Minnesota Noxious Weed Risk Assessment

Developed by the Minnesota Noxious Weed Advisory Committee

Assessment information

Common name: Brown knapweed

Scientific name: *Centaurea jacea* L.

Family name: Asteraceae (Aster)

Current reviewer name and organizational affiliation: Laura Van Riper, Minnesota Department of Natural Resources and Jason Beckler, Minnesota Board of Water and Soil Resources
Date of current review: June 30, 2025

Previous reviewer name and organizational affiliation: Monika Chandler, Minnesota Department of Agriculture
Date of previous review: September 12, 2012

Species description

Photos

Photo caption: Brown knapweed can grow up to four feet tall. Photo credit: Minnesota Department of Agriculture.

Photo caption: Knapweed species can look similar. The bracts below the flowers that look like small leaves or scales are the main way to tell knapweed species apart. Spotted knapweed (left) bracts have a dark, triangular mark on their tips. Brown knapweed (right) bracts are round and wide. Photo credit: Minnesota Department of Agriculture.

Why the plant is being assessed

- Brown knapweed is currently listed as Prohibited Eradicate Noxious Weed indicating it is a high threat to the state and high priority for control.
- The original risk assessment was written in 2012. There is more information now about brown knapweed and about its presence in Minnesota.
- There are four knapweed species on the noxious weed list, with diffuse knapweed (*Centaurea diffusa*) and brown knapweed listed as Prohibited Eradicate and meadow knapweed (*C.* x *moncktonii*) and spotted knapweed (*C. stoebe* subspecies *micranthos*) listed as Prohibited Control. The 2022 meadow knapweed risk assessment (Minnesota Noxious Weed Advisory Committee 2022) recommended moving meadow knapweed from Prohibited Eradicate to Prohibited Control. Brown knapweed was chosen for reassessment to determine if a similar change is warranted.

Identification, biology, and lifecycle

Information from Minnesota Department of Agriculture (2025a) and Winston et al. (2012).
Identification:

- Brown knapweed is an herbaceous perennial plant that has multiple upright, reddish stems that are 1-4 feet tall.
- Leaves: Basal leaves are up to 6 inches (15 cm) long and 1.25 inches (3 cm) wide, lance shaped and pubescent (hairy), occasionally with wavy margins (leaf edges) or lobed.
- Stems: Erect, branched near top with alternate branching.

- Flowers: Pink to purplish composite flower heads (rarely white), about 0.5-0.85 inches (12-22 mm) wide and have both male and female parts. Unlike spotted knapweed with black tipped bracts, brown knapweed bracts have brown tips.
- Roots: Seedlings are tap-rooted and mature plants develop a cluster of roots below the crown.
- Habitat: Commonly found in sunny meadows, pastures, roadsides, and disturbed areas across Europe and parts of North America.
- Brown knapweed is a parental species of meadow knapweed. Meadow knapweed (*Centaurea* x *moncktonii*) is a Minnesota Prohibited Control Noxious Weed and is likely a fertile hybrid between black knapweed (*C. nigra*) and brown knapweed (Minnesota Department of Agriculture 2025b). Roché and Susanna (2010) explain that meadow knapweed "is a frequent and fully fertile hybrid between *C. nigra* and *C. jacea*. Meadow knapweed is more of a species complex than individual species and can be very difficult to distinguish from brown knapweed.

Biology:

- Reproduction: Exclusively by seed.
- Pollinators: Attracts bees, butterflies, and other insects.

Lifecycle:

- Seed germination: Seeds germinate in the spring or fall under suitable conditions.
- Rosette stage: The plant develops a basal rosette of leaves during its first year or early in its second year.
- Bolting and flowering: It sends up flowering stems and blooms from June to September.
- Seed production: From late summer to fall it produces numerous seeds that are dispersed by wind, water, animals, or human activity.

Current distribution

Image caption: National level map from EDDMapS (2025). Map accessed on May 22, 2025.
Description of where the plant is found in the United States: Brown knapweed has been reported in the northeastern quarter of the United States along with western states.

