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March 15, 2021

*Via Electronic Mail*

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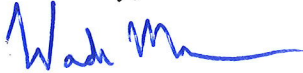
In re: Denbury Green Pipeline-North Dakota, LLC  
Denbury Green Pipeline-Montana, LLC  
Cedar Hills South Unit Lateral Pipeline Project  
Case No. PU-19-294  
Bowman & Slope Counties

Dear Mr. Kahl:

Please find enclosed for filing the Noxious Weed Management Plan in the captioned case.

If you have any questions, please feel free to contact me. Thank you.

Sincerely,



Wade C. Mann

WCM/lh  
Enc.

cc: Rusty Shaw (via email)  
Forrest Hudson (via email)

68 PU-19-294 Filed 03/15/2021 Pages: 27  
Noxious Weed Management Plan  
Denbury Green Pipeline - North Dakota, LLC  
Wade Mann, Crowley Fleck, PLLP



# Noxious Weed Management Plan Cedar Hills South Unit CO<sub>2</sub> Pipeline Project – North Dakota Segment

SEPTEMBER 2020

PREPARED FOR

**Denbury Green Pipeline – North Dakota, LLC**

PREPARED BY

**SWCA Environmental Consultants**



**NOXIOUS WEED MANAGEMENT PLAN  
CEDAR HILLS SOUTH UNIT CO<sub>2</sub> PIPELINE PROJECT –  
NORTH DAKOTA SEGMENT**

Prepared for

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September 2020



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# 1 INTRODUCTION

Noxious weeds can move into disturbed areas and dominate or disrupt natural communities or restoration projects. Noxious weeds compete with native species for soil, water, and other limiting resources and are often able to out-compete native vegetation to form monocultures, which degrade the value of agricultural and natural resources, including wildlife habitat. Noxious weed control is mandated by North Dakota Century Code (NDCC) Chapter 4.1-47 Noxious Weed Control (State of North Dakota 2020), which promulgates state, county, and city noxious weed control authorities, duties, and responsibilities. The North Dakota Department of Agriculture administers state- and county-level noxious weed control programs, including developing state- and county-listed noxious weed lists and conducting annual noxious weed surveys. The Slope County and Bowman County Weed Control Boards and Weed Control Officers are charged with implementing and enforcing county noxious weed control requirements.

This Noxious Weed Management Plan (Plan) for the Cedar Hills South Unit (CHSU) CO<sub>2</sub> Pipeline Project – North Dakota Segment (Project) provides an overview of the noxious weed management goals and standards that will be used to ensure successful treatment of noxious weeds in disturbed areas created by the Project. These standards are designed to establish the potential methodologies, monitoring, and reporting requirements for noxious weed treatment associated with this Project.

## 1.1 Plan Purpose

The purpose of this Plan is to prescribe methods to prevent and control the spread of noxious weeds during and following construction of the proposed Project. Denbury Green Pipeline – North Dakota, LLC (Denbury) and their contractors will be responsible for adhering to the methods described in this Plan, which is applicable to the construction and operation of the proposed Project.

## 1.2 Goals and Objectives

The objectives of noxious weed control for the Project include the following.

- Acquire information on the occurrence, distribution, and abundance of noxious weeds in the Project area prior to construction.
- Prevent the establishment of new populations of noxious weeds in previously un-infested areas within the Project area and limit the spread of existing infestations to the extent feasible.
- Minimize possible negative effects to rare flora or fauna within the Project area by control activities.
- Coordinate and consult with designated state and county weed personnel regarding noxious weed control activities conducted by Denbury to ensure compatibility with existing weed control protocols.
- Respond to landowner and/or land-regulating agency reports of weeds during the post-construction period.

## 1.3 North Dakota Weed Control Law

The North Dakota Weed Control Law is authorized by NDCC Chapter 4.1-47 and is administered by the North Dakota Department of Agriculture. Noxious weed control on state-owned or private land is guided by the various sections of NDCC 4.1-47, some of which are summarized below.

