City of Alamosa

NOXIOUS WEED

MANAGEMENT PLAN

April 29, 2016

City of Alamosa

Noxious Weed Management Plan

"The governing body of each municipality in the state shall adopt a noxious weed management plan for all lands within the territorial limits of the municipality. In addition to and independent of the powers elsewhere delegated by law, the governing body of a municipality may adopt and provide for the enforcement of such ordinances, resolutions, rules, and other regulations as may be necessary and proper to enforce said plan and otherwise provide for the management of noxious weeds within the municipality...." Colorado Noxious Weed Act (§ 35-5.5-106 (2008))

APPENDICES

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1.0 INTRODUCTION

1.1 The Weed Problem

The health and productivity of our natural plant communities are being threatened by the introduction of numerous invasive noxious weeds. These plants displace native vegetation and important wildlife forage, disrupt native hydrology, alter soil chemistry, and disturb the overall ecological balance of native habitats. They are also an agricultural pest, crowding out desirable crops and requiring immense investments in time, money, and materials to control. Roadsides, ranchland, open space, housing developments, industrial sites, private property, and Municipal, County, State, and Federal lands are all affected.

1.1.1 Several million acres of Colorado are infested with invasive non-indigenous plants that are continuing to spread to uninfested lands and increase in abundance. For this reason, the noxious weed problem is of concern not only to the rural and agricultural community, but also to urban communities, small landowners, recreational land users, and public land managers.

1.1.2 A number of these species, designated as state noxious weeds, aggressively invade or are detrimental to economic crops or native plant communities, are poisonous to livestock, are carriers of detrimental insects, diseases, or parasites, or are detrimental, directly or indirectly, to the environmentally sound management of natural or agricultural systems.

1.1.3 Noxious weeds are a present threat to the economic and environmental value of the lands of the state of Colorado and it is a matter of statewide importance that the governing bodies of counties and municipalities manage such weeds in a coordinated manner across the state. Lack of such coordination makes weed management efforts unnecessarily costly and limits the effectiveness of public and private efforts to control such noxious weeds.

1.1.4 By eradicating rare noxious weed species quickly (List A), these species can be prevented from establishing permanent populations in Colorado from which they will spread to harm the agricultural and environmental values of the lands of Colorado.

1.1.5 It is important that local governing bodies and affected landowners apply integrated management techniques that will achieve the specified management objectives, particularly for eradication. Some techniques are more effective than others (prescribed) and some techniques are likely to be ineffective or contribute to the spread of the weed species (not prescribed). Prescribing integrated management techniques to achieve specified management objectives will help landowners achieve management objectives such as eradication in a timely manner while limiting environmental damage, effort, and cost.

1.1.6 By stopping the spread of well-established species (List B), the values of non-infested lands for agriculture or the environment can be protected and the costs of land management to private and public landowners can be limited or reduced.

1.1.7 By educating the public about improved management for widespread species (List C), the harm associated with these species can be reduced and such efforts can be made more cost-effective for many citizens.

1.1.8 The absence of rules to implement a coordinated effort to manage noxious weeds results in increased management costs to public and private interests, a reduction in the

effectiveness of individual efforts, and the continued loss of agricultural and environmental values to the invasion of noxious weeds. *(Appendix A)*

1.2 Enactment Authority

In an effort to address the statewide threat of noxious weeds, the Colorado State Legislature passed the:

- Colorado Noxious Weed Act (C.R.S. 35-5.5-101 et seq.) ("The Act") *(Appendix B)*
- Rules Pertaining to the Administration and Enforcement of the Colorado Noxious Weed Act (8 CCR 1206-2) ("The Rules") *(Appendix C)*
- In an effort to address the requirements in the Act and the Rules, Council enacted: Resolution 5-2015, establishing the City of Alamosa Noxious Weed Advisory Board *(Appendix D)*
- City Ordinance, Chapter 14, Article III *(Appendix E)*

1.3 Colorado Noxious Weed Act Requirements

The Colorado Noxious Weed Act (Colorado Revised Statutes 35-5.5) was originally signed into law in 1991 and amended in 1996 and 2003. Also referred to in the document as the 'ACT', it directs the governing body of each municipality in the State to adopt a Noxious Weed Management Plan for all land within the territorial limits of the municipality (CRS 35-5.5-105). The 'ACT' further directs each municipality to appoint a local Weed Advisory Board whose power and duties are as follows:

Local advisory boards shall have the power and duty to:

- *Develop a recommended management plan for the integrated management of designated noxious weeds and recommended management criteria for noxious weeds within the area governed by the local government and governments appointing the local advisory board. The management plan shall be reviewed at regular intervals but not less often than once every three years by the local advisory board. The management plan and any amendments made thereto shall be transmitted to the local governing body for approval, modification, or rejection.*
- *Declare noxious weeds and any state noxious weeds designated by rule to be subject to integrated management.*
- *Recommend to the local governing body that identified landowners be required to submit an individual integrated management plan to manage noxious weeds on their property.*

The Colorado Department of Agriculture has developed 'Rules' pertaining to the 1996 'ACT'; and has adopted new 'RULES' (8 CCR 1206-2) each year since 2003 for the administration and enforcement of the 'ACT'.

1.4 Plan Purpose, Jurisdiction, and Scope

1.4.1 The purpose of the City of Alamosa Noxious Weed Management Plan is to protect effectively against certain undesirable plants, primarily non-native invaders which constitute a threat to the continued economic and environmental value of lands in the City. These species must be managed on private and public lands, using integrated management techniques which are least damaging to the environment and

which are practical and economically reasonable. In establishing a coordinated program for the integrated management of noxious weeds, it is the City's intent to encourage and require all appropriate and available management methods consistent with the noxious weed management objectives and plans mandated by the State.

1.4.2 This Plan shall apply to all public and private lands within the Alamosa city limits. It is the duty of all persons to use integrated methods to manage noxious weeds through the implementation of appropriate management plans, if such weeds are likely to be materially damaging to the land of neighboring landowners.

1.5 Definitions

The following definitions shall apply to the terms used in this WMP:

Act: the Colorado Noxious Weed Act, Article 5.5 of Title 35, C.R.S., as amended.

Adjacent: meeting or touching at some point, or having nothing of the same kind intervening.

Alien Plant: a plant species which is not indigenous to the State of Colorado,

Annual weed: a weed that lives for one year then dies. Seeds are the primary dispersal mechanism for annual plants.

Biennial weed: a weed that has a two year life cycle. It germinates and grows leaves one year, then sends up a flower stalk and sets seed the following year. Seeds are the primary dispersal mechanism for annual plants.

Biocontrol agent: a living creature that is used to control undesirable pests. Includes insects, diseases, and vertebrate animals.

Biological Management: the use of an organism to disrupt the growth of noxious weeds.

Bolting: a stage in the life cycle of a plant when it sends up a flower stalk

Chemical Management: the use of herbicides to disrupt the growth of noxious weeds.

Code Enforcement Officer: city employee who ensures City codes and ordinances are adhered to. The person(s) appointed or designated to enforce the provisions of this WMP.

Colorado Noxious Weed Act: the Act, as defined above.

Commissioner: the Commissioner of the Colorado Department of Agriculture or the Commissioner's designee.

Compliance Waiver: a written exemption granted by the Commissioner to the County or a landowner that releases the County and/or landowner from certain obligations to eradicate a specific population of List A or List B noxious weed species.

Containment: see "Management Objective," below.

Council: the Alamosa City Council.

County: the County of Alamosa.

Cultural Management: those methodologies or management practices conducted to favor the growth of desirable plants over noxious weeds, including but not limited to maintaining an optimum fertility and plant moisture status in the area, planting at optimum density and spatial arrangement in the area, and planting species and eco-types most suited to the area.

Department: the Colorado Department of Agriculture.

Eradication: see "Management Objective," below.
Escaping Ornamental Plants: exotic horticultural plant species which invade other lands, becoming an ecological or economic nuisance to the present management goals of those lands.
Extension Agent: the agent in the Colorado State University Cooperative Extension office who provides weed education to the public and may assists in the development of individual noxious weed management plans.
Federal Agency: each agency, bureau, or department of the federal government responsible for administering or managing federal land.
Geographic Information Systems (GIS): a method used to map weed infestations using satellite technology (Geographic Positioning System or GPS) coupled with on-the-ground observations and computer mapping programs to determine the extent and severity of an infestation and to track the effect of weed management practices.

Glyphosate: Non-selective active ingredient of herbicides such as Round-Up.

Infestation: a spreading or swarming in or over in a troublesome manner.
Infested Acreage: an area of land containing a noxious weed species, defined by the actual perimeter of the infestation delineated by the canopy cover of the plants, and excluding areas not subject to infestation.
Integrated Weed Management (IWM): the planning and implementation of a coordinated program uses a variety of effective tools to manage noxious weeds. The purpose is to achieve specified management objectives and promote desirable plant communities. Elements of an IWM plan include weed identification, education, prevention, cultural practices, mechanical removal, chemical use, and biological control.
Inspector: Code Enforcement Officer
Invasive Ornamental: A plant originally intended for horticultural or landscape situations that has escaped its intended boundaries and is capable of invading a plant community and creating a monoculture.
Landowner: any owner of record of federal, tribal, state, county, municipal, or private land and includes an owner of any easement, right-of-way or estate in the land.
List A Noxious Weed Species: rare noxious weed species that are subject to eradication wherever detected statewide in order to protect neighboring lands and the state as a whole.
List B Noxious Weed Species: noxious weed species with discrete statewide distributions that are subject to eradication, containment, or suppression in portions of the state designated by the Commissioner in order to stop the spread of these species.
List C Noxious Weed Species: widespread and well-established noxious weed species for which the Commissioner recommends but does not require management, although the Board may in its discretion require management.
Noxious Weed Advisory Board: as established by City Council through Resolution 5-2015 (Appendix C) to fulfill the role of the local advisory board under the Act to advise on matters of noxious weed program direction.
Local Noxious Weed: any weed of local importance in the City which has been declared a noxious weed by the Board.

Management: any activity that prevents a plant from establishing, reproducing, or dispersing itself.
Management Objective: the specific, desired result of integrated management efforts including:
"Eradication/Elimination," which means reducing the reproductive success of a noxious weed species or specified noxious weed population in largely uninfested regions to zero and permanently eliminating the species or population within a specified period of time. Once all specified weed populations are eliminated or prevented from reproducing, intensive efforts continue until the existing seed bank is exhausted.
"Containment," which means maintaining an intensively managed buffer zone that separates infested regions, where suppression activities prevail, from largely uninfested regions, where eradication activities prevail.
"Suppression," which means reducing the vigor of noxious weed populations within an infested region, decreasing the propensity of noxious weed species to spread to surrounding lands, and mitigating the negative effects of noxious weed populations on infested lands. Suppression efforts may employ a wide variety of integrated management techniques.
"Restoration," which means the removal of noxious weed species and reestablishment of desirable plant communities on lands of significant environmental or agricultural value in order to help restore or maintain said value.
Management Plan: a noxious weed management plan developed by the Board, using integrated management techniques, methods or practices.
Mechanical Management: those methodologies or management practices that physically disrupt plant growth, including but not limited to tilling, mowing, burning, flooding, mulching, hand-pulling, grazing and hoeing.
Municipality: a local governing body as set forth in C.R.S. Section 31-1-101(6).
Native Plant: a plant species which is indigenous to the State.
Neighboring: a property with a boundary immediately adjacent to the boundary of another property
Noxious Weed: an alien plant or parts of an alien plant that have been designated by State rule as being noxious or have been declared a noxious weed by the Board, and meets one or more of the following criteria:

- aggressively invades or is detrimental to economic crops or native plant communities;
- is poisonous to livestock;
- is a carrier of detrimental insects, diseases, or parasites;
- has a direct or indirect detrimental effect on the environmentally sound management of natural or agricultural ecosystems.

Noxious Weed List: a list of noxious plant species recommended by the Noxious Weed Advisory Board and approved by the Board of County Commissioners that are to be managed by landowners within the County.
Noxious Weed Management: the planning and implementation of an integrated program to manage noxious weed species.
Occupant: see "Person," below.
Perennial weed: a weed that lives for 3 or more years. These species usually spread by root systems or root pieces, as well as seeds.

Person: an individual, partnership, corporation, association, or federal, state, or local government or agency thereof owning, occupying, or controlling any land, easement, or rights-of-way, including but not limited to any city, county, state, or federally owned and controlled highway, drainage or irrigation ditch, spoil bank, borrow pit, gas and oil pipeline, high voltage electrical transmission line, or rights-of-way for a canal or lateral.

Plant growth regulator: means a substance used for controlling or modifying plant growth processes without appreciable phototoxic effect at the dosage applied.

Population: a group of designated noxious weeds of the same species occupying a particular geographic region and capable of interbreeding.

Propagule: a part of a plant (such as a cutting, seed, or spore) that serves to propagate the plant (i.e., causes or allows the plant to reproduce).

Restoration: see "Management Objective," above.

Rhizome: An elongated subterranean plant stem that produces shoots above and roots below, and is distinguished from a true root in possessing buds, nodes, and scale-like leaves.

Rosette: A cluster of leaves growing in crowded circles from a common center or crown, usually at or close to the ground.

State: the State of Colorado.

State Noxious Weed: any noxious weed identified by the Commissioner by rule after notifying and consulting with the State Noxious Weed Advisory Committee. Such weeds may be referred to herein as "State A List," "State B List" or "State C List" weeds depending upon their designation as such by the commissioner pursuant to the terms of C.R.S. section 35-5.5-108. The current list of noxious weeds can be found at http://www.colorado.gov/cs/Satellite/ag_Conservation/CBON/1251618874438.

State Noxious Weed Advisory Committee: A committee of 15 members appointed by the Commissioner to make recommendations on the designation of noxious weeds and to carry out related functions as specified in Section 35-5.5-108.7 of the Act.

State Weed Coordinator: a person within the Division of Plant Industry of the State Department of Agriculture whom the Commissioner designates to, among other functions, provide guidance to and coordinate with local government weed managers, such as the County Land Stewardship Manager, as provided for in Section 35-5.5-117 of the Act.

Suppression: see "Management Objective," above.

Undesirable plant: means a noxious plant species that is designated as undesirable by this article, the commissioner or by the weed advisory board.

Undesirable plant management: means the planning and implementation of an integrated program to manage undesirable plant species.

Weed: any undesirable plant.

Weed Management Plan (WMP): the City of Alamosa Noxious Weed Management Plan,

2.0 Colorado Noxious Weed List

2.1 A, B, and C Listings (Appendix F)

The State of Colorado has designated 78 plants as Noxious Weeds, and has categorized them into three lists based on priority for management in Colorado. These lists have been named Lists A, B, and C. Most simply put:

- List A plants are newly arrived and/or less common in Colorado and must be eradicated from all lands in the State.
- List B includes plants whose continued spread in Colorado should be halted.
- List C plants are those for which local governments have authority to decide the management strategy.

The purpose of such categorization is to guide the State and local governments in developing Management Strategies for each weed. The Management Strategy of a particular weed in an area may be one of the following:

- Eradication (complete elimination of all populations of a weed)
- Containment (confinement of populations of a weed to a defined area)
- Suppression (attempt to limit the vigor and spread of populations within a region)

All List A species have been designated by the Colorado Commissioner of Agriculture ("the Commissioner") for eradication. This means that it is a violation to allow any List A species to produce seed or develop other reproductive means such as roots, shoots and runners. Many List A weeds are not yet present in Colorado, but have become a problem in neighboring states. Others are present in small isolated populations. It is the intent of the Commission to eliminate these species before they become widespread. The Rules allow the local governing authority to file for a compliance waiver if it is determined that eradication is not a practical management objective for specific populations.

List B weed species may be designated for eradication, suppression, or containment, depending on the extent of their presence in a particular county. The local Management Strategy for each List B species in each county is determined by the Commissioner (in consultation with the State Noxious Weed Advisory Committee, local governments, and other interested parties). From these local Management Strategies, the Commissioner develops a State-wide noxious weed management plan for each List B species. This Plan is designed to stop the continued spread of List B species, making it a violation to allow any List B species to spread into any un-infested area.

Local governments are left to decide whether to require management of List C weed species, and, if so, whether the Management Strategy will be Eradication, Containment, or Suppression. State Management Plans for List C weed species developed by the Commissioner are designed to support the weed management efforts of local governing bodies. The goal of such plans is not to stop the continued spread of these species. Rather, they are meant to provide additional education, research, and biological control resources to jurisdictions that choose to require management of List C species.

2.2 Watch List (Appendix F & G)

Weed species that have been determined to pose a potential threat to the agricultural productivity and environmental values of the lands of the state. The Watch List is intended to serve advisory and educational purposes only. Its purpose is to encourage the identification and reporting of these species to the Commissioner in order to facilitate the collection of information to assist the Commissioner in determining which species should be designated as noxious weeds.

3.0 Targeted Noxious Weeds in the City of Alamosa

Weeds covered under this plan are all included in the state noxious weed list designated by rule. Considering the Alamosa County Noxious Weed Plan (#) and data compiled by the CDA (*) (Appendix H & I), the following noxious weeds will receive priority for control:

3.1 A-List Species:

3.1.1	Cypress Spurge *	Eliminate

3.2 B-List Species:

3.2.1	Black henbane #	Eliminate prior to seed development by 2018
3.2.2	Bouncingbet *	Eliminate prior to seed development by 2016
3.2.3	Canada thistle *#	Contain/Suppress
3.2.4	Common tansy *	Eliminate prior to seed development by 2016
3.2.5	Eurasian watermilfoil *	Suppress
3.2.6	Hoary cress (white top) *#	Contain/Suppress
3.2.7	Leafy spurge *#	Suppress
3.2.8	Musk thistle *	Eliminate prior to seed development by 2015
3.2.9	Perennial pepperweed *#	Suppress
3.2.10	Russian knapweed *#	Suppress
3.2.11	Russian olive *	Suppress
3.2.12	Salt cedar (tamarisk) *	Suppress
3.2.13	Spotted/hybrid knapweed *	Eliminate prior to seed development by 2020
3.2.14	Wild caraway *	Eliminate prior to seed development by 2016

3.3 C-List Species:

3.3.1	Downy brome #	Contain
3.3.2	Field bindweed #	Contain
3.3.3	Puncturevine	Contain
3.3.4	Quackgrass #	Contain

3.4 Additional weeds to consider:

3.4.1	Kochia	Contain

3.5 Staff Priorities

Infestations of some noxious weeds and infestations in certain areas are deemed to be more significant than others and are ranked accordingly. The goals for high priority noxious weed infestations are to stop the spread of noxious weeds in relatively non-infested parts of the City and to eradicate weeds that are not yet abundant. Eradication is

highly likely and highly desirable for weeds listed as high priority. Species listed as medium priority weeds may or may not occur within the City limits. These species are candidates for suppression and control, but not necessarily eradication. Low priority weeds occur in large, widespread infestations or are widespread in certain parts of the City. At best these weeds can be prevented from spreading to non-infested areas and may be controlled or managed on a case-by-case basis *(Appendix J)*.

3.5.1 High

3.5.1.1 Black henbane
3.5.1.2 Canada Thistle
3.5.1.3 Cypress Spurge (List A)
3.5.1.4 Musk Thistle
3.5.1.5 Hoary Cress
3.5.1.6 Leafy spurge
3.5.1.7 Perennial Pepperweed
3.5.1.8 Russian Knapweed

3.5.2 Medium

3.5.2.1 Bouncingbet
3.5.2.2 Common tansy
3.5.2.3 Eurasian watermilfoil
3.5.2.4 Field bindweed
3.5.2.5 Puncturevine
3.5.2.6 Spotted/hybrid knapweed
3.5.2.7 Wild caraway

3.5.3 Low

3.5.3.1 Downy brome
3.5.3.2 Kochia
3.5.3.3 Quackgrass
3.5.3.4 Russian olive
3.5.3.5 Salt cedar

4.0 Noxious Weed Management Approaches

City of Alamosa Weed Management prefers an integrated approach to weed management. An integrated approach implements cultural, mechanical, biological, and chemical control methods. Different species of noxious weeds grow or spread differently so not all methods will be effective on all weeds. Colorado's Noxious Weed Act requires that certain methods of control be used depending on the level of control that is mandated. Utilizing a variety of methods helps prevent chemical-resistant weeds, decreases "bare ground" situations, and allows for weed control efforts tailored to each individual site or scenario.

4.1 Cultural and Mechanical Control: First and foremost, good land management is always encouraged to prevent an invasion. The key is to create conditions favorable for desirable plants, thus increasing competition for undesirable noxious weeds. Methods include proper irrigation, mowing, burning, properly timed livestock grazing, plowing, and

seeding. When properly applied, these methods are effective as control measures as well as preventive measures. The target of these methods is primarily to prevent seed production. Weeds should be treated before flowers are in full bloom. In general, mechanical methods are very effective for control of annual and biennial weeds and less effective for perennials.

4.2 Biological Control: Many noxious weeds become prolific due to the fact that they have no natural predators. The Colorado State Insectary tests insects and pathogens to control invasive species. Care is taken to be sure they will not move to native species or crops. Biological management of noxious weeds will continue to grow as more biological controls are developed. Biological controls are not a valid eradication method when used alone, but can be integrated with other methods of weed control.

4.3 Chemical Control: The use of herbicides is expected to remain our most effective tool for managing noxious weeds. Due to a variety of factors, herbicides are often most effective, but can still be used in conjunction with other management methods. Not all herbicides are equally effective on all weeds nor can every herbicide be used in every situation. Alamosa Weed Control prefers applying selective herbicides using a spot-spraying technique when applicable. Spot spraying (when compared to broadcast spraying) is more cost-effective, reduces the amount of herbicide in the environment, and prevents unnecessary damage to surrounding vegetation or aquatic areas. Integrated noxious weed management calls for the sensible application of chemical herbicides. According to the policies stated previously, Alamosa will use chemical control methods when appropriate.

- Mandatory use of organic herbicides – City walking trails with easements through the Rio Grande Farm Park will only use approved organic herbicides for chemical control. Their effectiveness will be monitored for expanded use on other City property.
- Tordon herbicide containing the active ingredient Picloram and Perspective containing Aminoclopyrachlor + Chlorsulfuron active ingredients are banned from use in the San Luis Valley.
- Suggested herbicide usage is included in *Appendix M*.

5.0 Management Tools

5.1 Education/Outreach

Outreach and Education are pivotal to the sustained success of this WMP. Most weed species, if detected early, can be eradicated before they become established. It is important that the public is able to identify noxious weeds and is aware of and committed to the necessity of rapid response to new infestations. The public should be encouraged to take ownership of their weed problems and make the necessary effort to control weeds on their property. Once educated about noxious weeds and their impact, however, most landowners become actively involved. Educational efforts include publishing articles in the local newspapers; placing posters and displays in public places; creating brochures, flyers, and mailings; holding public lectures and workshops; and publishing information on social media and city websites.

Educational efforts should:

- Educate the public on the state mandated weed law (the Colorado Noxious Weed Act) and the State's mandate that the City of Alamosa act to manage, and sometimes to eradicate, certain noxious weeds so designated by the Department.
- Educate and make the public aware of the State of Colorado A, B, and C weed species, and additional weeds designated for management by the City of Alamosa.
- Assist the public with weed identification and mapping.
- Provide information on the Best Management Practices for weeds on the Alamosa County Noxious Weed List.
- Raise public awareness that noxious weeds disrupt intended land use and degrade the environment. Explain the environmental impact of weeds on our quality of life, on agricultural production, and on native plants and wildlife.
- Stress the economic impact of weeds on agricultural production and the cost of food, native plants and community ecology, wildlife habitat, real estate values, and recreational opportunities, among others.