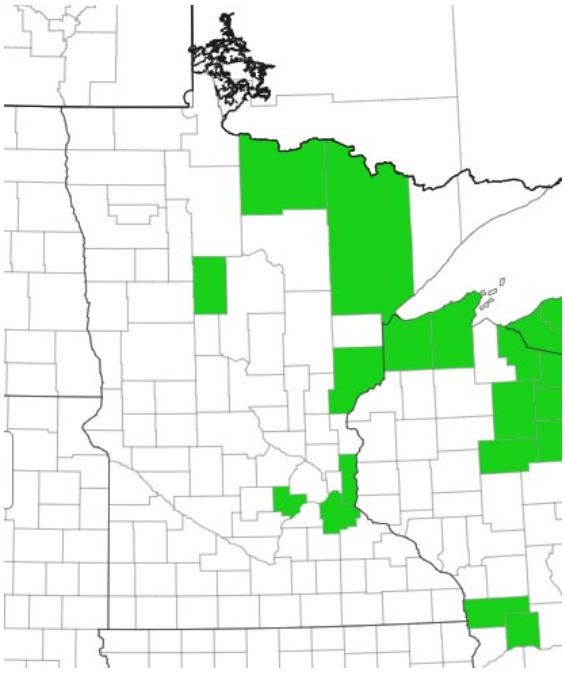

Image caption: State level map from EDDMapS (2025) by county. Map accessed on May 22, 2025.
Description of where the plant is found in Minnesota: Brown knapweed has been reported in EDDMapS in seven counties. List of counties with parentheses indicating the number of reports in EDDMapS: Koochiching (2), St. Louis (10), Hubbard (49), Pine (1), Washington (1), Dakota (2), and Carver (2).

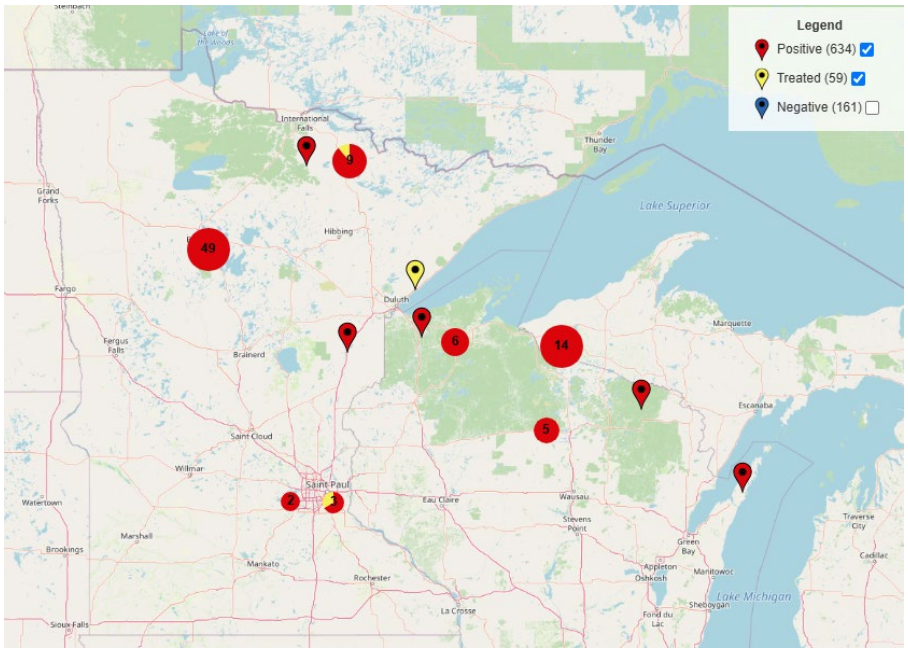

Image caption: State level map from EDDMapS (2025) with red indicating sites with brown knapweed and yellow points indicating sites that have been treated. Map accessed on May 22, 2025. Treatments have been reported to EDDMapS in three areas.

Current regulation

Currently regulated by the Minnesota Department of Agriculture as a Prohibited Eradicate Noxious Weed.