1. 4.1-47-01.6 defines noxious weed as a plant propagated by either seed or vegetative parts and determined to be injurious to public health, crops, livestock, land, or other property by:
  - a. the commissioner in accordance with Section 4.1-47-05;
  - b. a county weed board in accordance with Section 4.1-47-10; or
  - c. a city weed board in accordance with Section 4.1-47-21.
2. 4.1-47-02. Control of Noxious Weeds, mandates that:
  - a. each person shall do all things necessary and proper to control the spread of noxious weeds; and
  - b. no person may distribute, sell, or offer for sale within this state a noxious weed.
3. 4.1-47-03. Noxious Weed Control – Agriculture Commissioner Powers.

The commissioner may enter upon any land in the state to perform duties and to exercise powers under this chapter, including taking specimens of weeds or other materials, without the consent of the landowner or other person responsible for the land and without being subject to any action for trespass or damages, provided reasonable care is exercised.
4. 4.1-47-04. Noxious Weed Control – Agriculture Commissioner Duties.

The commissioner shall:

  - a. maintain a state noxious weed list;
  - b. direct the removal of a noxious weed from a county or city noxious weed list if the commissioner, after consultation with the respective weed board and the North Dakota state university extension service, determines there is insufficient justification for the continued inclusion of that particular noxious weed;
  - c. except as otherwise provided, forward all signed complaints to the proper weed control authority; and
  - d. call an annual meeting of all weed control officers to review noxious weed control efforts in this state.
5. 4.1-47-05. State Noxious Weed List – Compilation, provides that:
  - a. before the commissioner may add a weed to or remove a weed from the state noxious weed list, the commissioner shall consult with the North Dakota state university extension service; and
  - b. before January 1, 2010, and at least every 5 years thereafter, the commissioner shall review the state noxious weed list. The commissioner shall provide each county and city weed board with at least 14 days' notice of the time and place at which the list will be reviewed and, no later than 14 days after conclusion of the review, shall provide each county and city weed board with written notice of any changes to the state noxious weed list.
6. 4.1-47-10. County Weed Board – Development of County Weed List, provides, in part, that:
  - a. a county weed board may designate as noxious certain weeds that are not on the state noxious weed list, provided the county weed board consults with the North Dakota state university extension service and that the designation is approved by the commissioner.

7. 4.1-47-14. County Noxious Weed Control Program – Payment of Expenses, authorizes the board of county commissioners to pay the expenses of a county noxious weed control program authorized under NDCC 4.1-47 from the county general fund, the noxious weed control fund, or both.
8. 4.1-47-15. State appropriations for noxious weed control provides, in part, that the commissioner consult with the county and city weed boards and develop a method for the distribution to county and city weed boards of all moneys appropriated by the state for noxious weed control, other than the landowner assistance grants provided for in Section 4.1-47-16.
9. NDCC 4.1-47-16. State appropriations for noxious weed control is a landowner assistance program for the control of noxious weeds.

The county weed boards (CWBs) through the county weed officers (CWOs) are responsible for implementing and enforcing the regulations set forth in the North Dakota Weed Control Law (NDCC 41-47).

The noxious weed species designated by the State of North Dakota, and by Bowman and Slope Counties are listed in Table 1.

**Table 1. State of North Dakota, and Bowman and Slope Counties Weed List**

Common Name	Scientific Name
<b>State Noxious Weed List</b>	
Absinth wormwood	<i>Artemisia absinthium L.</i>
Canada thistle	<i>Cirsium arvense (L.) Scop.</i>
Dalmatian toadflax	<i>Linaria genistifolia spp. dalmatica</i>
Diffuse knapweed	<i>Centaurea diffusa Lam.</i>
Houndstongue	<i>Cynoglossum officinale L.</i>
Leafy spurge	<i>Euphorbia esula L.</i>
Musk thistle	<i>Carduus nutans L.</i>
Palmer amaranth	<i>Amaranthus palmeri</i>
Purple loosestrife	<i>Lythrum salicaria L., Lythrum virgatum L., and all cultivars</i>
Russian knapweed	<i>Centaurea repens L.</i>
Saltcedar	<i>Tamarisk spp.</i>
Spotted knapweed	<i>Centaurea maculosa Lam.</i>
Yellow toadflax	<i>Linaria vulgaris</i>
<b>Bowman County Noxious Weed List</b>	
Baby's breath	<i>Gypsophila paniculata</i>
Black henbane	<i>Hyoscyamus niger L.</i>
Scotch thistle	<i>Onopordum acanthium</i>
<b>Slope County Noxious Weed List</b>	
Black henbane	<i>Hyoscyamus niger L.</i>

Source: North Dakota Department of Agriculture (2020)

## 2 NOXIOUS WEED INVENTORY

Noxious weeds that may potentially occur in the Project area, as identified by the local CWBs, are presented in Table 1. During June 2020, biologists from SWCA Environmental Consultants conducted

field surveys for noxious weed occurrences within the proposed Project area, including permanent and temporary workspaces. The absence of recorded weeds does not infer that areas have no potential for noxious weed occurrences, but that weeds were not observed during the 2020 field surveys.

