Town of Vail
Weed Management Plan

(June 2017)

[R.8]

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****all files for the TOV Noxious Weed Plan are located under****
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1] Weed Management Plan Overview:

The Town of Vail in accordance with "Colorado Noxious Weed Act", Title 35, Article 5.5-107, and through Eagle County Resolution No. 2000-45, will through it's own Title 5, Public Health & Safety, Chapter 1 Public Nuisances, 5-1-6: Noxious Weeds (1997 Code: Ord. 19 (1993)§ 1) will designate the following plants as Noxious Weeds.

Common Name	Scientific Name	CDA Listing
*Myrtle Spurge	**Euphorbia myrsinites*	**A**
*Leafy Spurge	**Euphorbia esula*	**B**
Canada Thistle	*Cirsium arvense*	**B**
Musk Thistle	*Carduus nutans*	**B**
Plumeless Thistle	*Carduus acanthoides*	**B**
Scotch Thistle	*Onopordum acanthium*	**B**
Houndstongue	*Cynoglossum officinale*	**B**
Yellow Toadflax	*Linaria vulgaris*	**B**
Dalmatian Toadflax	*Linaria dalmatica & genistifolia*	**B**
Common Tansy	*Tanacetum vulgare*	**B**
Oxeye Daisy	*Chrysanthemum leucanthemum*	**B**
Scentless Chamomile	*Matricaria perforata*	**B**
*Russian Knapweed	**Acroptilon repens*	**B**
*Diffuse Knapweed	**Centaurea diffusa*	**B**
*Spotted Knapweed	**Centaurea stoebe*	**B**
*Hoary Cress/ Whitetop	**Cardaria draba*	**B**
Absinth Wormwood	*Artemisia absinthium*	**B**
Dame's Rocket	*Hesperis matronalis*	**B**
Sulfur Cinquefoil	*Potentilla recta*	**B**
Common Mullein	*Verbascum thapsus*	**C**
Poison Hemlock	*Conium maculatum*	**C**

Table 1. Town of Vail designated noxious weeds. Flagged species (*) indicate priority species for the Town of Vail - these species exist in small populations, and potentially pose a significant threat to lands within the town boundary. The town should take extra precautions to prevent their further spread.

See Appendix A for Colorado Department of Agriculture descriptions and management recommendation of each of these species.

The Colorado Department of Agriculture assigns noxious weeds as List A, B, or C.

"A" – List plants are listed for eradication in the State of Colorado
"B" – List plants have a state – adopted management plan
"C" – List plants are listed for local management with some state support

The purpose of this plan is to define the Town of Vail's noxious weed list and management goals as set forth in "Colorado Weed Management Act", Title 35, Article 5.5-107, and Eagle County Resolution No. 2000-45. The Town of Vail will-annually review and update this plan as needed and in accordance with Colorado Revised Statutes Title 35, Article 5.5-107, and Eagle County Resolution No. 2000-45.

2] Introduction:

Noxious weeds are a threat to the economic and environmental value of land in Eagle County. These plants are not indigenous to this county and have no natural predators or diseases to regulate their populations. They are rapidly displacing desirable native vegetation causing a loss of productive wildlife grazing and recreational resources.

Our mission as stewards of our environment shall be to place our focus and purpose toward public and private partnerships, which we can use to build and implement an integrated Weed Management Plan. As such, it must be safe, cost effective and cause the least harm to people and the environment.

This plan sets noxious weed management goals for the Town of Vail and also lays out the town's weed management methodology to achieve said goals. Furthermore, this plan recommends the use of integrated weed management practices and partnerships with federal, state, county, and Town of Vail and private land owners, to meet the challenges we now face in our state.

3] Goals of the plan:

1. Adopting and Implementing "*Title 35 Article 5.5-107 The Colorado Weed Management Act"* and *Eagle County Resolution No. 2000-45* as it applies to Vail. The Town of Vail Code Title 5, Public Health & Safety, Chapter 1 Public Nuisances, 5-1-6: Noxious Weeds will automatically update along with all future revisions and amendments to *Title 35 Article 5.5-107 and Eagle County Resolution No.2000-45.*

2. Education of the public and private landowners concerning weed management issues facing our community.

3. Work with the Federal, State, County, Private landowners, and I-70 Corridor Communities within Eagle County. Working together to implement *"Best Management Practices"*

4. Identify, inventory, and map out noxious weeds currently in our community and use as a means to monitor our effectiveness and as a tool for future work plans.

5. Notify property owners, both public and private within the Town of Vail jurisdiction, of significant populations of noxious weeds on their property.

6. Enforce the management of designated A and B listed noxious weeds as outlined in the Town of Vail Noxious Weed Ordinance 5-1-6, section D.

4] Weed Management Methods:

The Colorado Weed Management Act (C.R.S. 35-5.5) states that a combination of integrated methods must be utilized in the management of noxious weeds. Integrated methods include: 1] Cultural, 2] Mechanical, 3] Biological and 4] Chemical management.

1. **Cultural** – those methodologies or practices conducted to favor the growth of desirable plants over undesirable plants. Including but not limited to: maintaining an optimum fertility and plant moisture status in an area, and planting species most suited to an area. *(Grazing, Revegetation, Erosion Control)*

2. **Mechanical** – practices that physically disrupt plant growth including but not limited to: *(tilling, mowing, burning, mulching, hand pulling, and hoeing)*

3. **Biological** – the use of organisms to disrupt the growth of undesirable plants. *(Insects, Bacteria, Pathogens, Goats)*

4. **Chemical** – the use of herbicides or plant growth regulators to disrupt the growth of undesirable plants. *(Herbicides)*

The Colorado Department of Agriculture publishes Noxious Weed "Fact Sheets" for all noxious weed species listed in Colorado. They provide information on the plants and recommended IPM management strategies. Appendix A includes Fact Sheets for each of Vail's listed noxious weeds.

Appendix and References to follow:

5] References:

1. "Noxious Weeds." *Noxious Weeds | Department of Agriculture – Conservation Services*. Colorado Department of Agriculture, n.d. Web. 13 June 2017.

2. United States of America. Colorado Department of Agriculture. *TITLE 35 AGRICULTURE ARTICLE 5.5 Colorado Noxious Weed Act*. N.p.: n.p., n.d. Print.

3. Griffin, Scott. *Weed & Pest - Enforcement - Eagle County*. Eagle County, n.d. Web. 13 June 2017.

4. United States of America. Department of Agriculture. *RULES PERTAINING TO THE ADMINISTRATION AND ENFORCEMENT OF THE COLORADO NOXIOUS WEED ACT* . N.p.: n.p., n.d. Print. Conservation Services Division

5. Doran, Alicia, Steve Anthony, and Cathy Shelton, eds. *Noxious Weeds of Colorado*. 12th ed. Colorado Weed Management Association, 2015. Print.

6. Blossey, B. Biological Invasions (1999) 1: 301. doi:10.1023/A:1010084724526

7. Skinner, Kerri, Lincoln Smith, and Peter Rice. "Using noxious weed lists to prioritize targets for developing weed management strategies." *Weed Science* 48.5 (2000): 640-44. Web. 13 June 2017.

8. etc.usf.edu/clipart

6] Appendix A

Appendix A includes Colorado Department of Agriculture Fact Sheets for each species on Vail's Noxious Weed List. These sheets provide plants descriptions and recommended IPM management strategies. Fact Sheet shall be replaced in this Plan as they are updated by the CDA.

Myrtle spurge

Euphorbia myrsinites

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Myrtle spurge Identification and Management

Identification and Impacts

Myrtle spurge *(Euphorbia myrsinites)* is a low growing perennial with trailing fleshy stems. The leaves are fleshy, blue-green and alternate. Flowers are inconspicuous with yellow-green, petal-like bracts that appear from March to May. Myrtle spurge spreads by seed and plants are capable of projecting seeds up to 15 feet. The plant grows from a taproot, with new stems emerging in early spring and dying back in the winter. Plants can grow up to 8-12 inches high and 12-18 inches in width.

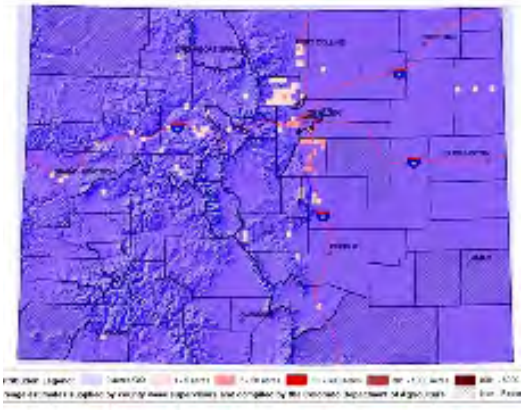
Myrtle spurge contains a toxic, milky sap which can cause severe skin irritations, including blistering. This plant is poisonous if ingested; causing nausea, vomiting and diarrhea. Wearing gloves, long sleeves, shoes, and eye protection is highly recommended when in contact with myrtle spurge, as all plant parts are considered poisonous.

Myrtle spurge is an invasive ornamental that is native to Eurasia. It is popular with xeriscapes and rock gardens, preferring sunny to partly sunny areas and well drained soils. Myrtle spurge rapidly escapes gardens and invades sensitive ecosystems, out competing native vegetation and reducing wildlife forage. Alternatives to planting myrtle spurge include native plants such as sulphur flower (*Erigonum umbellatum*), Kinnikinnick *(artcostaphylos uvursi*), or creeping mahonia (*Mahonia repens*). The soil seed reserve of myrtle spurge is estimated to be eight years. The site must be monitored for at least nine years after the last flowering adult plants have been eliminated and treatments repeated when necessary.

The key to effective control of myrtle spurge is to remove plants prior to seed set and to detect and remove new populations in natural areas early on. Small areas can be easily removed by mechanical means but should be done early to prevent triggering seed launching. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Myrtle spurge is designated as a "List A" species in the Colorado Noxious Weed Act. It is designated for statewide eradication. For more information visit www.colorado.gov/ag/weeds and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Map of myrtle spurge infestation.



Key ID Points

1. Low growing plant with blue-green, waxy leaves.
2. Flowers are yellow-green petal like bracts that appear from March to May.

Updated on: 7/2015

Photos © Kelly Uhing, Colorado Department of Agriculture and (above) Crystal Andrews, Colorado Department of Agriculture.

Management Recommendations

CULTURAL
Keeping desirable vegetation healthy and thick will help keep invaders out. Prevent the establishment of new infestations by minimizing disturbance and seed dispersal. Survey your land regularly to detect new invaders and eradicate any new populations quickly.

BIOLOGICAL
Biocontrol is not an approved method of contol for State List A species. Eradication as the management objective for all List A species. For more information on insect biocontrol in Colorado, please contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916

MECHANICAL
Hand pull or dig when soil is moist. Make certain to pull all the roots and wear rubber gloves and eye protection to protect yourself from the toxic milky sap. Treatment follow up is important to check root fragment resprouts that will occure when the tap root is severed too shallow.

Integrated Weed Management:

Since Myrtle spurge spreads mainly by seed, it is very important to prevent seed production and deplete the seed bank. Remove mature plants prior to setting seed and seedlings whenever present.

Populations can be managed mechanically and by spot treatment of herbicides. It is important to be persistent with follow up treatments for many years.

Myrtle spurge

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
2,4-D ester	2 qt./acre + 1% v/v methylated seed oil	Use a 2,4-D ester formulation that has a 4.0 lbs. active ingredient/acre. Apply during spring or during fall regrowth.
Dicamba + 2,4-D	1 pint/acre dicamba + 2-3 pints/acre 2,4-D (amine or ester)	Use a 2,4-D formulation that has a 4 lbs. active ingredient/gallon. Apply during spring or during fall regrowth.
Picloram (Tordon/Picloram 22K - Restricted use pesticide) + 2,4-D	20 oz./acre + 2-3 pints/acre 2,4-D (amine or ester)	Apply at flowering growth stage during spring or to fall regrowth. DO NOT use near trees, desirable shrubs, water, or high water table.
Additional herbicide recommendations for other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Top to bottom photos © Unknown, A. Murray, Univ. of Florida; USDA ARS Archive; and unknown.

Leafy spurge

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Leafy spurge Identification and Management

Key ID Points

1. Flowers are yellowish-green and have a pair of heart shaped yellow-green bracts below each inconspicuous flower.
2. The entire plant contains white, milky latex.

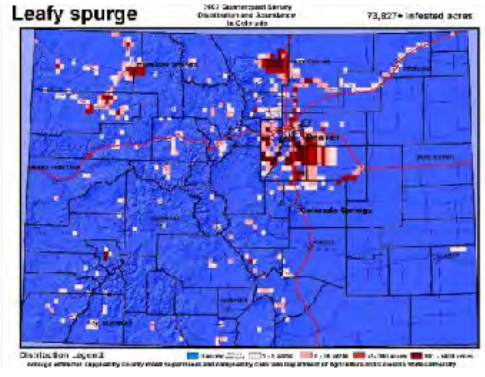
Identification and Impacts

Leafy spurge (*Euphorbia esula*) is a non-native deep-rooted perennial that spreads by seed and extensive, creeping roots. The roots can extend as deep as 30 feet into the soil and are extremely wide-spreading. The roots are brown and contain numerous pink buds that generally produce new shoots or roots. Leafy spurge can grow from 1 to 3 feet in height. The stems are smooth, pale green, and thickly clustered. Leaves are alternate, narrow, linear, and 1 to 4 inches long. The flowers are very small and yellowish-green. They are enclosed by very visible yellowish-green, heart-shaped bracts. The entire plant contains white, milky sap that exudes readily upon stem or leaf breakage. This sap can damage eyes and sensitive skin. Leafy spurge is one of the earliest plants to emerge in the spring. Flower clusters develop 1 to 2 weeks after stem emergence which is from mid-April to late May. One large leafy spurge plant can produce up to 130,000 seeds. Three-sided seed capsules explode when ripe and project the seeds up to 15 feet away from the parent plant.

