance of their eradication or containment
- Improved pasture management is most likely the best strategy for reducing the impacts of these thistles rather than regulation under the noxious weed law

Box	Question	Answer	Outcome
1	Is the plant species or genotype non-native?	Yes for both species Native to Europe (Gleason and Cronquist 1991, NatureServe)	Go to Box 3
3	Is the plant species, or a related species, documented as being a problem elsewhere?	Yes Widespread problem in north America, including 46 of the contiguous united states, possibly worst in pastureland in the Midwest and west (NatureServe)	Go to Box 6
6	Does the plant species have the capacity to establish and survive in Minnesota?	Yes Both are common and widespread in MN (personal observation, Bell Museum, EDDMaps)	Yes, go to Box 7
	A. Is the plant, or a close relative, currently established in Minnesota?	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?	Yes	Go to Box 7
7	Does the plant species have the potential to reproduce and spread in Minnesota?	Yes	Yes, go to Box 8
	A. Does the plant reproduce by asexual/vegetative means?	No, both species are biennial (Cronquist & Gleason NatureServe)	Go to Box 7.C.
	B. Are the asexual propagules effectively dispersed to new areas?	No, see above	

Box	Question	Answer	Outcome
	C. Does the plant produce large amounts of viable, cold-hardy seeds?	Up to 11,000 seeds per plant for <i>C. nutans</i> but only about 50% are typically viable (NatureServe) Others report that <i>C. nutans</i> can produce up to 20,000 seeds per plant with 95% germination (Roeth, et al.) Up to 9,000 seeds per plant for <i>C. acanthoides</i> (CWMA) Both species are known to thrive throughout much of North America, including the upper Midwest and northern plains states and southern Canada (Gleason & Cronquist, USDA Plants)	
	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?	Seeds of <i>C. nutans</i> remain viable for typically about 3 years but up to 10-15 years, with much of the recruitment of cohorts coming from soil seed bank (NatureServe) Seeds of <i>C. acanthoides</i> reported to last up to 10 years (CWMA)	Go to Box 7.F.
	E. Is this species self-fertile?	Yes for <i>C. nutans</i> (NatureServe) Limited self-pollination in <i>C. acanthoides</i> (Hilgenfeld and Martin)	
	F. Are sexual propagules – viable seeds – effectively dispersed to new areas?	Yes—wind dispersal for <i>C. nutans</i> seed reportedly deposits the majority of seed within 40-50m (NatureServe, Zouhar 2002) but long distance dispersal is vectored by human activities	Go to Box 7.I.
	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>C. nutans</i> and <i>C. acanthoides</i> can hybridize with each other and produce partly fertile hybrids (Gleason and Cronquist, NatureServe)	
	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?	Not Applicable	

Box	Question	Answer	Outcome
	I. Do natural controls exist, species native to Minnesota, which are documented to effectively prevent the spread of the plant in question?	<p>No.</p> <p>A non-native weevil, <i>Rhinocyllus conicus</i> that feeds on flower heads of <i>Carduus</i> species is widespread and may have reduced the density of <i>C. nutans</i> infestations (Becker, Gassman and Kok). However, control by <i>R. conicus</i> is highly variable and does not appear to prevent the spread of <i>C. nutans</i> or <i>C. acanthoides</i> (NatureServe). <i>R. conicus</i> is not sufficiently host-specific to meet current standards for biocontrol introductions and they are known to affect native and rare thistle species (NatureServe, Gassman and Kok).</p> <p>Other potential biocontrol agents that impact thistles (<i>Trichosirocalus horridus</i>, <i>Cheilosa corydon</i>, and <i>Puccinia carduorum</i>) are established in parts of the United States but not in Minnesota or adjacent states (Zouhar ,).</p>	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?	<p>No</p> <p>No toxic qualities</p> <p>Evidence does not show financial losses to be significant</p> <p>Infestations are ultimately caused by disturbance rather than being driven by the plant invading healthy plant communities or pastures.</p>	No Do not regulate.
	A. Does the plant have toxic qualities, or other detrimental qualities, that pose a significant risk to livestock, wildlife, or people?	<p>No</p> <ul style="list-style-type: none"> • Spiny texture inhibits grazing, but the effects of this are covered in box 8.B 	Go to 8.B

