

MN NWAC Risk Assessment Worksheet (04-2017)	Common Name	<i>Latin Name (Full USDA Nomenclature)</i>
	Yellow Sweetclover	<i>Melilotus officinalis (L.) Lam</i>
Original Reviewer: Laura Van Riper	Affiliation/Organization: Minnesota Department of Natural Resources	Original Review: (07/25/2017)

Species Description:

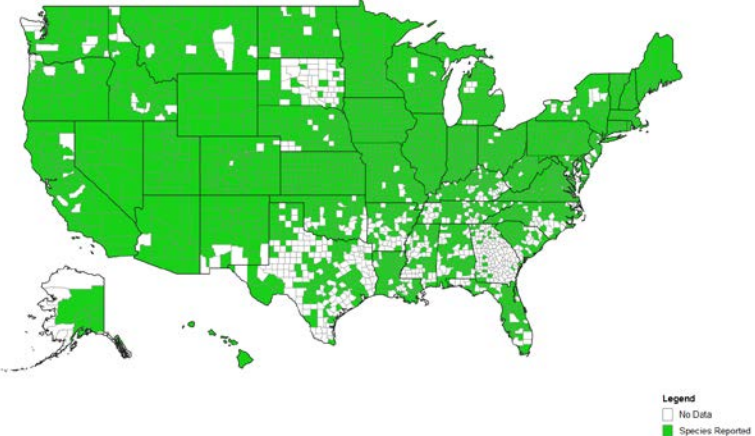
- Sweetclover is being evaluated due to its invasiveness in natural areas.
- Sweetclover invades and degrades native grasslands by overtopping and shading native sun-loving plants thereby reducing diversity. It grows abundantly on disturbed lands, roadsides and abandoned fields.
- Native to Europe it was brought to the U.S. in the late 1600s and still used today as a forage crop and soil enhancer predominantly in the Great Plains and Upper Midwest. It is also popular with bee keepers.
- Biennial herbaceous plant. First year plants do not bloom. Second year plants grow 3 - 6' high and are bush-like with yellow flowers.
- Similar in appearance to white sweetclover (*Melilotus albus*). White sweetclover has white flowers.
- For more information see the [Minnesota Department of Natural Resources \(DNR\) sweetclover website](#) or the [Wisconsin DNR sweetclover website](#).

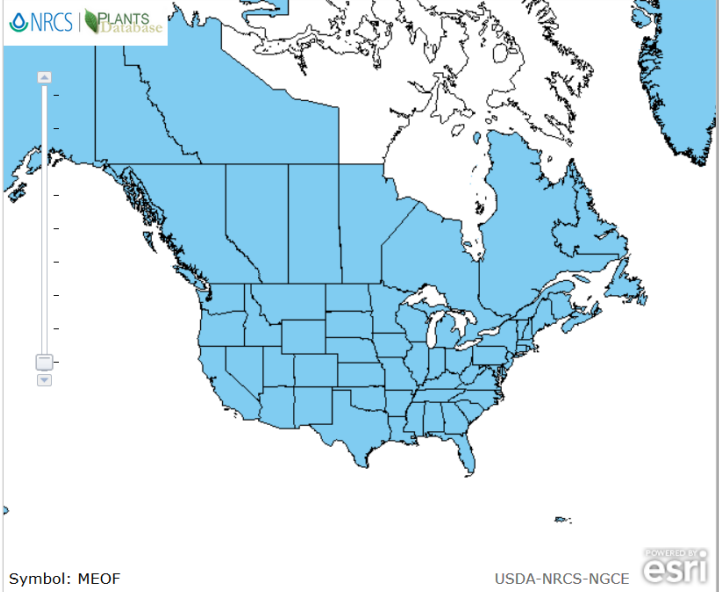


Yellow sweetclover photo by Howard F. Schwartz, Colorado State University, Bugwood.org

Current Regulation: Yellow sweetclover is not currently regulated.

NOTE: (Additional supporting information may be added to a box even when the decision tree process bypasses that question. Text used for the Answer box for this non-required text should be **BOLD AND ITALIC**. Furthermore, whenever text is entered for an answer to a question not required by the risk assessment decision tree process, the outcome box should contain the following statement: **This text is provided as additional information not directed through the decision tree process for this particular risk assessment.**)

Box	Question	Answer	Outcome
1	Is the plant species or genotype non-native?	Yes. Yellow sweetclover is native to Eurasia (Turkington et al. 1978). Sweetclover arrived in the US from Eurasia in the 1700s, likely as a contaminant in seed crops (Turkington et al. 1978).	Go to Box 3.
3	Is the plant species, or a related species, documented as being a problem elsewhere?	<p>Sweetclover is naturalized throughout the world including North America, the Arctic, and southeast Asia (Turkington et al. 1978, Klebesadel 2001, Wu et al. 2003). Sweetclover has been noted to be abundant in large natural areas in North America (Turkington et al. 1978, Lesica and DeLuca 2000, Weaver et al. 2001, Wolf et al. 2003).</p> <p>Current distribution of yellow sweetclover includes most of the continental United States and Alaska and Hawaii (EDDMapS 2017).</p>  <p>The USDA Plants database shows yellow sweetclover present in most of Canada (USDA 2017).</p>	Go to Box 6.