A 2025 review of information compiled by the National Plant Board (2025) listed Washington and Wisconsin as regulating brown knapweed. It is listed as a Restricted Invasive Species in Wisconsin (Wisconsin Department of Natural Resources 2025). In Washington state it is listed as a Class B Noxious Weed and is also on the Washington State Quarantine List (Washington State Noxious Weed Control Board 2025a).

Risk assessment

Box 1:

Is the plant species or genotype non-native?

Answer: Yes.
Outcome: Go to Box 3.
Brown knapweed is native to Europe (Roché and Roché 1991, Winston et al. 2012). In Europe, both diploid and tetraploid variations of brown knapweed coexist (Hardy and Vekemans 2001).

It was planted for hay and forage in eastern Canada in the 1850s. Subsequently, brown knapweed was introduced in the Pacific Northwest for forage, hay, and as a pollen source for honeybees (Roché and Roché 1991).

Box 2:

Does the species pose significant human or livestock concerns or have the potential to significantly harm agricultural production?

Question 2A: Does the plant have toxic qualities that pose a significant risk to livestock, wildlife, or people?

Outcome: Decision tree does not direct to this question.

Question 2B: Does the plant cause significant financial losses associated with decreased yields, reduced quality, or increased production costs?

Outcome: Decision tree does not direct to this question.

Box 3:

Is the species, or a related species, documented as being a problem elsewhere?

Answer: Yes.
Outcome: Go to Box 6.
Regulated in Wisconsin as a Restricted Invasive Species because it can outcompete desired vegetation, increase soil erosion, and uptake soil nutrients (Wisconsin Department of Natural Resources 2025). Washington state lists brown knapweed as a “Class B” noxious weed. Class B species are designated for control in regions where they are not yet widespread. Preventing new infestations in these areas is a high priority. In regions where a Class B species is already abundant, control is decided at the local level, with containment as the primary goal (Washington State Noxious Weed Control Board 2025b).

Box 4:

Are the species’ life history and growth requirements understood?

Outcome Decision tree does not direct to this question.

Box 5:

Gather and evaluate further information

Outcome: Decision tree does not direct to this question.

Box 6:

Does the species have the capacity to establish and survive in Minnesota?

Question 6A: Is the plant, or a close relative, currently established in Minnesota?

Answer: Yes.
Outcome: Go to Box 7.
Brown knapweed has been reported in EDDMapS (2025) in seven counties in Minnesota. The following counties (with parentheses indicating the number of reports in EDDMapS) have reports of brown knapweed: Koochiching (2), St. Louis (10), Hubbard (49), Pine (1), Washington (1), Dakota (2), and Carver (2).

Question 6B: Has the plant become established in areas having a climate and growing conditions similar to those found in Minnesota?

Outcome: Decision tree does not direct to this question.

Question 6C: Has the plant become established in areas having a climate and growing conditions similar to those projected to be present in Minnesota under future climate projections?

Outcome: Decision tree does not direct to this question.

Box 7:

Does the species have the potential to reproduce and spread in Minnesota?

Question 7A: Are there cultivars of the plant that are known to differ in reproductive properties from the species?

Answer: No.
Outcome: Go to Question 7B.
No cultivars were found for brown knapweed.

Question 7B: Does the plant reproduce by asexual/vegetative means?

Answer: No.
Outcome: Go to Question 7D.
Propagation is exclusively by seed (Winston et al. 2012).

Question 7C: Are the asexual propagules - vegetative parts having the capacity to develop into new plants - effectively dispersed to new areas?

Outcome: Decision tree does not direct to this question.

Question 7D: Does the plant produce large amounts of viable, cold hardy seeds? For woody species, document the average age the species produces viable seed.

Answer: Yes.
Outcome: Go to Question 7G.

Winston et al. (2012) state that brown knapweed plants can produce from 5 to a few hundred seeds and some of the seeds can remain dormant for many years.

Question 7E: For species that produce low numbers of viable seeds, do they have a high level of seed/seedling vigor or remain viable for an extended period (seed bank)?