All noxious weed occurrences identified during the 2020 surveys were documented via digital field data forms using geo-referencing tablets. Noxious weed occurrences larger than 0.1 acre were recorded as polygon features, and small occurrences under 0.1 acre in size were recorded as individual point features. During the field surveys, occurrences of Canada thistle (*Cirsium arvense*) and musk thistle (*Carduus nutans*) were identified.

## 2.1 Canada Thistle

One occurrence of Canada thistle was identified during the 2020 field surveys (Appendix A). This occurrence was found in association with a topographic depression, and was an isolated patch covering less than 0.1 acre. The occurrence was mapped east of Little Beaver Creek between mileposts 15.7 and 15.8.

## 2.2 Musk Thistle

One occurrence of musk thistle was identified in uplands east of Little Beaver Creek between mileposts 13.4 and 13.5 during the 2020 field surveys (see Appendix A). This isolated occurrence, covering less than 0.1 acre, was found in association with a disturbed area.

## 3 NOXIOUS WEED MANAGEMENT

Noxious weeds are spread by a variety of vectors, including vehicles, construction equipment, livestock, and wildlife. Noxious weed management must consider the best available scientific information, updated target population monitoring information, and the effectiveness of a control measure when selecting and implementing a range of complementary and environmentally sound technologies and methods to achieve the desired objectives (National Invasive Species Council 2005). Implementing preventative measures to control the spread of noxious weeds is the most cost-effective management approach. Noxious weed controls will be implemented in each phase of Project development within the construction footprint. Potential control options for Canada thistle and musk thistle are presented in Appendix B.

### 3.1 Preventative Measures

Prevention is the most cost-effective approach to noxious weed management. Denbury will assist noxious and invasive weed control efforts, comply with preventative requirements, and implement weed control measures on areas of the Project identified to be of special concern, as outlined below.

1. Denbury will complete noxious weed surveys along the construction right-of-way (ROW) prior to construction to identify the location and extent of any noxious weeds or noxious weed infestations.
2. Denbury will implement pre-construction treatments (i.e., pesticide application) to areas of noxious weed infestation before other construction activities, such as clearing, grading, and trenching or other soil-disturbing activities, are conducted (per specific landowner agreements and access permission).

3. To control the spread of aquatic invasive species (e.g., mussels), all construction equipment that contacts surface water will be thoroughly cleaned with a high-pressure washer using potable water immediately following contact with waterbodies. Per North Dakota Game and Fish Department requirements, all mud, water, and vegetation must be removed before leaving the area of the waterbody crossing. All water will then be allowed to drain from the construction equipment. Aquatic invaders can survive only in water and wet areas; therefore, all equipment will be allowed to dry completely before it moves to the next wet area.
4. Denbury will implement the following steps to ensure that all construction equipment, including timber mats, is free of soil and debris capable of transporting noxious weed seeds or parts prior to moving the equipment to the job site and immediately after topsoil stripping an area that contains noxious weeds or noxious weed infestations.
  - a. An Environmental Inspector will inspect and verify that vehicles and equipment are clean prior to being allowed access to the Project area or after topsoil removal from an area known to contain noxious weeds.
  - b. Equipment that requires cleaning will be cleaned using shovels and/or high-pressure washing devices using potable water in designated areas.
  - c. Equipment cleaning stations will be used in the Project area on a limited basis as directed by the private landowner.
5. Denbury will use certified, noxious weed-free mulch and straw bales for temporary erosion and sediment control.
6. If imported gravel and fill material are required during Project construction, the Environmental Inspector will inspect the area from which the gravel or fill was obtained to ensure it does not contain noxious weeds.
7. After pipeline construction and on any construction ROW over which Denbury has jurisdiction regarding the surface use of such land, Denbury will implement noxious weed control to limit the potential for the spread of weeds onto adjacent land.
8. Only a state-licensed pesticide applicator will perform noxious weed control spraying.
9. Denbury will reimburse respective entities and agencies for all reasonable costs incurred to control noxious weeds on adjacent land which can be reasonably determined to have spread from the Project area.