Box	Question	Answer	Outcome
		 <p>Yellow sweetclover is not regulated in other Midwest states, but is on several non-regulatory invasive plant lists. Yellow sweetclover is on Illinois' general invasive plant list, Indiana's invasive plant list (medium rank), Michigan's invasive plant list (category C, isolated distribution), Minnesota Department of Natural Resources invasive plant list, Missouri's general invasive plant list, and Wisconsin's general invasive plant list (Midwest Invasive Plant Network 2017).</p>	
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. Yellow sweetclover is currently established throughout Minnesota (see USDA 2017 and EDDMapS 2017 maps in Box 3).	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.	Go to Box 7B.
	C. Does the plant produce large amounts of viable, cold-hardy seeds?	Yes. Yellow sweetclover plants can produce up to 100,000 seeds per plant and the seeds can persist in the seed bank for more than 40 years (Turkington et al. 1978)	Go to Box 7F.
	E. Is this species self-fertile?	Yellow sweetclover has been found to have very little incidence of self-fertility (Barcikowska 1966).	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
	F. Are sexual propagules – viable seeds – effectively dispersed to new areas?	Seeds mainly spread by movement from rain and water (Turkington et al. 1978). Sweetclover has been planted throughout the US for a variety of uses including cattle forage, green manure to increase nitrogen levels in crop rotations, bee keeping, and roadside and mine soil stabilization (Turkington et al. 1978, Smith et al. 1986, Guntel et al. 1993, Wivstad 1999, Lesica and DeLuca 2000, Strong 2000, Wolf and Rohrs 2001).	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?	Sandal (1956) notes: “Yellow and white sweetclover do not cross and produce mature hybrid seed naturally in the field or from hand crossing. Seed pods are-formed following crossing, but the embryos abort and the pods fall off after developing two or three weeks.” Yellow and white sweetclover are the only two <i>Melilotus</i> species known to be in Minnesota (Minnesota Department of Natural Resources 2013).	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
	I. Do natural controls exist, species native to Minnesota that are documented to effectively prevent the spread of the plant in question?	No. There are no species native to Minnesota or biological control insects from sweetclover’s native range that are reported to prevent the spread of sweetclover.	Go to Box 8.

Box	Question	Answer	Outcome
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?	Yes. Sweetclover contains coumarin which becomes the anti-coagulant dicoumarol when the plant rots. When sweetclover is cut for hay or silage and it spoils, the cattle that eat the hay or silage can suffer from sweetclover bleeding disease (Turkington et al. 1978, Goplen 1980). Animals lose the ability to clot blood and can bleed to death (Goplen 1980). Sheep are thought to be less susceptible than cattle (Turkington et al. 1978). This is unlikely to be a human threat as humans do not eat molding sweetclover.	Go to Box 9
	B. Does, or could, the plant cause significant financial losses associated with decreased yields, reduced crop quality, or increased production costs?	No.	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
	C. Can the plant aggressively displace native species through competition (including allelopathic effects)?	Sweetclover has been noted to be abundant in large natural areas in North America (Turkington et al. 1978, Lesica and DeLuca 2000, Weaver et al. 2001, Wolf et al. 2003). Adult sweetclover plants can reach 2 m in height and so may negatively affect native plants by shading (Huenneke and Thomson 1995). Sweetclover can spread from areas where it was planted and form dense stands (Wolf et al. 2003, Lesica and DeLuca 2000). Sweetclover can compete strongly with native species (Parker et al. 1993, Reader et al. 1994).	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
	D. Can the plant hybridize with native species resulting in a modified gene pool and potentially negative impacts on native populations?	There are no native <i>Melilotus</i> species in Minnesota.	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>