Leafy spurge has adapted to a wide variety of habitats in the state and is very competitive with other plant species. Where it becomes established in rangeland, pasture, and riparian sites, it crowds out practically all other vegetation. The competitive, rapidly growing, and extensive root system makes leafy spurge very difficult to manage. Develop a management plan that uses several control methods that are compatible with your site.

The most effective method of control for Leafy spurge is to prevent its establishment through proper land management. Maintain healthy pastures and rangeland and continually monitor your property for new infestations. New infestations are much more easily controlled than established infestations. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Leafy spurge is designated as a "List B" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. On the back of this sheet are leafy spurge management recommendations. For more information, please visit www.colorado.gov/ag/csd and click on the Noxious Weed Program link. Or contact the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Flower photo, top, © Norman Rees, USDA, APHIS. Invasive.org. All other photos © Kelly Uhing.

Updated on: 07/2015

Euphorbia esula

Management Recomendations

CULTURAL
Establishment of selected grasses can be an effective cultural control of leafy spurge. 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
Both sheep and goats can be effective grazers of leafy spurge. The flea beetles *Apthona nigriscutis*, *A. lacertosa*, and *A. cyparissiae*, are effective especially when combined with grazing and/or herbicides. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture, 970-464-7916.

Photo © USDA.

MECHANICAL
Due to the extensive root system, hand-pulling this plant is not a viable option. Mowing will reduce seed production if repeated every 2 to 4 weeks during the growing season, but will provide little long-term control.

Integrated Weed Management:

Persistent monitoring of areas with known or potential infestations is crucial to managing leafy spurge. A combination of management methods in a long-term management plan is imperative. The management objective is to exhaust the root system and deplete the soil seed bank.

Leafy spurge

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gallons per acre. Please read label for exact rates. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
Aminocyclopyrachlor + chlorsulfuron (Perspective)* + Diflufenzopyr + dicamba (Overdrive, Distinct)	3-4 oz. Perspective/acre + 4 oz. Overdrive/acre + 1% v/v methylated seed oil	At flowering in the spring and/or fall.
Quinclorac (Paramount, Facel-L, Quinstar) + Diflufenzopyr + dicamba (Overdrive, Distinct)	12-24 oz. Quinstar/acre + 4 oz. Overdrive/acre + 1% v/v methylated seed oil	At flowering in the spring and/or fall.
Aminocyclopyrachlor + chlorsulfuron (Perspective)*	4.75-8 oz. product/acre + 1% v/v methylated seed oil	Post-emergence in spring until flowering, or to fall rosettes.
Note: *IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not permitted for use in the San Luis Valley. Perspective is not for use on grazed or feed forage.		
Additional herbicide recommendations for this and other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Canada Thistle Identification and Management

List B

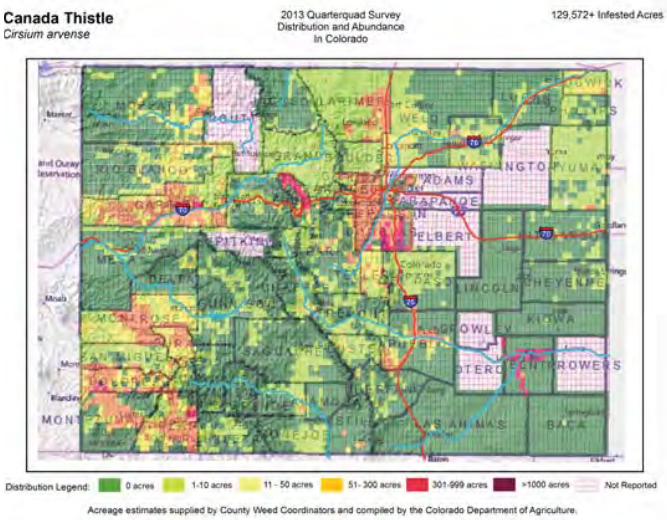
Canada thistle (*Cirsium arvense*) is a non-native, deep-rooted perennial that spreads by seeds and aggressive creeping, horizontal roots called rhizomes. Canada thistle can grow 2 to 4 feet in height. The leaves are oblong, spiny, bright green, and slightly hairy on the undersurface. Unlike other noxious biennial thistles which have a solitary flower at the end of each stem, Canada thistle flowers occur in small clusters of 1 to 5 flowers. They are about 1 cm in diameter, tubular shaped, and vary from white to purple in color.

Canada thistle emerges from its root system from late April through May. It flowers in late spring and throughout the summer. It produces about 1,000 to 1,500 seeds per plant that can be wind dispersed. Seeds survive in the soil for up to 20 years. Additionally, Canada thistle reproduces vegetatively through its root system, and quickly form dense stands. Each fragmented piece of root, 0.25 inch or larger, is capable of forming new plants. The key to controlling Canada thistle is to eliminate seed production and to reduce the plant's nutrient reserves in its root system through persistent, long-term management.

Canada thistle is one of the most troublesome noxious weeds in the U.S. It can infest diverse land types, ranging from roadsides, ditch banks, riparian zones, meadows, pastures, irrigated cropland, to the most productive dryland cropland. Large infestations significantly reduce crop and cattle forage production and native plant species. It is a host plant to several agricultural pests and diseases. Canada thistle prefers moist soils, but it can be found in a variety of soil types. It has been found at elevations up to 12,000 feet.

Effective Canada thistle control requires a combination of methods. Prevention is the most important strategy. Maintain healthy pastures and rangelands, and continually monitor your property for new infestations. Established plants need to be continually stressed. Management options become limited once plants begin to produce seeds. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

2013 Quarter Quad Survey



Canada thistle is designated as a "List B" species as described in the Colorado Noxious Weed Act. It is required to be either eliminated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/weeds and click on the Noxious Weed Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, (303) 869-9030.

Key ID Points

1. Cluster of 1-5 white to purple flowers on a stem.
2. Floral bracts are spineless.
3. Small flowers that are 1 cm in diameter.
4. Perennial, rhizomatous plant with spiny, oblong, green leaves.

Canada thistle

Cirsium arvense

List B

Integrated Weed Management Recommendations

Integrated weed management is imperative for effective Canada thistle control. This weed needs to be continually stressed, forcing it to exhaust root nutrient stores, and eventually die. Mowing or grazing can be followed up with herbicide application. Avoid hand-pulling and tilling which can stimulate the growth of new plants.

Canada thistle

Cirsium arvense

CULTURAL

Prevention is the best control strategy. Maintain healthy pastures , riparian areas, and rangelands. Prevent bare ground caused by overgrazing, and continually monitor your property for new infestations. Establishment of select grasses can be an effective control.

BIOLOGICAL

Cattle, goats, and sheep will graze on Canada thistle when plants are young and succulent in the spring. Follow up grazing with a fall herbicide application. Insects are available, and provide limited control. Currently, collection and distribution methods for Canada thistle rust (*Puccinia punctiformis*) are being refined. For more information on Canada thistle biocontrol, contact the Colorado Department of Agriculture - Palisade Insectary at (970) 464-7916.

MECHANICAL

Due to Canada thistle's extensive root system, hand-pulling and tilling create root fragments and stimulate the growth of new plants. Mowing can be effective if done every 10 to 21 days throughout the growing season. Combining mowing with herbicides will further enhance Canada thistle control.

CHEMICAL

The table below includes recommendations for herbicides that can be applied to rangeland and some pastures. Treatments may be necessary for an additional 1 to 3 years because of root nutrient stores. Always read, understand, and follow the label directions.

Herbicide	Rate	Application Timing
Aminopyralid* (Milestone)	5-7 oz. product/acre + 0.25% v/v non-ionic surfactant OR 1 teaspoon product/gal water + 0.32 oz./gal water	Apply in spring at the pre-bud growth stage until flowering and/or to fall regrowth. Can also add chlorsulfuron (Telar) at 1 oz./acre to the mix.
Clopyralid + Triclopyr (Prescott; Redeem; others)	3 pints product/acre + 0.25% v/v non-ionic surfactant OR 1.25 oz. product/gal water + 0.32 oz./gal water	Apply until flowering and/or fall regrowth.
Aminocyclopyrachlor + chlorsulfuron (Perspective)*	5.5 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply to spring rosette to flower bud growth stage; or fall. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage.
Note: *Product not permitted for use in the San Luis Valley.		
Additional herbicide recommendations for this and other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Colorado Department of Agriculture - Conservation Services
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Broomfield, CO 80021
(303) 869-9030
www.colorado.gov/ag/weeds

Updated:
07/2015

Musk Thistle Identification and Management

List B

© Bruce Ackley, OH State University

Musk thistle *Carduus nutans* L. is a non-native biennial forb that reproduces solely by seed. During the first year of growth, a rosette forms in spring or fall. During the second year in mid to late spring, the stem bolts, flowers, sets seed, and the plant dies.

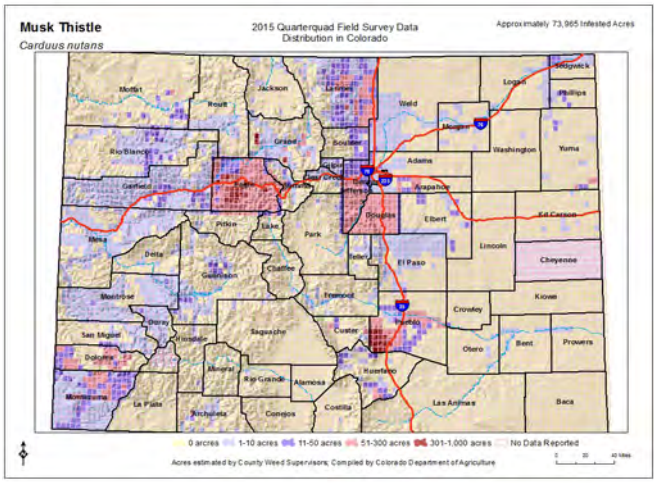
Musk thistle can grow up to 6 feet tall. The leaves have spines, are waxy, and dark green in color with a prominent light green to white midrib that can be seen from a distance. Leaves are dentately lobed; leaf bases sometimes extend down below the point of attachment. The terminal flower heads are purple, large in size (1.5 to 3 inches in diameter) and bend over as if nodding. These flower heads are made up of only disk flowers. They are surrounded by numerous, wide and stout lance-shaped, spine-tipped bracts that resemble an open pineapple. The pappus has plumose bristles that appear barbed under magnification. Musk thistle produces many flower heads. The tallest shoots flower first; lateral shoots develop in leaf axils. A robust plant may produce 100 or more flowering heads. Reproduction is usually via out-crossing through insect pollination, but self-pollination also occurs. Flowers emerge in May through September. Seeds develop shortly after flowers emerge. Flower buds can contain viable seeds from self-pollination. Seeds can mature on severed bud and flowerheads. Seeds remain viable in the soil for up to about 14 years. Seeds can germinate and emerge from spring through fall.

Musk thistle habitat is found in a variety of environments extending from shortgrass prairie to alpine. It is strongly associated with heavily disturbed sites, where over-use occurs or where site conditions are poor due to land management practices. This includes over-grazed areas, large fires, trails, ditches and roadsides. Infested livestock pasturs suffer from significantly decreased carrying capacity.

Because musk thistle reproduces solely from seed, the key for successful management is to prevent seed production. Once flowers emerge and start to produce seed, effective management options will become limited. Once sites are infested, musk thistle can form dense stands. Prevention, adjusting land management practices, a robust integrated treatment plan and restoration are critical to eliminating this species.

Musk thistle is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be eradicated; some populations may be contained or suppressed depending on state regulations. For management directions for each county, refer to the most recent Rule, or visit www.colorado.gov/ag/coweedcontacts for details.

2015 Quarter Quad Survey



© Chris Evans, University of IL

© Les Mehrhoff, DiscoverLife.org

Key ID Points

1. Leaf with white midrib and leaf margins with spines.
2. Pappus with plumose barbed bristles.
3. Wide, stout lance-shaped bracts with spiny tips.

Musk thistle

Carduus nutans L.

List B

Integrated Weed Management Recommendations

Musk thistle
Carduus nutans L.

Effective integrated management means using a variety of eradication methods that also includes restoration, prevention of seed production and dispersal, and monitoring. Maintain robust healthy native landscapes and restore degraded sites. Avoid soil disturbance. As with most biennials, prevent seed production in the first and second year of musk thistle growth. Prevent seed from dispersing, such as on contaminated equipment. Rest sites until they are effectively restored. Change land use practices. Use methods appropriate for the site.


© Norman E. Rees, USDA Ag Research Service

CULTURAL CONTROL METHODS

Musk thistle is not tolerant of competition and needs light to germinate seeds. Cultural methods should aim to maintain or restore a competitive assemblage of forbs, cool and warm season grasses. Implement whole site restoration of soils, plants and water regimes where stands of musk thistle exist where needed. Use locally adapted species that are ecologically appropriate for the site to improve competitiveness. Include annual as well as perennial species. Incorporate soil amendments, soil microbes and mycorrhizal fungi in restoration and land management efforts. Minimize soil compaction and disturbance, especially in wetlands and moist soil. Irrigation can increase competitive species.