Box	Question	Answer	Outcome
	<p>B. Does, or could, the plant cause significant financial losses associated with decreased yields, reduced crop quality, or increased production costs?</p>	<p>No</p> <p>Musk and Plumeless thistles are problematic in overgrazed pastures, but are a result of that disturbance rather than a primary problem, and are easily managed with herbicides or improved pasture management (Hartzler, Becker). Thistles compete poorly with healthy established grasses and require some disturbance such as fire, overgrazing, or trampling to encourage colonization (CDFA).</p> <p>Although these thistles are probably of concern for some livestock producers and have some economic impact, it is difficult to quantify the significance of that impact.</p> <p>Ten-plus year old estimates suggest annual losses to agricultural production in Nebraska were at \$162,000 (Hilgenfeld and Martin). However, cattle sales in Nebraska for the same year totaled \$5.1billion (Petersan & Frederick), making the costs quoted by Hilgenfeld and Martin seem rather insignificant.</p> <p>Gassmann and Kok state that a musk thistle infestation of one plant per 1.49m² can reduce pasture yields by 23%. However, although their figure is widely quoted, it seems to be theoretical and based on a simple calculation of the size of a thistle plant, and there is no evidence to support the logical conclusion that there would be 1/3 more beef production in the Midwest if it weren't for musk and plumeless thistles.</p> <p>State of Victoria estimates forage yield reductions of 13% are possible. The economic impacts may be less than they used to be because more producers are using rotational grazing systems that work to prevent large thistle infestations and also because the seedhead weevil seems to have some detrimental impact on the competitive ability of <i>C. nutans</i> (Becker). Of the two, Plumeless thistle is believed to be a more serious threat because it appears to be better able to invade less degraded pastures (Chandler).</p>	<p>Go to 8.C</p>

Box	Question	Answer	Outcome
	C. Can the plant aggressively displace native species through competition (including allelopathic effects)?	No, NatureServe review implies that <i>C. nutans</i> may be a significant threat in dry prairies in Nebraska and Kansas. However, these thistles are not a big threat to established native plant communities in Minnesota, according to an informal survey of over two dozen experienced ecological restoration practitioners around the state, in which the overriding sentiment was that these thistles form dense stands only as a result of disturbance and they fade away as a plant community recovers (Graeve).	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?	No No mention found of hybridization with native species, but <i>C. nutans</i> and <i>C. acanthoides</i> will hybridize with each other (see Box 7.G).	
	E. Does the plant have the potential to change native ecosystems (adds a vegetative layer, affects ground or surface water levels, etc.)?	No	
	F. Does the plant have the potential to introduce or harbor another pest or serve as an alternate host?	No	

Final Results of Risk Assessment

	Review Entity	Comments	Outcome
	NWAC Listing Subcommittee	First review – 06/20/2013, Final Review 08/12/2013 The subcommittee recommends removing <i>C. nutans</i> and <i>C. acanthoides</i> from the noxious weed list because of their lack of significant impact on agriculture, native ecosystems, or human health.	Delist both Musk and Plumeless Thistle

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Box	Question	Answer	Outcome
	NWAC Full-group	<p>Review 12/18/2013 – Delisting caused quite a bit of discussion among members. It was mentioned by several members that non-native thistles have a significant impact on grazing agriculture, haying, and marginal land profitability. Plumeless thistle was thought to be a much greater problem than musk thistle and was thought to be a species that can freely invade and establish in quality grazing paddocks as well as high-value haying lands and wildlife areas. Musk thistle is thought to be more regional to the SE, SC and SW counties. Musk thistle could be added to County Noxious Weed lists where presumed to be a problem. Plumeless thistle is thought to be too wide-spread of a problem to delist. It is also being reported to displace current musk thistle populations and continues to spread southward from its source populations in northern MN.</p>	<p>MUSK THISTLE – Vote 11 – 2 for delisting</p> <p>PLUMELESS THISTLE - Vote 7 – 6 in favor of delisting</p>