Outcome: Decision tree does not direct to this question.

Question 7F: Is the plant self-fertile?

Answer: ***This information is supplemental and is not part of the flow chart pathway for this risk assessment.*** Brown knapweed is self-incompatible (Albrecht et al. 2009).

Question 7G: Are sexual propagules – viable seeds – effectively dispersed to new areas? List and consider all vectors.

Answer: Yes.
Outcome: Go to Question 7I.
Seeds can spread by wind, water, wildlife, grazing, haying, mowing, and contaminated equipment (Winston et al. 2012, Minnesota Department of Agriculture 2025a).

Question 7H: Can the species hybridize with native species (or other introduced species) and produce viable seed and fertile offspring in the absence of human intervention?

Answer: Yes. ***This information is supplemental and is not part of the flow chart pathway for this risk assessment.***
In Europe, both diploid and tetraploid variations of brown knapweed coexist (Hardy and Vekemans 2001). Tetraploids and can hybridize freely with black and meadow knapweeds, also tetraploids.

Závada et al. (2021) studied hybridization between brown knapweed and spotted knapweed on Nantucket Island in Massachusetts. Thy analyzed chloroplast and nuclear markers and did not find evidence of hybridization between brown knapweed and spotted knapweed.

Meadow knapweed (*Centaurea* x *moncktonii*) is a Minnesota Prohibited Control Noxious Weed and is likely a fertile hybrid between black knapweed (*C. nigra*) and brown knapweed (Minnesota Department of Agriculture 2025b). Roché and Susanna (2010) explain that meadow knapweed "is a frequent and fully fertile hybrid between *C. nigra* and *C. jacea*. *Centaurea nigra* is native to the British Isles, with hybrids being common when *C. jacea* was introduced from the European Continent." They also note that because "the F1 hybrid can back-cross with either parent and with other F1 individuals, hybrid swarms normally completely replace the pure forms. Both the parent species and the hybrid are common in Eurasia, becoming rare to the East."

Question 7I: Are there natural controls (species native to Minnesota) which have been documented to effectively prevent the spread of the species in question?

Answer: No.
Outcome: Go to Box 8.
No species native to Minnesota are documented to provide control.

There are biological control insects from Eurasia that have been introduced to the United States as biocontrol for knapweed species that may also affect brown knapweed. According to Winston et al. (2012), *Urophora quadrifasciata* (a fruit fly) is the only biological control insect established on brown knapweed. Monika Chandler

(Minnesota Department of Agriculture, personal communication 2025) has made the following observations in Minnesota. Biological control has successfully reduced large, stable spotted knapweed infestations when combinations of root and seedhead biocontrol agents were used. Root-boring weevils (*Cyphocleonus achates*) and root moths (*Agapeta zoegana*) are effective on spotted knapweed but are unlikely to utilize brown knapweed because mature plants don't have a taproot where weevils and moth larvae can develop. Therefore, biological control is less likely to be effective on brown knapweed. Seedhead weevils (*Larinus* spp.) were observed on brown knapweed.

Image caption: Biological control seedhead weevils (*Larinus* spp.) on a brown knapweed flower. Photo credit: Minnesota Department of Agriculture.

Question 7J: Was the answer to Question 7A (Are there cultivars that differ in reproductive properties from the original species) "Yes"?

Outcome: Decision tree does not direct to this question.

Box 8:

Does the species pose significant human or livestock concerns or have the potential to significantly harm agricultural production, native ecosystems, or managed landscapes?

Question 8A: Does the plant have toxic qualities, or other detrimental qualities, that pose a significant risk to livestock, wildlife, or people?

Answer: No.

Outcome: Go to Box 9 (yes) or Question 8B (no)

No information was found on toxicity issues. The Minnesota Department of Natural Resources (2025) recommends that people cover their skin by wearing gloves and long sleeves when working with knapweeds as they can be a skin irritant for some people. Brown knapweed is unpalatable as forage (see Question 8B).

Question 8B: Does, or could, the plant cause significant financial losses associated with decreased yields, reduced crop quality, or increased production costs?