© Eric Coombs, OR Dept of Agriculture

BIOLOGICAL CONTROL METHODS

Although horses, cattle, goats and sheep may eat flower heads on a few plants, seeds pass through their digestive tracks unaltered and spread. The leaf and stalk spines can cause domestic livestock to avoid mature musk thistle. Thus, musk thistle can become an "increaser" in over-grazed systems. Properly managed grazing can improve vigor of desired species and indireclty reduce musk thistle. *Trichosirocalus horridus* is the only biological control agent available for musk thistle in Colorado. The other species, *Rhinocyllus conicus*, is not host specific and will damage native thistles, and therefore cannot be released as an agent in Colorado. For more information, visit the Colorado Department of Agriculture's Palisade Insectary website at www.colorado.gov/ag/biocontrol.


© Friends of NV Wilderness Stewardship Team

MECHANICAL CONTROL METHODS

Methods, such as tilling, hoeing and digging, are best for infestations smaller than 0.5 acres; weigh this against other plants present, ecology and site condition. Sever roots below the soil surface during the first year before the plant stores energy, and in the second year before flower production. Mowing, chopping and deadheading stimulates more flower production; these methods require consecutive years of season-long treatments. All flowerbuds and heads must be collected, bagged, and disposed of or destroyed; seeds will mature and germinate if left on the ground. Prescribed fire that results in high soil burn severity damage roots and above ground biomass, but is not recommended due to impacts on desired plants. Fire generally favors musk thistle germination.

CHEMICAL

NOTE: The following are recommendations for herbicides that can be applied to pastures and rangeland. Rates are approximate and based on equipment with an output of 30 gal/acre. Follow the label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Aminopyralid* (Milestone)	6 oz./acre + 0.25% v/v non-ionic surfactant	Apply in spring rosette to early bolting growth stages or in fall to rosettes. *Product not permitted for use in the San Luis Valley.
Chlorsulfuron** (Telar)	1-2.6 oz. product/ acre + 0.25% v/v non-ionic surfactant	Apply in spring from rosette through very early flower growth stages. (Can prevent viable seed formation if applied no later than the first viable flowers begin to open.) **This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.
Clopyralid (Transline)	0.67-1.33 pints product/acre + 0.25% v/v non-ionic surfactant	Apply to rosettes through flower bud stage in spring, or to fall rosettes.

Colorado Department of Agriculture - Conservation Services
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Rev. 11/16

Plumeless thistle

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Key ID Points

1. Flower heads cluster 2-5 and are purple to dark red in color.
2. Leaves are alternate, stalk-less and hairy underneath.

Updated on:
07/2015

Plumeless thistle
Identification and Management

Identification and Impacts

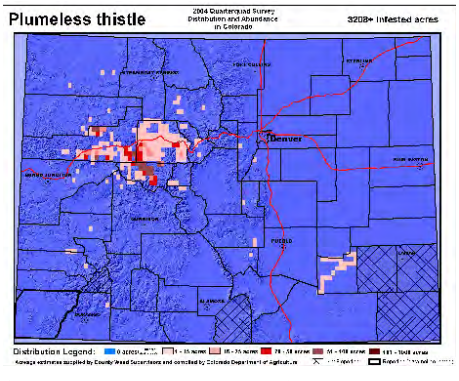
Plumeless thistle *(Carduus acanthoides)* is a winter annual or biennial that is native to Europe and Asia. Plumeless thistle rosettes have wavy leaves with yellow spines along the white-colored leaf margins. The stems are covered with leaf-like, winged spines that extend up to the flowering heads. The flower heads, in clusters of 2 to 5, are alone at the end of the branches. They are purple to dark red in color and are 1/2 to 1 inch in diameter. Leaves are alternate, stalk-less, hairy underneath and blend into the stem. Mature plants can grow taller than 5 feet and can produce upwards of 9,000 seeds.

Habitats for Plumeless thistle include pastures, fields, disturbed lands, logged-over areas, river valleys, along roadsides and in native grasslands. Plumeless thistle out competes native species and forage crops. It is one of the most aggressive thistles, due to its high seed production. Plumeless thistle is unpalatable to livestock and it may accumulate nitrates.

Plants over winter and grow from seeds and rosettes. The seed viability for Plumeless thistle is unknown. The site must be monitored for at least 10 years after the last flowering adult plants have been eliminated and treatments repeated when necessary.

The key to effective control of Plumeless thistle is very similar to Musk thistle. Preventing Plumeless thistle seed production and planting desirable grasses and forbs to out compete plumeless thistle is effective. An integrated weed management approach is an effective tool when dealing with plumeless thistle; using herbicide, biological and cultural control methods. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Plumeless thistle is designated as a "List B" species in 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.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Photos © Map above: Crystal Andrews, Colorado Department of Agriculture; All other photos: Kelly Uhing, Colorado Department of Agriculture.

Carduus acanthoides

Management Recommendations

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
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. These insects have been known to threaten native thistle populations. Contact the Insectary of Colorado Department of Agriculture to get complete information at 970-464-7916. Or visit www.colorado.gov/ag/csd.

MECHANICAL
Any mechanical or physical method that severs the root below the soil surface will kill Plumeless thistle. Mowing or chopping is most effective when Plumeless 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.

Integrated Weed Management:

The key to managing Plumeless thistle is to prevent seed production. Dense Plumeless thistle stands can be treated by spot use of herbicide programs. Due to the unknown seed viability of plumeless thistle, monitoring up to 10 years, and repeating control methods may need to occur for many years to completely eliminate an infestation.

Plumeless thistle

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
Aminopyralid* (Milestone)	5 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply in spring rosette to early bolting growth stages or in fall to rosettes.
Chlorsulfuron** (Telar)	1-2.6 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply in spring from rosette through very early flower growth stages. (Can prevent viable seed formation if applied no later than the first viable flowers begin to
Clopyralid (Transline)	0.67-1.33 pints product/acre + 0.25% v/v non-ionic surfactant	Apply to rosettes through flower bud stage in spring, or to fall rosettes.

Note: *Product not permitted for use in the San Luis Valley. **This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.

Additional herbicide recommendations for this and other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf

Photos Top to bottom © Loke T. Kok, Virginia Polytechnic Institute and State University, Bugwood.org; Richard Old, XID Services, Inc., Bugwood.org; and Kelly Uhing, Colorado Department of Agriculture.

Scotch Thistle Identification and Management

List B

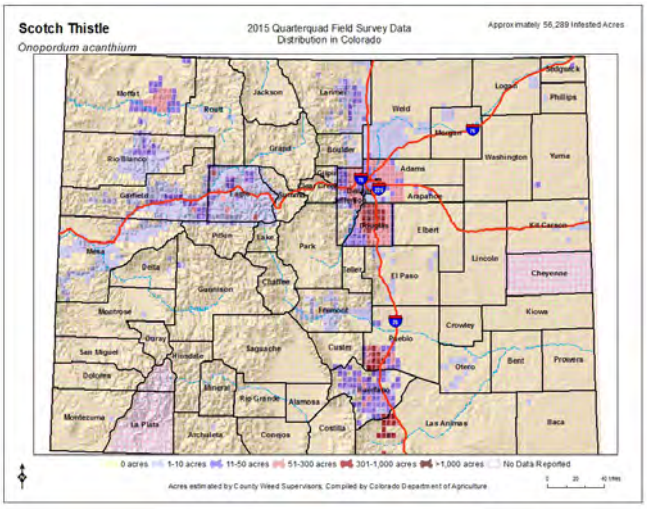
Scotch thistle includes two species, *Onopordum acanthium* L. and *O. tauricum* Willd. Both are non-native biennial forbs. During the first year of growth, both species appear as a rosette in spring or fall. During the second year in mid to late spring the stems bolt, the plants flower, set seed, and the plants die. Both Scotch thistle species can grow up to 12 feet tall and basal rosettes can be up to 2 feet in diameter. Stems are numerous and branched. Characteristically, the entire length of stems from both species have broad wings with spiny tips. *O. acanthium* leaves have an overall gray color from dense woolly hairs. *O. tauricum* leaves are glandular and not as hairy as *O. acanthium*. For both, leaves are spiny. Both species have a distinct mid-rib. Flower heads are terminal, violet to reddish in color, 1 to 3 inches in diameter, and arranged in a raceme. One plant can produce up to 100 flower heads. The spine-tipped bracts curve away from the flowering head. The flower receptacle is fleshy and has pits to hold seeds. The plants flower from mid-June to September. Scotch thistle seeds have the ability to mature in flower buds and heads that have been removed from the stalk. Both species can produce up to 14,000 seeds per plant. Seeds remain viable for up to 30 years but germinate readily with moisture in spring and fall.

Scotch thistle invades rangeland, overgrazed pastures, roadsides, and irrigation ditches. Both species prefer moist soil, such as areas adjacent to creeks and rivers. Roadsides appear to be especially vulnerable to invasion likely due to the water runoff from the shoulders. Maintaining healthy pastures and native plants, minimizing soil disturbance, changing land use practices to prevent overuse, and using seed-free equipment are critical measures to preventing infestations. As with most biennials, once established, limiting seed production is critical to effective control. Due to the robust, spiny nature of Scotch thistle, this plant can act as a living barbed wire fence, making areas impassible for wildlife, livestock, and people and unpalatable to cattle.

To control seed production, plants with buds or flowers should be collected, bagged and immediately disposed of or destroyed. Chemical control is most effective when plants are in rosette stage, spring or early fall. Mechanical controls can be used to eliminate small patches or plants in a later growth stage.

Scotch thistle is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be eradicated; some populations may be contained or suppressed depending on state regulations. For state regulations described for each county, refer to the most recent Rule, or visit www.colorado.gov/ag/coweedcontacts for details.

2015 Quarter Quad Survey



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Key ID Points

1. Pitted fleshy flower receptacle.
2. Prominent mid-rib.
3. Wide lobed leaves with distinct mid-rib.
4. Wide spiny wings extend the length of the stem.

Scotch thistle

Onopordum acanthium L. and *O. tauricum* Willd.

List B

Integrated Weed Management Recommendations

Scotch thistle

Onopordum acanthium L. and *O. tauricum* Willd.

Effective integrated management means using a variety of eradication methods along with restoration, prevention of seed production and dispersal, and monitoring. Maintain robust healthy native landscapes. Restore degraded sites. Avoid soil disturbance. As with most biennials, prevent seed production in the first and second year of growth. Prevent seed from dispersing, such as on contaminated equipment. Rest sites until they are effectively restored. Change land use practices. Use methods appropriate for the site.

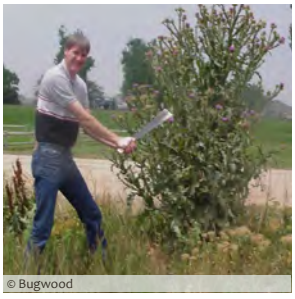
CULTURAL CONTROL METHODS

Effectiveness begins with maintaining or restoring a competitive native forb and forb assemblage. Continue restoration efforts until native plants are robust and abundant. Use locally adapted native seeds whenever possible to improve competitiveness. Include cool season and warm season, as well as perennial and annual grasses in revegetation efforts. Soil may need to be restored by adding soil amendments, soil microbes, mycorrhizal fungi and nitrogen fixing plants such as legumes. Manage land uses so they do not create bare mineral soil or compact soil. Annual crop cultivation appears to be an effective control measure.

© Jacqui Turner, The Timaru Herald

BIOLOGICAL CONTROL METHODS

Domestic livestock are likely to avoid this plant due the large number of spines all over the plant. Goats and sheep may eat flower heads if plants are small. Since most livestock and herbivores avoid the leaves and stems, Scotch thistle can become an "increaser" in over-grazed systems. Properly managed grazing systems can increase desireable plant vigor and indirectly reduce Scotch thistle. There are no known biological control agents effective against scotch thistle or authorized in Colorado. For more information about biological control agents, visit the Colorado Department of Agriculture's Palisade Insectary website at www.colorado.gov/ag/biocontrol.



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MECHANICAL CONTROL METHODS

Methods, such as tilling, hoeing and digging, are best for infestations smaller than 0.5 acres; weigh this against other plants present, ecology and site condition. Sever roots below the soil surface during the first year before the plant stores energy and in the second year before seed production. Mowing, chopping and deadheading stimulates more flower production; these methods require consecutive years of season-long treatments. Flower heads must be collected, bagged, and disposed of or destroyed; seeds will mature and germinate if left on the ground. Fire gives Scotch thistle a competitive advantage. Large fleshy stems and leaves would not be consumed in a low severity fire and seeds would remain unaffected. High severity fires would likely damage native plants, which favors Scotch thistle if seeds are not killed and this is not recommended.

CHEMICAL

NOTE: The following are recommendations for herbicides that can be applied to pastures and rangeland. Rates are approximate and based on equipment with an output of 30 gal/acre. Follow the label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Aminopyralid* (Milestone)	7 oz. product/acre + 0.25-0.5% v/v non-ionic surfactant	Apply in spring rosette to early bolting growth stages or in fall to rosettes. *Product not permitted for use in the San Luis Valley.
Chlorsulfuron** (Telar)	1-2.6 oz. product/acre (0.75 oz. active ingredient/acre)+ 0.25% v/v non-ionic surfactant	Spring from bolting to flower bud stages. **This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.
Metsulfuron + Chlorsulfuron (Cimarron X-tra)	2 oz. product/acre + 0.25-0.5% v/v non-ionic surfactant	Apply during rosette to flower bud stages.
Clopyralid (Transline)	0.67-1.33 pints product/acre + 0.25% v/v non-ionic surfactant	Apply to rosettes in spring or fall.
Aminocyclopyrachlor + chlorsulfuron (Perspective)* *Product not permitted for use in the San Luis Valley.	4.75-8 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply from the seedling to the bolting stage. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage.