5.2 Identification and Mapping

5.2.1 Identification

- The first and most important step in developing a plan of attack on noxious weeds is species identification. Misidentification of weed species leads to improper, costly, and ineffective control and management.
- Newcomers and long-time residents may be familiar with a weed but each may call it by a different common name. For example, a weed commonly known as kochia (*Kochia scoparia*) by weed managers is called ironweed, fireweed, pigweed and Mexican fireweed by non-specialists. Once the weed is identified, recommendations for control and management can be obtained.
- Proper identification of new noxious weed species is extremely valuable for eradication efforts and any unusual or unfamiliar plant should be reported to the City Code Enforcement Officer. A cluster or small infestation of unusual plants or plants that appear to be spreading rapidly should also be reported to the Officer.

5.2.2 Mapping

Marking out weed infestations on a map, whether it be by computer (GIS) or hand drawn methods, provides a landowner or City with information about the extent of the infestation, possible modes for spread, potential non-infested areas to be protected and monitored, and the effectiveness of control methods. Over the long term maps provide historical evidence of the epicenter of an infestation and track its spread or decline.

In a continuing effort to manage noxious weeds with sound strategy, existing noxious weed inventories will be compared to new mapping data that will encompass City and privately owned lands. City staff will be working hand-in-hand with SLVWMA to develop these noxious weed maps.

5.3 Enforcement

Enforcing control of noxious weeds on private property is currently done on a complaint basis where these plants are found to be threatening agricultural production or spreading

to neighboring land, or are destructive to ornamental landscapes. Complaints are kept anonymous. Complaints that are deemed spurious or related to neighbor-to-neighbor feuds are not pursued.

5.3.1 **Statutory Enforcement Provisions Govern**

The Colorado Noxious Weed Act, § 35-5.5-101, C.R.S. (2009), et seq., (hereinafter *the Act*) states that certain invasive weeds pose a threat to the continued economic and environmental value of the land in Colorado; designates these weeds as "noxious" in Colorado; and mandates their management by all landowners in the State. *The Act* contains specific provisions empowering the City to enforce its terms, including without limitation §§ 35-5.5-108.5, -109, and -110. This WMP shall be enforced in accordance with those statutory provisions and rules developed by the City.

5.3.2 **Noxious Weeds Declared a Public Nuisance**

The noxious weeds listed in this WMP, at any and all stages, are subject to all the laws and remedies relating to the prevention and abatement of nuisances, including, but not limited to, those set forth in *the Act.*

5.3.3 **Authorized Agents for Enforcement**

Pursuant to §*35-5.5-105(2), C.R.S.,* the City Manager and their respective designees are hereby designated as "authorized agents," empowered to enforce *the Act* and this *WMP*, by utilizing those procedures set forth in *§35-5.5-108, -108.5,-109, C.R.S* and any other applicable local, State and Federal statutes, rules, regulations, and ordinances, including the remaining provisions of this Section.

5.3.4 Restrictions

No eradication or management of noxious weeds on private property shall occur without applying the same or greater management measures to any land or rights-of-way owned or administered by the City of Alamosa that are adjacent to the private property or notifying party.

6.0 Annual Review of the Noxious Weed Management Plan

The Advisory Board has, pursuant to the direction of the Alamosa City Council, originally developed the Management Plan, and will review such Management Plan on an annual basis for any desirable changes or adjustments to the plan and shall report to City Council on such basis with any recommended changes or adjustments. As part of such review, the Advisory Board will review the list of noxious weeds to consider additional weeds and to prioritize control efforts. The Management Plan must be renewed and approved by City Council not less than once every three years, but nothing shall prevent City Council from approving any interim changes or adjustments to the Management Plan in any interim years.

Economic Impact of Invasive Weed Species in Colorado: Phase I

Final Report

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Agricultural & Resource Economics
Colorado State Univeristy

February 2014

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Contents

Introduction

For a number of years, the Colorado Weed Management Association (CWMA), an organization comprised of weed managers representing government agencies, private and commercial applicators, non-governmental organizations, and private citizens, has discussed the need to document the economic impact of invasive weeds across the state of Colorado (www.cwma.org). Although a variety of studies have been implemented in surrounding states, even basic Colorado-specific impacts have yet to be calculated. Phase I of this project addresses this gap by leveraging a formed partnership between the Colorado Department of Agriculture, Colorado Department of Natural Resources, CWMA, and Colorado State University to document the basic economic impacts of a prioritized list of terrestrial and aquatic noxious weeds to the State of Colorado.

Given the numerous and varied types of impacts of differential invasive species across the state (including but not limited to agriculture, energy, infrastructure, natural resources, tourism, and ecosystem services), this project is conceptualized as a sequence of interconnected yet reasonably separate studies. The first phase provides a rough outline of the impacts of selected species across the state. Funding permitting, additional phases may be completed that augment primary data and expand the scope of analysis.

Identified Species of Interest

Ten species were identified for analysis in Phase I on the basis of their presence and potential threat to Colorado, the interests of the partners, and the existence of out-of-state cost data that can be used for external validity:

- Cheatgrass (*Bromus tectorum*) (List C);
- Eurasian watermilfoil (*Myriophyllum spicatum*) (List B);
- Knapweeds – diffuse (*Centaurea diffusa*) (List B), meadow (*Centaurea pratensis*) (List A), Russian (*Acroptilon repens*) (List B), spotted (*Centaurea maculosa*) (List B), and Yellow starthistle (*Centaurea solstitialis*) (List A); and
- Thistles – Canada (*Cirsium arvense*), musk (*Carduus nutans*), and scotch (*Onopordum acanthium or O. tauricum*) (All List B).

Objectives

The objectives of Phase I of the project include:

- identify the uses affected by each of the ten identified species across Colorado
- estimate the extent of the physical infestation of each species on each identified use
- estimate the direct costs (lost benefits) of the infestation on each identified use
- estimate the direct impact on Colorado economy as the aggregate of costs imposed by the presence of ten identified species in all identified uses

Procedure

This first-cut analysis was governed largely by the commitment by all parties to use readily available "off the shelf" data with the overarching goal of identifying what is currently known and to inform pathways for subsequent analysis. This approach limits scope and nature of analysis of this phase but provides guidance for future data collection and analysis.

The overall objective of estimating the economic impact of weed species on the state economy is an ambitious one. The commitment to using available data, the core question for the current effort was distilled to determine the cost of weed species as: "the amount by which the productive value of state resources are diminished because of the presence of the weed species". Recognize that this first-cut analysis ignores many of the "costs" that invasive weed species impose on the economy that extend well beyond the services and activities supplanted by their presence. The present level of invasion is conditioned on recent and current weed control activities (both public and private) which have their own costs. Further, a given presence of invasive species represents a threat for further invasion that could result in the diminishment of future activities in the state. For the current study, only the value of given activities presumed diminished by the presence of the weed species are taken to be a direct cost. This generally follows the general philosophy used by Hirsh and Leitch, 1996.

In the study, we focused on three primary use components to estimate the loss of value. These included agricultural production, wildlife habitat, and recreation. For each of the three use components, the estimate of economic value supplanted by the presence of the weed species required an estimate of (a) the average economic value of a parcel of "non-invaded" land of given "use" character, (b) the proportion of diminishment of economic value due to "presence" of each weed species of interest, and (c) the proportion of land area "invaded" which supplanted the valued activity. The product of these three values provides the estimated "cost" of weed presence on a given parcel of land for the use category. Summing across all parcels and all uses within the State provides an estimate of the estimate of state-wide direct costs.

Data and Analysis

Presence of Invasive Weed Species

The primary driver necessary for the analysis is an accurate depiction of weed infestations across the state of Colorado. We used the Colorado Department of Agriculture's (CDA) QuarterQuad (QQ) mapping of noxious weeds for 2009 (latest available) as the best available depiction of current weed infestation. CDA requests data from the County Weed Supervisors on an annual basis and infested acreages estimates are per 9,000 acre QuarterQuad. A QuarterQuad is one quarter of a standard 1:24,000 U.S.G.S. 7.5min topographic quadrangle. Data is collected for ninety noxious weed species including the ten species targeted in this study. The map in Figure 1 depicts the geographic distribution of the presence reported of the ten species across the state.

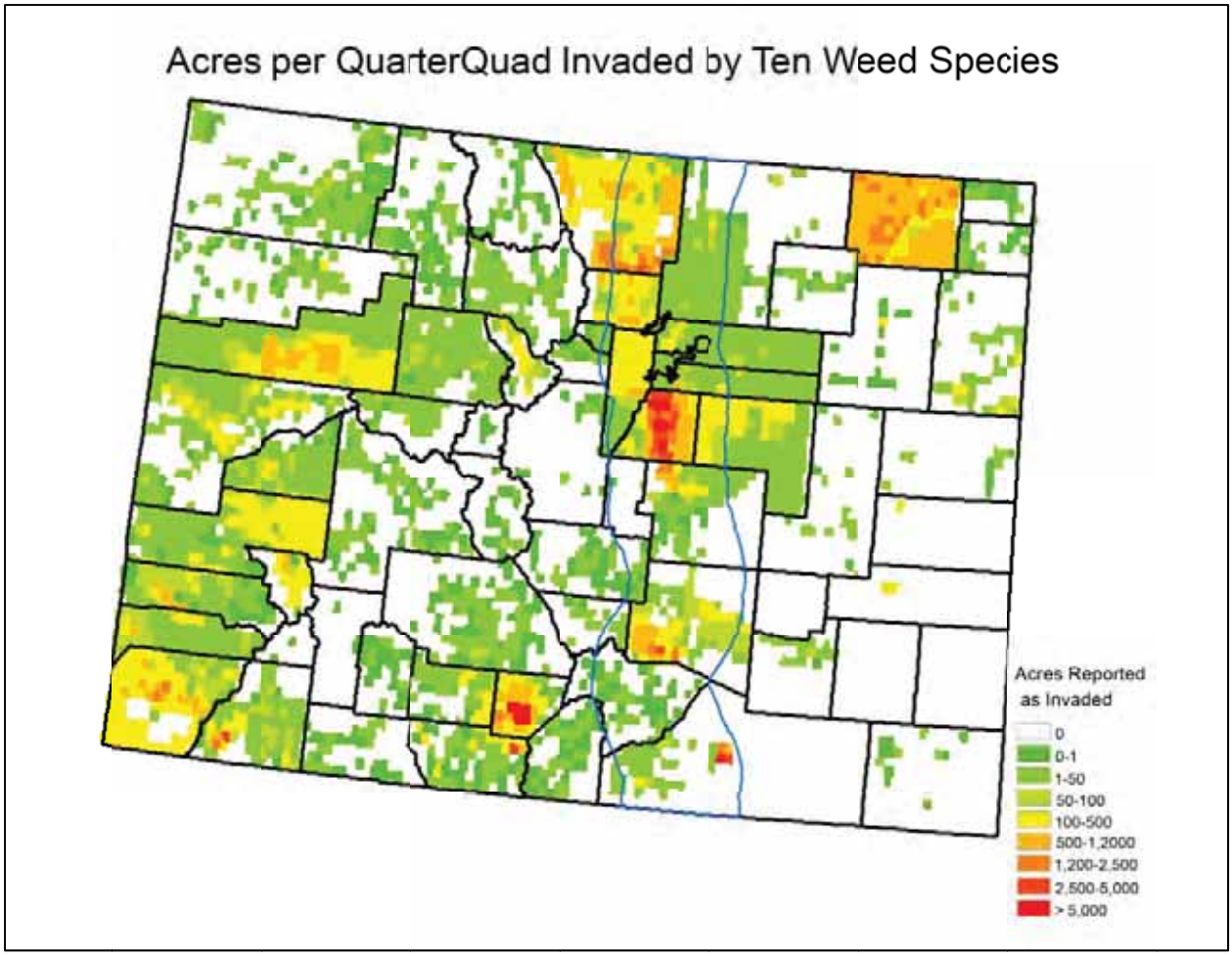

Figure 1. Acreage per quarterquad map unit (approximately 9,000 acres) reported infested by the ten selected weed species in 2009 Colorado Department of Agriculture Noxious Weeds database.

It should be noted that there are some serious limitations imposed for the economic analysis given the nature of the noxious weed inventory. Table 1 summarizes the reported incidence of each of the ten identified species by Agricultural Reporting District. First, it appears that there is significant under-reporting of weed species presence in the state. All 90 weed species which are tracked are reported to occupy just over 1.5 million acres (2.3% of Colorado's total land area) with the targeted "ten species" in this study accounting for over one third of this total. Over one-half of the QQ are reported to have none of the "Ten Species" and only one third of QQ are reported to have more than 25 acres of weeds across all ninty species. For this given analysis, if a weed is not reported as present in a QQ, then the estimated economic impact of invasive weed species will be zero for that QQ.

Further, the coarse resolution of the QQ mapping of weed species does not provide information about the distribution of the species within the 9,000 acre block which increases the error of attempting to associate weed presence with land use characteristics which are measured at a much finer resolution. There is also no information regarding the intermingling of weed species, their concentration, vigor, or other qualitative dimensions of invaded sites which

Table 1. Acres of Invasive Weed Species Reported to Colorado Department of Agriculture by County Weed Programs.

	Crop Reporting District						
Species	Northwest and Mountain	Northeast	East Central	Southwest	San Luis Valley	Southeast	Colorado
Cheatgrass	-	110,450	-	10,574	-	-	121,024
Musk Thistle	3,555	6,902	14,978	7,945	22	13,088	46,490
Diffuse Knapweed	573	31,862	91,170	156	1	14,381	138,143
Spotted Knapweed	289	122	204	8,707	1	116	9,439
Meadow Knapweed	2	-	-	512	-	-	514
Russian Knapweed	876	629	878	73,489	51,445	4,712	132,029
Yellow Starthistle	1	2	-	45	-	35	83
Candada Thistle	1,223	86,455	3,507	4,533	2,657	43	98,418
Eurasian Watermilfoil	-	183	51	-	5	8	247
Scotch Thistle	625	329	15,917	1,571	5	7,139	25,586
"Ten Species" Total	7,144	236,934	126,705	107,532	54,136	39,522	571,973
Percent of District/State	0.04%	3.12%	0.95%	0.88%	1.03%	0.33%	0.86%
Nintey Species Total	150,989	484,225	221,470	445,223	174,761	54,321	1,530,989
Percent of District/State	0.94%	6.38%	1.66%	3.62%	3.33%	0.45%	2.30%

certainly influence the impact of the presence of the species. The only option to carry forward with this analysis is to assume that the weed species are distributed across the underlying land uses (within each of the agricultural, habitat, and recreation components) in the same proportion at which these uses are present within the QQ. In reality, because weeds are often opportunists of specific circumstances, species presence tends to align disproportionately with specific land characteristics. The nature of the data precludes accurate depiction of this likelihood.

Agricultural Production

To identify the impact on agricultural production, it was necessary to identify the current land uses. USGS Landsat remote image data used to estimate these uses. This geo-referenced raster data classifies land uses into seventeen different Land Cover Classes. For our analysis, these seventeen classes were aggregated into six categories as summarized in Table 2.

Table 2. Definition of Land Use Categories Utilized in Study.

USGS Land Cover Class		Land Use Category for
Code	Category	Analysis
11	Open Water	Water
12	Ice/Snow	Forestland
21	Developed - Open Space	Other
22	Developed - Low Intensity	Other
23	Developed - Medium Intensity	Other
24	Developed - High Intensity	Other
31	Barren Land	Other
41	Deciduous Forest	Forestland
42	Evergreen Forest	Forestland
43	Mixed Forest	Forestland
52	Shrub/Scrub	Rangeland
71	Grassland / Herbaceous	Rangeland
81	Pasture / Hay	Pasture
82	Cultivated Crops	Cropland
90	Woody Wetlands	Wetlands
95	Emergent Herbaceous	Wetlands
	Uncoded	Uncoded

These data were analyzed to determine the proportion of each QQ that was determined to belong to a given Land Cover Class. These proportions were then applied to the total acreage of each given weed species to estimate the number of acres of a particular land use that were invaded by a given weed species. The total acres and proportions of invasion are summarized in Tables 3 and 4, respectively.

Table 3. Acres of Invasive Weed Species Reported as Correlated with Land Use in Colorado.

Species	Forestland	Rangeland	Cropland	Pasture	Other	Wetlands	Water	All Uses
Cheatgrass	5,059	61,487	46,072	1,909	4,867	1,176	450	121,024
Musk Thistle	13,370	24,024	2,481	1,042	4,362	940	270	46,490
Diffuse Knapweed	31,630	77,732	4,427	872	19,470	3,300	711	138,143
Spotted Knapweed	2,110	4,339	421	1,924	337	298	10	9,439
Meadow Knapweed	342	79	0	75	12	2	4	514
Russian Knapweed	21,632	76,536	3,503	16,867	5,814	7,196	480	132,029
Yellow Starthistle	38	37	0	4	2	2	0	83
Canada Thistle	30,727	36,578	17,063	3,395	5,700	3,453	1,497	98,418
Eurasian Watermilfoil	1	35	14	8	160	14	14	247
Scotch Thistle	3,389	17,811	605	371	2,846	486	79	25,586
"Ten Species" Total	108,297	298,657	74,586	26,468	43,569	16,866	3,515	571,973
Proportion of State-wide Invasion	19%	52%	13%	5%	8%	3%	1%	

Table 4. Proportion of Species Invasion Attributed to Identified Land Use.

Species	Forestland	Rangeland	Cropland	Pasture	Other	Wetlands	Water	All Uses
Cheatgrass	4%	51%	38%	2%	4%	1%	0%	100%
Musk Thistle	29%	52%	5%	2%	9%	2%	1%	100%
Diffuse Knapweed	23%	56%	3%	1%	14%	2%	1%	100%
Spotted Knapweed	22%	46%	4%	20%	4%	3%	0%	100%
Meadow Knapweed	67%	15%	0%	15%	2%	0%	1%	100%
Russian Knapweed	16%	58%	3%	13%	4%	5%	0%	100%
Yellow Starthistle	46%	44%	1%	5%	3%	2%	0%	100%
Canada Thistle	31%	37%	17%	3%	6%	4%	2%	100%
Eurasian Watermilfoil	1%	14%	6%	3%	65%	6%	6%	100%
Scotch Thistle	13%	70%	2%	1%	11%	2%	0%	100%
"Ten Species" Total	19%	52%	13%	5%	8%	3%	1%	100%

Among the ten selected weed species, cheatgrass, diffuse knapweed, Russian knapweed, and Canada thistle account for 86 percent of the invasion considered in this study. The summary in Table 4 spotlights the fact that rangelands are reported to be the predominant invaded land use for all weed species with meadow knapweed and yellow starthistle being significant invaders of forestland, cheatgrass also significant in cropland, and the majority of Eurasian watermilfoil being attributed to the "Other" land use category.

Due to the significant differences in spatial resolution (9,000 acres per QQ vs. less than one acre for a Landsat pixel), significant error is induced in attempting to match weed species with land use. This is best illustrated in the distribution of Eurasian watermilfoil with acreage showing in every category even though it is known to exist only in water bodies. Similar error is expected to exist across all weed species, though the error will be less for weed species that are more prevalent in land uses that are more dominant in proportion of given QQ. This error is highlighted to underscore the value of collecting weed species invasions at a finer geographic scale than has historically been done.

Taking the resulting distribution of weed species across land uses with in each QQ as summarized above, the next step is determine the cost of their presence. For this first-cut analysis, the approach was to estimate the amount of productivity reduction induced by the presences of the weeds. For this analysis, it was assumed that an acre of weed species invasion on agricultural lands completed eliminated the net value of production from that acre. This, of course, will vary from site to site but there is no evidence of the nature of the invasion in the weed data. Some acres of invasion will diminish the net value of production less, however, some invasions can reduce production below the total costs of production within a given year, causing negative returns in the short run. On balance, the "take-all" of annual net returns is not as extreme as it may appear on the surface. Clearly, lacking sufficient empirical evidence, this is another source of error in this study.

To estimate the monetary value of the net returns supplanted by the presence of weed species, the value of production was represented by the prevailing cash rental rates for each given land use. The primary agricultural activity for Rangeland, Pasture, Forestland, and Wetlands was taken to be grazing. Weed infested Cropland was taken to be non-irrigated. The Water and Other categories were taken to not have any agricultural activities. Table 5 summarizes the

Table 5. Average Cash Rental Rates for Agricultural Lands, 2009-2013 ($/acre/yr)

District	Pastureland	Cropland
Northwest and Mountain	4.18	20.00
Northeast	4.89	24.18
East Central	6.57	23.98
Southwest	5.53	27.23
San Luis Valley	6.33	28.55
Southeast	3.47	26.44
Colorado	5.10	24.80

Source: USDA-NASS "Quick Stats". http://quickstats.nass.usda.gov/

annual monetary value of an acre of undiminished grazing (applied to the four land use categories identified above) and dryland cropland as reflected by the annual cash rental rates. The productivity of lands in these uses varies across the state so fortunately USDA National Agricultural Statistics Service collects cash rental rates by Crop Reporting District. For this analysis the average reported rental rates for 2009-2013 were used.

Wildlife Habitat

The approach to determining the impact of weed presence on wildlife habitat follows the general approach for agricultural production. Within each QQ for which any of the ten species are present the composition of wildlife habitat that would be inhibited by the species presence was identified. In this case the Western Governors' Wildlife Council's crucial habitat index (CHI) was used as a proxy for wildlife habitat "production" for a given land area. The CHI score is a one to five rating that identifies a level of importance of habitat for multiple wildlife species in a given area. Figure 2 illustrates the geographic distribution of CHI values for Colorado.

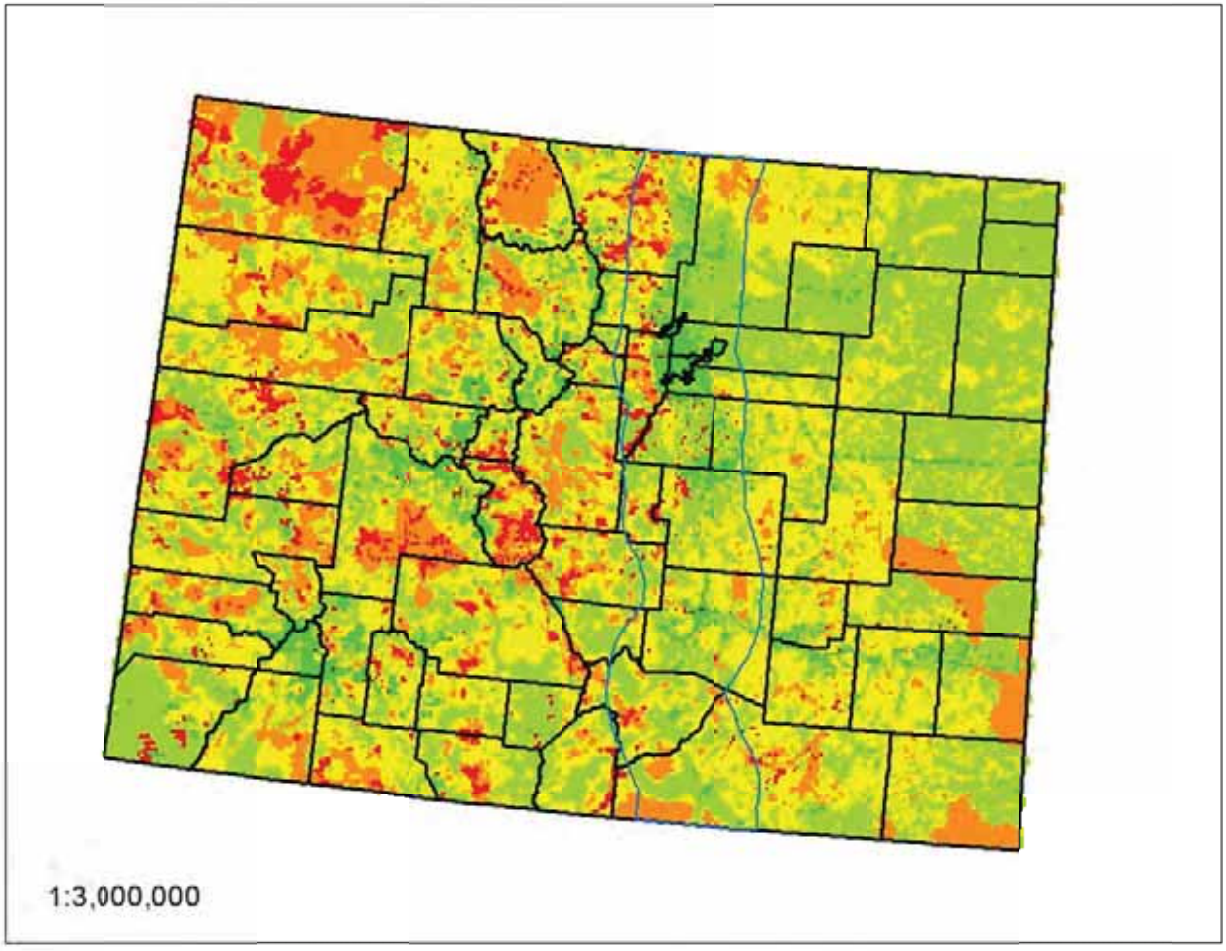

Figure 2. Western Governors Wildlife Council Crucial Habitat Index (CHI) (red is high [CHI=1], dark green is low [CHI=5])

The resolution of the CHI data is much finer than the weed invasion data so, again, any weeds present within a QQ were assumed to be linked with CHI values according to their proportion within the QQ. Lacking any evidence of the nature of the weed invasions within each QQ, presence of weed species on an acre was taken to fully diminish the value of habitat from its identified CHI value.