Box	Question	Answer	Outcome
	E. Does the plant have the potential to change native ecosystems (adds a vegetative layer, affects ground or surface water levels, etc.)?	Sweetclover may cause ecosystem level changes to the nitrogen cycle due to its association with <i>Sinorhizobium meliloti</i> bacteria, which allows it to fix atmospheric nitrogen and potentially enrich the soil in nitrogen (Turkington et al. 1978, Wivstad 1999, Zakhia and de Lajudie 2001). Sweetclover's two-year life cycle means that new patches, potentially high in nitrogen, are continually opening up on the landscape as sweetclover plants die, which may facilitate the invasion of other exotic species (Maron and Connors 1996, Carino and Daehler 2002). Sweetclover produces persistent litter that can alter habitat conditions (Wivstad 1999).	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
	F. Does the plant have the potential to introduce or harbor another pest or serve as an alternate host?	Did not find any reports of this.	<i>This text is provided as additional information not directed through the decision tree process for this particular risk assessment.</i>
9	Does the plant species have clearly defined benefits that outweigh associated negative impacts?		

Box	Question	Answer	Outcome
	A. Is the plant currently being used or produced and/or sold in Minnesota or native to Minnesota?	<p>Yes. Sweetclover is planted for cattle forage, can be used as green manure to increase nitrogen levels in crop rotations, and is popular with bee keepers (Turkington et al. 1978, Smith et al. 1986, Guntel et al. 1993, Wivstad 1999). Sweetclover can grow well on disturbed soils and so has been planted along roadsides and on mine sites to stabilize soils (Lesica and DeLuca 2000, Strong 2000, Wolf and Rohrs 2001). Sweetclover has been recommended in conservation plantings and CRP mixtures (Meyer et al. 1994, Berry and Juni 2000). Sweetclover is attracting renewed attention due to the rising interest in pollinators.</p> <p>The following paragraph is from personal communication with Dr. Roger Becker of the University of Minnesota, from his conversations with distributors of sweetclover seed in the Midwest.</p> <p>Of the sweetclover seed sold in the U.S. about 95% is produced in Canada. Of U.S. sources, Oregon is a common producer. Yellow blossom sweetclover is used widely for nitrogen for organic producers and for Amish, Mennonites, etc. Sweetclover can produce 80 to 120 lbs. of nitrogen per acre. It is an efficient, economical, and reliable source of nitrogen for organic producers of corn. White sweetclover is harder to get than yellow sweetclover. Also it is harder to get uniform germination from white sweetclover. White sweetclover seeds often have up to 10% contamination with yellow sweetclover seeds.</p>	Yes, go to 9B.
	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?	No. Sweetclover is introduced and is challenging to control.	Go to 9C.
	C. Is the plant native to Minnesota?	No.	Go to 9D.

Box	Question	Answer	Outcome
	D. Is a non-invasive, alternative plant material commercially available that could serve the same purpose as the plant of concern?	Other legumes not as well suited for annual quick nitrogen production. Some other annuals no longer available for use for economic reasons (personal communication with Dr. Roger Becker, University of Minnesota). There are numerous native species that can provide pollen and nectar resource for pollinators (Minnesota Board of Water and Soil Resources 2016).	If Yes, go to Box 10. If No, go to Box 9E.
	E. Does the plant benefit Minnesota to a greater extent than the negative impacts identified at Box #8?		Yes, go to Box 11. No, 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.	Go to 9B.
	B. Does the plant pose a serious human health threat?	No.	Go to 9C.
	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?	No.	List the plant as restricted noxious weed.
11	Should the plant species be allowed in Minnesota via a species-specific management plan; designate as specially regulated?		Do not list. Continue to educate on the negative ecological impacts of sweetclover and discourage planting where possible.

Box	Question	Answer	Outcome
Final Results of Risk Assessment			
	Review Entity	Comments	Outcome
	NWAC Listing Subcommittee	The Listing subcommittee recommended following the risk assessment path that leads to this recommendation: “Do not list. Continue to educate on the negative ecological impacts of sweetclover and discourage planting where possible.”	Do not list.
	NWAC Full-group	September 7, 2017: NWAC Full group agreed to vote on “Do not list”. November 28, 2017: NWAC voted in favor of “Do not list”.	Do not list.
	MDA Commissioner		Do not list.
	FILE # MDARA00063YSC_07_20_2017		

Risk Assessment Current Summary (*Current Year – 07/25/2017*):

- Both yellow and white sweetclover are widely distributed in Minnesota.
- Both species have been purposefully planted for a variety of economic uses.
- Both species are non-native and can form dense monocultures and have negative impacts on native species.
- Both species would be challenging to control on a statewide level.
- In conclusion, since the species are widespread and have economic uses, regulation is not recommended at this time. However, due to the negative ecological impacts of sweetclover, it is recommended that education on sweetclover encourage the planting of native species where possible.

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