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Rev. 11/16

Houndstongue

Colorado Department of Agriculture

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(303) 869-9030
weeds@state.co.us

Key ID Points

1. Panicles of reddish-purple flowers with 5 petals and 5 soft, hairy sepals.
2. Velcro-like seeds with 4 nutlets.

Updated on:
07/2015

Houndstongue
Identification and Management

Identification and Impacts

Houndstongue (*Cynoglossum officianale)* is a short lived perennial or biennial forb. It produces rosettes in the first year, and bolts a stout, erect stem that is 1 to 4 feet tall, by mid-summer of the second year. Then it flowers and produces fruit. Flowers are reddish-purple (occasionally white) and droop slightly from densely clustered panicles. The five rounded petals are cupped by five sepals covered with long, soft white hairs. Flowering occurs May to July. The simple leaves are lance or oblong shaped, with a smooth edge and no teeth or lobes. Leaves are alternate, 1 to 12 inches long and 1 to 3 inches wide. The leaf tip is sharply pointed, like a hound's tongue, yet are covered with long-soft white hairs. Leaves often appear dusty and insect-ridden. A thick, dark, woody taproot can reach 3 to 4 feet deep.

Reproduction is solely by seeds. Seeds are 4 prickly teardrop-shaped nutlets, which are packed in a pyramid-shaped receptacle. Most seeds fall close to the parent plant, but the seeds can travel great distances. The seeds have barbs like Velcro, with a hooked tip that clings to animals, clothing and machinery. A mature plant can produce 2,000 seeds. Seed viability is 1 to 3 years. Houndstongue is poisonous. Toxic pyrrolizidine alkaloids in Houndstongue stop liver cells from reproducing. Livestock and wildlife may live up to six months after ingesting a lethal dose. Though the plant has a distinctive odor that repels animals, it is more palatable when dried. Animals rarely eat it unless it is dried and mixed with hay. Houndstongue's toxicity effects horses and cattle more severely, sheep seem more resistant. Burs will reduce the value of sheep wool if present.

Habitats for Houndstongue are open to shady, moist, disturbed areas, along trails, roadsides, fields, pasture, rangeland, along the edge of forests, sand dunes and ditch banks. Houndstongue prefers moist areas, but often grows on sandy or gravelly alkaline soil up to 9,000 feet elevation. Areas with more than 10% bare ground are particularly vulnerable to Houndstongue invasions.

The key to effective control of Houndstongue is preventing establishment and to prevent seed production. Planting competing and desirable grasses and forbs can be effective. Helping with reestablishment of disturbed sites. An integrated weed management approach can also be successful. Chemical, mechanical, and biological controls can be effective when dealing with Houndstongue. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Houndstongue is designated as a "List B" species in 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.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Photos: top left Aspen County, CO; all other Kelly Uhing , Colorado Department of Agriculture.

Cynoglossum officianale

Management Recommendations

CULTURAL
Prevent the establishment of new infestations by minimizing disturbance and seed dispersal, eliminating seed production and maintaining healthy native communities. Contact your local Natural Resources Conservation Service for seed mix recommendations. Maintain healthy pastures and prevent bare spots caused by overgrazing.

BIOLOGICAL
A root weevil, *Mogulones cruciger*, has been successful in Canada and introduced in Montana, but has not yet been approved for use in Colorado. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Cut or pull plants, and remove entire root crown when plants are in the rosette stage. Remove dense litter layer (up to 4 inches) to stimulate germination of desired plants. To reduce seed production, mow or cut flowering stems before seed nutlets develop, this can significantly reduce seed production.

Integrated Weed Management:

Prevention is the best option when dealing with Houndstongue. Use only certified weed-free hay. If an infestations does occur, reducing the seed production is key in controlling Houndstongue. Chemical, mechanical and the developing biological controls can also be effective management techniques.

Houndstongue

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to specific areas. Rates are approximate and based on equipment with an output of 30 gal./acre. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
Metsulfuron (Escort XP) + 2,4-D	1 oz. product/acre + 1 qt 2,4-D/acre +0.25% v/v non-ionic surfactant	Apply in spring rosette to early flower growth stages.
Chlorsulfuron* (Telar) + 2,4-D	1-1.5 oz. product/acre + 1 qt 2,4-D/acre +0.25% v/v non-ionic surfactant	Apply in spring rosette to early flower growth stages.
Metsulfuron + Chlorsulfuron (Cimarron X-tra)	2.0 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply in spring rosette to early flower growth stages.
Additional herbicide recommendations for other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Top photo, © Kelly Uhing, Colorado Department of Agriculture. *Mogulones cruciger* photo ©H. Goulet. Mechanical management by Kelly Uhing.

Yellow toadflax

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Key ID Points

1. Yellow flowers that are like snapdragons with deep orange centers.
2. Stems that are woody at the base and smooth to the top.

Updated on:
07/2015

Yellow toadflax Identification and Management

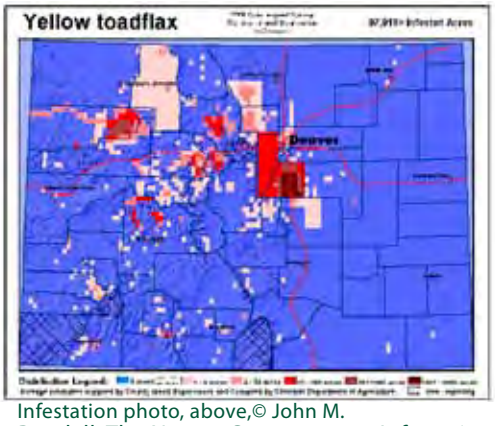
Identification and Impacts

Yellow toadflax (Linaria vulgaris) is a perennial escaped ornamental plant that is native to the Mediterranean region. The leaves are narrow, linear, and 1 to 2 inches long. The stems are woody at the base and smooth toward the top. Sparingly branched and 1 to 3 feet tall. The showy snapdragon-like flowers are bright yellow with a deep orange center and have a spur as long as the entire flower. It develops an extensive root system, making control options varied. Yellow toadflax displaces desirable plant communities reducing ecological diversity and rangeland value. Decreases forage for domestic livestock, some big game species and decreases habitat for associated animal communities. The plant is known to be mildly poisonous to cattle. Goats and sheep have been known to graze the plants with little effect.

Habitats for Yellow toadflax include roadsides, vacant lots, gravel pits, fields, waste areas, other disturbed sites and rangeland. It has adapted to a variety of site conditions, from moist to dry and does well in all types of soil. The plant can even establish in areas of excellent condition in natural disturbances or small openings.

The key to effective control of Yellow toadflax is prevention and integrating as many management strategies as possible. Prevention is always desirable when dealing with Yellow toadflax. Early detection and eradication can keep populations from exploding, making more management options available. With the plants varying genetically using many different approaches is important such as; herbicide, mechanical, cultural and biological methods. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Yellow toadflax is designated as a "List B" species in 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.colorado.gov/ag/weeds and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Infestation photo, above,© John M. Randall, The Nature Conservancy. Infestation map, Crystal Andrews, Colo.Dept.of Agriculture. Flower photo, top, © Missouri Extension. Flower bract photo, left,© Paul Slichter, University of Wisconsin, Stevens Point. Leaves photo © Gary Fewless, Unviersity of Wisconsin, Stevens Point.

Linaria vulgaris

Management Recommendations

CULTURAL
Establish select grasses and forbs as an effective cultural control of Yellow toadflax. Contact your local Natural Resources Conservation Service for seed mix recommendations. Bareground is prime habitat for weed invasions, so maintain healthy pastures and prevent bare spots caused by overgrazing.

BIOLOGICAL
Calophasia lunula, a predatory noctuid moth, feeds on leaves and flowers of Yellow toadflax. Eteobalea intermediella, a root boring moth and Mecinus janthinus a stem boring weevil are also available. For more information, contact the Colorado Department of Agriculture's Insectary in Palisade, Colorado at 970-464-7916.

MECHANICAL
Handpulling or digging is not recommended for eradication of Yellow toadflax because it's unlikely that the entire root will be excavated and a new plant is likely to occur. A single new plant might be an exception. Tillage is not recommended due to the creeping root system.

Integrated Weed Management:

Because of the high genetic variability of the toadflax species it is critical to integrate as many management strategies as possible into the control program. Two local populations may respond differently to the same herbicides.

Keys to management are to prevent seed formation and vegetative spread by roots. Controlling is expensive and difficult to treat toadflaxes, prevention is the best option.

Yellow toadflax

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasture-lands. *Rates are approximate and based on equipment with an output of 30 gallons per acre.* Always read, understand, and follow the label directions. The herbicide label is the LAW!

Herbicide	Rate	Application Timing
Aminocyclopyrachlor + Chlorsulfuron (Perspective)*	4 oz. product/acre + 0.5% v/v methylated seed oil	Apply at flowering through fall post-flower into senescence. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage.
Picloram* (Tordon/Picloram 22K - Restricted use pesticide) + Chlorsulfuron (Telar)	1 qt./acre Tordon + 1.25 oz./acre Telar + 0.25% v/v non-ionic surfactant	Apply at flowering through fall post-flower into senescence. Typically late August through September application timing has shown best results. Re-treatment may be necessary. Refer to label for grazing restrictions on Telar. DO NOT use near trees, desirable shrubs, water, or high water table.
Note: *Product not permitted for use in the San Luis Valley.		
Additional herbicide recommendations for this and other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Dalmatian toadflax

Colorado Department of Agriculture

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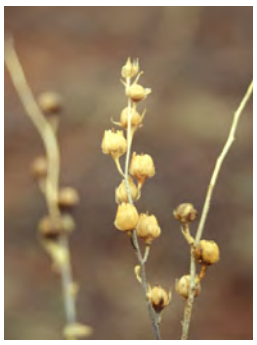


Key ID Points

1. Showy yellow snapdragon-like flowers with an orange throat on elongated racemes.
2. Thick, waxy, bluish heart-shaped leaves that wrap the stem.

Updated on:
07/2015

Dalmatian toadflax Identification and Management

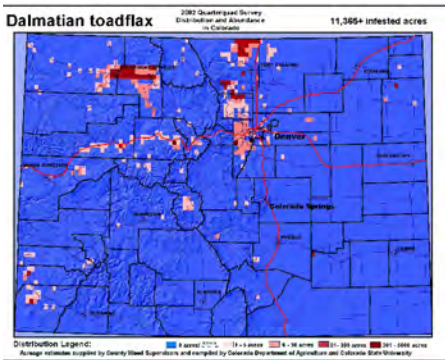
Identification and Impacts

Dalmatian toadflax (*Linaria dalmatica*) is a non-native, perennial forb introduced from the Mediterranean region as a folk remedy, fabric dye and ornamental. It reproduces both by seed and by extensive, creeping rhizomes. A single plant produces 500,000 seeds, most of which fall within 18 inches of the parent plant. Seeds can remain viable for at least 10 years. Dalmatian toadflax grows to 3 feet, and has bright yellow snapdragon-like flowers with an orange throat on elongated racemes. The alternate leaves are broad, with a thick, waxy cuticle and a bluish cast. Each leaf is heart-shaped and wraps the stem.

Habitats for Dalmatian toadflax include disturbed open sites, fields, pastures, rangeland, roadsides, cropland and forest clearings. Infestations can begin in small disturbed sites, then spread even to rangeland and wildlife habitats in excellent condition. Dalmatian toadflax is a highly aggressive plant that can genetically adapt to varied environmental conditions and herbicide controls. Its extreme competitiveness is due to early spring regeneration from vegetative buds on roots that are not dependent on soil moisture or native plant competition. Once established, toadflax quickly overruns native plants and becomes a monoculture that severely reduces forage, productivity, biodiversity and wildlife habitat.

The key to effective control of Dalmatian toadflax is prevention and integrating as many management strategies as possible. Prevention is always desirable when dealing with Dalmatian toadflax. Early detection and eradication can keep populations from exploding, making more management options available. With the plants varying genetically using many different approaches is important such as; chemical, mechanical, cultural and biological methods. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Dalmatian toadflax is designated as a "List B" species in 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.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Clockwise, from lower left, photos © John M. Randall of The Nature Conservancy; and Linda Wilson and Susan Turner of Invasive.org. Infestation map by Crystal Andrews, Colorado Department of Agriculture.

Linaria dalmatica

Management Recommendations

Dalmatian toadflax

CULTURAL
It is imperative to seed managed areas with competitive grasses such as thickspike wheatgrass and streambank wheatgrass. The combination of herbicide spraying and seeding competitive grasses controls Dalmatian toadflax better than spraying alone. (K.G. Beck, CSU)

BIOLOGICAL
Calophasia lunula, a predatory noctuid moth, feeds on leaves and flowers of Dalmatian toadflax. Eteobalea intermediella, a root boring moth, and Mecinus janthinus, a stem boring weevil, are also available. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
For small infestations, pulling toadflax by hand can be effective. Pull every year for 5 to 6 years to deplete the reserves of the root system. Monitor the site for 10 - 15 years to remove seedlings produced from dormant seeds.

Integrated Weed Management:

Because of the high genetic variability of the toadflax species, it is critical to integrate as many management strategies as possible into the control program. Two local populations may respond differently to the same herbicides.

Keys to management are to prevent seed formation and vegetative spread by roots. Controlling toadflaxes is expensive and difficult, prevention is the best option.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
Aminocyclopyrachlor + chlorsulfuron (Perspective)*	4 oz. product/acre + 1% v/v methylated seed oil	Apply when flowering in spring and/or in the fall regrowth. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage.
Picloram* (Tordon/Picloram 22K - Restricted use pesticide)	1-2 qts./acre + 1% v/v methylated seed oil	Apply when flowering in spring and/or in the fall regrowth. DO NOT use near trees, desirable shrubs, water, or high water table.
Chlorsulfuron** (Telar)	1.5-2 oz./acre + 1% v/v methylated seed oil	Apply when flowering in spring and/or in the fall regrowth.
Note: *Not permitted for use in the San Luis Valley. **This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.		
Additional herbicide recommendations for this and other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Top photo, © Kelly Uhing, Colorado Department of Agriculture. *Calophasia lunula* larva photo © Bob Richard, USDA APHIS, Invasive.org. Handpulling toadflax photo © Lake Tahoe Environmental Education Coalition.