To estimate the monetary value of this reduction in habitat services, the monetary value of undiminished crucial habitat was assumed to decline linearly across CHI values from one to five allowing for differentiation between invaded sites with high habitat value and those with less value. Further investigation is necessary to identify whether the linear decline is merited.

With this modeling of structural response in value across CHI, identifying the monetary value of the most important habitats (CHI=1) allows the others to also be determined. In best cases, estimates of monetary values of habitat are difficult. We attempted to utilize the Benefit Transfer and Use Estimating Model Toolkit developed by Loomis et al. (2008) to derive terrestrial habitat values on certain criteria. Depending on the nature of the setting identified, values per acre ranged from zero to nearly ten thousand dollars per acre. The primary difficulty here was that none of the driving criteria are known at the QQ resolution so this approach was abandoned.

Ultimately a pair of separate studies (a willingness-to-pay study and a hedonic property study) were used to set a proxy monetary value for crucial habitat in the highest value. In a 1997 study Loomis and Ekstrand found that willingness to pay for 4.6 million acres of Mexican Spotted Owl habitat was $435 per acre. A 2003 U.S. Fish and Wildlife Service study found that based on a hedonic property study that households were willing to pay between $435 and $817 per acre to support open space critical to Preble's Meadow Jumping mouse habitat. The conservative result was to select the value of $434 per acre for this study. This is a present value of a tract of land in the highest condition. To make this commensurate with the annual values used elsewhere in the study, a four percent capitalization rate yields an annual cost of $17.36 per acre for lands with the highest habitat values being invaded by weed species.

Recreation

Tourism and recreation are strong economic drivers in Colorado. Invasive weed species have the potential to significantly diminish recreation values by their presence. However, not all of Colorado yields the same recreation opportunities or use. Most recreation valuation studies identify values in terms of dollars per visitor day for a given area or destination. For the study at hand, it is necessary to identify a value per acre of land that the presence of weed species diminishes recreational values. This proved to be far more difficult than for either agricultural or wildlife habitat values.

For this first-cut analysis, Theobald's index for the Human Use of Ecosystems was used as a proxy for recreational activity. For the purpose of this study this recreation index (RI) characterizes human activity on a one to ten scale with ten being the highest level. Figure 3 represents the spatial distribution of the index values across Colorado with red representing the lowest values and green representing the areas with the highest activity levels.

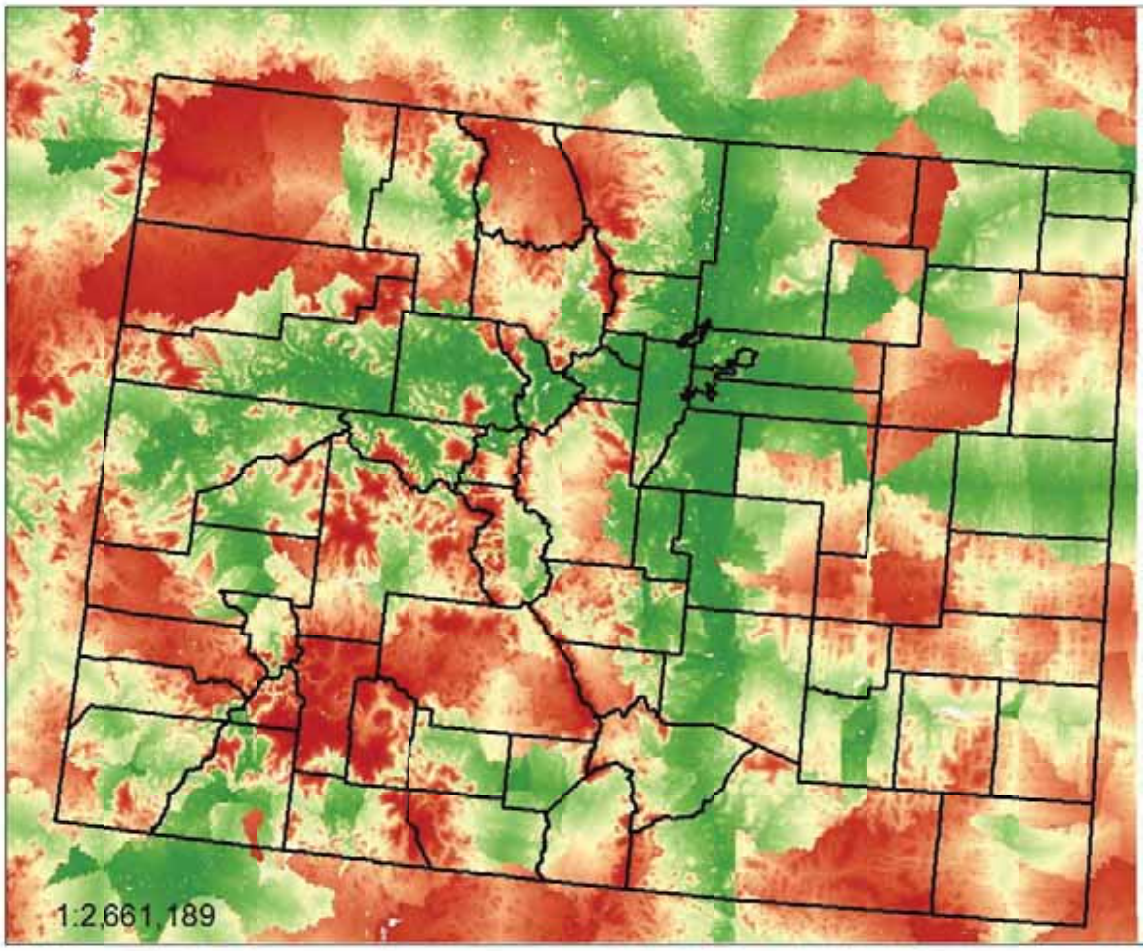

Figure 3. Recreation Index values for Colorado (red is low [RI=1], dark green is high [RI=10])

The resolution of the RI data is much finer than the weed invasion data so, again, any weeds present within a QQ were assumed to be linked with RI values according to their proportion within the QQ. Lacking any evidence of the nature of the weed invasions within each QQ, presence of weed species on an acre was taken to fully diminish the value of recreation from its identified RI value.

To estimate the monetary value of this reduction in recreation, the monetary value of undiminished recreation site was assumed to decline linearly across RI values from ten to one allowing for differentiation between invaded sites with high recreation value and those with less value. Further investigation is necessary to identify whether this linear decline is merited or how recreation values might be better represented and estimated.

With this modeling of structural response in value across RI, identifying the monetary value of the most important recreational sites (RI=10) allows the others to also be determined. Analytically this is straightforward, but there is practically no empirical evidence to identify monetary values that are calibrated to a given RI value.

Results

All of the data previously described for weed species invasion, land use, crucial habitat index, and recreation index was analyzed in GIS to create summary information for each QQ in the study area that was then compiled in a single Excel workbook. Drawing from this spatial database, the mean diminishment of each of the three categories of economic importance (agricultural production, wildlife habitat, recreation) was calculated for each QQ and then scaled by the monetary value per acre described previously. Table 6 summarizes the cost of the presence of the ten weed species as the total foregone direct economic value.

Table 6. Total Direct Cost to Colorado of Reported Invasion of Ten Weed Species ($/year)

District	Agricultural Production	Wildlife Habitat	Recreation*	Total Cost
Northwest & Mtn	28,346	77,021	53,919	159,286
Northeast	2,328,473	2,159,497	1,602,314	6,090,283
East Central	749,567	1,082,600	1,223,230	3,055,397
Southwest	646,831	1,080,528	733,403	2,460,763
San Luis Valley	326,075	411,370	462,611	1,200,055
Southeast	200,901	336,689	335,545	873,135
Colorado	4,280,192	5,147,706	4,411,022	13,838,920

* Recreation values are based on an assumed $10/acre for lands with a Recreation Index value of 10. Total Costs in this category will scale directly with this value (e.g. if RI=10 lands are valued at $100/acre, the total cost to recreation would be $44 million annually to Colorado).

Based on the evidence at our disposal, the total annual direct cost of the ten weed species is nearly $14 million annually with agricultural, wildlife, and recreational values all being similar. There are a number of caveats that must be considered before basing any important decisions on that number.

The first (and arguably most important) of these is quickly revealed by comparing the cost categories between the six Crop Reporting Districts. The Northeast District is highest in all categories. That should be viewed skeptically as a truth. However, a quick review of Figure 1 points quickly to why this is the case—more weed presence is reported here than in any other area of the state. Contrast this with the acreage of invasion reported in either the Northwest or Southeast Districts. Large portions of these areas report that none of the identified species are present. Following our procedures, this means that there is no economic cost of weed species in these areas. In short, regardless of the sophistication and accuracy of other elements of the analysis, the apparent under-reporting of weed invasions severely hampers our ability to generate an estimate of total cost that should generate any confidence in those who would use this number to justify any policy decisions. If anything, given the apparent under-reporting of weed invasion and the consistent analytic choices toward conservative values, the total cost values presented here should be viewed as rather extreme lower bounds on the true values.

The valuation of recreation values was particularly troublesome, so a choice was made to value land with the highest index value at $10 per acre annually. This provides easy scaling as the users of this data wish to consider outcomes at other peak values.

Conclusions and Implications

The overarching purpose of this phase of research was to identify a pathway to future research activities. It is clear that secondary data is clearly lacking in terms of being able to develop accurate estimates of the cost that invasive weed species impose on the Colorado economy. Ready availability of appropriate data on several fronts proves to be the primary limitation in this effort.

Most significantly, it seems apparent that that the inventory of weed infestation in the state is lacking. Many infested acres are reported, but reporting is voluntary, from a single source (county weed programs) and seems to be incomplete. Further, the coarse spatial resolution of the data (acres infested per 9,000 acre block) without any qualitative information beyond acres and species identifier would hamper any more sophisticated analysis. The nature of weed invasion is important when determining its effect on all three of our impact areas. This would include density on the landscape, geographic distribution within the reporting block, interactions with other invasive species, the degree of use diminishment, and other biological indicators of the state of the invasion. Qualitative information and finer spatial resolution can, to some degree, substitute for one another, though we presently have neither. The most useful analysis would benefit significantly from both.

The commitment to utilize only readily available data also provides very coarse representation of agricultural land uses, wildlife habitat, and recreational activities. Here data exist with much finer spatial resolution, but these are merely proxies to the various values of activities that are diminished by the presence of invasive weed species. Without better depiction of the state of weed invasion across time, there is little opportunity to model relationships against these use data to characterize statewide impairment due to invasions.

Finally, the approach utilized in this study comes short of reflecting the total “cost of weeds” to the Colorado due to procedural choices in the analysis. This was a starting point to assess only the foregone value of three impact areas due to presence of ten identified weed species (which itself proves difficult). Even if this could be accurately estimated, these costs are conditioned on an extensive and systematic effort to control weed species by both private landowners and public agencies. None of these costs are reflected in this analysis. Further, the full cost of an invasive stand of weed species on a given tract of land is more than the value of the activities that it supplants. This presence increases the risk of spread and future infestations to other lands which translates into greater expected diminishment of valued activities and services and/or increased control costs in the future. Limitations in current data availability prevent applying more sophisticated analysis that could reflect these additional dimensions on a state-wide basis.

Further Work

The analysis presented here focuses on data that is best suited to documenting the impact of terrestrial species. Eurasian watermilfoil was selected as one of the ten identified species to demonstrate the unique character of invasive aquatic weed species. Work is continuing following the same principles applied to the terrestrial species but utilizing data sources unique to the aquatic setting.

Given the issues identified in this study, now is the time to engage in conversation to identify whether further effort is warranted to improve upon the data and analysis utilized in this report. The results from this study suggest that the central question would be how invasions of invasive weed species across Colorado should be documented and reported in the future and the nature of the questions to be addressed with this information.

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Western Governors' Crucial Habitat Assessment Tool available online at http://westgovchat.org

Funding Partners for This Report

Yuma County

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COLORADO
DEPARTMENT OF AGRICULTURE

TITLE 35
AGRICULTURE

ARTICLE 5.5
Colorado Noxious Weed Act

35-5.5-101. Short title. This article shall be known and may be cited as the "Colorado Noxious Weed Act".

35-5.5-102. Legislative declaration - rule of construction. (1) In enacting this article the general assembly finds and declares that there is a need to ensure that all the lands of the state of Colorado, whether in private or public ownership, are protected by and subject to the jurisdiction of a local government empowered to manage undesirable plants as designated by the state of Colorado and the local governing body. In making such determination the general assembly hereby finds and declares that certain undesirable plants constitute a present threat to the continued economic and environmental value of the lands of the state and if present in any area of the state must be managed. It is the intent of the general assembly that the advisory commissions appointed by counties and municipalities under this article, in developing undesirable plant management plans, consider the elements of integrated management as defined in this article, as well as all appropriate and available control and management methods, seeking those methods which are least environmentally damaging and which are practical and

economically reasonable.

(1.5) The general assembly hereby finds and declares that:

(a) Noxious weeds have become a threat to the natural resources of Colorado, as thousands of acres of crop, rangeland, and habitat for wildlife and native plant communities are being destroyed by noxious weeds each year;

(b) An organized and coordinated effort must be made to stop the spread of noxious weeds and that such an effort can best be facilitated by a state coordinator who will assist in building local coalitions and coordinate the efforts of state, federal, local, and private landowners in developing plans for the control of noxious weeds without unnecessarily disrupting the development of such lands;

(c) The designation and classification of noxious weeds into categories for immediate eradication, containment, and suppression will further assist the state in coordinating efforts to stop the spread of noxious weeds;

(d) Because the spread of noxious weeds can largely be attributed to the movement of seed and plant parts on motor vehicles, and because noxious weeds are becoming an increasing maintenance problem on highway right-of-ways in this state, additional resources are needed to fight the spread of noxious weeds; and

(e) The use of moneys in the noxious weed management fund to assist local governing bodies and affected landowners in the eradication, containment, or suppression of noxious weeds best serves the citizens of Colorado.

(2) This article is in addition to article 5 of this title and is intended to be an expansion of, not a substitution for, the provisions of said article 5.

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35-5.5-103. Definitions. As used in this article, unless the context otherwise requires:

(2) "Alien plant" means a plant species that is not indigenous to the state of Colorado.

(4) "Commissioner" means the commissioner of the department of agriculture or his or her designee.

(4.5) "Department" means the department of agriculture.

(5) "District" means a local governing body's geographic description of a land area where noxious weeds are to be managed.

(7) "Federal agency" means each agency, bureau, or department of the federal government responsible for administering or managing federal land.

(8) "Federal land manager" means the federal agency having jurisdiction over any federal lands affected by the provisions of this article.

(9) "Integrated management" means the planning and implementation of a coordinated program utilizing a variety of methods for managing noxious weeds, the purpose of which is to achieve specified management objectives and promote desirable plant communities. Such methods may include but are not limited to education, preventive measures, good stewardship, and the following techniques:

(a) "Biological management", which means the use of an organism to disrupt the growth of noxious weeds.

(b) "Chemical management", which means the use of herbicides or plant growth regulators to disrupt the growth of noxious weeds.

(c) "Cultural management", which means methodologies or management practices that favor the growth of desirable plants over noxious weeds, including maintaining an optimum fertility and plant moisture status in an area, planting at optimum density and spatial arrangement in an area, and planting species most suited to an area.

(d) "Mechanical management", which means methodologies or management practices that physically disrupt plant growth, including tilling, mowing, burning, flooding, mulching, hand-pulling, hoeing, and grazing.

(10) "Landowner" means any owner of record of federal, tribal, state, county, municipal, or private land.

(10.5) "Local advisory board" means those individuals appointed by the local governing body to advise on matters of noxious weed management.

(11) "Local governing body" means the board of county commissioners of a county, the city council of a city and county or statutory or home rule city, the board of trustees of a statutory town or home rule town, or the board of selectmen or city council of a territorial charter municipality, as the context so requires.

(11.4) "Local noxious weed" means any plant of local importance that has been declared a noxious weed by the local governing body.

(11.6) "Management" means any activity that prevents a plant from establishing, reproducing, or dispersing itself.

(11.7) "Management objective" means the specific, desired result of integrated management efforts and includes:

(a) "Eradication" which means reducing the reproductive success of a noxious weed species or specified noxious weed population in largely uninfested regions to zero and permanently eliminating the species or population within a specified period of time. Once all specified weed populations are eliminated or prevented from reproducing, intensive efforts continue until the existing seed bank is exhausted.

(b) "Containment" which means maintaining an intensively managed buffer zone that separates infested regions, where suppression activities prevail, from largely uninfested regions, where eradication activities prevail.

(c) "Suppression" which means reducing the vigor of noxious weed populations within an infested region, decreasing the propensity of noxious weed species to spread to surrounding lands, and mitigating the negative effects of noxious weed populations on infested lands. Suppression efforts may employ a wide variety of integrated management techniques.

(d) "Restoration" which means the removal of noxious weed species and reestablishment of desirable plant communities on lands of significant environmental or agricultural value in order to help restore or maintain said value.

(12) "Management plan" means the noxious weed management plan developed by any person or the local advisory board using integrated management.

(14) "Municipality" has the meaning set forth in section 31-1-101 (6), C.R.S.

(15) "Native plant" means a plant species that is indigenous to the state of Colorado.

(16) "Noxious weed" means an alien plant or parts of an alien plant that have been designated by rule as being noxious or has been declared a noxious weed by a local advisory board, and meets one or more of the following criteria:

(a) Aggressively invades or is detrimental to economic crops or native plant communities;

(b) Is poisonous to livestock;

(c) Is a carrier of detrimental insects, diseases, or parasites;

(d) The direct or indirect effect of the presence of this plant is detrimental to the environmentally sound management of natural or agricultural ecosystems.

(16.2) "Noxious weed management" means the planning and implementation of an integrated program to manage noxious weed species.

(17) "Person" or "occupant" means an individual, partnership, corporation, association, or federal, state, or local government or agency thereof owning, occupying, or controlling any land, easement, or right-of-way, including any city, county, state, or federally owned and controlled highway, drainage or irrigation ditch, spoil bank, borrow pit, gas and oil pipeline, high voltage electrical transmission line, or right-of-way for a canal or lateral.

(18) "Plant growth regulator" means a substance used for controlling or modifying plant growth processes without appreciable phytotoxic effect at the dosage applied.

(18.5) "State noxious weed" means any noxious weed identified by the commissioner by rule after notifying and consulting with the state noxious weed advisory committee created in section 35-5.5-108.7.

(18.6) "State weed coordinator" means the state weed coordinator under contract with or appointed by the commissioner pursuant to section 35-5.5-117.

(21) "Weed" means any undesirable plant.

35-5.5-104. Duty to manage noxious weeds. It is the duty of all persons to use integrated methods to manage noxious weeds if the same are likely to be materially damaging to the land of neighboring landowners.

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35-5.5-104.5. Intentional introduction, cultivation, or sale of noxious weeds - costs. (1)(a) It shall be unlawful to intentionally introduce, cultivate, sell, offer for sale, or knowingly allow to grow in violation of this article or any rule promulgated hereunder in this state any noxious weed designated pursuant to section 35-5.5-108 (2)(a); except that this prohibition shall not apply to:

(I) Research sanctioned by a state or federal agency or an accredited university or college;

(II) Activities specifically permitted by the commissioner;

(III) Noxious weed management plans that are part of an approved reclamation plan pursuant to section 34-32-116 (7) or 34-32.5-116 (4), C.R.S.;

(IV) Noxious weed management activities that are conducted on disturbed lands as part of an approved reclamation plan pursuant to section 34-33-111 (1), C.R.S.; or

(V) Noxious weed management activities that are part of activities conducted on disturbed lands pursuant to section 34-60-106 (12), C.R.S.

(b) It shall not be a violation of this section for a person to knowingly allow to grow a state noxious weed that is being properly managed in accordance with the rules promulgated by the commissioner.

(2) Any entity or person that violates the provisions of this section shall be responsible for the costs associated with remediation of the noxious weeds. In assessing the cost of remediation, the commissioner may include both actual immediate and estimated future costs to achieve specified management objectives.

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35-5.5-105. Noxious weed management - powers of county commissioners. (1) The board of county commissioners of each county in the state shall adopt a noxious weed management plan for all of the unincorporated lands within the county. Such plan shall include all of the requirements and duties imposed by this article. Guidelines may be included that address no pesticide noxious weed management plans. In addition to and not in limitation of the powers delegated to boards of county commissioners in section 30-11-107 and article 15 of title 30, C.R.S., article 5 of this title, and elsewhere as provided by law, the board of county commissioners may adopt and provide for the enforcement of such ordinances, resolutions, rules, and other regulations as may be necessary and proper to enforce said plan and otherwise provide for the management of noxious weeds within the county, subject to the following limitation: No county ordinance, rule, resolution, other regulation, or exercise of power pursuant to this article shall apply within the corporate limits of any incorporated municipality, nor to any municipal service, function, facility, or property, whether owned by or leased to the incorporated municipality outside the municipal boundaries unless the county and municipality agree otherwise pursuant to part 2 of article 1 of title 29, C.R.S., or article 20 of title 29, C.R.S.

(2) The board of county commissioners shall provide for the administration of the noxious weed management plan authorized by this article through the use of agents, delegates, or employees and may hire additional staff or provide for the performance of all or part of the management plan through outside contract. Any agent, delegate, employee, staff, or contractor applying or recommending the use of chemical management methods shall be certified by the department of agriculture for such application or recommendation. Costs associated with the administration of the noxious weed management plan shall be paid from the noxious weed management fund of each county.

(3) The board of county commissioners may cooperate with other counties and municipalities for the exercise of any or all of the powers and authorities granted by this article. Such cooperation shall take the form of an intergovernmental agreement pursuant to part 2 of article 1 of title 29, C.R.S., or article 20 of title 29, C.R.S.

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35-5.5-106. Noxious weed management - municipal authority. (1) The governing body of each municipality in the state shall adopt a noxious weed management plan for all lands within the territorial limits of the municipality. In addition to and independent of the powers elsewhere delegated by law, the governing body of a municipality may adopt and provide for the enforcement of such ordinances, resolutions, rules, and other regulations as may be necessary and proper to enforce said plan and otherwise provide for the management of noxious weeds within the municipality, subject to the following limitation: No municipal ordinance, resolution, rule, other regulation, or exercise of power pursuant to this article shall apply to unincorporated lands or facilities outside the corporate limits of the municipality, except such lands or facilities which are owned by or leased to the municipality, unless the municipality and the county otherwise agree pursuant to part 2 of article 1 of title 29, C.R.S., or article 20 of title 29, C.R.S.