## 3.2 Treatment Methods

Noxious weed treatment will be in accordance with federal, state, and county regulations. Treatment methods will be based on species-specific and site-specific conditions (e.g., plant phenology, proximity to water or riparian areas, agricultural activities, time of year) and will be coordinated with the CWOs.

Pre- and post-construction noxious weed control measures will include one or more of the following methods.

- Mechanical methods, including hand-pulling, mowing, or discing (tilling) weeds.
- Use of federally approved pesticides by a state-licensed pesticide/pesticide applicator, either by spot application for isolated noxious weed occurrences or broader application for larger noxious weed occurrences or infestations.

In the event that an area is not seeded until the spring following construction due to weather or scheduling constraints, all established annual weed species and undesirable vegetation will be mechanically removed (e.g., discing, harrowing) as part of seedbed preparation. Methods used to reduce the spread and establishment of noxious weeds will be determined in coordination with the Bowman and Slope County CWBs and affected landowners. Chemical treatments may be used, depending on species-specific and site-specific conditions (e.g., proximity to water or wetlands and time of year), and will be coordinated with the CWBs and affected landowners.

### **3.3 Education**

Information regarding noxious weed identification, management, and impacts on livestock, wildlife, and special-status species will be provided to all Project personnel. Additionally, workers will be informed on the critical importance of preventing the spread of noxious weeds in areas not infested and controlling the proliferation of weeds already present. The importance of adhering to measures to prevent the spread of noxious weeds (e.g., use of permitted travel lanes and proposed access roads; preventive measures that control the collection of soil and plant seeds on vehicles prior to entering the proposed constructions areas; and quickly identifying new infestations of noxious weeds) will be emphasized.

## **4 PESTICIDE APPLICATION, HANDLING, SPILLS, AND CLEANUP**

Pesticides will be used during the pre-construction phase and as the primary control method during the post-construction phase. Only federally approved pesticides will be used for the Project and all persons applying pesticides will have appropriate and current North Dakota certification, as required by NDCC 4.1-33-07.

### **4.1 Pesticide Application and Handling**

A certified pesticide applicator will handle, store, and complete pesticide application, in accordance with all applicable laws and regulations. All application records will be completed within 24 hours of the pesticides being applied to the noxious weeds and include the following information.

- Project name
- Applicator name and certification number
- Date of application
- Time frame of application
- Location of application (Township, Range, and Section)
- Type of equipment used
- Pesticide used (common and trade names)
- Rate of application (active ingredient per acre and volume of formulation per acre)
- Actual area treated
- Total Project area
- Primary pest involved
- Stage of pest development
- Wind velocity

- Wind direction
- Temperature

U.S. Environmental Protection Agency pesticide label instructions will be strictly followed. Pesticide application will be suspended when any of the following conditions exist.

- Wind velocity exceeds 6 miles per hour for the application of liquids or 15 miles per hour for application of granular pesticides.
- Snow or ice covers the foliage of noxious weeds.
- Precipitation is occurring or is imminent.

Vehicle-mounted sprayers (e.g., handgun, boom, and injector) will be used primarily in open areas that are readily accessible by vehicle. Hand application methods (e.g., backpack spraying) that target individual plants will be used to treat small, scattered weed populations in rough terrain. Calibration checks of equipment will be conducted at the beginning of spraying and at least monthly throughout the spray season to ensure that proper application rates are being achieved.

Pesticide management in the Project area will entail the following provisions.

- Pesticide concentrate will be transported daily to the Project area in approved containers, in a manner that will prevent tipping or spilling, and in a compartment that is isolated from food, clothing, and safety equipment.
- Pesticide mixing will only be conducted by certified pesticide applicators at one specific location designated by the construction superintendent, wearing proper personal protective equipment, and at a minimum distance of 500 feet from open or flowing water, wetlands, or other sensitive resources.
- All pesticide equipment and containers will be inspected daily for leaks.