Answer: Yes.

Outcome: Go to Box 9.

Similar to other knapweed species there are concerns that brown knapweed can reduce forage quality and yield in pastures and hayfields, leading to lower productivity (Minnesota Department of Agriculture 2025a, Wisconsin Department of Natural Resources 2025). Fields with brown knapweed may require costly control measures such as mowing, herbicides, or reseeding. The Washington State Noxious Weed Control Board (2025a) states: "Knapweed invasions have many impacts including an increase in production costs for ranchers, degrading wildlife habitat, crowding out desirable forage, decreasing plant diversity, increasing soil erosion rates, and posing wildfire hazards."

Image caption: Brown knapweed infested pasture greatly reduced forage for cattle. Only a few patches of green grass remain. Photo credit: Minnesota Department of Agriculture.

Question 8C: Can the plant aggressively displace native species through competition (including allelopathic effects)?

Answer: Yes. ***This information is supplemental and is not part of the flow chart pathway for this risk assessment.***

Millati (2024) studied plant-soil feedback involving brown knapweed, arbuscular mycorrhizal fungi (AMF), and nematodes. They found that brown knapweed was able to tolerate high densities of the nematodes when AMF was present. They found that soils conditioned by brown knapweed had soil bacteria that reduced plant growth, with or without the nematodes. When AMF was added, this reduced the bacteria's impact on plant growth. The complex relationships between AMF, bacteria, and nematodes with brown knapweed influenced plant biomass.

Portlas (2022) found that brown knapweed is preadapted to drought stress, so it may do well in cycles of drought.

The Wisconsin Department of Natural Resources (2025) notes that brown knapweed can invade "open grasslands, prairies, open forests, orchards, cultivated fields, field edges and travel corridors" and "aggressively outcompetes desired vegetation, reducing overall biodiversity and forage quality".

Question 8D: Can the plant hybridize with native species resulting in a modified gene pool and potentially negative impacts on native populations?

Answer: ***This information is supplemental and is not part of the flow chart pathway for this risk assessment.*** In Europe, both diploid and tetraploid variations of brown knapweed coexist (Hardy and Vekemans 2001). Brown knapweed tetraploids might cross with tetraploid black and meadow knapweeds. However, there have not been genetic studies on members of the *Centaurea jacea* complex in North America (Lachmuth et al. 2019). Genetic variation and its impact on invasive potential are unstudied.

Question 8E: Does the plant have the potential to change native ecosystems (adds a vegetative layer, affects ground or surface water levels, etc.)?

Answer: ***This information is supplemental and is not part of the flow chart pathway for this risk assessment.*** It can increase soil erosion (Wisconsin Department of Natural Resources 2025). The Washington State Noxious Weed Control Board (2025a) notes that brown knapweed can crowd out other plant species and increase soil erosion and increase wildlife risk.

Question 8F: Does the plant have the potential to introduce or harbor another pest or serve as an alternate host?

Outcome: Decision tree does not direct to this question.

Box 9:

Does the species have clearly defined benefits that outweigh associated negative impacts?

Question 9A: Is the plant currently being used or produced and/or sold in Minnesota or native to Minnesota?

Answer: No.

Outcome: Go to Box 10.

Brown knapweed is currently listed as a Prohibited Eradicate Noxious Weed and so is illegal to sell in Minnesota. Brown knapweed is not native to Minnesota.

Question 9B: 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?

Outcome: Decision tree does not direct to this question.

Question 9C: Is the plant native to Minnesota?

Outcome: Decision tree does not direct to this question.

Question 9D: Is a non-invasive, alternative plant material or cultivar commercially available that could serve the same purpose as the plant of concern?

Outcome: Decision tree does not direct to this question.

Question 9E: Does the plant benefit Minnesota to a greater extent than the negative impacts identified at Box #8?

Outcome: Decision tree does not direct to this question.

Box 10:

Should the species be regulated as Prohibited/Eradicate, Prohibited/Control, or Restricted Noxious Weed?

Question 10A: Is the plant currently established in Minnesota?