Box	Question	Answer	Outcome
	MDA Commissioner	<p>Review 02/24/2014 - Petition letters received by the commissioner's office from four member organizations overwhelmingly disagreed with NWAC's recommendation for these non-native thistles. The MDA also received other comments regarding the recommendations to delist plumeless and musk thistles that indicated farmers and private landowners alike would be upset if the recommendation was approved – primarily for plumeless thistle. Also, the Farmer's union was unable to attend the voting meeting on 12/18/2013. Had they have been able to vote, they would have voted against delisting thus making the vote a 7 – 7 tie and by NWAC's bylaws that would have made the recommendation for plumeless thistle to remain as a Prohibited-Control Species.</p>	<p>MUSK THISTLE - Based on NWAC's majority vote and lack of specific feedback by member groups, the commissioner accepted NWACS recommendation to de-list, allowing counties to add to their County Noxious Weed Lists.</p> <p>PLUMELESS THISTLE - The commissioner rejected NWAC's recommendation to delist plumeless thistles.</p> <p>The commissioner has directed that plumeless thistle remain as a prohibited-control species to support the counties and townships opinion, in addition to comments from the Farmer's Union and MN Crop Improvement Association, that any changes would be detrimental to grazing agriculture and potentially cause confusion within the seed industry</p>
	FILE # MDARA00033PTMT_2 _24_2014	<p>MUSK THISTLE - Delisted</p> <p>PLUMELESS THISTLE – Prohibited-Control Noxious Weed</p>	

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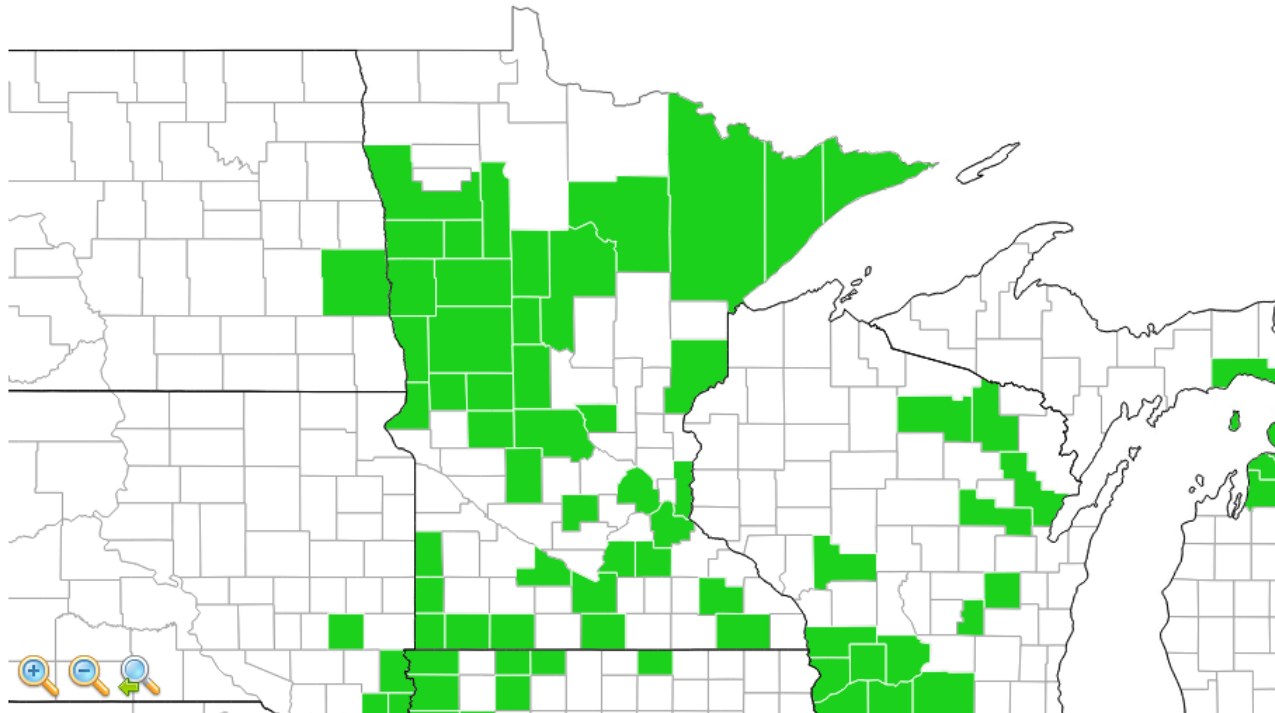
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spiny plumeless thistle