## 4.2 Pesticide Spills and Cleanup

All reasonable precautions will be taken to avoid spilling pesticides. In the event of a pesticide spill, cleanup requires immediate action. A spill kit is required for contractor vehicles used for pesticide application and in the pesticide mixing area. The spill kit will contain the following items.

- Protective clothing and gloves
- Adsorptive clay or other commercial adsorbent
- Shovel
- Fiber brush with screw-in handle
- Dustpan
- Caution tape
- Highway flares (for use on established roads only)
- Detergent and bucket
- Plastic garbage bags

Response to a pesticide spill will vary with the size and location of the spill, but the following is the general procedure to be implemented in the event of a spill.

- Initiate traffic control.
- Dress the cleanup team with protective clothing.
- Stop the leaks.
- Contain the spilled material.
- Clean up and remove the spilled pesticide and contaminated adsorptive material and soil.
- Transport the spilled pesticide and contaminated material to an authorized disposal site.

### **4.3 Worker Safety and Spill Reporting**

All pesticide contractors will obtain and have readily available copies of the appropriate Safety Data Sheets (SDS) for the pesticides being used. Pesticide spills will be reported in accordance with all applicable laws and requirements and pesticide applicators will adhere to the protocols set forth in Denbury's Spill Prevention Control and Countermeasure Plan.

## **5 POST-CONSTRUCTION MONITORING AND REPORTING**

The distribution and density of noxious weeds will be monitored following Project construction. Surveys will be conducted as early in the year as feasible to identify and control noxious weeds before they produce seed. Weed monitoring will be conducted in conjunction with overall revegetation monitoring after the first growing season following revegetation.

Success standards outlined in the Stormwater Permit will be used to assess whether revegetation requirements for the Project are being met. Part of successful revegetation includes maintaining native plant communities and controlling noxious weed occurrences. Success standards and management goals are designed to be site-specific to each surface-disturbing activity and the surrounding vegetation. Monitoring and treatment both prior to construction and during the operational phase will ensure that these goals are achieved.

### **5.1 Reporting**

An annual report will be prepared that details weed control activities during the pre-construction and post-construction periods. The report will describe baseline conditions (occurrence, distribution, and abundance) of noxious weed species located in the Project area, weed control activities accomplished to date, and anticipated activities for the following year, for a 5-year post-construction period.

Annual monitoring reports will include the following.

1. Narrative summary of the status of noxious weed occurrence, distribution, and abundance.
2. Summary of activities conducted in the Project area during the previous year.
3. Projected activities for the following year.
4. Survey dates, pesticide treatments, amount and types of active ingredient applied, and a list of participants and their activities (see Section 4.1, above, for a complete list).
5. GIS shapefiles of all noxious weed populations with attribute data including species and population density.

## 6 LITERATURE CITED

National Invasive Species Council. 2005. *Guidelines for Ranking Invasive Species Control Projects*. Version 1. U.S. Department of the Interior, National Invasive Species Council.

North Dakota Department of Agriculture. 2020. North Dakota Noxious Weed List. Available at: <https://www.nd.gov/ndda/plant-industries/noxious-weeds>. Accessed July 31, 2020.

State of North Dakota. 2020. North Dakota Century Code. Available at: <https://www.legis.nd.gov/general-information/north-dakota-century-code>. Accessed July 31, 2020.

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## **APPENDIX A**

### **Noxious Weed Occurrences\***

**\*The absence of recorded weeds does not infer that areas have no potential for noxious weed occurrences, but that weeds were not detected during field surveys.**



### Noxious Weed Occurrence Table

Common Name	Species	U.S. Department of Agriculture / Plants Code	Occurrence Size (acres)	Latitude	Longitude
Canada thistle	<i>Cirsium arvense</i>	CIAR4	<0.1	46.2395	-103.9493
Musk thistle	<i>Carduus nutans</i>	CANU4	<0.1	46.2687	-103.9562

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## **APPENDIX B**

### **Potential Control Options for Noxious Weed Species\***

**\*Potential control options for noxious weed species observed during field surveys. The following information is provided as a resource only and is not intended to limit control methods.**



# Canada thistle



## Key ID Points

1. Purple flowers form in clusters of 1-5 per branch
2. Floral bracts are spineless
3. Small heads, vanilla scent

## Canada thistle Identification and Management



Canada thistle during the flowering stage. This stage typically occurs in the early summer. Seed production will follow and effective management options will then become limited.