Answer: Yes.
Outcome: Go to Question 10D.
As a Prohibited Eradicate Noxious weed, brown knapweed has been a priority for identification trainings, mapping efforts, and management efforts. Brown knapweed looks similar to other knapweed species, so it is likely under-reported with people thinking it is the widely distributed spotted knapweed.

Brown knapweed has been reported in EDDMapS in seven counties. List of counties with parentheses indicating the number of reports in EDDMapS: Koochiching (2), St. Louis (10), Hubbard (49), Pine (1), Washington (1), Dakota (2), and Carver (2). Management efforts are reported in EDDMapS at several of the sites (EDDMapS 2025). The Minnesota Department of Agriculture has funded management efforts in Hubbard County, and they have been successful (personal communication Monika Chandler 2025).

Question 10B: Would prohibiting this species in trade prevent the likelihood of introduction and/or establishment?

Outcome: Decision tree does not direct to this question.

Question 10C: Does this risk assessment support this species being a top priority for statewide eradication if found in the state?

Outcome: Decision tree does not direct to this question.

Question 10D: Does the plant pose a serious human health threat?

Answer: No.
Outcome: Go to Question 10F.
No serious human health threats have been documented.

Question 10E: Is the health threat posed by the plant serious enough, and is the plant distribution sufficiently small enough to be manageable, and are management tools available and effective enough to justify listing as Prohibited / Eradicate species?

Outcome: Decision tree does not direct to this question.

Question 10F: Is the plant known to cause significant ecological or economic harm and can the plant be reliably <u>eradicated</u> (entire plant) on a statewide basis using existing practices and available resources considering the distribution, reproductive biology and potential for spread?

- *For distribution, note if the distribution is well documented, the number and acreage of known infestations and how widespread they are in the state. Note if there are infestations in border areas.*

- *For reproductive biology, note if there are reproductive biology factors that make the plant easier to control and eradication more likely (for example, long pre-reproductive period, self-incompatible pollination, short-lived seed bank).*
- *For potential for spread and re-invasion of controlled areas, note its potential to spread beyond places where it is being controlled such as deliberate planting by people, wildlife vectors, re-infestation from border states, or other factors that facilitate spread.*
- *For known management tools, note what management tools are available, potential non-target impacts, and the reasonableness of state management or mandating that landowners throughout the state use the management tools to eradicate or control existing plants.*
- *For available resources, consider the capacity of state and local personnel and availability of funding to respond to new and existing infestations.*

Answer: Yes.

Outcome: LIST THE PLANT AS A PROHIBITED / ERADICATE NOXIOUS WEED.

Brown knapweed is of significant concern in Minnesota due to the known impacts of plants in the knapweed family. Brown knapweed has limited distribution in Minnesota at this time and there have been active management efforts.

Significant harm: The Minnesota Department of Agriculture (2025a) states: "Brown knapweed outcompetes desirable species to form large monocultures. Forage quality, species diversity and wildlife habitat are reduced". Initial concerns about the potential for brown knapweed and spotted knapweed to hybridize are likely not an issue. Závada et al. (2021) studied hybridization between brown knapweed and spotted knapweed on Nantucket Island in Massachusetts. Thy analyzed chloroplast and nuclear markers and did not find evidence of hybridization between brown knapweed and spotted knapweed. Meadow knapweed (which is a hybrid of brown knapweed and black knapweed) and black knapweed backcrosses are a concern.

Distribution: Brown knapweed has been reported in EDDMapS (2025) in seven counties. List of counties with parentheses indicating the number of reports in EDDMapS: Koochiching (2), St. Louis (10), Hubbard (49), Pine (1), Washington (1), Dakota (2), and Carver (2). There are active management projects in many of the areas. An EDDMapS (2025) query of brown knapweed reports in Minnesota from 12/31/2009 to 5/23/2025 resulted in 66 locations that have exact coordinates that are shared publicly and listed a total of 79 infested acres in the state.