Common tansy

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Key ID Points

1. Button shaped flowerheads lack petals .
2. Foliage is strong smelling when crushed .
3. Slender leaflets.

Updated on:
07/2015

Common tansy
Identification and Management

Identification and Impacts

Common tansy *(Tanacetum vulgare L.)* is a perennial plant that reproduces by both seed and creeping rootstocks. Seeds are yellowish brown achenes with short, five-toothed crowns. Yellow flowers are numerous in flat-topped dense clusters at the tops of the plants. Button-like flower heads lack ray flowers. Flowering typically occurs from July to September. The leaves are alternate, deeply divided into numerous narrow, individual leaflets. Mature plants are 1.5 to 6 feet tall. Stems are often purplish-red in color and extensively branched towards the top. The foliage emits a strong odor when crushed.

Habitats for Common tansy include along roadsides, streams, irrigation ditch banks, waste places, ornamental beds and in pastures. It grows best in full sun and on fertile, well-drained soil. Common tansy is found throughout the United States, although it is native to Europe.

Common tansy is considered undesirable forage for livestock. The plant is considered toxic if large quantities are consumed; fortunately animals rarely ingest it as it is very unpalatable. Common tansy can impact forage quality and quantity. With adequate moisture common tansy will displace native and other desirable species.

The key to effective control of Common tansy is to stop the establishment and spread of infestations. Mechanical and hand cutting/pulling can assist with limiting seed production, but will not eradicate plants. Common tansy is considered toxic, use protective equipment when controlling. Another effective contol method is using herbicides. A combination of these two methods, will offer desirable results. Since Common tansy grows rhizometously, depleting the storage of carbohydrates in the root system will help control the plants. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Common tansy is designated as a "List B" species in 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.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Photos © Kelly Uhing, Colorado Department of Agriculture.

Tanacetum vulgare L.

Management Recommendations

Common tansy

CULTURAL
Prevent the establishment of new infestations by minimizing disturbance and seed dispersal, eliminating seed production and maintaining healthy native communities. Contact your local Natural Resources Conservation Service for seed mix recommendations. Maintain healthy pastures and prevent bare spots caused by overgrazing.

BIOLOGICAL
There is no biological control available for Common tansy. Since biological control agents take years to research, develop and release, no releases are expected in the foreseeable future. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Controls such as hand cutting are most effective in combination with other methods. Tansy regenerates from root fragments, so cultivation could expand the size of an infestation. Common tansy can be mowed just before flowering and seed set to decrease seed production. This method may have to be repeated to eliminate re-growth from the rootstocks.

Integrated Weed Management:

Preventing the establishment and seed production of the plants is the most effective control method.

Combining control methods, mechanical and chemical will help deplete the storage of essential carbohydrates in the root system and control the plants.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

Herbicide	Rate	Application Timing
Aminocyclopyrachlor + chlorsulfuron (Perspective)	4.75-8 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply to when in the flower bud to flowering growth stages. (Late spring to mid-summer) IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not permitted for use in the San Luis Valley.
Aminopyradlid + Metsulfuron (Opensight)	3.3 oz. product/acre	Apply to when in the flower bud to flowering growth stages. (Late spring to mid-summer)
Metsulfuron (Escort XP)	1 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply to when in the flower bud to flowering growth stages. (Late spring to mid-summer)
Additional herbicide recommendations for other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Photos © Top to bottom: Jan Samanek, State Phytosanitary Administration, Bugwood.org; Richard Old, XID Services, Inc., Bugwood.org; and Michael Shephard, USDA Forest Service, Bugwood.org.

Oxeye Daisy Identification and Management

List B

Oxeye daisy (*Leucanthemum vulgare*) was introduced from Europe as a seed contaminant and as an ornamental. It is a rhizomatous, creeping, short-lived perennial that grows 10 inches to 2 feet tall. The basal and lower leaves are spoon-shaped, toothed, and with long petioles (leaf stem). The upper leaves are narrow, toothed, and clasp the stem. Flowers bloom between June and August. The flowers are 1 to 3 inches in diameter, with 15 to 30 white ray flowers, and mostly solitary. The phyllaries beneath the flower head are green with a dark brown margin. One flower head can produce up to 200 seeds. Oxeye daisy spread vegetatively from roots, root fragments, or by seed. Seeds may be viable up to 38 years or more. Infestation sites needs to be monitored for at least 10 years after the last flowering plant has been eliminated and treatments repeated when necessary. Ornamental Shasta daisy (*Leucantheum* x *superbum*) is not an aggressive invader and looks similar to oxeye daisy, but it is 6 to 12 inches taller and has larger flowers.

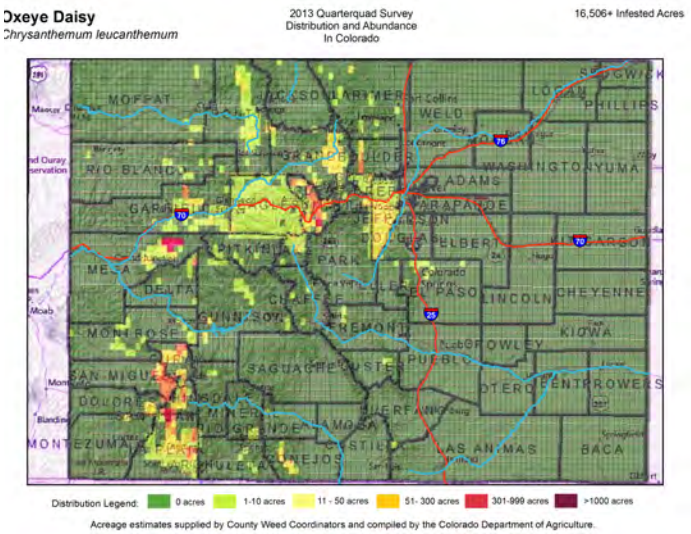
Oxeye daisy is an strong competitor. It forms dense stands that reduce native plant diversity. It degrades pastures and natural areas because cattle and wildlife avoid feeding on oxeye daisy. Heavy infestations may reduce nutrient cycling due to a shallow root system and create areas of bare soil, thus increasing soil erosion.

Habitats for oxeye daisy included mountain meadows, grasslands, pastures, streams, gardens, waste grounds, railway, and roadsides. Oxeye daisy typically grows in high elevations, up to 11,000 feet in Colorado.

The key to effective control of oxeye daisy is education and prevention. Oxeye daisy has been included in many different seed mixes, thus consumers should carefully read the label prior to planting so-called "native wildflower" mixes. Homeowners and land managers often overlook the impacts and the need to manage this weed because of the plant's attractiveness. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Oxeye daisy is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eliminated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/weeds and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, (303) 869-9030.

2013 Quarter Quad Survey



Key ID Points

1. 15-30 white ray flowers on flowerheads that are 1-3 inches in diameter.
2. Rosette and lower leaves are spoon-shaped and toothed.
3. Upper leaves on the stem are narrow, toothed, and clasp the stem.

Oxeye daisy

Leucanthemum vulgare

List B

Integrated Weed Management Recommendations

Oxeye daisy

Leucanthemum vulgare

Oxeye daisy has been included in many different seed mixes, thus consumers should carefully read the label prior to planting so-called "native wildflower" mixes. Repeated hand pulling can eliminate small infestations. Mowing or grazing by sheep or goats can be effective, in addition with a chemical approach.

© Ohio State University

CULTURAL

Generate awareness for this noxious weed. Carefully inspect "wildflower" seed mixes; do not plant mixes that include *Leucanthemum vulgare*. Avoid overgrazing, disturbance, and seed dispersal. Bare ground is prime habitat for weed invasions. Tall perennial grasses that shade oxeye daisy are good competitors.

BIOLOGICAL

Goats or sheep can be effective in the control of oxeye daisy. There are no insect biological controls available for oxeye daisy. For more information on biocontrols, contact the Colorado Department of Agriculture-Palisade Insectary at 970-464-7916.

MECHANICAL

Repeated hand pulling or digging when soil is moist and infestations are small. Oxeye daisy is fairly shallow rooted; pull up as much of the root as possible. If removed during or after flowering, bag specimens carefully so as to not scatter seeds. Mowing before flowering or when flower buds are present can limit dispersal; do not mow during or after flowering. Tilling at 6 inches or deeper, and repeated shallowly as necessary, can control patches.

CHEMICAL

The table below includes recommendations for herbicides that can be applied to rangeland and pastures. 0.25% v/v non-ionic surfactant is equivalent to 0.32 oz/gal of water or 1 pt/100 gal of water. Always read, understand, and follow the label directions. The herbicide label is the LAW!

Herbicide	Rate	Application Timing
Aminopyralid (Milestone)	4-6 oz./acre + 0.25% v/v non-ionic surfactant	Optimum control when applied at the pre-flower bud growth stage.
Metsulfuron (Escort XP)	1 oz. product/acre + 0.25% v/v non-ionic surfactant	Surfactant is absolutely necessary. Optimum control when applied at flowering growth stage. 1 oz. product is the minimum eradication rate based on best treatment observed in several CSU
Additional herbicide recommendations for this and other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Colorado Department of Agriculture - Conservation Services
305 Interlocken Parkway
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www.colorado.gov/ag/weeds

Updated:
07/2015

Scentless chamomile

Colorado Department of Agriculture

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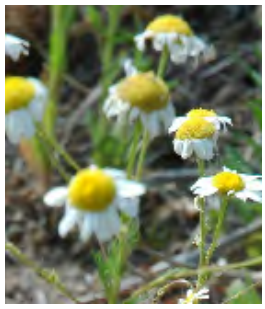
(303) 869-9030
weeds@state.co.us



Key ID Points

1. Flowers have a yellow centered disk surrounded by white petals.
2. Leaves are alternate, finely divided, and odorless when crushed.

Updated on:
07/2015

Scentless chamomile Identification and Management

The key to effective control of Scentless chamomile is prevention and preventing seed production. A combination of tillage, herbicide and competitive cropping can be very effective in managing Scentless chamomile. The goal is to prevent seed production and crowd out infestations through crop or natural species competition. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Identification and Impacts

Scentless chamomile (*Matricaria perforata*) is a an annual, biennial, or short-lived perennial forb that is native to Europe. Seedlings emerge in spring and can produce a dense mat, out competing other species. Seeds and flowers are continually being formed. Each flower head can produce 300 seeds and a single plant can produce 300,000 seeds. The flowers are white in color, ¾ inches and are daisy like flowers that are solitary on each stem. Flowers have a yellow central disk surrounded by white petals. Leaves are alternate, fernlike, finely divided, and odorless when crushed. The stems can reach 6 inches to 3 feet tall and have numerous branches.

Habitats for Scentless chamomile include: hayfields, pastures, roadsides, streambanks, fencelines, and moist areas such as drainages. There are limited control options in an agricultural setting because more spray is needed that can be used with crops. In addition, blistering on livestock muzzles and irritation to mucous membranes are another agricultural concern.

Scentless chamomile is designated as a "List B" species in 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.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Photos © Kelly Uhing, Colorado Department of Agriculture.

Matricaria perforata

Management Recommendations

Scentless chamomile

CULTURAL
Any practice that aids in the establishment of the forage, such as seeding good forage seed shallowly into a firm, moist seedbed, will help in reducing Scentless chamomile growth. Contact your local Natural Resources Conservation Service for seed mix recommendations. Bareground is prime habitat for weed invasions, so maintain healthy pastures and prevent bare spots caused by overgrazing.

BIOLOGICAL
There is no biological control available for Scentless chamomile. Since biological control agents take years to research, develop and release, no releases are expected in the foreseeable future. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Frequent, shallow tillage can help exhaust the seed bank in non-native areas. Mowing is not an effective long-term control method due to the fact the plant will prostate, in the short-term mowing will assist with limiting seed production. Hand pulling can prevent spread into new areas and is effective on small infestations.

Integrated Weed Management:

A combination of tillage, herbicide and competitive cropping can be very effective in managing Scentless chamomile. The goal is to prevent seed production and crowd out infestations through crop competition.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasture-lands. *Rates are approximate and based on equipment with an output of 30 gallons per acre.* **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
Metsulfuron (Escort XP)	0.33 oz. product/ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette to bolting growth stage. (Early Spring to Early Summer, sometimes Fall rosettes)
Chlorsulfuron* (Telar)	0.33 oz. product/ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette or bolting growth stage. (Early Spring to Early Summer, sometimes Fall rosettes)
Aminopyralid (Milestone)	7 oz./ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette growth stage. (Early Spring to Early Summer, sometimes Fall rosettes)
Note: *This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.		
Additional herbicide recommendations for other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Above photos © (Top to Bottom): Kelly Uhing, Colorado Department of Agriculture; Whitney Cranshaw, Colorado State University, Bugwood.org; and Unknown.