### Identification and Impacts

Canada thistle (*Cirsium arvense*) is a non-native deep-rooted perennial that spreads by seeds and aggressive, creeping, horizontal roots (rhizomes). Canada thistle can grow 2 to 4 feet in height. The leaves are oblong, spiny, bright green in color, and are only slightly hairy on the undersurface. Flowers occur in small clusters that form on the ends of branches. They are about 1 cm in diameter, tubular shaped, and vary from white to purple in color with a strong vanilla scent (female flowers).

Canada thistle emerges from its root system from late April through May. It begins to flower in late spring to early summer with increase in day length. Canada thistle only produces about 1,000 to 1,500 seeds per plant. Typically, it reproduces vegetatively through a creeping root system, and can quickly form dense stands. Every piece of root, from ½ to 1 inch in length, is capable of forming new plants. The key

to controlling Canada thistle is to eliminate seed production and also to reduce the plant's nutrient reserves in its root system through persistent, long-term management.

Canada thistle is designated as a "B" list species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit [www.ag.state.co.us](http://www.ag.state.co.us).

Canada thistle is one of the most feared noxious weeds in the U.S. as it can infest many land types, from roadsides, ditch banks, riparian zones, pastures, irrigated cropland, to the most productive dryland cropland. Forage production is severely reduced because cattle will not graze near infestations.

Combining control methods for Canada thistle is imperative. The weed needs to be continually stressed, forcing it to exhaust root nutrient stores and eventually die. Of all control methods, prevention is most important. Maintain healthy pastures and rangeland and continually monitor your property for new infestations.

On the backside of this sheet are Canada thistle management recommendations. If you have any questions or would like more information, please contact the Adams County Weed Department at 303-637-8115. Please visit our website [www.adamscountyextension.org](http://www.adamscountyextension.org).



Canada thistle infestation.

*Cirsium arvense*

**CULTURAL**

Establishment of selected grasses can be an effective cultural control of Canada thistle. Contact your local Natural Resources Conservation Service for seed mix recommendations. Maintain healthy pastures and prevent bare spots caused by overgrazing. Bareground is prime habitat for weed invasions.

**BIOLOGICAL**

Cattle, goats, and sheep will graze on Canada thistle when the plants are young and succulent in the spring. Follow up grazing with a fall herbicide application. Insects are available but have not been effective. Insects can be obtained at no charge from the Colorado Department of Agriculture. Please call 970-464-7916 or visit [www.ag.state.co.us](http://www.ag.state.co.us) for more information.

**MECHANICAL**

Due to the extensive root system, hand-pulling this plant is not a viable option. Mowing can be effective if done every 10 to 21 days throughout the growing season. Combining mowing with herbicides will further enhance control of Canada thistle.

Shallow tillage (disk, sweep) has shown to be counter-productive, creating a denser, more uniform stand of Canada thistle.

*Integrated Weed Management:*

*Combining control methods for Canada thistle is imperative. This weed needs to be continually stressed, forcing it to exhaust root nutrient stores and eventually die.*

*Of all control methods, prevention is most important. Maintain healthy pastures and rangeland and continually monitor your property for new infestations.*

## Canada thistle

**HERBICIDES**

The following are recommendations for herbicides that can be applied to range and pasturelands. Always read, understand, and follow the label directions. The herbicide label is the LAW!

*Rates are approximate and based on equipment with an output of 30 gallons per acre. Please read label for exact rates.*

HERBICIDE	RATE	APPLICATION TIMING
Milestone	5-7 ounces/acre or 1 teaspoon/gal water	Spring at pre-bud growth stage and/or in the fall to plant regrowth Add non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.
Telar DF	1-3 ounces/acre or 0.50 grams/1gal water	Apply in the spring during bud to bloom stage and/or to fall regrowth. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.
Redeem R&P	3 pints/acre or 1.25 oz/gal water	Apply from rosette to bud stage when all plants have emerged. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.
Tordon 22K <i>*This is a Restricted Use Pesticide*</i>	1 qt/acre or 1.0 oz/gal water	Spring - early bud stage and/or fall regrowth. DO NOT apply near or under trees or where soils have rapid permeability or where water level is high. Add a non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.