When the previous brown knapweed noxious weed risk assessment was completed in 2012, brown knapweed was known to be present in two locations in Koochiching County. The increased number of reports from 2012 to 2025 are likely due to both increased outreach and reporting as well as spread.

Reproductive biology: There are no features of brown knapweed reproductive biology that make it especially easy to control.

Potential for re-invasion: Reinvasion is more likely to occur if there are nearby populations of brown knapweed or if the site is likely to receive materials contaminated with brown knapweed seeds.

Known management tools: Quoted from the Minnesota Department of Transportation (2023) noxious weed guide:

- Mechanical - Hand pulling or digging can be an effective step when coupled with chemical treatments. Repeated mowing or cutting can reduce seed production.

- Chemical - Foliar herbicide treatments should target rosettes.
- Cultural - Grazing animals do not typically target knapweeds.
- Biological - *Urophora quadrifasciata*, a seedhead feeding fly, is the only bioagent that has established on brown knapweed. Biological controls are not an eradication tool, and are insufficient if used alone for a Prohibited-Eradicate species because the noxious weed law requires that the plant is killed.
- Fire - Prescribed fire can be used to encourage stands of native grasses that will compete with knapweeds.
- Effective herbicide formulations: aminopyralid, clopyralid, picloram.

Available resources: No specific additional resources known for this species.

Question 10G: Is the plant known to cause significant ecological or economic harm and can the plant be reliably controlled to limit spread on a statewide basis using existing practices and available resources? Would the economic impacts or other hardships incurred in implementing control measures be reasonable considering any ongoing or potential future increase of ecological or economic harm?

- *Also consider all bullet points listed under 10F when evaluating 10G*

Outcome: Decision tree does not direct to this question.

Question 10H: Would prohibiting this species in trade have any significant or measurable impact to limit or reduce the existing populations or future spread of the species in Minnesota?

Outcome: Decision tree does not direct to this question.

Question 10I: Are there any other measures that could be put in place as Special Regulations which could mitigate the impact of the species within Minnesota?

Outcome: Decision tree does not direct to this question.

Box 11:

The species is being proposed to be designated as a Specially Regulated Plant. What are the specific regulations proposed?

Answer: Decision tree does not direct to this question.

Final outcomes of risk assessment (2025)

NWAC Listing Subcommittee

Outcome: Remain a prohibited eradicate noxious weed
Comments: No comments

NWAC Full Committee

Outcome: Remain a prohibited eradicate noxious weed
Comments: The vote on 12/16/25 was 19 to 0 in favor of the recommendation.

MDA Commissioner

Outcome: Remain a prohibited eradicate noxious weed

Comments: No comments

Risk Assessment Current Summary (06-30-2025)

- Brown knapweed can form monocultures that reduce forage quality, species diversity and wildlife habitat.
- The closely related spotted knapweed is widespread in Minnesota and is listed as a Prohibited Control Noxious Weed. The closely related meadow knapweed is not widespread in Minnesota and is listed as a Prohibited Control Noxious Weed.
- Brown knapweed is not widely distributed in Minnesota at this time, but due to its similarity in appearance to the widespread spotted knapweed, brown knapweed may be more widely spread than documented.
- Brown knapweed is recommended to stay as a Prohibited Eradicate Noxious Weed due to its potential for impacts and the successes of active management in the state. Additionally, brown knapweed is easier to identify than meadow knapweed.

Final outcomes of risk assessment (2012)

NWAC Listing Subcommittee

Outcome: List as a Prohibited Noxious Weed – undecided on Prohibited Eradicate or Prohibited Control.
Comments:

NWAC Full Committee

Outcome: Remain a Prohibited Eradicate Noxious Weed.
Comments:

MDA Commissioner

Outcome: List as a Prohibited Eradicate Noxious Weed.
Comments: Became effective on January 14, 2013.

References

Albrecht M., P. Duelli, M.K. Obrist, D. Kleijn, B. Schmid. 2009. Effective long-distance pollen dispersal in *Centaurea jacea*. PLoS ONE 4(8): e6751. https://doi.org/10.1371/journal.pone.0006751.