Russian Knapweed Identification and Management

List B

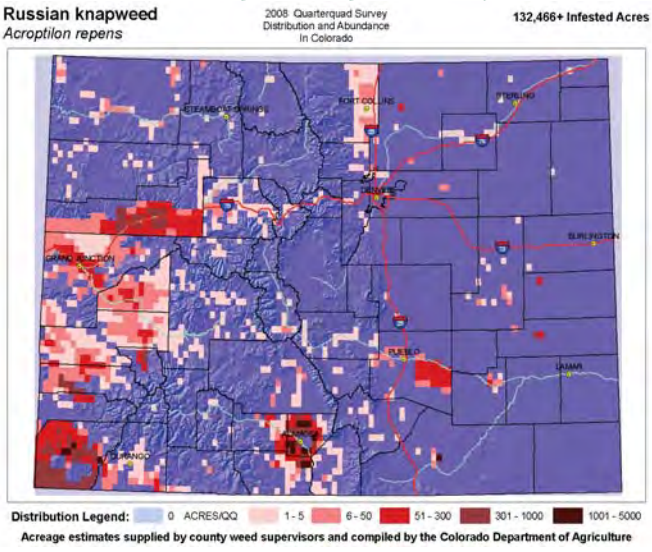
Russian knapweed (*Acroptilon repens*) is a non-native, deep-rooted perennial that spreads by aggressive, creeping, horizontal roots (rhizomes) and seeds. The roots are brown to black with a scaly appearance. Russian knapweed can grow up to 3 feet in height. The stems and leaves are covered with short gray hairs. The flowers are urn-shaped, pink to purple in color, and are solitary at the tips of the upper branches. Russian knapweed can be distinguished from other knapweeds by the smooth, papery, rounded bracts that surround the flowers. Russian knapweed emerges in early spring after soil temperatures remain above freezing. It produces flowers from June to August and sets seed in late summer to early fall. The seeds are viable for two to three years. Russian knapweed reproduces primarily from its root system. Buds on the horizontal roots can form adventitious shoots, August through the winter, that can grow to become independent plants. Once rosettes emerge in the spring, remaining root buds slough-off until they develop again in late summer. Additionally, root fragments can develop into new plants.

Russian knapweed is allelopathic, which means it contains a toxic substance that inhibits the growth of competing plants. This weed may also be toxic to horses resulting in serious injury or possibly death of the animal. Russian knapweed displaces native vegetation and reduces forage values on range and pasturelands.

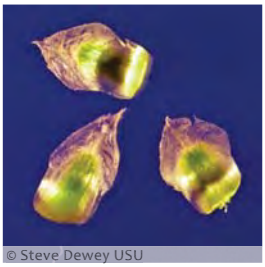
Habitat for Russian knapweed includes roadsides, ditch banks, riparian zones, pastures, rangeland, saline soils, clear cuts, and cropland. It typically invades degraded areas and sites with full sun.

The most effective method of control for Russian knapweed is to prevent its establishment through proper land management. Maintain healthy pastures and rangeland and continually monitor your property for new infestations. If Russian knapweed is already established, using an integrated weed management approach proves to be effective. Russian knapweed can be managed with herbicides or biocontrol insects, but long-term control must include planting competitive plant species to occupy bare ground once infested by the weed. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

2008 Quarter Quad Survey



Russian knapweed is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eliminated, contained, or suppressed depending on the local infestations. For more information, visit www.colorado.gov/ag/weeds and click on the Noxious Weed Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-869-9030.



© Steve Dewey USU

Black, scaly root

Key ID Points

1. Distinguished from other knapweeds by the flower's smooth, papery bracts.
2. Roots are brown to black with scaly appearance.
3. Rosettes and lower leaves deeply lobed.
4. Upper leaves are smaller, smooth margined, and not lobed.

Russian knapweed

Acroptilon repens

List B

Integrated Weed Management Recommendations

Russian knapweed

Acroptilon repens

The most effective control for Russian knapweed is to prevent its establishment through proper land management. An integrated weed management approach can be effective when dealing with Russian knapweed. It can be managed with herbicides or insects, but long-term control must include planting competitive plant species to occupy bare ground once infested by the weed.

CULTURAL

Maintain healthy pastures and prevent bare spots caused by overgrazing. Bare ground is prime habitat for weed invasions. Establishing sod-forming grasses or vegetation with dense shade can be an effective cultural control of Russian knapweed. Contact your local Natural Resources Conservation Service for seed mix recommendations.

BIOLOGICAL

The gall midge, *Jaapiella ivannikovi*, is a fly that lays eggs in the shoot tips of Russian knapweed. It forms galls that reduce flowering, seed production, and stunts the plants' growth. This biocontrol will stress the stand of Russian knapweed but will not likely eliminate it. The Colorado Department of Agriculture - Palisade Insectary, 970-464-7916, is currently establishing this biocontrol . It is not yet available to the public.

MECHANICAL

Mowing several times before the plants bolt stresses Russian knapweed and forces it to use nutrient reserves stored in the root system. However, mowing alone will not eliminate the infestation and it can stimulate shoot sprouting the following year. Mowing combined with a fall herbicide application will enhance control. Tilling and disking can create root fragments that can sprout. However, repeated deep tillage (1 feet) over 3 years can kill much of the root system.

CHEMICAL

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

Herbicide	Rate	Application Timing
Aminopyralid* (Milestone)	7 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply in the fall when above-ground stems die back and root buds are highly susceptible. Can also apply in the bud to senescence stages or in the spring during early bolt before flower buds form.
Aminocyclopyrachlor + Chlorsulfuron (Perspective)*	4-5 oz. product/acre + 1% v/v methylated seed oil	Apply in the fall when above-ground stems die back and root buds are highly susceptible. Can also apply in the bud to senescence stages or in the spring during early bolt before flower buds form. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage. Not for use on grazed or feed forage.
Note: *Product not permitted for use in the San Luis Valley. **This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.		
Additional herbicide recommendations for this and other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Updated:
07/2015

Colorado Department of Agriculture - Conservation Services
305 Interlocken Parkway
Broomfield, CO 80021
(303) 869-9030
www.colorado.gov/ag/weeds

Diffuse knapweed

Colorado Department of Agriculture

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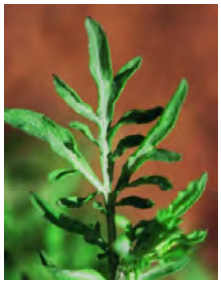


Key ID Points

1. Floral bracts have yellow spines with teeth appearing as a comb and a distrinct terminal spinte.
2. Flowers are white or lavender.
3. Seedlings have finely divided leaves

Updated on:
07/2015

Diffuse knapweed Identification and Management

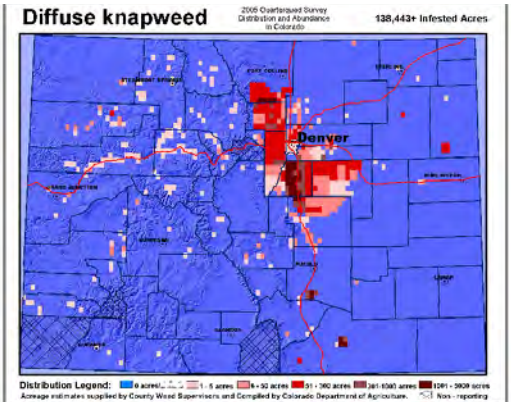
Identification and Impacts

Diffuse knapweed *(Centaurea diffusa)* 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, diffuse knapweed 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. Once the plant dries up, it breaks off at ground level and becomes a tumbleweed which disperses the still viable seeds over long distances. A prolific seed producer, diffuse knapweed can produce up to 18,000 seeds per plant. Therefore, the key to managing this plant is to prevent seed production. Diffuse knapweed can grow 1 to 3 feet tall, and is diffusely branched above ground. This gives the plant a ball-shaped appearance and tumble-weed mobility when broken off. Leaves are small, and are reduced in size near the flowering heads. Flowers are mostly white, sometimes purple, urn-shaped, and are located on each branch tip. Bracts that enclose the flowerheads are divided like the teeth of a comb, and are tipped with a distinct slender spine. Upon drying, the bracts become rough, rendering them injurious to the touch. Flowers bloom July through August. Seed set usually occurs by mid-August.

Diffuse knapweed tends to invade disturbed, overgrazed areas. Other habitats may also include rangeland, roadsides, riparian areas, and trails. It is a tough competitor on dry sites and rapidly invades and dominates disturbed areas. Once established, diffuse knapweed outcompetes and reduces the quantity of desirable native species such as perennial grasses. As a result, biodiversity and land values are reduced, and soil erosion is increased.

The key to effective control of Diffuse knapweed is to prevent the plant from flowering and going to seed. An integrated weed management approach dealing with Diffuse knapweed is highly recommended. There are many options of mechanical, chemical, and biological controls, available. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Diffuse knapweed is designated as a "List B" 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.colorado.gov/ag/csd and click on the Noxious Weed Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division at 303-239-4100.



Plant photo, top © Kelly Uhing. Infestation map above, Crystal Andrews. Flower photo © Cindy Roche. Rosette and leaf photos © Dale Swenarton.

Centaurea diffusa

Management Recomendations

CULTURAL
Establishment of selected grasses can be an effective cultural control of diffuse knapweed. 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
The seedhead weevil (*Larinus minutus*) and the root weevil fly (*Cyphocleonus achates*) provide fair to good control when used in combination with each other. Expect to wait at least 3 to 5 years for the insects to establish and achieve optimum results. This is an option for large infestations. To obtain the insects, contact the Colorado Department of Agriculture, 970-464-7916.

MECHANICAL
Any mechanical or physical method that severs the root below the soil surface will kill diffuse knapweed. Mowing or chopping is most effective when diffuse knapweed 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.

Integrated Weed Management:

Diffuse knapweed is best controlled in the rosette stage. It is imperative to prevent seed production. Do not allow diffuse knapweed flowers to appear. Management must be persistent in order to deplete the seed bank in the soil.

Diffuse knapweed

HERBICIDES : The following are recommendations for herbicides that can be applied to range and pasturelands. Always read, understand, and follow the label directions. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. **The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
Aminocyclopyrachlor + chlorsulfuron (Perspective)*	4.75-8 oz. product/acre + 0.25% non-ionic surfactant	Pre-emergence or from seedling to mid-rosette stage. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage.
Aminopyralid* (Milestone)	5-7 oz./acre + 0.25% non-ionic surfactant	Spring at rosette to early bolt stage and/or in the fall to rosettes. Add 1 qt./acre 2,4-D or 3 oz. Perspective when treating in the bolting to flowering growth stages.
Clopyralid (Transline)	0.67-1.33 pints/acre + 0.25% non-ionic surfactant	Apply to spring/fall rosettes before flowering stalk lengthens. Add 1 qt./acre 2,4-D when treating in the bolting to flowering growth stages.
Note: *Not permitted for use in the San Luis Valley.		
Additional herbicide recommendations for this and other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Weevil photo © J. Johnson, Univ. Idaho, bugwood.org. All other photos © Kelly Uhing.

Spotted Knapweed Identification and Management

List B

Spotted knapweed (*Centaurea stoebe*) is a non-native, short-lived perennial forb that reproduces mainly by seed. A prolific seed producer, spotted knapweed can grow up to 900 seeds per plant annually that are viable for up to 8 years. The key to distinguishing spotted from other knapweeds is the black-tipped, spiny, involucral bracts (phyllaries) at the base of the flower. Unlike diffuse knapweed, it does not have a long, distinct terminal spine at the tip of the bracts. Spotted knapweed can grow up to 3 feet tall on ridged stems that are openly branched on the upper half of the plant. Urn-shaped flowers are solitary on the tip of each branch. Flowers are pink to purple, and rarely white. Leaves on the stem are alternate, deeply lobed, and become smaller and simple near the tips of the stem. Basal rosette leaves are deeply lobed and up to 6 inches long.

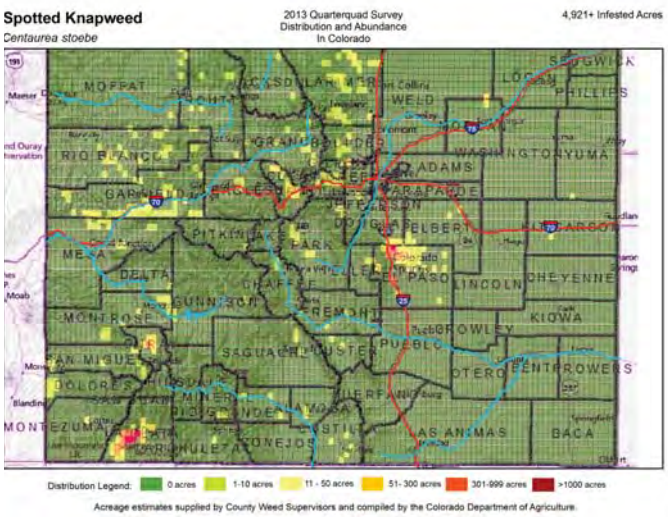
Flowers bloom from June to October and seed-set usually occurs by mid-August. Spotted knapweed can also reproduce vegetatively from lateral roots.

Spotted knapweed tends to invade disturbed, overgrazed areas. It also occurs in grasslands, pastures, foothill clearings, logged areas, roadsides, sandy soils, and floodplains. Since it can tolerate both dry conditions and moist areas it is an especially versatile invader. Spotted knapweed and diffuse knapweed infestations often occur together in Colorado and plants can hybridize. Once established, spotted knapweed reduces livestock and wildlife forage by out-competing native and desirable species.

The most effective method of control for spotted knapweed is to prevent seed production and establishment through proper land management. Maintain healthy pastures, rangeland, and forests; and continually monitor for new infestations. If spotted knapweed is already established, applying an integrated weed management approach is effective. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Spotted knapweed is designated as a "List B" species as described in the Colorado Noxious Weed Act. It is required to either be eliminated, contained, or suppressed depending on the local infestations. For more information please visit www.colorado.gov/ag/weeds and click on the Noxious Weed Program link or call the State Weed Coordinator, Colorado Department of Agriculture at 303-869-9030.