(2) The governing body of the municipality shall provide for the administration of the noxious weed management plan authorized by this article through the use of agents, delegates, or employees and may hire additional staff or provide for the performance of all or part of the noxious weed management plan through outside contract. Any agent, delegate, employee, staff, or contractor applying or recommending the use of chemical management methods shall be certified by the department of agriculture for such application or recommendation.

(3) The governing body may cooperate with counties and other municipalities for the exercise of any or all of the powers and authorities granted by this article. Such cooperation shall take the form of an intergovernmental agreement pursuant to part 2 of article 1 of title 29, C.R.S., or article 20 of title 29, C.R.S.

(4) To the degree that a municipality has, upon enactment of this article, or subsequent to that date, adopted an ordinance or ordinances for the management of noxious weeds, the adoption of such an ordinance or ordinances shall be deemed to satisfy the requirement for the adoption of a noxious weed management plan imposed by this article.

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35-5.5-107. Local advisory board - formation - duties. (1) The governing body of each county and municipality shall appoint a local advisory board. The local governing body, at its sole option, may appoint itself, or a commission of landowners, to act as the local advisory board for that jurisdiction. The members of each local advisory board shall be residents of the unincorporated portion of the county or residents of the municipality, as the case may be, and in the case of a county, at least a majority of the members of the local advisory board shall be landowners of over forty acres.

(2) In the event a county or municipality elects to cooperate with another county or municipality for any of the purposes set forth in this article, the membership of the local advisory board shall be determined by the governing bodies of such cooperating local governments.

(3) Each local advisory board shall annually elect a chairman and secretary. A majority of the members of the board shall constitute a quorum for the conduct of business.

(4) Local advisory boards shall have the power and duty to:

(a) Develop a recommended management plan for the integrated management of designated noxious weeds and recommended management criteria for noxious weeds within the area governed by the local government or governments appointing the local advisory board. The management plan shall be reviewed at regular intervals but not less often than once every three years by the local advisory board. The management plan and any amendments made thereto shall be transmitted to the local governing body for approval, modification, or rejection.

(b) Declare noxious weeds and any state noxious weeds designated by rule to be subject to integrated management.

(c) Recommend to the local governing body that identified landowners be required to submit an individual integrated management plan to manage noxious weeds on their property.

(5) The local governing body shall have the sole and final authority to approve, modify, or reject the management plan, management criteria, management practice, and any other decision or recommendation of the local advisory board.

(6) The state weed coordinator shall review any recommendations of a local advisory board appointed pursuant to article 5 of this title and note any inconsistencies between the recommendations of the state weed coordinator or the commissioner and any such local advisory board.

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35-5.5-108. Designated noxious weeds - legislative declaration. (1) The general assembly hereby finds and declares that the noxious weeds designated by rule are a present threat to the economic and environmental value of the lands of the state of Colorado and declare it to be a matter of statewide importance that the governing bodies of counties and municipalities include plans to manage such weeds as part of their duties pursuant to this article.

(2)(a) The state list of plant species that are designated as noxious weeds shall be designated by rule and shall be managed under the provisions of this article. On and after August 6, 2003, the commissioner shall classify noxious weeds into one of a minimum of three categories, including:

(I) "List A", which means rare noxious weed species that are subject to eradication wherever detected statewide in order to protect neighboring lands and the state as a whole;

(II) "List B", which means noxious weed species with discrete statewide distributions that are subject to eradication, containment, or suppression in portions of the state designated by the commissioner in order to stop the continued spread of these species;

(III) "List C", which means widespread and well-established noxious weed species for which control is recommended but not required by the state, although local governing bodies may require management.

(b) A local governing body may adopt eradication, containment, or suppression standards that are more stringent than the standards adopted by the commissioner.

(2.1) The commissioner shall review and revise, as necessary, the state noxious weed list at least once every three years.

(2.3) The commissioner shall develop and implement by rule state noxious weed management plans for noxious weed species classified as list A or list B species. For each noxious weed species, each management plan shall designate the management objectives for all lands of the state appropriate to achieve the stated purpose of the species classification.

(2.5) The commissioner shall prescribe integrated management techniques to achieve specified management objectives for each listed species after consulting with the state noxious weed advisory committee. The prescribed management techniques shall be mandatory techniques for list A species and populations of list B species designated for eradication. The commissioner shall develop management techniques pursuant to science-based methodologies, peer reviewed studies, or any other method that is based on credible research.

(2.6) The classifications made pursuant to paragraph (a) of subsection (2) of this section shall primarily reflect the known distribution of the designated species, the feasibility of current control technologies to achieve specified management objectives, and the costs of carrying out the prescribed state weed management plan.

(2.7)(a) The commissioner shall also adopt rules for granting compliance waivers to local governing bodies and landowners; except that a waiver may not be granted to the affected landowner when a landowner has wilfully or wantonly violated the provisions of this section or section 35-5.5-104.5 or 35-5.5-108.5 or attempts to delay eradication of a species without just cause.

(b) Such rules shall include:

(I) A process by which a local governing body or an affected landowner may petition the commissioner to change the management objectives specified in a state noxious weed management plan;

(II) The criteria used to evaluate such petitions; and

(III) Time frames in which the commissioner shall grant or deny such petitions.

(c) Actions sufficient to implement the management objective for a noxious weed species shall continue until the commissioner grants a waiver pursuant to this subsection (2.7).

(3) The board of county commissioners or governing body of a municipality may declare additional noxious weeds, within its jurisdictional boundaries, after a public hearing with thirty days prior notice to the public. Any declaration of additional noxious weeds pursuant to this subsection (3) shall include the management objectives for all affected landowners.

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35-5.5-108.5. Responsibilities related to eradication of designated noxious weeds - commissioner - local governing bodies - affected landowners. (1) This section shall apply to noxious weeds that have been classified as list A species and to populations of list B species designated for eradication pursuant to section 35-5.5-108 (2)(a). This section shall govern the responsibilities of the commissioner, local governing bodies, and affected landowners.

(2) **Duties of commissioner.** (a) The commissioner may enforce the provisions of this section as necessary to ensure the cooperation of local governing bodies and affected landowners.

(b) The commissioner shall provide:

(I) Educational resources to local governing bodies and affected landowners regarding the eradication of list A species and populations of list B species designated for eradication. Such education shall include an explanation of why the species has been listed for eradication, the prescribed techniques for eradication in the most cost-effective manner, and the duties of the local governing body and affected landowner regarding such eradication.

(II) Financial or in-kind resources to local governing bodies or affected landowners to eradicate list A species and populations of list B species designated for eradication from the available moneys in the noxious weed management fund created in section 35-5.5-116. Such financial or in-kind resource allocation shall be determined by the commissioner according to the identified benefits to the citizens of Colorado, the surrounding community, and the affected landowners.

(III) The inventory and mapping infrastructure necessary to facilitate the classification of state noxious weeds and the development and implementation of state noxious weed management plans.

(3) **Duties of local governing bodies.** (a) In compliance with the rules promulgated by the commissioner, a local governing body shall initiate and maintain communications with landowners who are affected by list A species and populations of list B species designated for eradication by the commissioner.

(b) In addition to the existing powers and duties of a local governing body provided in this article a local governing body shall:

(I) Provide affected land owners with technical assistance for the eradication of list A species and populations of list B species designated for eradication by the commissioner;

(II) Carry out sufficient measures, including project oversight and enforcement, as may be necessary to ensure the eradication of list A species and populations of list B species designated for eradication by the commissioner;

(III) Provide the commissioner with assistance in disseminating financial resources to affected landowners and mapping data pursuant to rules promulgated by the commissioner; and

(IV) Determine the cost of eradication to be borne by affected landowners.

(c) Local governing bodies may apply to the commissioner for a waiver of compliance with an eradication designation pursuant to section 35-5.5-108 (2.7).

(d) If the commissioner determines, in consultation with the local governing body, that the most cost-effective manner to eradicate designated noxious weeds is for the commissioner to implement an eradication program, the commissioner may implement the eradication program directly.

(4) **Duties of affected landowners or occupants.** Except as provided pursuant to section 35-5.5-104.5 (1)(a), an affected landowner or occupant whose property may be affected by list A species or by populations of list B species designated for eradication shall allow the commissioner or local weed control officials access to such property for the purpose of immediate inspection and eradication when at least one of the following events has occurred:

(a) The affected landowner or occupant has requested the inspection;

(b) A neighboring landowner or occupant has reported a suspected noxious weed infestation and requested an inspection; or

(c) An authorized agent of the local government or commissioner has made a visual observation from a public right-of-way or area and has reason to believe that a noxious weed infestation exists.

(5)(a) If verbal permission to inspect the land by the affected landowner is not obtained, no entry upon any premises, lands, or places shall be permitted until the local governing body has notified the affected landowner that such inspection is pending by certified mail if the landowner's mailing address is within the United States or mailed in a comparable manner to a landowner whose mailing address is outside of the United States. Where possible, inspections shall be scheduled and conducted with the concurrence of the affected landowner or occupant. A local governing body may notify an affected landowner in an electronic format, in addition to notice by certified mail.

(b)(I) If, after ten days with no response from the affected landowner or upon denial of access before the expiration of ten days, the inspector may seek an inspection warrant issued by a municipal, county, or district court having jurisdiction over the land. The court shall issue an inspection warrant upon presentation by the local governing body of an affidavit stating:

(A) The information that gives the inspector reasonable cause to believe that any provision of this section, section 35-5.5-104.5, or section 35-5.5-108, is being or has been violated;

(B) The affected landowner has failed to respond or the landowner or occupant has denied access to the inspector; and

(C) A general description of the location of the affected land.

(II) No affected landowner or occupant shall deny access to an authorized agent of the local governing body or the commissioner in possession of an inspection warrant.

(6) An affected landowner shall notify a lessee or occupant of affected lands of all notices of inspection and eradication efforts on such lands as soon as practicable.

(7) The local governing body of the county or municipality having jurisdiction over private and public lands on which list A species or populations of list B species designated for eradication are found shall notify the affected landowner or occupant of such lands by certified mail if the landowner's mailing address is within the United States or mailed in a comparable manner to a landowner whose mailing address is outside of the United States. The notice shall name the noxious weeds, identify eradication as the required management objective, advise the

affected landowner or occupant to commence eradication efforts within a specified period or condition, and state the integrated weed management techniques prescribed by the commissioner for eradication. Where possible, the local governing body shall consult with the affected landowner or occupant in the development of a plan for the eradication of noxious weeds on the premises or land.

(8) Within five days after the local governing body mails notification, the landowner shall comply with the terms of the notification or submit an acceptable plan and schedule for the completion of the management objective.

(9)(a) In the event the affected landowner or occupant fails to comply with the notice to eradicate the identified noxious weeds and implement an appropriate eradication program, the local governing body having authority over the public or private land shall:

(I) Provide for and complete the eradication of such noxious weeds at such time, upon such notice, and in such manner consistent with achieving the management objective as the local governing body deems appropriate; and

(II) Do one of the following:

(A) Assess the whole cost of the eradication, including up to one hundred percent of inspection, eradication, and other incidental costs in connection with eradication, upon the lot or tract of land where the noxious weeds are located; except that no local governing body shall levy a tax lien against land it administers as a part of a public right-of-way. Such assessment shall be a lien against each lot or tract of land until paid and shall have priority over all other liens except general taxes and prior special assessments. Such assessment may be certified to the county treasurer of the county in which the property is located and collected and paid over in the same manner as provided for the collection of taxes. Any funds collected pursuant to this section shall be utilized in furtherance of the local governing body's weed management efforts.

(B) In the event the state board, department, or agency fails to comply with the notice to eradicate the identified noxious weeds, the local governing body in whose jurisdiction the infestation is located may enter upon such lands and undertake the management of such noxious weeds or cause the same to be done. The expenses associated with inspection and eradication shall be paid by the state board, department, or agency that has jurisdiction over the lands. An agreement for reimbursement shall be reached within two weeks after the date such statement of expense for eradication is submitted by the local governing body. Such reimbursement agreement shall be in writing. If no reimbursement agreement has been reached or the amount reflected in the agreement is not paid upon presentation, the amount in the agreement shall be submitted to the state controller, who shall treat such amount as an encumbrance on the budget of the state board, department, or agency involved or such charge may be recovered in any court with jurisdiction over such lands. The expense associated with eradication may be recovered in any court with jurisdiction over such infested land.

(b) No local governing body shall provide for or compel the eradication of list A species and populations of list B species designated for eradication or list B noxious weeds on private or public property pursuant to this subsection (9) without first applying the same measures to any land or rights-of-way owned or administered by the local governing body that are adjacent to the property.

(10) The local governing body, through its delegates, agents, or employees, shall have the right to enter upon any premises, lands, or places during reasonable business hours for the purpose of ensuring compliance with the requirements of this section concerning noxious weed eradication.

(11) No agent, employee, or delegate of a local governing body shall have a cause of action against an affected landowner or occupant for personal injury or property damages while on private or public land for purposes of eradication of noxious weeds except when such damages were the result of gross negligence, recklessness, or intentional action by the landowner.

(12) If, in the opinion of the commissioner, any local governing body fails to adequately perform any of the duties set forth in this section, the commissioner is authorized to conduct any of the functions or duties of a local governing body pursuant to this section.

(13) The commissioner or the local governing body may require the affected landowner to pay a portion of the costs associated with eradication of the noxious weeds.

(14) An affected landowner may apply to the commissioner for a waiver of compliance with an eradication designation pursuant to section 35-5.5-108 (2.7).

(15) For the purposes of this section, an "occupant" shall not include the owner of an easement or right-of-way.

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35-5.5-108.7. State noxious weed advisory committee - repeal. (1)(a) There is hereby created the state noxious weed advisory committee, referred to in this section as the "state advisory committee". The state advisory committee shall consist of fifteen members. Such members shall be appointed by the commissioner and shall serve without per diem compensation or expenses. Of the fifteen members, at least one member shall represent private and public landowners or land managers; at least two members shall represent weed management professionals from the federal, state, or local levels; at least one member shall represent public or private weed scientists; at least two members shall represent local governing bodies; four members shall be agricultural producers, as defined in section 35-1-102; and at least three members shall represent knowledgeable resource specialists or industries, including, but not limited to, environmental organizations. Representation on the state advisory committee shall reflect the different geographic areas of the state equally, to the greatest extent possible. Members of the state advisory committee that represent the various stakeholders and regions shall solicit input from similar stakeholders within each member's area of expertise and region of the state. Members of the state advisory committee shall communicate the committee's recommendations to the region and stakeholders represented by each member.

(b) Staggered appointments shall be made so that not more than eight members' terms expire in any one year, and thereafter appointments shall be for terms of two years each. Appointees shall be limited to two full terms each. Each state advisory committee member shall hold office until the expiration of the term for which such member is appointed or until a successor has been duly appointed.

(c) In the event of a vacancy on the state advisory committee, the commissioner shall fill such vacancy promptly to allow a quorum of the state advisory committee to function.

(d) The commissioner may remove any member of the state advisory committee for misconduct, incompetence, or neglect of duty.

(e) A quorum of the state advisory committee shall elect or appoint annually a chairman and a vice-chairman.

(f) A quorum of the state advisory committee shall be a majority of the members appointed to the state advisory committee.

(g) The state advisory committee shall meet at least quarterly.

(2) The state advisory committee shall make recommendations to the commissioner concerning the:

(a) Designation of state noxious weeds;

(b) Classification of state noxious weeds;

(c) Development and implementation of state weed management plans; and

(d) Prescribed techniques for eradication, containment, and suppression of state noxious weeds.

(3) Recommendations of the state advisory committee shall be made by a majority vote of the members of the state advisory committee.

(4) The state advisory committee shall periodically assess the progress made to implement the provisions of sections 35-5.5-104.5, 35-5.5-108.5, 35-5.5-108.7, and 35-5.5-108 (2)(a); measure the results and effectiveness of endeavors to eradicate, contain, and suppress noxious weeds within this state; and recommend to the commissioner ways to enhance statewide efforts to stop the spread of noxious weeds.

(5) This section is repealed, effective July 1, 2013.

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35-5.5-109. Private lands - management of noxious weeds - charges. (1) The local governing body, through its delegates, agents, and employees, shall have the right to enter upon any premises, lands, or places, whether public or private, during reasonable business hours for the purpose of inspecting for the existence of noxious weed infestations, when at least one of the following circumstances has occurred:

(a) The landowner or occupant has requested an inspection;

(b) A neighboring landowner or occupant has reported a suspected noxious weed infestation and requested an inspection; or

(c) An authorized agent of the local government has made a visual observation from a public right-of-way or area and has reason to believe that a noxious weed infestation exists.

(2)(a) No entry upon any premises, lands, or places shall be permitted until the landowner or occupant has been notified by certified mail that such inspection is pending. Where possible, inspections shall be scheduled and conducted with the concurrence of the landowner or occupant.

(b) If after receiving notice that an inspection is pending the landowner or occupant denies access to the inspector of the local governing body, the inspector may seek an inspection warrant issued by a municipal, county, or district court having jurisdiction over the land. The court shall issue an inspection warrant upon presentation by the local governing body, through its agent or employee, of an affidavit stating: The information which gives the inspector reasonable cause to believe that any provision of this article is being or has been violated; that the occupant or landowner has denied access to the inspector; and a general description of the location of the affected land. No landowner or occupant shall deny access to such land when presented with an inspection warrant.

(3) The local governing body of the county or municipality having jurisdiction over private lands upon which noxious weeds are found shall have the authority, acting directly or indirectly through its agent or staff, to notify the landowner or occupant of such lands, advising

the landowner or occupant of the presence of noxious weeds. Said notice shall name the noxious weeds, advise the landowner or occupant to manage the noxious weeds, and specify the best available control methods of integrated management. Where possible, the local governing body shall consult with the affected landowner or occupant in the development of a plan for the management of noxious weeds on the premises or lands.

(4)(a) Within a reasonable time after receipt of notification, which at no time shall exceed ten days, the landowner or occupant shall either:

(I) Comply with the terms of the notification;

(II) Acknowledge the terms of the notification and submit an acceptable plan and schedule for the completion of the plan for compliance; or

(III) Request an arbitration panel to determine the final management plan.

(b) The arbitration panel selected by the local governing body shall be comprised of a weed management specialist or weed scientist, a landowner of similar land in the same county, and a third panel member chosen by agreement of the first two panel members. The landowner or occupant shall be entitled to challenge any one member of the panel, and the local governing body shall name a new panel member from the same category. The decision of the arbitration panel shall be final.

(5)(a) In the event the landowner or occupant fails to comply with the notice to manage the identified noxious weeds or implement the plan developed by the arbitration panel, the local governing body has the authority to:

(I) Provide for and compel the management of such noxious weeds at such time, upon such notice, and in such manner as the local governing body shall prescribe by ordinance or resolution; and

(II) Assess the whole cost thereof, including up to twenty percent for inspection and other incidental costs in connection therewith, upon the lot or tract of land where the noxious weeds are located; except that no local governing body shall levy a tax lien against land it administers as part of a public right-of-way. Such assessment shall be a lien against each lot or tract of land until paid and shall have priority over all other liens except general taxes and prior special assessments. Such assessment may be certified to the county treasurer of the county in which the property is located and collected and paid over in the same manner as provided for the collection of taxes. Any funds collected pursuant to this section shall be deposited in the local governing body's weed fund or any similar fund.

(b) No local governing body shall provide for or compel the management of noxious weeds on private property pursuant to this subsection (5) without first applying the same or greater management measures to any land or rights-of-way owned or administered by the local governing body that are adjacent to the private property.

(c) No local governing body shall assess the cost of providing for or compelling the management of noxious weeds on private property until the level of management called for in the notice or the management plan developed by the arbitration panel has been successfully achieved.

(6) The local governing body, through its delegates, agents, and employees, shall have the right to enter upon any premises, lands, or places, whether public or private, during reasonable business hours for the purpose of ensuring compliance with the requirements of this article concerning noxious weed management and any other local requirements.

(7) No agent, employee, or delegate of a local governing body shall have a civil cause of action against a landowner or occupant for personal injury or property damage incurred while on public or private land for purposes consistent with this article except when such damages were willfully or deliberately caused by the landowner.

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35-5.5-110. Public lands - control of undesirable plants - charges. (1) It is the duty of each state board, department, or agency that administers or supervises state lands to manage noxious weeds on any lands under its jurisdiction using the methods prescribed by the local governing body in whose jurisdiction such state lands are located. The local governing body may give notice to any such state board, department, or agency advising of the presence of noxious weeds and naming them. Such notice shall specify the best available methods of integrated management that are not in conflict with federal law or contractual restrictions included in federal land conveyances to the state. Wherever possible, the local governing body shall consult with the affected state board, department, or agency in the development of a plan for the management of noxious weeds on the premises or lands.

(2)(a) Within a reasonable time after receipt of notification, which at no time shall exceed ten days, the state board, department, or agency shall do one of the following:

(I) Comply with the terms of the notification;

(II) Acknowledge the terms of the notification and submit an acceptable plan and schedule for the completion of the plan for compliance;

(III) Request an arbitration panel to determine the final management plan.

(b) The arbitration panel selected by the local governing body shall be comprised of a weed management specialist or weed scientist, a landowner of similar land in the same county, and a third panel member chosen by agreement of the first two panel members. The state board, department, or agency shall be entitled to challenge any one member of the panel, and the local governing body shall name a new panel member from the same category. The decision of the arbitration panel shall be final.

(3) In the event the state board, department, or agency fails to comply with the notice to manage the identified noxious weeds or implement the plan developed by the arbitration panel, the local governing body in whose jurisdiction the infestation is located may enter upon such lands and undertake the management of such noxious weeds or cause the same to be done, the expense thereof to be a proper charge against said state board, department, or agency which has jurisdiction over the lands. An agreement for payment shall be reached within two weeks after the date such an expense is submitted, with respect to the amount of reimbursement to be paid. Such agreement shall be in writing. If no agreement has been reached and if the charge is not immediately paid, such charge shall be submitted to the controller, who shall treat such amount as an encumbrance on the budget of the state board, department, or agency involved, or such charge may be recovered in any court with jurisdiction over such lands. Any state board, department, or agency may enter into a contract with the local governing body to authorize the management of noxious weeds on state-administered land on terms and conditions satisfactory to both parties.

(4) In addition to the requirements of subsection (3) of this section, the division shall enter into agreements with local governing bodies for the control of weeds on any property the division owns in fee title or has effective surface control over pursuant to a long-term lease or easement agreement. For purposes of this subsection (4) and subsection (5) of this section,

"long-term lease or easement agreement" means any lease or easement agreement that exceeds ten years. Agreements between the division and local governing bodies for weed control shall describe the terms and conditions of weed control, provide an annual estimated budget for such weed control, and identify specific weed control responsibilities for the division and the property owner, if different than the division. Weed control agreements required pursuant to this subsection (4) shall be executed on or before July 1, 1997.

(5) Any weed control expense incurred by a local governing body pursuant to subsection (3) of this section on any lands held by the division in fee title or by long-term lease or easement agreement, as described in subsection (4) of this section, and for which a weed control agreement as described in subsection (4) of this section has been signed, and which costs are in accordance with that long-term agreement, shall be deemed correct and final and shall be paid by the division pursuant to section 33-1-110 (6.5), C.R.S.

35-5.5-111. Cooperation with federal and state agencies. The local governing bodies of all counties and municipalities in this state are hereby authorized to enter into cooperative agreements with federal and state agencies for the integrated management of noxious weeds within their respective territorial jurisdictions.

35-5.5-112. Public rights-of-way - management of noxious weeds - charges. It shall be the duty of each local governing body and each state board, department, or agency to confirm that all public roads, public highways, public rights-of-way, and any easements appurtenant thereto, under the jurisdiction of each such entity, are in compliance with this article, and any violations of this article shall be the financial responsibility of the appropriate local governing body or state board, department, or agency.