Chandler, Monika. 2025. Noxious and invasive plant program coordinator. Minnesota Department of Agriculture. Personal communication with Laura Van Riper on 10 June 2025.

EDDMapS. 2025. Brown knapweed (*Centaurea jacea* L.). https://www.eddmaps.org/distribution/usstate.cfm?sub=5278. Accessed 23 May 2025.

Hardy, O.J. and X. Vekemans. 2001. Patterns of allozyme variation in diploid and tetraploids *Centaurea jacea* at different spatial scales. *Evolution* 55(5): 943-954.

Lachmuth, S., J. Molofsky, L. Milbrath, J. Suda, and S. Keller. 2019. Association between genomic ancestry, genome size and capitula morphology in the invasive meadow knapweed hybrid complex (*Centaurea* x *moncktonii*) in eastern North America. *AoB PLANTS* 11: plz055; doi: 10.1093/aobpla/plz055.

Millati, G.Z. 2024. How do different arbuscular mycorrhizal fungi (AMF) communities affect interactions between plants and root-feeding nematodes? Master's Thesis. Netherlands Institute of Ecology and Wageningen University and Research.

Minnesota Department of Agriculture. 2025a. Brown knapweed. https://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/brownknapweed. Accessed 23 May 2025.

Minnesota Department of Agriculture. 2025b. Meadow knapweed. https://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist/meadowkw. Accessed 23 May 2025.

Minnesota Department of Natural Resources. 2025. Brown, diffuse, and meadow knapweeds. https://www.dnr.state.mn.us/invasives/terrestrialplants/brown-diffuse-and-meadow-knapweeds.html. Accessed 22 May 2025.

Minnesota Department of Transportation. 2023. Minnesota noxious weeds. https://files.dnr.state.mn.us/eco/invasives/noxious-weeds.pdf. Accessed 23 May 2025.

Minnesota Noxious Weed Advisory Committee. 2022. Minnesota Noxious Weed Risk Assessment: Meadow knapweed. https://static1.squarespace.com/static/57539006044262fce01261c5/t/63ceb167580c6c53668467be/1674490216508/Meadow+knapweed+2022.pdf. Accessed 22 May 2025.

National Plant Board. 2025. Laws and regulations. https://www.nationalplantboard.org/state-law--regulation-summaries.html. Accessed 20 February 2025.

Portlas, Z. 2022. Drought tolerance in native and invasive populations of the *Centaurea jacea* hybrid complex. Master's Thesis. University of Vermont.

Roché, C.T. and B.F. Roché, Jr. 1991. Meadow knapweed invasion in the Pacific Northwest, U.S.A., and British Columbia, Canada. Northwest Science. 65(1): 53-61.

Roché, C.T. and A. Susanna. 2010. New habitats, new menaces: *Centaurea* x *kleinii* (*C. moncktonii* x *C. solstitialis*), a new hybrid species between two alien weeds. Collectanea Botanica (Barcelona) 29: 17-23.

Washington State Noxious Weed Control Board. 2025a. Brown knapweed (*Centaurea jacea*). https://www.nwcb.wa.gov/weeds/brown-knapweed. Accessed 22 May 2025.

Washington State Noxious Weed Control Board. 2025b. Noxious weed index: Class B. https://www.nwcb.wa.gov/class-b-noxious-weeds. Accessed 22 May 2025.

Winston, R., M. Schwarzlander, C.B. Randall, and R. Reardon. 2012. Biology and biological control of knapweeds. USDA-Forest Service FHTET-2011-05.

Wisconsin Department of Natural Resources. 2025. Brown knapweed (*Centaurea jacea*). https://dnr.wisconsin.gov/topic/Invasives/fact/BrownKnapweed. Accessed 22 May 2025.

Závada, T., K.A. Omand, R.J. Malik, D. Tsirelson, and R.V. Kesseli. 2021. Testing for hybridization between *Centaurea stoebe* and *Centaurea jacea* (Asteraceae) in the isolated island setting of Nantucket, Massachusetts, USA. Rhodora 123(993): 1-10.