2013 Quarter Quad Survey



Key ID Points

1. Floral bracts have black tips, with comb-like spines of equal length.
2. Flowers are pink to purple, and rarely white.
3. Basal and stem leaves are deeply lobed, but become simple and oblong towards the tips of the stem.

Spotted knapweed

Centaurea stoebe

List B

Integrated Weed Management Recommendations

Spotted knapweed

Centaurea stoebe

Spotted knapweed is best controlled at the rosette stage with mechanical or chemical techniques in the spring and fall. A key goal is to prevent seed production. Management must be intense and persistent in order to deplete the seed bank in the soil.

© Patrick J. Alexander

Hybrid spotted-diffuse knapweed flower

CULTURAL

Bareground is prime habitat for weed invasions. Maintaining healthy pastures and forests, while minimizing disturbance and overgrazing, is crucial. Contact your local Natural Resources Conservation Service for seed mix recommendations.

BIOLOGICAL

Root and seed head weevils (*Cyphocleonus achates* and *Larinus minutus*) attack the roots and reduce seed production in spotted and diffuse knapweeds. This is an option for large infestations, though optimum results take 3-5 years. To obtain the insects, contact the Colorado Department of Agriculture's Insectary in Palisade, Colorado at 970-464-7916.

MECHANICAL

Dig when the soil is moist; remove the root crown, 2-4 inches of taproot, and lateral roots. Digging alone requires several years of multiple treatments within a growing season. Mowing spotted knapweed when flower buds or early flowers are present will stress the plant, but not kill it. Do not mow after seed-set because it can disperse the seeds. Annual cultivation can eliminate spotted knapweed.

CHEMICAL

The table below includes recommendations for herbicides that can be applied to rangeland and some pastures. Always read, understand, and follow the label directions. The herbicide label is the LAW!

Herbicide	Rate	Application Timing
Aminocyclopyrachlor + chlorsulfuron (Perspective)*	4.75-8 oz. product/acre + 0.25% non-ionic surfactant	Pre-emergence or from seedling to mid-rosette stage. IMPORTANT: Applications greater than 5.5 oz. product/acre exceeds the threshold for selectivity. DO NOT treat in the root zone of desirable trees and shrubs. Not for use on grazed or feed forage.
Aminopyralid* (Milestone)	5-7 oz./acre + 0.25% non-ionic surfactant	Spring at rosette to early bolt stage and/or in the fall to rosettes. Add 1 qt./acre 2,4-D or 3 oz. Perspective when treating in the bolting to flowering growth stages.
Clopyralid (Transline)	0.67-1.33 pints/acre + 0.25% non-ionic surfactant	Apply to spring/fall rosettes before flowering stalk lengthens. Add 1 qt./acre 2,4-D when treating in the bolting to flowering growth stages.
Note: *Product not permitted for use in the San Luis Valley.		
Additional herbicide recommendations for this and other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Updated: 07/2015

Colorado Department of Agriculture - Conservation Services
305 Interlocken Parkway
Broomfield, CO 80021
(303) 869-9030
www.colorado.gov/ag/weeds

Hoary cress

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Hoary cress
Identification and Management

Identification and Impacts

Hoary cress *(Cardaria draba),* commonly known as whitetop, is a creeping perennial that is a member of the mustard family and native to Europe. The stems, in the rosette stage, may grow up to 2 inches in height and produce grayish-green leaves that are lance shaped. The leaves are alternate and 3/4 to 4 inches long. The upper leaves have 2 lobes that clasp the stem. The plant has numerous small, white flowers with 4 petals on stalks radiating from a stem. Seed capsules are heart-shaped with two small, flat, reddish brown seeds. One plant can produce from 1,200 to 4,800 seeds. The plants emerge in early spring with stems emerging from the center of each rosette in late April. Hoary cress flowers from May to June and plants set seed by mid-summer.

Habitats for Hoary Cress include: fields, waste places, meadows, pastures, croplands and along roadsides. It is typically found on unshaded, generally open areas of disturbed ground. It generally does better with moderate amounts of precipitation and grows well on alkaline soils.

Key ID Points

1. White flowers.
2. Grows erect 10-24” in height.
3. Leaf is 3/4-4” long with blunt end and fine white hairs.

The key to effective control of Hoary cress is prevention. Preventing the encroachment of these weeds is the most cost-effective management. Preventing invasions by limiting seed dispersal, monitoring and using weed free hay, and quarantine animals that may have grazed in infested areas. Beyond prevention, the key is early detection when infestations are small, and aggressive management. Integrated Weed Management is required for proper control. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Hoary cress is designated as a “List B” species in 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.colorado.gov/ag/weeds and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division.

Photos © Kelly Uhing, Colorado Department of Agriculture; Mark Schwarzlander, University of Idaho, Above map: Crystal Andrews, Colorado Department of Agriculture,

Updated on:
07/2015

Cardaria draba

Management Recommendations

http://www.colorado.gov/ag/weeds

Hoary cress

CULTURAL
Prevent the establishment of new infestations by minimizing disturbance and seed dispersal, eliminating seed production and maintaining healthy native communities. Contact your local Natural Resources Conservation Service for seed mix recommendations. Planting competitive legumes, such as alfalfa, can reduce Hoary cress in crop rotations.

BIOLOGICAL
There is no biological control avaiable for Hoary cress. Since biological control agents take years to research, develop and release, no releases are expected in the foreseeable future. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Mowing several times before the plants bolt stresses Hoary cress and forces the plant to use nutrient reserves stored in the root system. Combining mowing with herbicides will further enhance control of this weed. Mow repeatedly during the summer, then apply a herbicide in the fall.

Integrated Weed Management:

No single treatment provides effective, long term control. The best and first defense is always prevention. Once established, integrate a variety of combinations of competitive planting, crop rotations, and herbicides. This can reduce Hoary cress to manageable levels.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

Herbicide	Rate	Application Timing
Chlorsulfuron* (Telar)	1 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply at flowering. (Early spring to early summer)
Metsulfuron (Escort XP)	1 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply at flowering. (Early spring to early summer)
Imazapic (Plateau, Panoramic)	12 oz./acre + 2 pints/acre methylated seed oil or crop oil concentrate	Apply at late flower to post-flower growth stage. (Late spring to mid-summer)
Note: *This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.		
Additional herbicide recommendations for other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Top to bottom photos, © R. Old, XID Servisces; A. Sparks Jr., University of Georgia; and Kelly Uhing

Colorado State University

CDA CO

Absinth wormwood

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Absinth wormwood
Identification and Management

Key ID Points

1. Absinth is well branched and gets 3 feet tall and 2 feet across.
2. Silver-grey leaves and small yellow flowers.

Identification and Impacts

Absinth wormwood *(Artemisia absinthium)* is native to Eurasia, the Middle East and North Africa. It was introduced to North America in the early 19th century to be cultivated for medicinal use. It was first reported outside cultivated gardens in 1841, along roadsides and waste grounds.

Absinth wormwood is a long-lived perennial that possesses a strong sage odor and bitter taste. Plants grow 2 to 4 feet in height and are prolific seed producers. It has a taproot that can reach 2 inches in diameter and shallow lateral fibrous root branches that can extend up to 6 feet long in all given directions. Plants are woody at the base and regrow from the soil level each spring. The stems are numerous and are covered with fine, gray hairs while the leaves area blue-olive green, alternate and highly divided. Flowers are small, yellowish and arranged in large, spike-like panicles. The seed viability is estimated to be 3 to 4 years and are easily scattered by wind, water, animals, and in hay. The seeds are less than 1/6 inch long, smooth, flattened and light gray.

Habitats for Absinth wormwood include disturbed sites, moist soils, and is also shade tolerant. It can occur in 5,000 to 7,000 feet elevation and is considered a weed in pastureland, cropland, and rangeland. Absinth wormwood is listed as poor palatability in horses, but good for sheep.

The key to effective control of Absinth wormwood is a combination of control methods. Compared to most perennials, it is fairly easy to control with chemicals in combination with mechanical control. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Absinth wormwood is designated as a "List B" species in 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.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

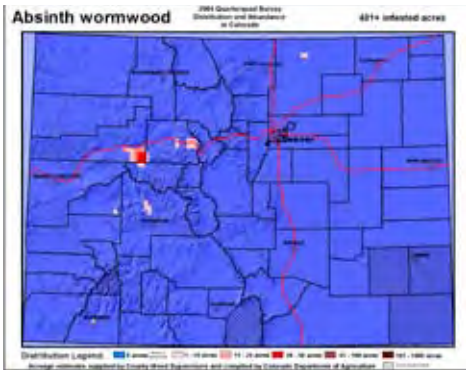


Photo s © Kelly Uhing, Colorado Department of Agriculture; and map above by Crystal Andrews, Colorado Department of Agriculture.

Artemisia absinthium L.

Updated on:
07/2015

Management Recommendations

CULTURAL
Cultural controls are possible in theory, but are very time consuming and expensive. Complete removal of any seedlings or newly established plants by continual hand pulling is also possible.

BIOLOGICAL
There is no biological control available for Absinth wormwood. Since biological control agents take years to research, develop and release, no releases are expected in the foreseeable future. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Hand pull or dig when soil is moist. Make certain to pull all the roots, including short horizontal roots. Bag specimens carefully so as to not scatter seeds if removed during or after flowering. Multiple mowings prior to seed generation can cause stress and may provide a control option.

Integrated Weed Management:

Absinth Wormwood is easily controlled using a combination of methods such as chemical and mechanical.

Compared to most perennials, it is fairly easy to control.

Absinth wormwood

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
Aminopyralid* (Milestone)	7 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply late spring into summer though the flowering growth stage.
Aminopyralid* + Metsulfuron (Opensight)	3.3 oz. product/acre	Apply late spring into summer though the flowering growth stage.
Aminopyralid* + 2,4-D (Forefront HL)	2 pints product/acre	Apply late spring into summer though the flowering growth stage.
Clopyralid (Transline)	0.66 pint/acre	Apply late spring into summer though the flowering growth stage. Provides greater selectivity when applying near trees and shrubs.
Picloram* + 2,4-D (Tordon/Picloram 22K - Restricted use pesticide)	1 pint product/acre + 1 qt./acre 2,4-D	Apply late spring into summer though the flowering growth stage. DO NOT use near trees, desirable shrubs, water, or high water table.
*Product not permitted for use in the San Luis Valley.		
Additional herbicide recommendations for other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Top to bottom photos, © Chris Evans, River to River CWMA, Bugwood.org; Mary Ellen (Mel) Harte, , Bugwood.org; and Richard Old, XID Services, Inc., Bugwood.org.

Dame's rocket

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Key ID Points

1. Flowers are white or purple in color with four petals.
2. Leaves are lanced shaped with toothed margins and 2-4" long.

Updated on:
07/2015

Dame's rocket Identification and Management

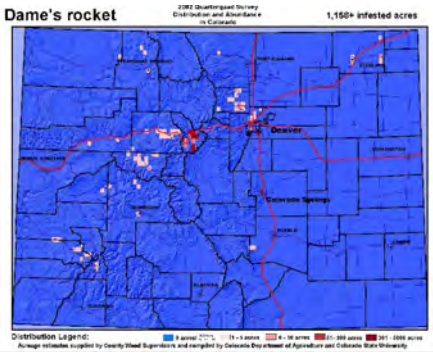
Identification and Impacts

Dame's rocket *(Hesperis matronalis)* is a native Eurasia and is a biennial or short lived perennial forb belonging to the mustard family. The flowers are white to purple with four petals and are clustered in loose terminal stalks. Flowers appear from May to August and the plant can produce seeds and flowers on any flower cluster at the same time. The fruits are long, narrow and cylindrically shaped that contains many seeds. The seeds are small, angular, grooved and dark reddish brown. The seed pods are about 1 ½ inches long and very narrow. Leaves are slightly hairy, alternate, and 2 to 4 inches long. The leaves are lance shaped with toothed margins. A mature plant ranges from 4 inches to 3 feet in height. Dame's rocket has a shallow fibrous root system.

Habitats for Dame's rocket include: gardens, partly shaded woodlands, ditches, roadsides, pastures, rangelands, thickets, open woods, disturbed sites, and other areas that have moist well drained soils and full sun to light shade. Many people think that it is a native wildflower and is planted as a garden ornamental, however; the plant quickly escapes cultivation due to its prolific seed production. It is often sold in "native wildflower" mixes, so please be sure to check the contents of "native wildflower" seed mixes and do not plant those that carry Dame's rocket.

The key to effective control of Dame's rocket is prevention. Locate and remove plants immediately before plants set seed to prevent the spread of Dame's rocket. Since the plant reproduces solely by seed, integrated management efforts must include the elimination of seed production and depletion of seed bank. Combing control methods of herbicide and mechanical can be effective. Mechanical methods include removal of rosettes, and removal of seed heads from any plants that have bolted to prevent seed dispersal. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Dame's rocket is designated as a "List B" species in 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.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Photos © Clockwise from lower left: Richard Old, XID Services Inc., Bugwood.org; dnr.state.wi.us; Tom Heutte, USDA Forest Service, Bugwood.org; Kelly Uhing, Colorado Department of Agriculture; and map above by Crystal Andrews, Colorado Department of Agriculture.

Hesperis matronalis

Management Recommendations

Dame's rocket

CULTURAL
Prevent the establishment of new infestations by minimizing disturbance and seed dispersal, eliminating seed production and maintaining healthy native communities. Contact your local Natural Resources Conservation Service for seed mix recommendations.