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35-5.5-113. Public nuisance - abatement. All noxious weeds, at any and all stages, their carriers, and any and all premises, plants, and things infested or exposed to infestation therewith may be declared to be a public nuisance by the local governing body having jurisdiction over the lands upon which said noxious weeds are situated. Once declared, such nuisances are subject to all laws and remedies relating to the prevention and abatement of nuisances. The local governing body, in a summary manner or otherwise, may take such action, including removal and destruction, with reference to such nuisance as in its discretion appears necessary. The remedies of this section shall be in addition to all other remedies provided by law.

35-5.5-114.1. Survey of compliance on federal land. On or before January 1, 1998, the state weed coordinator shall survey those counties that include significant amounts of federal land to determine the level of cooperation and compliance by the federal government with this article.

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35-5.5-115. Rules. The commissioner shall promulgate rules as necessary to carry out the purposes of this article, which rules shall include a designation of state noxious weeds.

35-5.5-116. Noxious weed management fund - creation - allocation of funds. (1) There is hereby created in the office of the state treasurer the noxious weed management fund. The fund shall consist of any civil penalties collected pursuant to section 35-5.5-118; any gifts, donations, and grants received pursuant to section 35-1-104 (1)(cc); and any moneys approved by the

general assembly for the purpose of funding noxious weed management projects. All interest derived from the deposit and investment of moneys in the fund shall be credited to the fund. The general assembly shall annually appropriate moneys in the fund to the department of agriculture for the purposes specified in subsection (2) of this section.

(2) The interest earned on moneys in the noxious weed management fund and appropriated to the department of agriculture shall be expended for costs incurred by the department of agriculture in administering this article, and any moneys appropriated that exceed the amount needed for such costs may be expended for noxious weed management projects in accordance with this section.

(3) The department may expend moneys through grants or contracts to communities, weed control districts, or other entities it considers appropriate for noxious weed management projects.

(4) The department may expend moneys for the following purposes:

(a) Noxious weed management programs with local weed control districts, if expenses are shared with such districts;

(b) With the approval of the agricultural commission, the department may make special grants to local weed control districts to eradicate or contain state noxious weeds, which grants may be issued without matching funds from the district;

(c) Administrative expenses incurred by the department;

(d) Any project the agricultural commission determines will significantly contribute to the management of noxious weeds within the state;

(e) With the approval of the agricultural commission, grants to the Colorado state university cooperative extension service, the Colorado state university experiment station, and universities for weed management research, evaluation, and education;

(f) Employment of a new and innovative noxious weed management project or the development, implementation, or demonstration of any noxious weed management project that may be proposed, implemented, or established by local, state, or national organizations, whether public or private. Such expenditures shall be shared with such organizations.

(5) If a new and potentially harmful noxious weed is discovered growing in the state and its presence is verified by the department, the governor may declare a noxious weed emergency. In the absence of necessary funding from other sources, the department is authorized to allocate up to fifty thousand dollars of the principal in the noxious weed management fund to government agencies for emergency relief to manage or confine the new noxious weed species.

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35-5.5-117. The state weed coordinator. (1) There shall be designated within the division of plant industry in the department of agriculture a state weed coordinator, who shall be under contract with or appointed by the commissioner.

(2) The state weed coordinator shall:

(a) Develop a recommended management plan for the integrated management of designated noxious weeds within state-owned lands;

(b) Facilitate cooperation between federal, state, and local land managers in the formation of a memorandum of understanding;

(c) Provide guidance and coordination for local governmental weed managers.

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35-5.5-118. Civil penalties. (1)(a) Any person who violates this article or any rule adopted pursuant to this article is subject to a civil penalty, as determined by the commissioner. The penalty shall not exceed one thousand dollars per violation; except that such penalty may be doubled if it is determined that the person has violated the provision or rule more than once. No civil penalty shall be imposed unless and until the person charged is given notice and opportunity for a hearing pursuant to article 4 of title 24, C.R.S.

(b) In addition to any civil penalties assessed pursuant to paragraph (a) of this subsection (1), any person who violates the provisions of section 35-5.5-104.5, 35-5.5-108, or 35-5.5-108.5, or any rule adopted to implement these sections, shall, upon an order of the commissioner, pay the cost of inspection and eradication of list A or list B noxious weed species, including, but not limited to, any immediate remediation costs, the estimated cost of future eradication, any administrative costs, and any court cost and attorney fees incurred by the commissioner in enforcing section 35-5.5-104.5, 35-5.5-108, or 35-5.5-108.5, or any rule adopted to implement these sections. The commissioner may not enforce such order unless and until the person charged is given notice and opportunity for a hearing pursuant to article 4 of title 24, C.R.S. All moneys due and owing pursuant to this paragraph (b) shall be payable to the department for the payment and reimbursement of enforcement and costs associated with such enforcement and are hereby continuously appropriated to the department for such purpose.

(2) If the commissioner is unable to collect a civil penalty, payment of costs imposed pursuant to subsection (1) of this section, or if the person fails to pay all or a specified portion of such penalty or payment, the department may bring suit in any court of competent jurisdiction to recover such amount plus costs and attorney fees.

(3) Before imposing any civil penalty or payment of costs, the commissioner may consider the effect of such penalty or payment of costs on the ability of the person charged to stay in business.

(4) All civil penalties and payment of costs collected pursuant to this section shall be deposited in the noxious weed management fund created in section 35-5.5-116.

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35-5.5-119. County funding. The board of county commissioners is authorized to levy a special tax, subject to the approval of the voters, upon every dollar of valuation of assessment of taxable property within the county for the purpose of creating a county fund to control noxious weeds; except that the amount raised from such levy in any one year shall not exceed the amount raised by five mills.

Effective August 6, 2003

DEPARTMENT OF AGRICULTURE

Conservation Services Division

RULES PERTAINING TO THE ADMINISTRATION AND ENFORCEMENT OF THE COLORADO NOXIOUS WEED ACT

8 CCR 1206-2

[Editor's Notes follow the text of the rules at the end of this CCR Document.]

Part 1 Definitions

1.1. "Act" means the Colorado Noxious Weed Act, §§ 35-5.5-101 through 119, C.R.S. (2003).

1.2. "Compliance waiver" means a written exemption granted to a local governing body or landowner by the Commissioner that releases the local governing body and/or landowner from certain management obligations for a specific population of a List A or List B species.

1.3. "Elimination" means the removal or destruction of all emerged, growing plants of a population of List A or List B species designated for eradication by the Commissioner. It is the first step in achieving eradication and is succeeded by efforts to detect and destroy newly emerged plants arising from seed, reproductive propagule, or remaining root stock for the duration of the seed longevity for the particular species.

1.4. "Infested acreage" means an area of land containing a noxious weed species, defined by the actual perimeter of the infestation as delineated by the canopy cover of the plants and excluding areas not infested.

1.5. "Population" means a group of designated noxious weeds of the same species occupying a particular geographic region and capable of interbreeding.

1.6. "Ordinary high water mark" means that line on the shore of any river or perennial or intermittent stream established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

1.7. "Public open space" means publicly-owned land that is managed for its natural or agricultural value.

1.8 All definitions in Section 35-5.5-103, CRS apply to these Rules.

Part 2 General Provisions

2.1. At any time, affected persons may suggest and the Commissioner may approve additional prescribed integrated management techniques not specified in these Rules for the eradication, elimination, containment, or suppression of designated state noxious weeds. Such approval may be site-specific or broadly applicable. The Commissioner will publish a list on the Colorado Department of Agriculture website (http://www.ag.state.co.us/csd/weeds/Weedhome.html) of the herbicides, cultural techniques, and mechanical techniques approved for use under the specific state noxious weed management plans for List A and List B species.

2.2. As a condition for granting a compliance waiver releasing a local governing body and/or landowner from certain management obligations, the Commissioner may require the local governing body and/or landowner to implement other specified management actions with respect to a specific population.

2.3. No recommendations or requirements in these Rules concerning the use of herbicides are intended to contradict or supersede any other federal, state or local law regulating herbicide use.

All use of herbicides to achieve any management objectives specified in these Rules must comply with all applicable federal, state and local legal requirements, including but not limited to

compliance with all directions for use, cautionary statements and any other requirements in the labeling of the particular herbicide product.

Part 3 List A Noxious Weed Species

3.1. List A of the Colorado noxious weed list comprises the following noxious weed species:

African rue (Peganum harmala) [Rule 3.6.1.]

Camelthorn (Alhagi maurorum) [Rule 3.6.2.]

Common crupina (Crupina vulgaris) [Rule 3.6.3.]

Cypress spurge (Euphorbia cyparissias) [Rule 3.6.4.]

Dyer's woad (Isatis tinctoria) [Rule 3.6.5.]

Elongated mustard (Brassica elongata) [Rule 3.6.18.]

Flowering rush (Butomus umbellatus) [Rule 3.6.24]

Giant reed (Arundo donax) [Rule 3.6.19.]

Giant salvinia (Salvinia molesta) [Rule 3.6.6.]

Hairy willow-herb (Epilobium hirsutum) [Rule 3.6.23]

Hydrilla (Hydrilla verticillata) [Rule 3.6.7.]

Japanese knotweed (Polygonum cuspidatum) [Rule 3.6.20.]

Giant knotweed (Polygonum sachalinense) [Rule 3.6.21.]

Bohemian knotweed (Polygonum x bohemicum) [Rule 3.6.22.]

Meadow knapweed (Centaurea nigrescens) [Rule 3.6.8.]

Mediterranean sage (Salvia aethiopis) [Rule 3.6.9.]

Medusahead (Taeniatherum caput-medusae) [Rule 3.6.10.]

Myrtle spurge (Euphorbia myrsinites) [Rule 3.6.11.]

Orange hawkweed (Hieracium aurantiacum) [Rule 3.6.12.]

Parrotfeather (Myriophyllum aquaticum) [Rule 3.6.25]

Purple loosestrife (Lythrum salicaria) [Rule 3.6.13.]

Rush skeletonweed (Chondrilla juncea) [Rule 3.6.14.]

Squarrose knapweed (Centaurea virgata) [Rule 3.6.15.]

Tansy ragwort (Senecio jacobaea) [Rule 3.6.16.]

Yellow starthistle (Centaurea solstitialis) [Rule 3.6.17.]

3.2. All populations of List A species in Colorado are designated by the Commissioner for eradication.

3.3. It is a violation of these rules to allow any plant of any population of any List A species to produce seed or develop other reproductive propagules.

3.4. Prescribed management techniques must be applied to every population of List A noxious weeds present in Colorado to achieve the following objectives:

A. The plants of every population of List A species must be eliminated prior to seed development.

B. Once all mature plants are eliminated, appropriate efforts must be made to detect and eliminate new plants arising from seed, reproductive propagule, or root stock for the duration of the seed longevity for the particular species.

C. In order to ensure that seeds or other reproductive propagules are not produced or spread, any plant with flowers, seeds, or other reproductive propagules must be placed in sealed plastic bags and disposed of by:

1. high intensity burning in a controlled environment that completely destroys seed viability;

2. removal of plant materials to a solid waste landfill which covers refuse daily with six inches of soil or alternative material; or

3. any other method approved by the Commissioner.

3.5. Within one year of detection, any local governing body with a population of any List A species must provide to the State Weed Coordinator mapping data pertinent to each population including:

A. Species name

B. Population location(s) including distribution and abundance

C. Estimated infested acreage

3.6. State Noxious Weed Management Plans for List A Noxious Weed Species

3.6.4. Cypress spurge (Euphorbia cyparissias). In addition to the requirements set forth in this Part 3 for the management of all List A species, the following conditions also apply for cypress spurge:

A. The prescribed integrated management techniques are limited to the use of herbicides approved by the Commissioner and hand-pulling, digging, or other mechanical techniques approved by the Commissioner.

B. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques or mechanical techniques other than those approved by the Commissioner.

C. Seed longevity is estimated to be eight years.

Part 4 List B Noxious Weed Species

4.1. List B of the Colorado noxious weed list comprises the following noxious weed species:

Absinth wormwood (Artemisia absinthium) [Rule 4.7.1.; Figures 1.01-1.03]

Black henbane (Hyoscyamus niger) [Rule 4.7.6.; Figures 5.01-5.02]

Bouncingbet (Saponaria officinalis) [Rule 4.7.29.; Figures 26.01-26.03]

Bull thistle (Cirsium vulgare) [Rule 4.7.19.; Figures 16.01-16.05]

Canada thistle (Cirsium arvense) [Rule 4.7.34.; Figures 30.01-30.06]

Chinese clematis (Clematis orientalis) [Rule 4.7.2.]

Common tansy (Tanacetum vulgare) [Rule 4.7.30.; Figures 27.01-27.03]

Common teasel (Dipsacus fullonum) [Rule 4.7.24.; Figures 21.01-21.10]

Corn chamomile (Anthemis arvensis) [Rule 4.7.22.; Figures 19.01-19.05]

Cutleaf teasel (Dipsacus laciniatus) [Rule 4.7.25.; Figures 22.01-22.03]

Dalmatian toadflax, broad-leaved (Linaria dalmatica) [Rule 4.7.12.; Figures 11.01-11.10]

Dalmatian toadflax, narrow-leaved (Linaria genistifolia) [Rule 4.7.12.; Figures 11.01-11.10]

Dame's rocket (Hesperis matronalis) [Rule 4.7.26.; Figures 23.01-23.07]

Diffuse knapweed (Centaurea diffusa) [Rule 4.7.7.; Figures 6.01-6.11]

Eurasian watermilfoil (Myriophyllum spicatum) [Rule 4.7.20.; Figures 17.07-17.02]

Hoary cress (Cardaria draba) [Rule 4.7.16.; Figures 13.01-13.21]

Houndstongue (Cynoglossum officinale) [Rule 4.7.10.; Figures 9.01-9.13]

Jointed goatgrass (Aegilops cylindrica) [Rule 4.7.27.; Figures 24.01-24.12]

Leafy spurge (Euphorbia esula) [Rule 4.7.13.; Figures 12.01-12.19]

Mayweed chamomile (Anthemis cotula) [Rule 4.7.22.; Figures 19.01-19.05]

Moth mullein (Verbascum blattaria) [Rule 4.7.28.; Figures 25.01-25.03]

Musk thistle (Carduus nutans) [Rule 4.7.21.; Figures 18.01-18.10]

Oxeye daisy (Leucanthemum vulgare) [Rule 4.7.8.; Figures 7.01-7.16]

Perennial pepperweed (Lepidium latifolium) [Rule 4.7.11.; Figures 10.01-10.14]

Plumeless thistle (Carduus acanthoides) [Rule 4.7.3.; Figures 2.01-2.02]

Russian knapweed (Acroptilon repens) [Rule 4.7.17.; Figures 14.01-14.11]

Russian-olive (Elaeagnus angustifolia) [Rule 4.7.35.; Figures 31.01-31.16]

Salt cedar (Tamarix chinensis, T. parviflora, and T. ramosissima) [Rule 4.7.5.; Figures 4.01- 4.13]

Scentless chamomile (Tripleurospermum perforatum) [Rule 4.7.22.; Figures 19.01-19.05]

Scotch thistle (Onopordum acanthium) [Rule 4.7.23.; Figures 20.01-20.14]

Scotch thistle (Onopordum tauricum) [Rule 4.7.23.; Figures 20.01-20.14]

Spotted knapweed (Centaurea stoebe) [Rule 4.7.4.; Figures 3.01-3.04]

Spotted x diffuse knapweed hybrid (Centaurea x psammogena = C. stoebe x C. diffusa) [Rule 4.7.4.; Figures 3.01-3.04]

Sulfur cinquefoil (Potentilla recta) [Rule 4.7.18.; Figures 15.01-15.04]

Wild caraway (Carum carvi) [Rule 4.7.31.; Figures 28.01-28.02]

Yellow nutsedge (Cyperus esculentus) [Rule 4.7.32.; Figures 29.01-29.05]

Yellow toadflax (Linaria vulgaris) [Rule 4.7.9.; Figures 8.01-8.14]

Yellow x Dalmatian toadflax hybrid (Linaria vulgaris x L. dalmatica) [Rule 4.7.12.; Figures 11.01-11.10]

4.2. List B noxious weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, develops and implements state noxious weed management plans designed to stop the continued spread of these species. List B species must be managed in accordance with all the provisions of this Part 4, including any applicable state noxious weed management plans. Until a plan for a particular species is developed and implemented by rule, all persons are recommended to manage that species.

4.3. Local governing bodies and other interested parties are encouraged to make special note of the distribution and abundance of bull thistle, musk thistle, Scotch thistle, common teasel, cutleaf teasel, jointed goatgrass, and Eurasian watermilfoil as the Commissioner will consult with the state noxious weed advisory committee, local governments, and other interested parties, in order to update and implement state noxious weed management plans in 2015-2016 designed to stop the continued spread of these species.

4.4. It is a violation of these rules to allow any plant of any population of a List B species designated for elimination by the Commissioner in a state noxious weed management plan (Rules 4.7.1-4.7.23) to produce seed or develop other reproductive propagules after the time specified in the plan for elimination.

4.5. Prescribed management techniques must be applied to every population of List B species designated for elimination by the Commissioner in a state noxious weed management plan (Rules 4.7.1-4.7.23) to achieve the following objectives:

A. The plants of every population of List B species designated for elimination must be eliminated prior to seed development in the year specified.

B. Any population that is discovered in areas designated for elimination subsequent to the year specified for elimination must be eliminated prior to the development of viable seed. If the population is discovered after seed development has occurred, then efforts must be made to minimize the dispersion of seed and elimination is required prior to seed development in the following year.

C. Once all plants are eliminated, appropriate efforts must be made in subsequent years to detect and eliminate new plants arising from seed, reproductive propagule, or root stock prior to seed development for the duration of the seed longevity for the particular species.

D. In order to ensure that seeds or other reproductive propagules are not produced or spread, any plant with flowers, seeds, or other reproductive propagules must be placed in sealed plastic bags and disposed of by:

1. high intensity burning in a controlled environment that completely destroys seed viability;

2. removal of plant materials to a solid waste landfill which covers refuse daily with six inches of soil or alternative material; or

3. any other method approved by the Commissioner.

4.6. Within one year of detection, any local governing body with a population of any List B species for which the Commissioner has developed and implemented a state noxious weed management plan must provide to the State Weed Coordinator mapping data pertinent to distribution and abundance of such species in a form prescribed by the State Weed Coordinator.

4.7. State Noxious Weed Management Plans for List B Noxious Weed Species

4.7.4. Spotted knapweed (Centaurea stoebe) and Spotted x diffuse knapweed hybrid (Centaurea x psammogena; C. stoebe x C. diffusa). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for spotted knapweed and spotted x diffuse knapweed hybrid:

A. Elimination of all populations is required prior to seed development in 2018 and each year thereafter in all Colorado counties except for Alamosa, Boulder, Clear Creek, Costilla, Dolores, Eagle, El Paso, Fremont, Garfield, Gilpin, Jefferson, Larimer, La Plata, Mesa, Moffat, Montezuma, Montrose, Ouray, Park, Rio Blanco, Rio Grande, and Summit counties.

B. Except as specified in Part 4.7.4G and Part 4.7.4H, **elimination** of all populations in **Alamosa**, Boulder, Clear Creek, Dolores, Eagle, Fremont, Garfield, Gilpin, Jefferson, Larimer, Mesa, Moffat, Montezuma, Montrose, Ouray, Park, Rio Blanco, and Rio Grande counties is required prior to seed development in **2020** and each year thereafter.

G. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking must be eliminated prior to seed development on an annual basis.

H. All populations that are located within the area from the center of any river or perennial or intermittent stream to 15 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment requirement of the two counties by 2018, and each year thereafter. For the mainstem of the South Platte River where it forms the boundary between Douglas and Jefferson counties, all populations need to be eliminated on both banks from the center of the mainstem river to 15 feet beyond the ordinary high water mark by 2018, and each year thereafter.

I. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner and hand-pulling, digging, or other mechanical techniques approved by the Commissioner.

J. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques or mechanical techniques other than those approved by the Commissioner.

K. Seed longevity is estimated to be at least eight years. Infested sites must be monitored for at least nine years after the populations have been eliminated and treatments must be repeated when necessary to prevent flowering and development of seed.

4.7.5. Salt cedar (Tamarix chinensis, T. parviflora, and T. ramosissima). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for any salt cedar populations in public open space areas, and any populations within 300 feet of any intermittent or perennial streams, rivers, water conveyance ditches, ponds, lakes and reservoirs, whether natural or man-made. These conditions also apply to any salt cedar populations that are directly contiguous to any salt cedar populations within this 300-foot treatment area.

A. Elimination of all populations is required prior to seed development in 2019 and each year thereafter in all Colorado counties except for Adams, Arapahoe, Archuleta, Broomfield, Delta, Dolores, Eagle, El Paso, Fremont, Huerfano, Jefferson, La Plata, Larimer, Lincoln, Morgan, Ouray, Rio Blanco, San Miguel, Sedgwick, Washington, Weld, and Yuma counties, and those counties specified in Part 4.7.5P.

P. Except as specified in Part 4.7.5Q and part 4.7.5R, **suppression** is the specified State management objective for all populations in **Alamosa**, Bent, Crowley, Garfield, Kiowa, Las Animas, Mesa, Moffat, Montezuma, Montrose, Otero, Prowers, and Pueblo counties.

Q. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking must be eliminated prior to seed development on an annual basis.

R. All populations that are located within the area from the center of any river or perennial or intermittent stream to 300 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment requirement of the two counties by 2019, and each year thereafter. For the mainstream of the South Platte River where it forms the boundary between Douglas and Jefferson counties, all populations need to be eliminated on both banks from the center of the mainstream river to 300 feet beyond the ordinary high water mark by 2019, and each year thereafter.

S. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner and hand-pulling, digging, sawing, or other mechanical techniques approved by the Commissioner.

T. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques, or mechanical techniques other than those approved by the Commissioner.

U. Seed longevity is less than one year. Infested sites must be monitored for at least one year after the populations have been eliminated and treatments must be repeated when necessary to prevent stump and root re-sprouting.

4.7.6. Black henbane (Hyoscyamus niger). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for black henbane:

A. **Elimination of all populations is required prior to seed development in 2018 and each year thereafter** in all Colorado counties except for Costilla, Eagle Grand, Moffat, Rio Blanco, Rio Grande, and Saguache counties.

E. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking must be eliminated prior to seed development on an annual basis.

F. All populations that are located within the area from the center of any river or perennial or intermittent stream to 15 feet beyond the ordinary high water mark

on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment requirement of the two counties by 2018, and each year thereafter. For the mainstem of the Rio Grande where it forms the boundary between Conejos and Costilla counties, all populations need to be eliminated on both banks from the center of the mainstem river to 15 feet beyond the ordinary high water mark by 2018, and each year thereafter.

G. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner and hand-pulling, digging, or other mechanical techniques approved by the Commissioner.

H. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques or mechanical techniques other than those approved by the Commissioner.

I. Seed longevity is estimated to be at least four years. Infested sites must be monitored for at least four years after the populations have been eliminated and treatments must be repeated when necessary to prevent flowering and development of seed.

4.7.11 Perennial pepperweed (Lepidium latifolium). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for perennial pepperweed:

A. Elimination of all populations is required prior to seed development in 2019 and each year thereafter in all Colorado counties except for Adams, Archuleta, Bent, Boulder, Chaffee, Conejos, Costilla, Custer, Denver, El Paso, Elbert, Gunnison, Jefferson, La Plata, Larimer, Mesa, Mineral, Moffat, Montezuma, Montrose, Morgan, Ouray, Prowers, Rio Blanco, Rio Grande, Saguache, Summit, and Weld counties, and those counties specified in Part 4.7.11R.