# Musk thistle



## Key ID Points

1. Broad, spine-tipped bracts located under the flower
2. Flowering heads are terminal, solitary, and usually nodding
3. Grows up to 6 feet tall

## Musk thistle Identification and Management



Musk thistle during the flowering stage. This stage typically occurs in the early summer. Seed production will follow and effective management options will then become limited.

### Identification and Impacts

Musk thistle (*Carduus nutans*) is a non-native biennial forb that reproduces solely by seed. A biennial is a plant that completes its lifecycle within two years. During the first year of growth, musk thistle appears as a rosette in spring or fall. During the second year in mid to late spring – the stem bolts, flowers, sets seed, and the plant dies. A prolific seed producer, musk thistle can produce up to 20,000 seeds per plant. Therefore, the key to managing this plant is to prevent seed production.

Musk thistle can grow up to 6 feet tall. The leaves are spiny, waxy, and dark green in color with a light green midrib. The flowers are purple, large in size (1.5 to 3 inches in diameter), nodding, and terminal. The flowers are surrounded by numerous, lance-shaped, spine-tipped bracts. You can expect to see flowers from late May and June. Seed set usually occurs in June or July.

Musk thistle is designated as a “B” list species on the Colorado

Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit [www.ag.state.co.us](http://www.ag.state.co.us).

Musk thistle tends to invade disturbed, overgrazed areas. Once a pasture is infested, the livestock carrying capacity for that area is significantly decreased.

Musk thistle may also occur on rangeland, roadsides, ditches, riparian areas, and trails.

On the backside of this sheet are musk thistle management recommendations. If you have any questions or would like more information, please contact the Adams County Weed Department at 303-637-8115. Please visit our website [www.adamscountyextension.org](http://www.adamscountyextension.org).



*Carduus nutans*

**CULTURAL**

Establishment of selected grasses can be an effective cultural control of Musk thistle. Contact your local Natural Resources Conservation Service for seed mix recommendations. Maintain healthy pastures and prevent bare spots caused by overgrazing. Bareground is prime habitat for weed invasions.

**BIOLOGICAL**

Livestock tend to avoid grazing on musk thistle, although horses and cattle have been known to eat the flowerheads. Biological control insects, such as the seed head weevil and the crown weevil are effective on large infestations. When used together, these insects provide fair to good control. Insects can be obtained at no charge from the Colorado Department of Agriculture. Please call 970-464-7916 or visit [www.ag.state.co.us](http://www.ag.state.co.us)

**MECHANICAL**

Mowing or chopping is most effective when musk thistle plants are at full-bloom. Be sure to properly dispose of the flowering cut plants, since seeds can mature and become viable after the plant has been cut down. Grubbing or digging the plants below the root crown level is effective as well. Do this while the plant is in the rosette stage.

*Integrated Weed Management:*

*The key to managing musk thistle is to prevent seed production. Dense musk thistle stands can be treated by spot use of herbicides and by a persistent mechanical program.*

*Due to the long seed viability of musk thistle, up to 10 years, control methods may have to be repeated for many years to completely eliminate an infestation.*

# Musk thistle

**HERBICIDES**

The following are recommendations for herbicides that can be applied to range and pasturelands. Always read, understand, and follow the label directions. The herbicide label is the LAW!

*Rates are approximate and based on equipment with an output of 30 gallons per acre. Please read label for exact rates.*

HERBICIDE	RATE	APPLICATION TIMING
Milestone	3-5 ounces/acre or 1 teaspoon/gal water	Spring at rosette to early bolt stage and/or in the fall to rosettes. Add non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.
Escort XP	0.5-1 ounce/acre or 0.25-0.50oz/2gal water	Apply in the spring during rosette to bloom stage or in the fall to rosettes. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.
Redeem R&P	1.5-2 pints/acre or 0.75 oz/gal water	Apply from rosette to early bolt stage of growth and/or in the fall to rosettes. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.
2,4-D Amine	1 qt/acre or 1.0 oz/gal water	Spring/fall rosette - before flowering stalk lengthens. DO NOT apply when outside temperatures will exceed 85 degrees F. Add a non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.