BIOLOGICAL
There is no biological control available for Dame's rocket. Since biological control agents take years to research, develop and release, no releases are expected in the foreseeable future. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Hand pull or dig when soil is moist, making sure to get the roots to prevent resprouting. Removing flowers before the plant sets seed will also be effective. Be sure to bag specimens carefully so the spread of seeds does not occur.

Integrated Weed Management:

Locate and remove plants immediately before plants set seed to prevent the spread of Dame's rocket. Since the plant reproduces solely by seed, integrated management efforts must include the elimination of seed production and depletion of seed bank. Combing control methods such as herbicide and mechanical can be effective.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
Chlorsulfuron* (Telar)	1 oz. product/acre + 0.25% non-ionic surfactant	Apply when plant is in rosette or bolting growth stage. (Early spring)
Metsulfuron (Escort XP)	1 oz. product/ acre + 0.25% non-ionic surfactant	Apply when plant is in rosette or bolting growth stage. (Early spring)
Imazypic (Plateau)	9 to 10 oz./acre + 2 pint/acre methylated seed oil	Apply in the late flower growth stages. (Late spring to fall)
Note: *This herbicide has residual soil activity that will affect all broadleaf seedlings germinating after application has occurred.		
Additional herbicide recommendations for other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Sulfur cinquefoil

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Key ID Points

1. Seeds coated with net-like pattern.
2. Light yellow flowers with 5 petals.
3. Long, right-angled hairs on the leafstalks and stems

Updated on:
07/2015

Sulfur cinquefoil
Identification and Management

Identification and Impacts

Sulfur cinquefoil (*Potentilla recta*) is a perennial forb that is native to Eurasia. The flowers are pale yellow with 5 heart-shaped petals and are slightly longer than the 5 enclosing green sepals and 5 small bracts. Sulfur cinquefoil's flowers appear from May to July with peak flowering generally occurring in late June. Each flower produces numerous small seeds that are slightly flattened and 1.3 mm long. The seeds are comma-shaped, brownish-purple in color and covered with a net-like pattern of veins. Seeds remain viable in the soil for at least three years. Leaves are numerous, alternate and compound with 5 to 7 leaflets having toothed edges. Leafstalks have conspicuous perpendicular hairs and leaves appear green on the underside. The erect stems are single to several, with few (or none) slender branches and are 12 to 28 inches in height that grow from well developed rootstock. The plant has a single taproot and may have several shallow, spreading branch roots but no rhizomes.

Sulfur cinquefoil is unpalatable to grazing animals and is avoided for the most part. The low preference is believed to be a result of a high concentration of phenolic tannins (acidity) in the leaves and stems. The plant has a long life span and twenty year old plants are not uncommon.

Habitats for Sulfur cinquefoil include: open grasslands, shrubby areas, open forest and logged areas, roadsides, clear cuts, waste areas, abandoned fields, and other disturbed sites. This plant is now becoming common in areas such as natural grasslands, shrubby areas, and open canopy forests. Sulfur cinquefoil grows on dry sandy, gravelly, and rocky soils, and prefers climates that receive from 13 to 50 inches of mean annual precipitation.

The key to effective control of Sulfur cinquefoil is an integrated weed management approach. Properly identifying sulfur cinquefoil is imperative, since it resembles the native cinquefoils. Hand pulling or digging when infestations are small and the soil is moist, is effective. What has proven to be the most effective control method for Sulfur cinquefoil, has been the use of selective herbicides. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Sulfur cinquefoil is designated as a "List B" species in 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.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Photos © Kelly Uhing, Colorado Department of Agriculture.

Potentilla recta

Management Recommendations

CULTURAL
Increasing the competitiveness of native species can assist in preventing establishment of Sulfur cinquefoil. Contact your local Natural Resources Conservation Service for seed mix recommendations. Bareground is prime habitat for weed invasions.

BIOLOGICAL
Biocontrol species have been used in trials, since Sulfur cinquefoil is similar to strawberries though, the insects used are considered pests. For more information, contact the Colorado Department of Agriculture's Insectary in Palisade, Colorado at 970-464-7916.

MECHANICAL
Mowing is not effective, as new shoots will replace the cut steams. Hand dig or pull when soil is moist is effective on small infestations. Be sure to dig up as much of the root system as possible, especially since root fragments can produce new plants.

Integrated Weed Management:

Sulfur cinquefoil is a competitive weed that uses its early emergence to establish itself and push out desirable vegetation. It is not a serious problem in cropland because it does not tolerate frequent plowing. Small infestations can be controlled by hand pulling, but larger stands are commonly controlled with herbicide. Management programs for sulfur cinquefoil should focus on improving the competitiveness of other more desirable species, and preventing the spread of this weed.

Sulfur cinquefoil

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasture-lands. *Rates are approximate and based on equipment with an output of 30 gallons per acre.* **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

Herbicide	Rate	Application Timing
Aminopyralid* (Milestone)	5-7 oz. product/acre + 0.25-0.5% v/v non-ionic surfactant	Spray rosettes to pre-bud growth stage. (Late spring to early summer)
Metsulfuron (Escort XP) + Aminopyralid* (Milestone)	1 oz. Escort XP/acre + 5-7 oz. Milestone/acre + 0.25% v/v non-ionic surfactant	Spray rosettes to pre-bud growth stage. (Late spring to early summer)
Picloram* (Tordon/Picloram 22K - Restricted use pesticide)	1 pint/acre + 0.25-0.5% v/v non-ionic surfactant	Spray rosettes to pre-bud growth stage. (Late spring to early summer) DO NOT use near trees, desirable shrubs, water, or high water table.
Note: *Products not permitted for use in the San Luis Valley. **These products are non-selective and will kill any vegetation contacted. IMPORTANT: Treat weeds before desirable perennials have emerged. Glyphosate has no soil activity.		
Additional herbicide recommendations for this and other species can be found at: www.colorado.gov/agconservation/CSUHerbicideRecommendations.pdf		

Above photos © (Top & Bottom): State of Washington, King County Noxious Weed Program; (Middle) Whitney Cranshaw, Colorado State University, Bugwood.org.

Common mullein

Verbascum thapsus

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

(303) 869-9030
weeds@state.co.us

Key ID Points

Updated on:
08/09

Identification and Management

Identification and Impacts

Common mullein (*Verbascum thapsus*) is a biennial forb native to Europe and Asia. The first year of the plant it produces a basal rosette. Basal rosettes can grow to 30 inches in diameter. The leaves are light-green in color and are covered in fine soft hairs. The woolly leaves are alternate and overlapping each other and can grow over a foot long. In spring of the second year the plant bolts an erect stem, that grows 2 to 6 feet tall. The flowers of the plant are borne in terminal spikes. These terminal spikes may reach up to 20 inches in length. The flowers are sulfur-yellow in color and have five petals. The flowers range from 3/4 of an inch to 1 1/2 inches in diameter. Numerous two chambered fruits produce 100,000 to 250,000 seeds per plant. Flowering and seed production typical occur from June to August. The plant has a deep taproot along with a fiberous root system.

Habitats for Common mullein are roadsides, waste places, right-of-ways, pastures, hay fields, and abandoned lands. It prefers gravelly soil types, but can grow in other soil types. Livestock will avoid eating Common mullein, due to the hairy leaves of the plants. The plants were originally introduced as a medicinal plant. The Europeans used the flowers for tea, and the leaves for many remedies like burns and rashes. Both the Europeans and the Indians smoked the dried leaves to treat bronchitis.

The key to effective control of Common mullein is preventing the production of seeds. This plant is difficult to control due to the large amount of seed produced and seed bank left in the soil. Mechanical, cultural, biological and chemical treatments can be successful if utilized together in an integrated weed management plan. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Common mullein is designated as a "List C" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local jurisdictions managing this species. For more information, visit www.colorado.gov/ag/weeds or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Photos © All Photos from Kelly Uhing, Department of Agriculture; Except Bottom left Mary Ellen (Mel) Harte, United States

Management Recommendations

Common mullein

CULTURAL
Cultural control can be effective in assistance with other treatment options. Once the parent plants have been removed, cultivating the area with desirable grasses and forbs may outcompete Common mullein seedlings. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes.

BIOLOGICAL
Gymnetron tetrum, a seed eating weevil, biological control has been found in eastern Washington State and is currently working on populations there. The weevil has not yet been approved for use in Colorado. Contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916 for more information.

MECHANICAL
Hand pull or dig when soil is moist, prior to flowering and seed production can be effective. If flowers are present, bag specimens carefully so as not to scatter any potential seeds. The key to effective control is to prevent seed production and/or spread.

Integrated Weed Management:

Preventing the establishment and the seed production of Common mullein is key to controlling populations. If the population is established, using a combination of cultural, chemical, biological and mechanical treatments can aid in suppressing population size. Since plants produce thousands of seed treatments need to occur over an extended period of time.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
Chlorsulfuron (Telar XP)	1-3 oz/acre	Apply to rosette stages in spring or fall prior to bolting. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.
2,4-D Picloram (Grazon P+D *this is a Restricted Use Pesticide*)	4 pts/acre	Apply to rosette stages in spring or fall prior to bolting. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water. DO NOT apply near trees/shrubs/high water table.
Picloram (Tordon 22K *this is a Restricted Use Pesticide*)	1-2 qts/acre	Apply to rosette stages to early growth stages in spring or fall. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water. DO NOT Apply near trees/shrubs/high water table.
Metsulfuron (Cimmaron)	1.0 oz/acre	Apply to rosette stages in spring or fall. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.

Photos © Top to Bottom; Kelly Uhing, Colorado Department of Agriculture; Whitney Cranshaw, Colorado State University, Bugwood.org; Kelly Uhing, Colorado Department of Agriculture

Poison hemlock

Colorado Department of Agriculture

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Poison hemlock
Identification and Management

Identification and Impacts

Poison hemlock *(Conium maculatum)* is an erect biennial weed that is native to Europe. The plant typically grows 4 to 8 feet tall and has smooth, hallow stems that are rigid and have distinct purple spots. The plant has shiny green leaves that are pinnately compound, multi-stemmed and have a fern like appearance. The leaves are lacy, resembling parsley and have a musty odor when crushed. The first year the plant usually forms a large rosette. The second year the plant bolts a large stem, flowers and then dies. The flowers have 5 petals, clawed, notched (1 to 1.5 mm long) and are white, umbrella-like clusters at the end of the branch. They appear from June to July. The fruit matures in August-September and is flat, small and grayish-green in color.

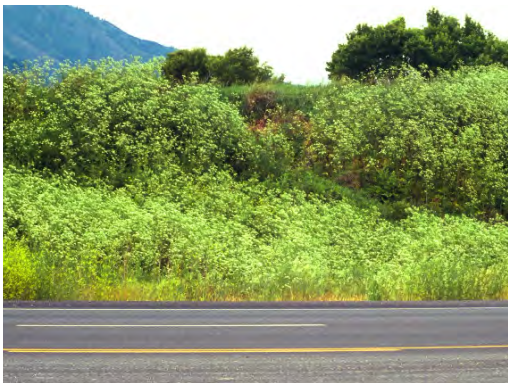
Habitats for Poison hemlock include streams, rivers, irrigation and roadside ditches, crop and pasturelands, as well as disturbed sites. All parts of the plant are poisonous, they contain alkaloids. Animals do not eat the plant, unless food is scarce. Ingestion of 0.25-0.30% of an animals body weight is lethal. Poisoning of humans has occurred, the plant can easily be confused with members of the carrot family. Consumption in large quantities can be fatal.

The key to effective control of Poison hemlock is prevention and containment. Identified early enough, pulling the taproot when soil is moist can be an effective control method. When plants are already present, containment using herbicides is crucial. Other herbicide control methods include spraying plants in the rosette stage in early spring or late fall. Mechanical treatments are also effective, depleting root reserves and reducing seed production, with repeat mowings. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Poison hemlock is designated as a "List C" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local jurisdictions managing this species. For more information, visit www.colorado.gov/ag/weeds or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Key ID Points

1. Fern-like shiny green leaves.
2. Smooth, hallow stems that are rigid and have purple spots.



Photos © Clockwise from lower left: Ohio State Weed Lab Archive, Ohio State University, Bugwood.org; Unknown; Unknown; Richard Old, XID Services, Inc., Bugwood.org; and Steve Dewey, Utah State University, Bugwood.org.

Updated on: 08/09

Conium maculatum

Poison hemlock

Management Recommendations

CULTURAL
Broadcast seeding or "no-till" drill seeding can be effective by helping out compete hemlock. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes.

BIOLOGICAL
The hemlock moth (Agonopterix alstroemericana) larvae feed on leaves, young stem tissue, flowers, and seeds causing severe defoliation and death of the plant. Contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916 for more information.

MECHANICAL
Hand pull or dig when soil is moist, but make sure to wear gloves. Bag specimens carefully so as not to scatter seeds. The key to effective control is to prevent seed production and/or spread.

Integrated Weed Management:

Integrated management approaches have not been an approved method of control concerning Poison hemlock. Even though it has not been a proven method, does not mean that it is ineffective. Using a combination of biological and herbicide treatments may be successful in combating Poison hemlock. Adding the promotion of desirable plants to help out compete the infestation of Poison hemlock may assist with control as well.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. Always read, understand, and follow the label directions. The herbicide label is the LAW!

HERBICIDE	RATE	APPLICATION TIMING
2,4-D (4 lb ai/gallon)	2 qt/ac. + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette to early bolting growth stages. (36 inches tall or less)
Grazon P+D	2 qt/ac. + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette to early bolting growth stages. (36 inches tall or less)
Escort	1 oz product/ac. + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette to early bolting growth stages.
Telar	1 oz product/ac. + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette to early bolting growth stages.

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