B. Except as specified in Part 4.7.11S and Part 4.7.11T, elimination of all populations in Archuleta, Bent, Chaffee, Custer, El Paso, Elbert, Gunnison, La Plata, Mineral, Montezuma, Montrose, Prowers, Rio Blanco, and Summit counties is required prior to seed development in 2021 and each year thereafter.

R. Except as specified in Part 4.7.11S and Part 4.7.11.T, **suppression** is the State management objective for all populations in **Alamosa**, Eagle, Garfield, and Pueblo counties.

S. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking must be eliminated prior to seed development on an annual basis.

T. All populations that are located within the area from the center of any river or perennial or intermittent stream to 15 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment requirement of the two counties by 2019, and each year thereafter. For the mainstem of the Rio Grande where it forms the boundary between Conejos and Costilla counties, and the mainstem of the South Platte River where it forms the boundary between Douglas and Jefferson counties, all populations need to be eliminated on both banks from the center of the mainstem river to 15 feet beyond the ordinary high water mark by 2019, and each year thereafter.

U. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner.

V. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques or mechanical techniques other than those approved by the Commissioner.

W. Seed longevity is unknown. Infested sites must be monitored for at least ten years after the populations have been eliminated and treatments must be repeated when necessary to prevent flowering and development of seed.

4.7.13. Leafy spurge (Euphorbia esula). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for leafy spurge:

A. Elimination of all populations is required prior to seed development in 2019 and each year thereafter in all Colorado counties except for Adams, Arapahoe, Archuleta, Boulder, Chaffee, Custer Delta, Eagle, El Paso, Fremont, Garfield, Gilpin, Grand, Huerfano, La Plata, Lincoln, Mesa, Moffat, Montezuma, Montrose, Morgan, Ouray, Pitkin, Pueblo, Rio Blanco, Routt, San Miguel, Sedgwick, Summit, Teller, and Weld counties, and those counties specified in Part 4.7.13W.

W. Except as specified in Part 4.7.13X and in Part 4.7.13Y, **suppression** is the specified State management objective for all populations in **Alamosa**, Denver, Douglas, Jefferson, and Larimer counties.

X. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking must be eliminated prior to seed development on an annual basis.

Y. All populations in this state that are within the area from the center of any river or perennial or intermittent stream to 15 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be eliminated prior to seed development in 2019 and each year thereafter.

Z. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner and digging or hand-pulling seedlings, or other mechanical techniques approved by the Commissioner.

AA. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques or mechanical techniques other than those approved by the Commissioner.

AB. Seed longevity is estimated to be at least 8 years. Infested sites must be monitored for at least 8 years after the populations have been eliminated and treatments must be repeated when necessary to prevent flowering and development of seed.

4.7.16. Hoary cress (Cardaria draba). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for hoary cress:

A. Elimination of all populations is required prior to seed development in 2019 and each year thereafter in all Colorado counties except for Adams, **Alamosa**, Arapahoe, Archuleta, Bent, Boulder, Broomfield, Chaffee, Conejos, Costilla, Douglas, El Paso, Fremont, Grand, Gunnison, Jackson, Kit Carson, Larimer, Las Animas, Logan, Mineral, Montezuma, Montrose, Morgan, Prowers, Rio Blanco, Rio Grande, Saguache, San Miguel, Sedgwick, and Weld counties, and those counties specified in Part 4.7.16X.

D. Elimination of all populations in **Alamosa** County is required prior to seed development in 2021 and each year thereafter for all land outside the boundaries of an area demarcated by the western and southern borders of Alamosa County, South 112 Road on the east, Latitude 37°34'32.6"N and County Road 0.0 (Stanley Road) on the north. Within these boundaries, all populations that are located within the area from the center of any river or perennial or intermittent

stream to 15 feet beyond the ordinary high water mark on both banks, and that are within ¼-mile of the downstream boundary of this area, must be treated to meet the treatment requirement for the area immediately downstream. Except as specified in Part 4.7.16Y, **for all land within the area described above, suppression is the specified State management objective (see Rule 4.8, Figure 13.02).**

Y. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking must be eliminated prior to seed development on an annual basis.

Z. All populations in this state that are within the area from the center of any river or perennial or intermittent stream to 15 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment requirement of the two counties by 2019, and each year thereafter. For the mainstem of the Rio Grande where it forms the boundary between Conejos and Costilla counties, and the mainstem of the South Platte River where it forms the boundary between Douglas and Jefferson counties, all populations need to be eliminated on both banks from the center of the mainstem river to 15 feet beyond the ordinary high water mark by 2019, and each year thereafter.

AA. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner and hand-pulling seedlings, or other mechanical techniques approved by the Commissioner.

AB. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques or mechanical techniques other than those approved by the Commissioner.

AC. Seed longevity is estimated to be at least three years. Infested sites must be monitored for at least three years after the populations have been eliminated and treatments must be repeated when necessary to prevent flowering and development of seed.

4.7.17. Russian knapweed (Centaurea repens). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for Russian knapweed:

A. Elimination of all populations is required prior to seed development in 2019 and each year thereafter in all Colorado counties except for Adams, Arapahoe, Archuleta, Boulder, Broomfield, Chaffee, Cheyenne, Conejos, Denver, Dolores, El Paso, Elbert, Fremont, Gunnison, Huerfano, Jefferson, La Plata, Larimer, Las Animas, Lincoln, Mineral, Morgan, Ouray, Rio Blanco, Rio Grande, Saguache, and Weld counties and those counties specified in Part 4.7.17N.

N. Except as specified in Part 4.7.17O and in Part 4.7.17P, **suppression** is the specified State management objective for all populations in **Alamosa**, Costilla, Crowley, Custer, Delta, Eagle, Garfield, Kiowa, Mesa, Moffat, Montezuma, Montrose, Otero, and Pueblo Counties.

O. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking must be eliminated prior to seed development on an annual basis.

P. All populations in this state that are within the area from the center of any river or perennial or intermittent stream to 15 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment requirement of the two counties by 2019, and each year thereafter.

Q. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner and hand-pulling or digging seedlings, mowing, or other mechanical techniques approved by the Commissioner.

R. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques or mechanical techniques other than those approved by the Commissioner.

S. Seed longevity is estimated to be at least three years. Infested sites must be monitored for at least three years after the populations have been eliminated and treatments must be repeated when necessary to prevent flowering and development of seed.

4.7.20. Eurasian watermilfoil (Myriophyllum spicatum). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for Eurasian watermilfoil:

A. Elimination of all populations is required prior to seed or rooted fragment development in 2015 and each year thereafter in all Colorado counties except for Arapahoe, and Denver counties and those counties specified in Part 4.7.20D.

D. **Suppression** is the specified State management objective for all populations in **Alamosa**, Boulder, Fremont, Jefferson and Weld counties.

E. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner and hand-pulling, or other mechanical techniques approved by the Commissioner.

F. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques or mechanical techniques other than those approved by the Commissioner.

G. Seed longevity is not an important factor for this species. Infested sites must be monitored continuously after the populations have been eliminated and treatments must be repeated when necessary to prevent reestablishment from plant fragmentation.

4.7.21. Musk thistle (Carduus nutans). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for musk thistle:

A. Except as specified in Part 4.7.21N, **elimination of all populations is required prior to seed development in 2015 and each year thereafter** in all Colorado counties except for Archuleta, Jackson, Mesa, Moffat, Park, Phillips, Rio Blanco, Routt, Sedgwick, and Yuma counties and those counties specified in Part 4.7.21L.

M. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking must be eliminated prior to seed development on an annual basis.

N. All populations that are located within the area from the center of any river or perennial or intermittent stream to 15 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment requirement of the two counties by 2016 and each year thereafter.

O. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner and hand-pulling, digging, or other mechanical techniques

approved by the Commissioner.

P. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques or mechanical techniques other than those approved by the Commissioner.

Q. Seed longevity is estimated to be at least ten years. Infested sites must be monitored for at least ten years after the populations have been eliminated and treatments must be repeated when necessary to prevent flowering and development of seed.

4.7.29. Bouncingbet (Saponaria officinalis). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for bouncingbet:

A. **Elimination of all populations is required prior to seed development in 2016 and each year thereafter** in all Colorado counties except for Denver, Larimer and Pueblo counties, and those counties specified in Part 4.7.29E.

F. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking must be eliminated prior to seed development on an annual basis.

G. All populations that are located within the area from the center of any river or perennial or intermittent stream to 15 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment requirement of the two counties by 2014, and each year thereafter. For the mainstem of the South Platte River where it forms the boundary between Douglas and Jefferson counties, all populations need to be eliminated on both banks from the center of the mainstem river to 15 feet beyond the ordinary high water mark by 2016, and each year thereafter.

H. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner and other mechanical techniques approved by the Commissioner.

I. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques, or mechanical techniques other than those approved by the Commissioner.

J. Seed longevity is unknown. Infested sites must be monitored for at least 10 years after the populations have been eliminated and treatments must be repeated when necessary to prevent flowering and development of seed.

4.7.30. Common tansy (Tanacetum vulgare). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for common tansy:

A. **Elimination of all populations is required prior to seed development in 2016 and each year thereafter** in all Colorado counties except for Boulder, Garfield, and Jackson counties.

E. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking must be eliminated prior to seed development on an annual basis.

F. All populations that are located within the area from the center of any river or perennial or intermittent stream to 15 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment req1uirement of the two counties by 2016, and each year thereafter.

G. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner and hand-pulling, mowing, or other mechanical techniques approved by the Commissioner.

H. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques, or mechanical techniques other than those approved by the Commissioner.

I. Seed longevity is unknown. Infested sites must be monitored for at least 10 years after the populations have been eliminated and treatments must be repeated when necessary to prevent flowering and development of seed.

4.7.31. Wild caraway (Carum carvi). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for wild caraway:

A. **Elimination of all populations is required prior to seed development in 2016 and each year thereafter** in all Colorado counties except for Larimer and Summit counties and those counties specified in Part 4.7.31D.

E. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking must be eliminated prior to seed development on an annual basis.

F. All populations that are located within the area from the center of any river or perennial or intermittent stream to 15 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment requirement of the two counties by 2016, and each year thereafter. For the mainstem of the South Platte River where it forms the boundary between Douglas and Jefferson counties, all populations need to be eliminated on both banks from the center of the mainstem river to 15 feet beyond the ordinary high water mark by 2014, and each year thereafter.

G. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner and hand-pulling, digging, tilling or other mechanical techniques approved by the Commissioner.

H. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques, or mechanical techniques other than those approved by the Commissioner.

I. Seed longevity is unknown. Infested sites must be monitored for at least 10 years after the populations have been eliminated and treatments must be repeated when necessary to prevent flowering and development of seed.

4.7.34. Canada thistle (Cirsium arvense). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for Canada thistle:

A. Elimination of all populations is required prior to seed development in 2017 and each year thereafter in all Colorado counties except for Alamosa, Conejos, Las Animas, Mesa, Prowers, and Weld counties, and those counties specified in Part 4.7.34H.

B. Elimination of all populations in **Alamosa** County is required prior to seed development in 2017 and each year thereafter for all land outside the boundaries of an area demarcated by the western, southern, and eastern borders of Alamosa County, and US Highway 160, State Highway 17, County Road 0.0 (Stanley Road) on the north. Except as specified in Part 4.7.34I and Part 4.7.34J, **for all land within the area described above, suppression is the specified State**

management objective (see Rule 4.8, Figure 30.01).

I. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking, must be eliminated prior to seed development on an annual basis.

J. All populations that are located within the area from the center of any river or perennial or intermittent stream to 15 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment requirement of the two counties by 2017, and each year thereafter. For the mainstem of the Rio Grande where it forms the boundary between Conejos and Costilla counties, all populations need to be eliminated on both banks from the center of the mainstem river to 15 feet beyond the ordinary high water mark by 2017, and each year thereafter.

K. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the Commissioner, and mowing or other mechanical techniques approved by the Commissioner.

L. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques, or mechanical techniques other than those approved by the Commissioner.

M. Seed longevity is estimated to be up to 20 years. Infested sites must be monitored for at least 20 years after the populations have been eliminated and treatments must be repeated when necessary to prevent flowering and development of seed.

4.7.35. Russian-olive (Elaeagnus angustifolia). In addition to the requirements set forth in this Part 4 for the management of all List B species, the following conditions also apply for any Russian-olive populations in public open space areas, and any populations within 100 feet of any intermittent or perennial streams, rivers, water conveyance ditches, ponds, lakes and reservoirs, whether natural or man-made. These conditions also apply to any Russian-olive populations that are directly contiguous to any Russian-olive populations within this 100-foot treatment area.

A. Elimination is required prior to seed development in 2022 and each year thereafter in all Colorado counties except for Arapahoe, Boulder, Chaffee, Conejos, Crowley, Delta, Dolores, El Paso, Larimer, Las Animas, Moffat, Montrose, Morgan, Prowers, Rio Blanco, and San Miguel Counties and those counties specified in Part 4.7.35S.

S. Except as specified in Part 4.7.35T and Part 4.7.35U, **suppression** is the specified State management objective in **Alamosa**, Baca, Bent, Costilla, Douglas, Garfield, Huerfano, Jefferson, Lincoln, Logan, Mesa, Montezuma, and Pueblo Counties.

T. All populations on public land in this state that are within 15 feet from the edge of any public road and any immediately adjacent area used for parking, must be eliminated prior to seed development on an annual basis.

U. All populations that are located within the area from the center of any river or perennial or intermittent stream to 100 feet beyond the ordinary high water mark on both banks, and are within ¼-mile of the downstream boundary of the county, must be treated to meet the higher treatment requirement of the two counties by 2018, and each year thereafter.

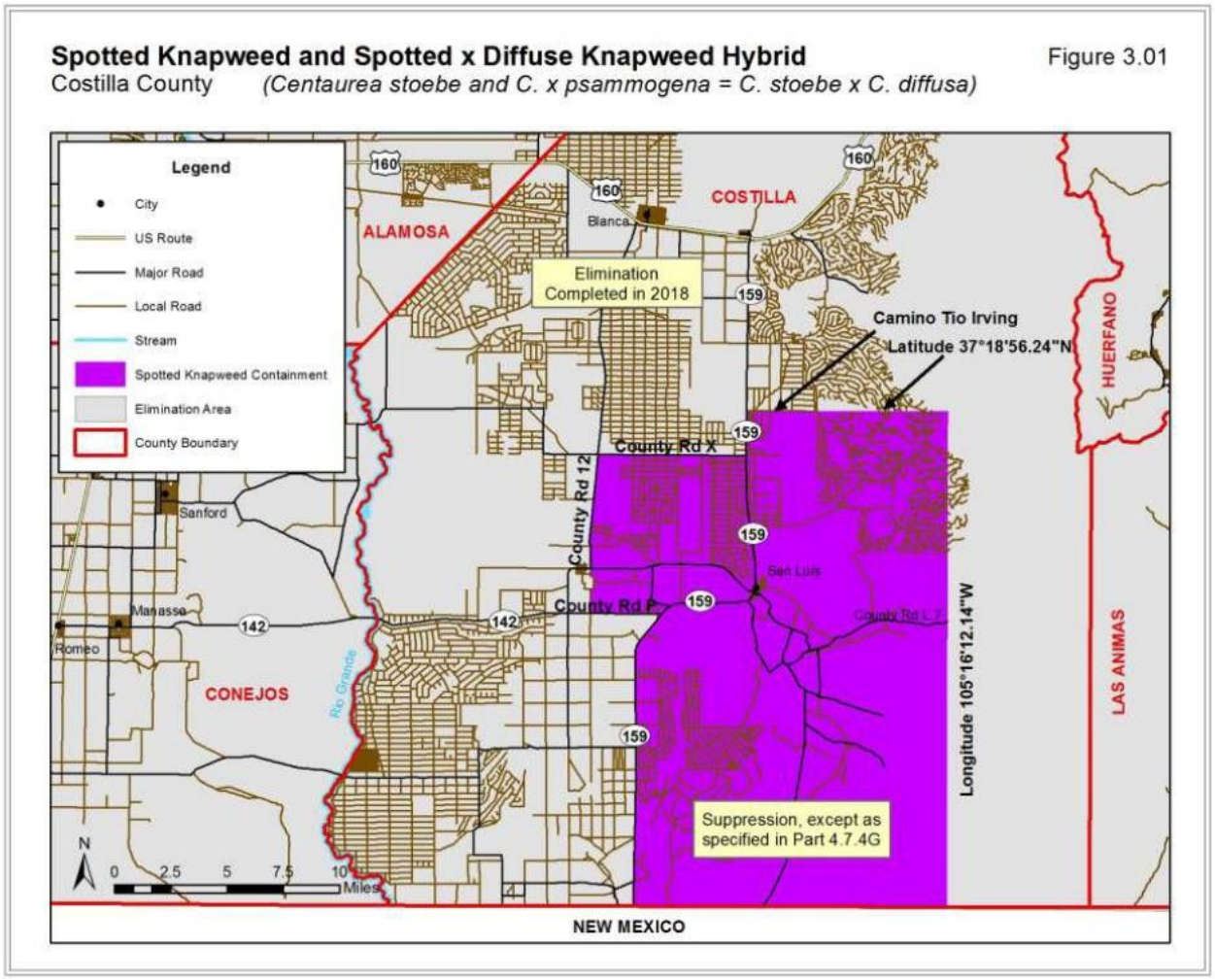
V. The prescribed integrated management techniques for the elimination of designated populations are limited to the use of herbicides approved by the

Commissioner and hand-pulling, digging, sawing, or other mechanical techniques approved by the Commissioner.

W. Prescribed integrated management techniques do not include the use of any biocontrol agents, herbicides, cultural techniques, or mechanical techniques other than those approved by the Commissioner.

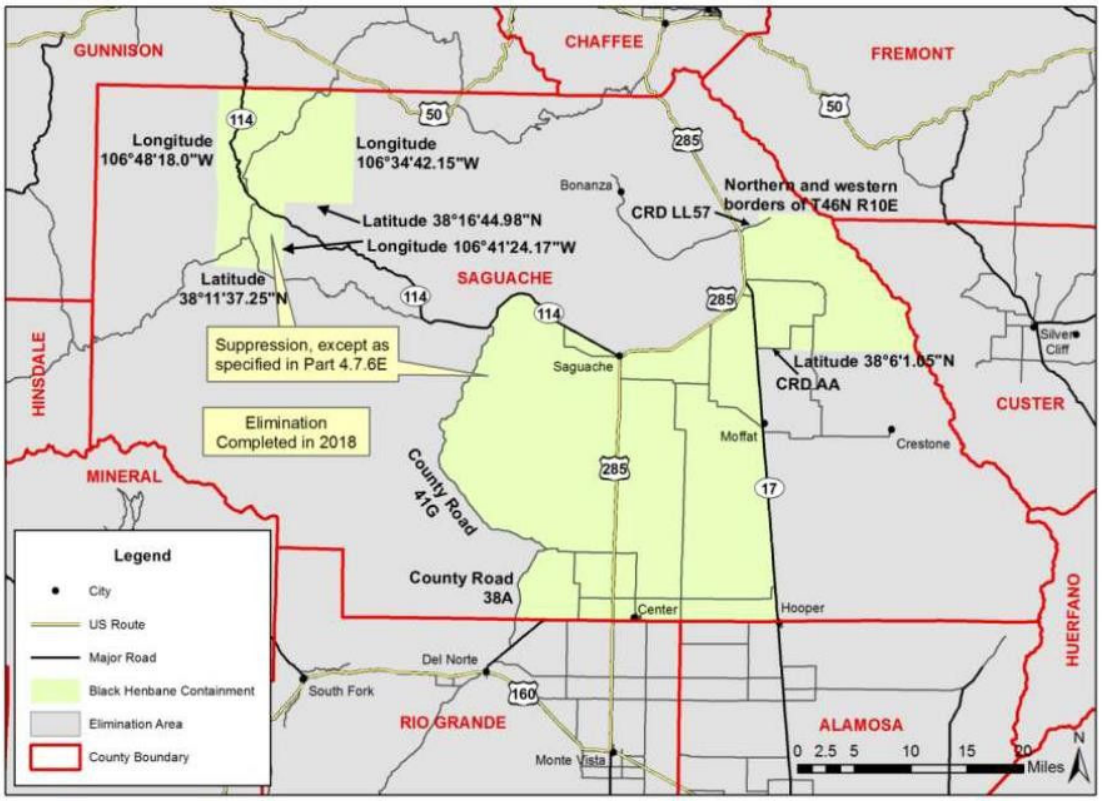
X. Seed longevity is estimated to be at least three years. Infested sites must be monitored for at least four years after the populations have been eliminated and treatments must be repeated when necessary to prevent stump and root re-sprouting.