Carduus acanthoides L.

USDA PLANTS Symbol: CAAC
Invasive Plant Atlas

Distribution Maps: [County](#) / [Southeast](#) / [Points on Google Maps](#)



Please cite the EDDMapS as:

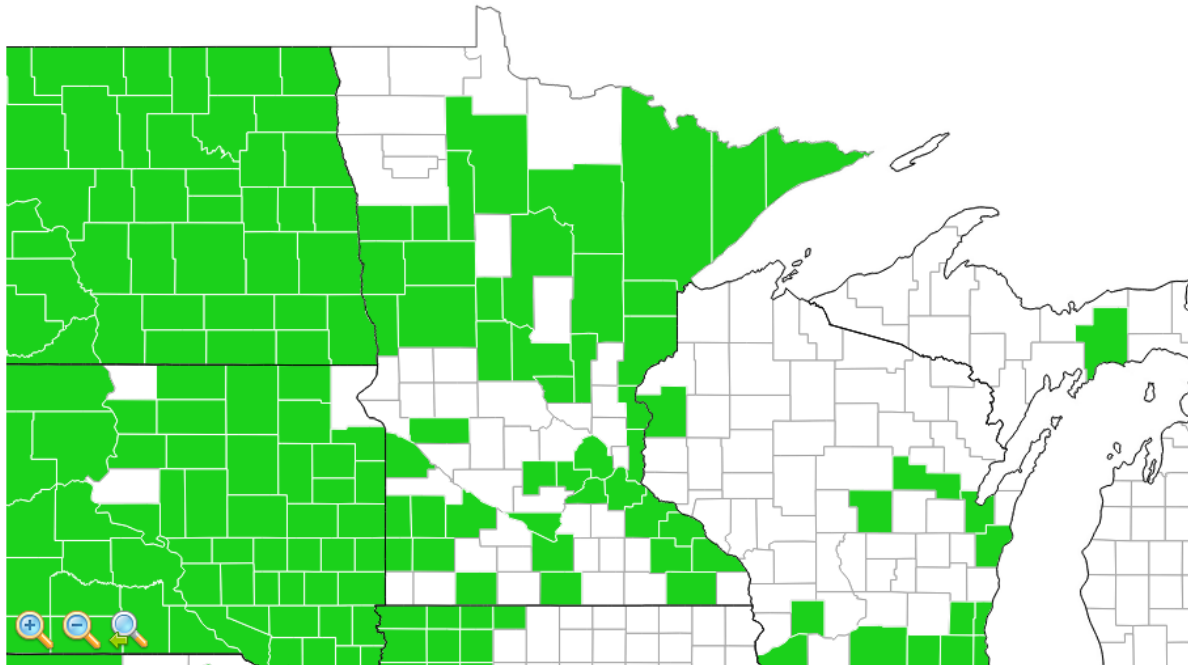
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musk thistle

Carduus nutans L.

USDA PLANTS Symbol: CANU4
Invasive Plant Atlas

Distribution Maps: [County](#) / [Southeast](#) / [Points on Google Maps](#)



Please cite the EDDMapS as:

EDDMapS. 2013. Early Detection & Distribution Mapping System. The University of Georgia - Center for Invasive Species and Ecosystem Health. Available online at <http://www.eddmaps.org/>; last accessed July 22, 2013.