4.8. Figures 1.01 – 31.16



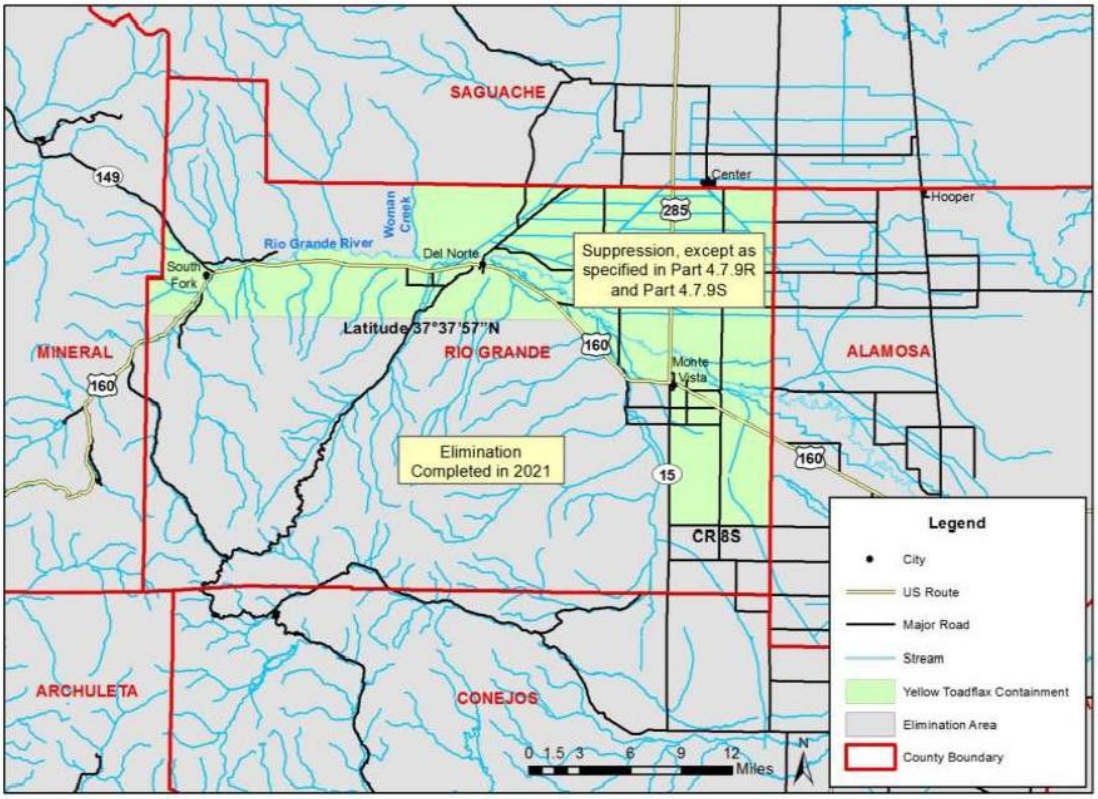
Black henbane *(Hyoscyamus niger)* Figure 5.02

Saguache County



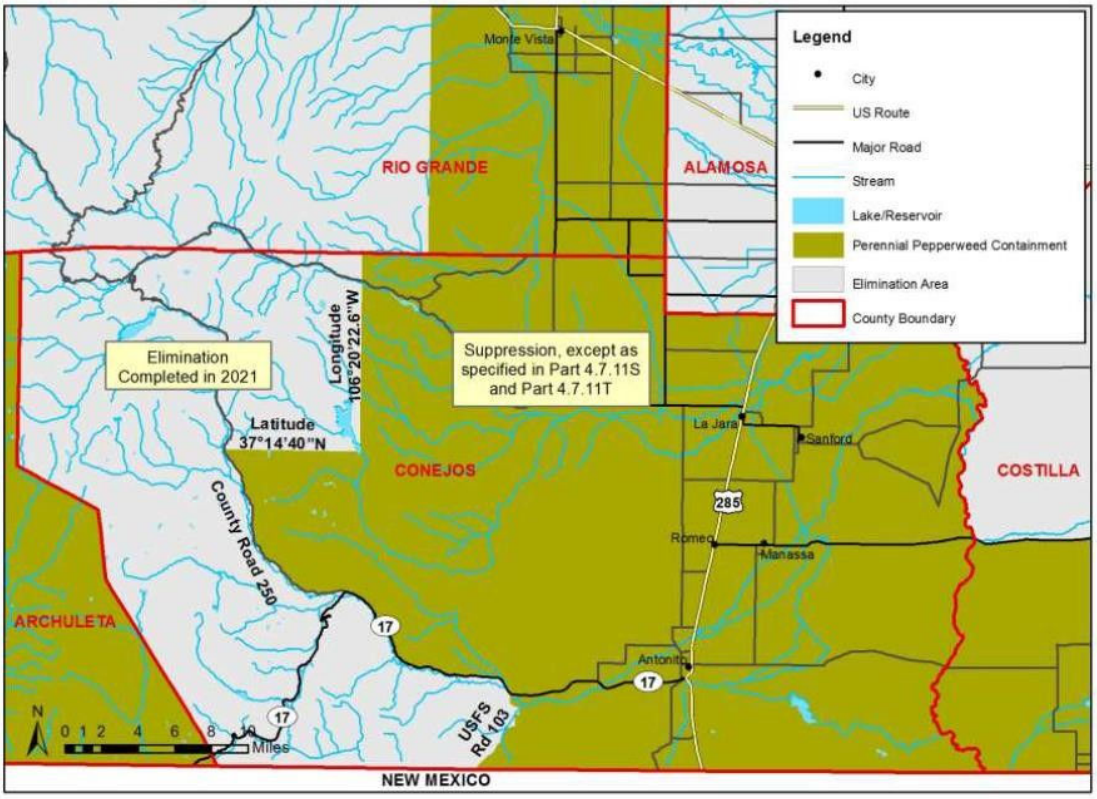
Yellow toadflax *(Linaria vulgaris)* Figure 8.13

Rio Grande County



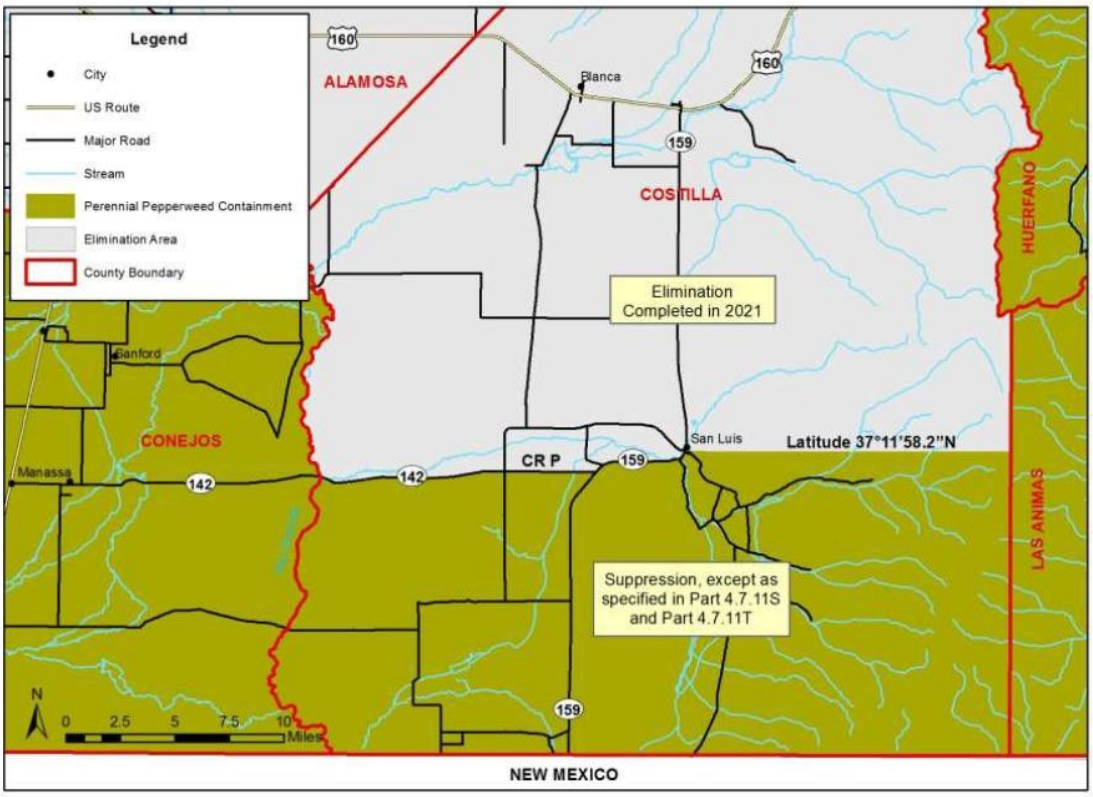
Perennial Pepperweed *(Lepidium latifolium)*
Conejos County

Figure 10.03



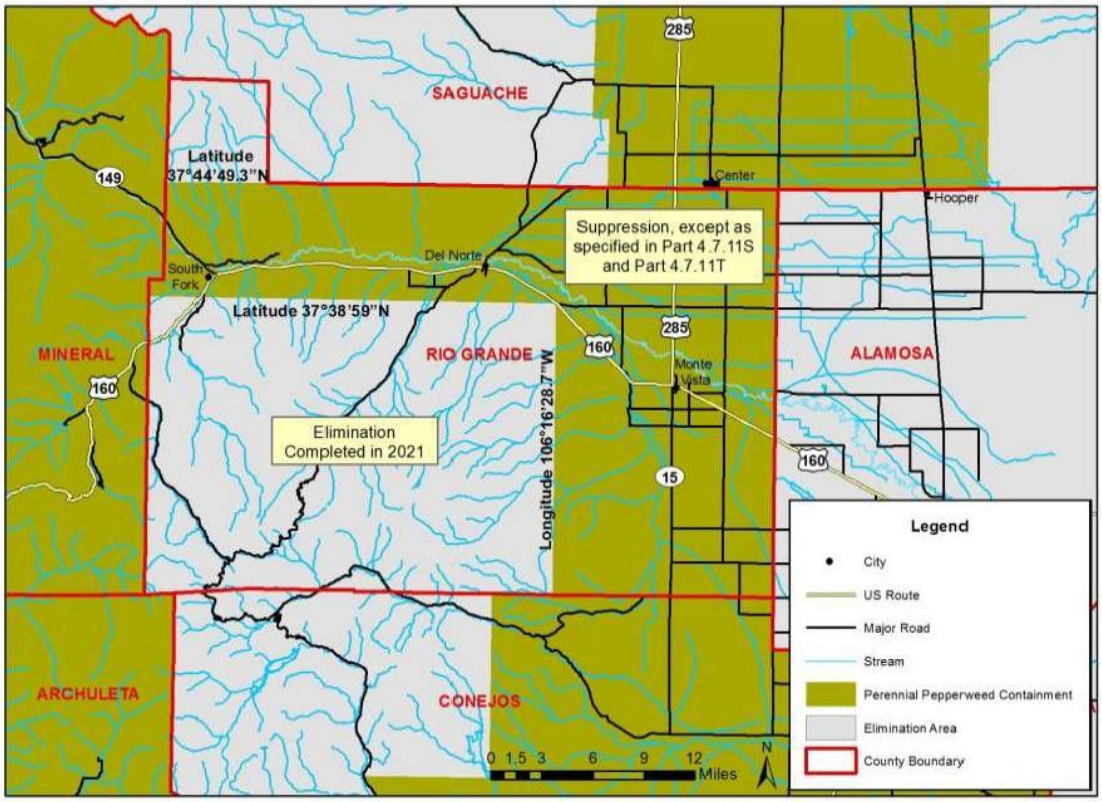
Perennial Pepperweed *(Lepidium latifolium)*
Costilla County

Figure 10.04



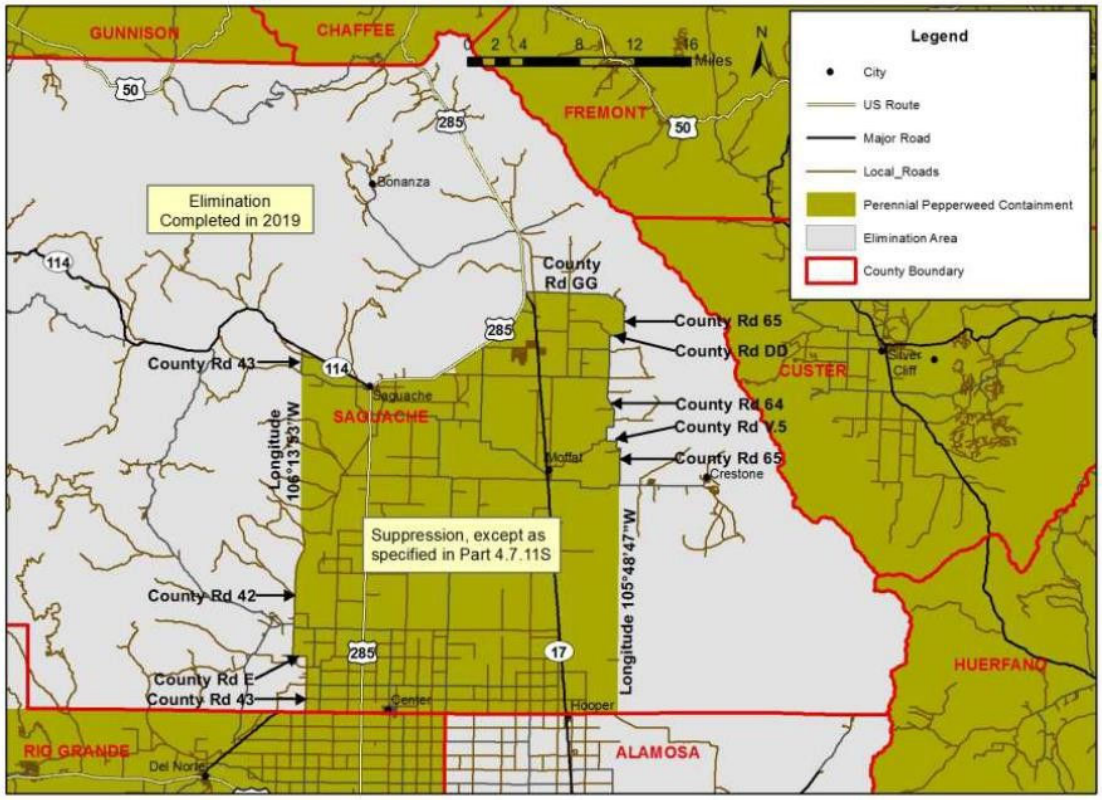
Perennial Pepperweed *(Lepidium latifolium)*
Rio Grande County

Figure 10.12



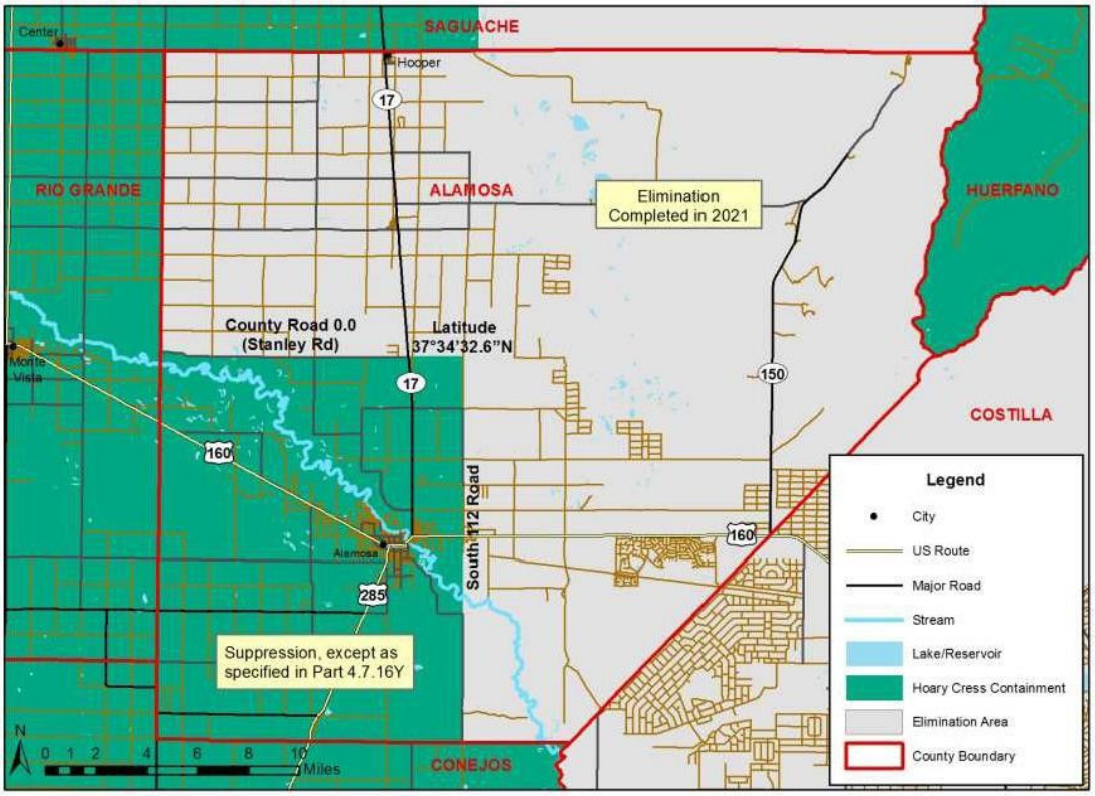
Perennial Pepperweed *(Lepidium latifolium)*
Saguache County

Figure 10.13



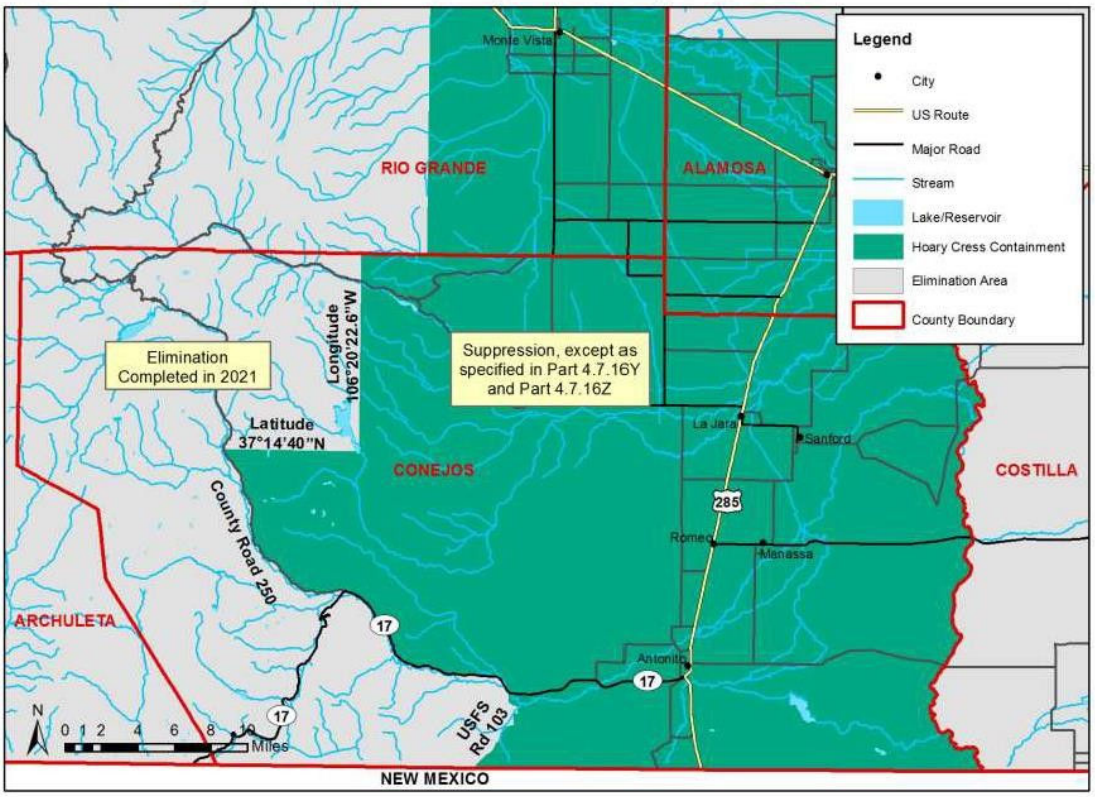
Hoary Cress *(Cardaria draba)*
Alamosa County

Figure 13.02



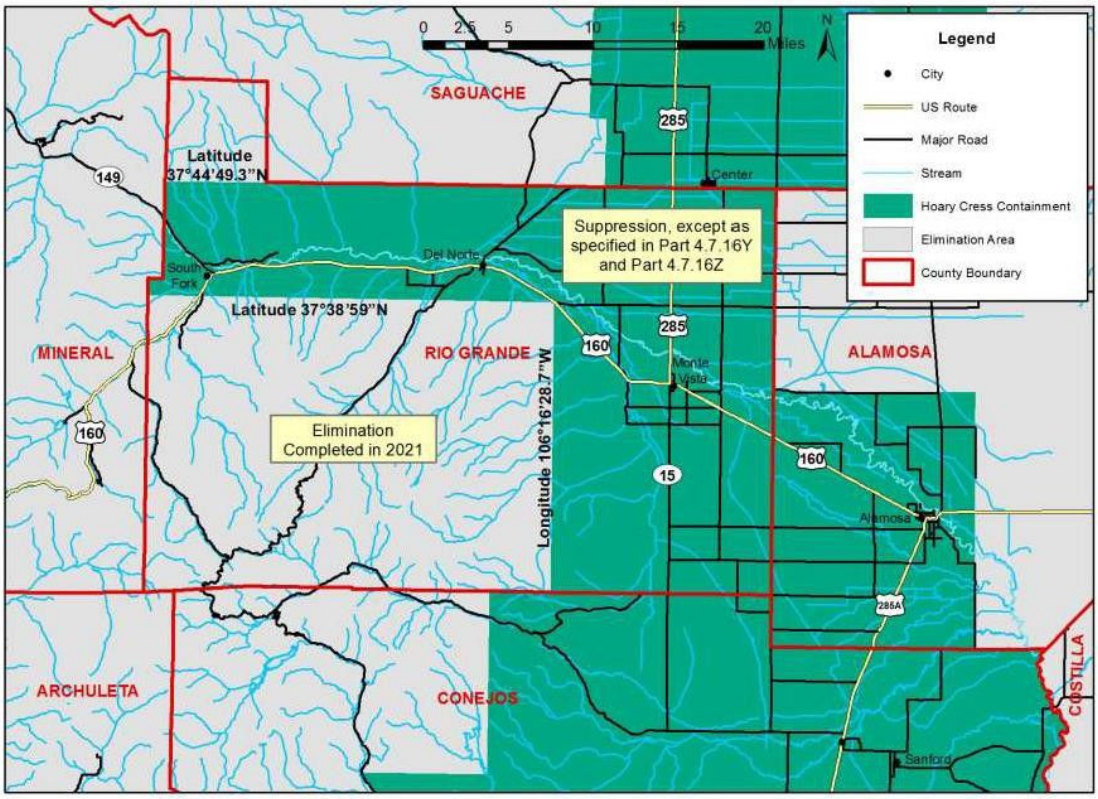
Hoary Cress *(Cardaria draba)*
Conejos County

Figure 13.07



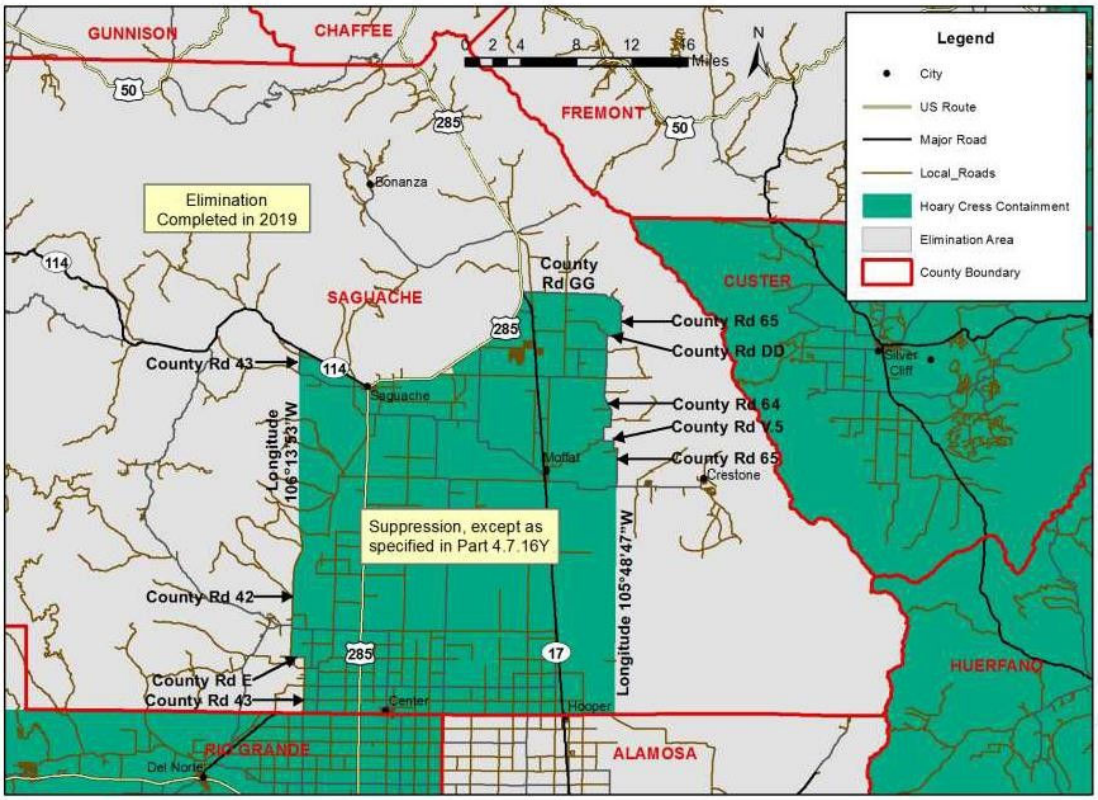
Hoary Cress *(Cardaria draba)*
Rio Grande County

Figure 13.17



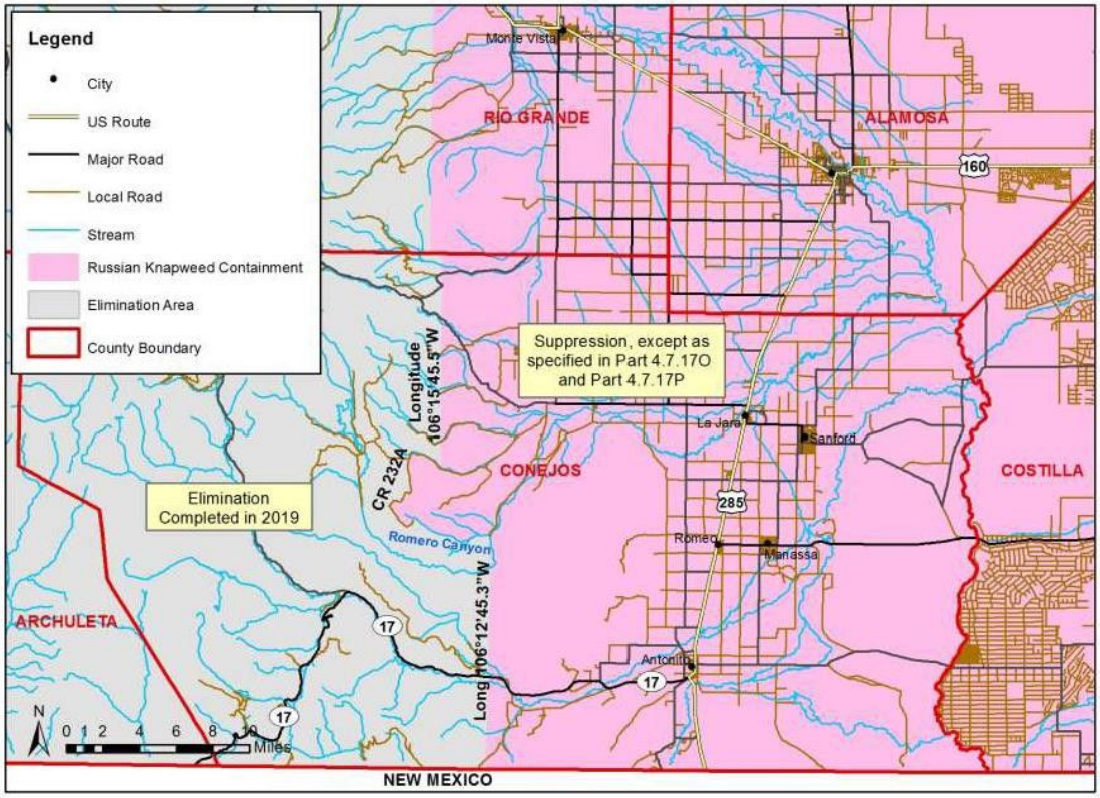
Hoary Cress *(Cardaria draba)*
Saguache County

Figure 13.18



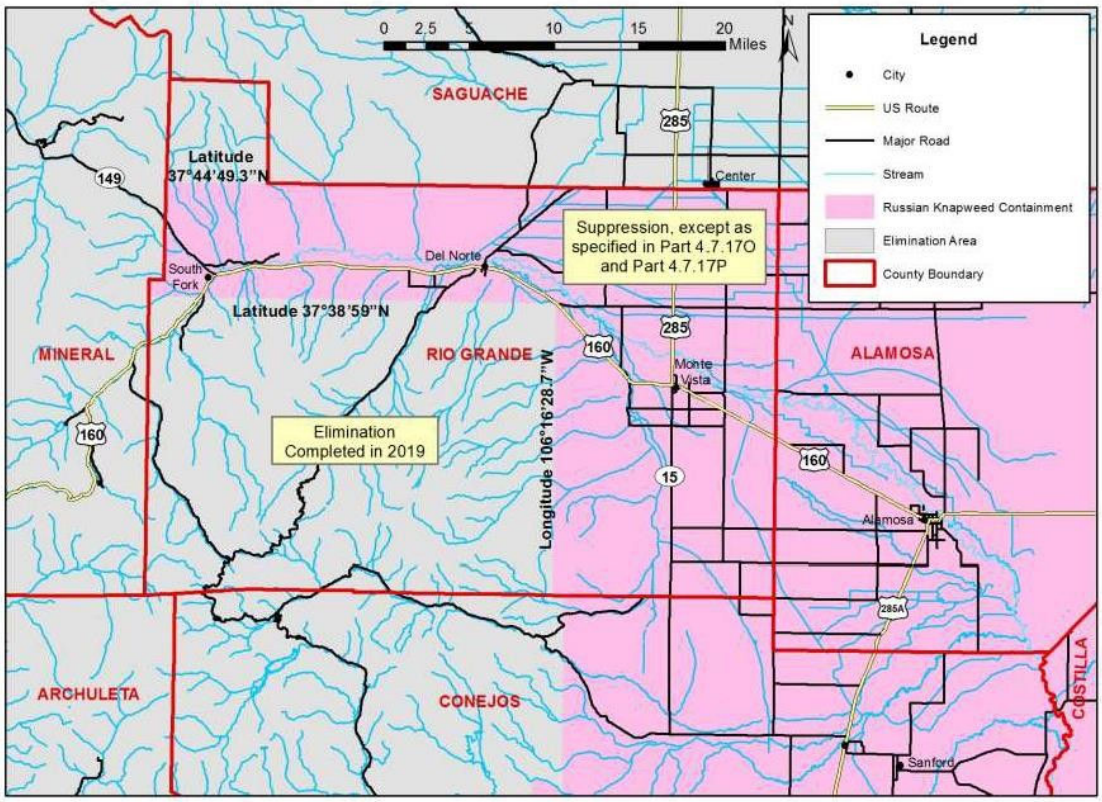
Russian Knapweed *(Acroptilon repens)*
Conejos County

Figure 14.03



Russian Knapweed *(Acroptilon repens)*
Rio Grande County

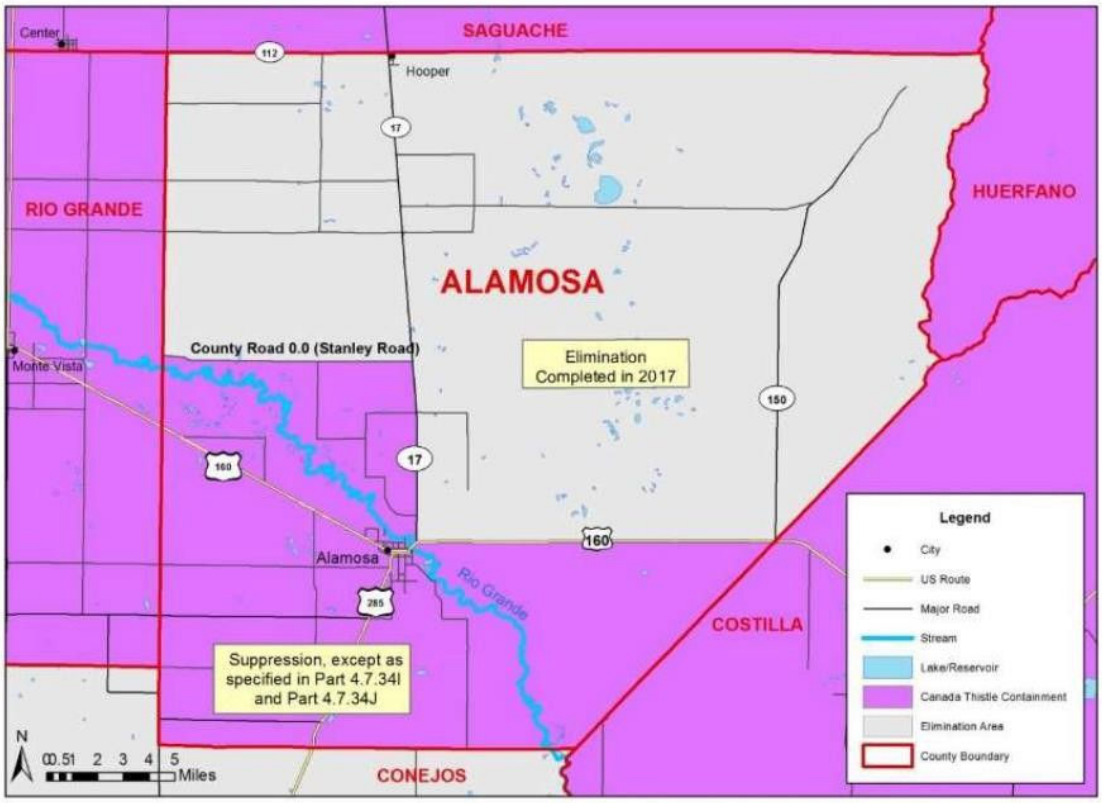
Figure 14.10



Canada thistle *(Cirsium arvense)*

Figure 30.01

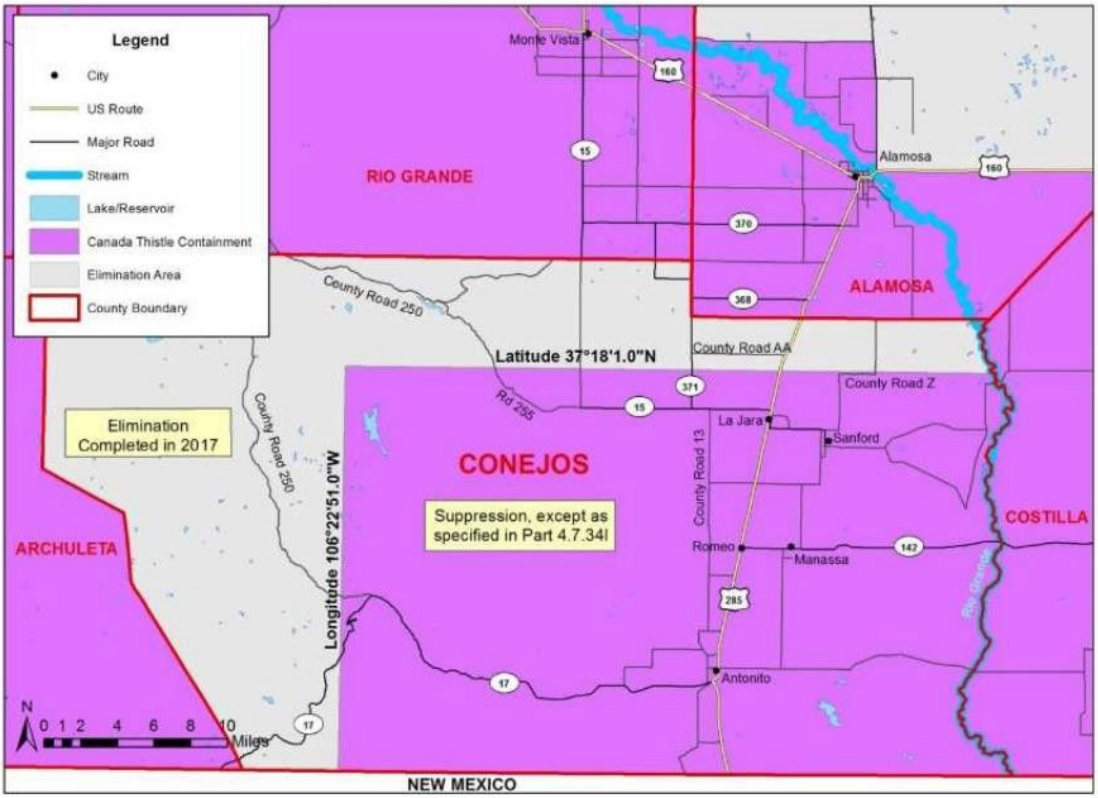
Alamosa County



Canada thistle *(Cirsium arvense)*

Figure 30.02

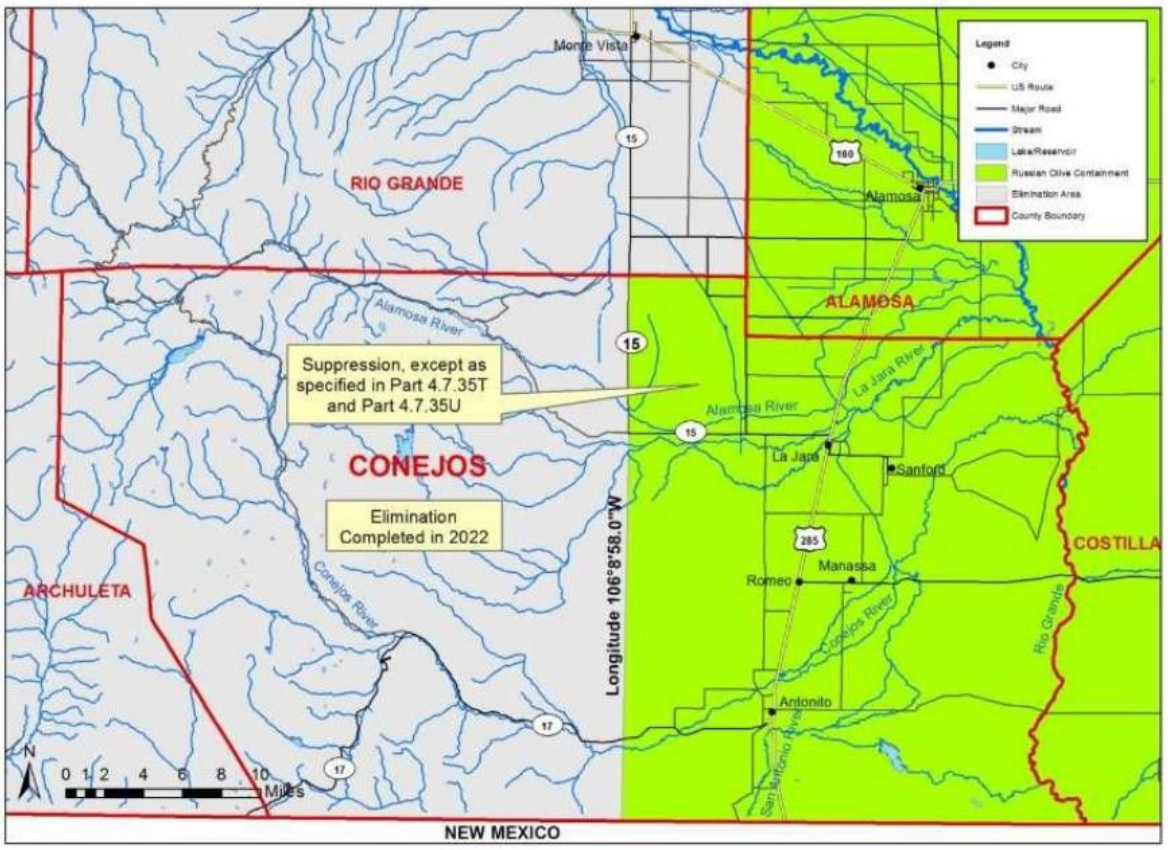
Conejos County



Russian Olive *(Elaeagnus angustifolia)*

Figure 31.04

Conejos County



Part 5 List C Noxious Weed Species

5.1. List C of the Colorado noxious weed list comprises the following noxious weed species:

Bulbous bluegrass (Poa bulbosa)

Chicory (Cichorium intybus) Common

burdock (Arctium minus) Common

mullein (Verbascum thapsus)

Common St. Johnswort (Hypericum perforatum)

Downy brome (Bromus tectorum)

Field bindweed (Convolvulus arvensis)

Halogeton (Halogeton glomeratus)

Johnsongrass (Sorghum halepense)

Perennial sowthistle (Sonchus arvensis)

Poison hemlock (Conium maculatum)

Puncturevine (Tribulus terrestris)

Quackgrass (Elymus repens)

Redstem filaree (Erodium cicutarium)

Velvetleaf (Abutilon theophrasti)

Wild proso millet (Panicum miliaceum)

5.2. List C noxious weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, will develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands. The goal of such plans will not be to stop the continued spread of these species but to provide additional education, research, and biological control resources to jurisdictions that choose to require management of List C species.

Part 6 Watch List Species

6.1. The Watch List is comprised of the following species:

Asian mustard (Brassica tournefortii)

Baby's breath (Gypsophila paniculata)

Bathurst burr, Spiny cocklebur (Xanthium spinosum)

Brazilian egeria, Brazilian elodea (Egeria densa)

Common bugloss (Anchusa officinalis)

Common reed (Phragmites australis)

Garden Loosestrife (Lysimachia vulgaris)

Garlic mustard (Alliaria petiolata)

Himalayan blackberry (Rubus armeniacus)

Japanese blood grass/cogongrass (Imperata cylindrica)

Meadow hawkweed (Hieracium caespitosum)

Onionweed (Asphodelus fistulosus)

Purple pampas grass (Cortaderia jubata)

Scotch broom (Cytisus scoparius)

Sericea lespedeza (Lespedeza cuneata)

Swainsonpea (Sphaerophysa salsula)

Syrian beancaper (Zygophyllum fabago)

Water hyacinth (Eichhornia crassipes)

Water lettuce (Pistia stratiotes)

White bryony (Bryonia alba)

Woolly distaff thistle (Carthamus lanatus)

Yellow flag iris (Iris pseudacorus)

Yellow floatingheart (Nymphoides peltata)

Yellowtuft (Alyssum murale, Alyssum corsicum)

6.2. Watch List weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, has determined to pose a potential threat to the agricultural productivity and environmental values of the lands of the state. The Watch List is intended to serve advisory and educational purposes only. Its purpose is to encourage the identification and reporting of these species to the Commissioner in order to facilitate the collection of information to assist the Commissioner in determining which species should be designated as noxious weeds. The Commissioner may place a plant species on the Watch List if any of the following are present:

6.2.1. The plant species is not known to occur in the state, but its noxious characteristics are recognized by another state or states in the region.

6.2.2. The plant species is not known to occur in the state, but has been found to exhibit noxious characteristics in agricultural lands and/or native plant communities similar to those found in Colorado.

6.2.3. The plant species with suspected noxious qualities as determined by the use of a plant assessment process is present in the state but its distribution and effect on agricultural and natural lands is undetermined at this time.

6.3. Once the noxious characteristics and distribution of plant species on the Watch List are better known, the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, may act to place a species on List A or List B, or may remove it from the Watch List.

Part 7 Compliance Waiver

7.1. Local governing bodies and landowners with any population of any List A species or population of any List B species may apply for a compliance waiver granted by the Commissioner.

7.2. To apply for a compliance waiver, local governing bodies or landowners must submit a written petition to the State Weed Coordinator via mail (Colorado Department of Agriculture, 305 Interlocken Parkway, Broomfield, CO 80021), fax (303) 466-2860, or email (weeds@state.co.us with “Attention: noxious weed petition” in the subject line). The Department will only consider a petition for waiver during the growing season of the target weed when the extent of the problem can be properly evaluated at the site for which the petition is submitted. The petition should provide specific information pertinent to the reevaluation of the specified management objective for the target weed in a specified geographic region.

7.3. The Commissioner will evaluate petitions using the following criteria:

A. The known distribution of the target weed species in the specified geographic region;

B. The feasibility of current control technologies to achieve the management objective for the target population;

C. The cost of carrying out the management objective specified in the target weed management plan; and

D. Any other site-specific information that establishes that the specified management objective is not feasible for a specific population in a specified geographic region.

Petitioners must address these criteria and explain specifically what conditions exist that establish that the specified management objective is not viable.

7.4. The Commissioner will grant or deny a petition within fifteen business days of receiving it.

7.5. The Commissioner may revoke a compliance waiver at any time if the information provided in the petition was incomplete or inaccurate, or if conditions change such that the specified management objective becomes viable.

Resolution No. 5-2015

A RESOLUTION ESTABLISHING THE CITYOF ALAMOSA NOXIOUS WEED ADVISORY BOARD

WHEREAS, the *Code of Ordinances* of the City of Alamosa provides, at Section 2-236, for the establishment of standing advisory committees to provide input to council on matters of a recurring nature; and

WHEREAS, the Colorado Noxious Weed Act, C.R.S. § 35-5.5-101, *et seq.,* requires, at C.R.S. § 35-5.5-107, that municipalities establish local advisory boards to, among other duties, develop a management plan for the integrated management of designated noxious weeds, which boards may either consist of the Council itself or of residents of the City; and

WHEREAS, Council desires the input and advice of City residents concerning the development and implementation of such a plan;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF ALAMOSA, COLORADO:

Section 1: The City Council of the City of Alamosa, Colorado, hereby appoints the sitting citizen members of the Alamosa Recreation Advisory Board and one City Staff Representative (Parks & Recreation Director), together with the Mayor (and the Mayor Pro-Tem, as an alternate) to constitute the Alamosa Noxious Weed Advisory Board (the "Board"), which shall be a standing advisory committee under the provisions of Section 2-236 of the *Code of Ordinances* of the City of Alamosa.

Section 2: The Alamosa Noxious Weed Advisory Board shall meet at least annually at a date, time and place as determined by the Board. Until the management plan for the integrated management of noxious weeds referenced below is finalized, the Noxious Weed Advisory Board shall meet more frequently to develop such plan. Meetings of the Noxious Weed Advisory Board may take place such that they are coordinated with meetings of the Recreation Advisory Board, at the discretion of the Board. The chair, secretary, and other positions of the Board may be the identical person as fills such position on the Recreation Advisory Board, but need not be.

Section 3: The Noxious Weed Advisory Board shall have the power and duty to:

(a) Review, modify, and recommend to City Council the existing management plan for the integrated management of designated noxious weeds and recommended management criteria for noxious weeds within the City of Alamosa. Once finalized, the Board shall review the management plan at regular intervals, but not less often than once every three years. The management plan and any amendments made thereto shall be transmitted to City Council for approval, modification, or rejection. As used in this Resolution, "Integrated management" means the planning and implementation of a coordinated program utilizing a variety of methods for managing noxious weeds, the purpose of which is to achieve specified management objectives and promote desirable plant communities. Such methods may include but are not limited to education, preventive measures, good stewardship, and the following techniques:

(1) "Biological management", which means the use of an organism to disrupt the growth of noxious weeds.
(2) "Chemical management", which means the use of herbicides or plant growth regulators to disrupt the growth of noxious weeds.
(3) "Cultural management", which means methodologies or management practices that favor the growth of desirable plants over noxious weeds, including maintaining an optimum fertility and plant moisture status in an area, planting at optimum density and spatial arrangement in an area, and planting species most suited to an area.
(4) "Mechanical management", which means methodologies or management practices that physically disrupt plant growth, including tilling, mowing, burning, flooding, mulching, hand-pulling, hoeing, and grazing.

(b) Declare noxious weeds and any state noxious weeds designated by rule to be subject to integrated management. The Board shall recommend any noxious weeds to be considered for designation by the Director of Parks and Recreation as noxious weeds pursuant to Section 14-51(a) of the *Alamosa Code of Ordinances*. Consistent with the definition found in C.R.S § 35-5.5-103(16), "Noxious weed" means an alien plant or parts of an alien plant that have been designated by rule as being noxious or has been declared a noxious weed by the Director of Parks and Recreation pursuant to Section 14-51(a) of the *Alamosa Code of Ordinances* , and meets one or more of the following criteria:

(1) Aggressively invades or is detrimental to economic crops or native plant communities;
(2) Is poisonous to livestock;
(3) Is a carrier of detrimental insects, diseases, or parasites;
(4) The direct or indirect effect of the presence of this plant is detrimental to the environmentally sound management of natural or agricultural ecosystems.

(c) Recommend to City Council that identified landowners be required to submit an individual integrated management plan to manage noxious weeds on their property when deemed by the Board to be necessary.

Section 4: City Council shall have the sole and final authority to approve, modify, or reject the management plan, management criteria, management practice, and any other recommendation of the Noxious Weed Advisory Board.

Section 5: The Noxious Weed Advisory Board shall forward the recommended plan to the state weed coordinator prior to submission to City Council so that the state weed coordinator may review the plan for any inconsistencies between the plan and the recommendations of the state weed coordinator or the commissioner of the department of agriculture.

Section 6: This resolution to be in full force and effect from and after its passage and approval.

PASSED AND ADOPTED, SIGNED AND APPROVED, THIS 1st DAY OF APRIL, 2015.

ATTEST

Holly Martinez, Deputy City Clerk

CITY OF ALAMOSA, COLORADO

Josef Lucero, Mayor

Chapter 14 - NUISANCES[1]

ARTICLE III. - WEEDS, NOXIOUS VEGETATION, TRASH, AND RUBBISH[3]

Footnotes:

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Editor's note— Ord. No. 2-2015, § 1, adopted February 4, 2015, amended art. III, §§ 14-51—14-57, in its entirety. Former art. III pertained to weeds, noxious vegetation, diseased and infested trees, trash and rubbish and was derived from Code 1964, §§ 12-1—12-4; Ord. No. 3-1989, §§ 2—4, adopted June 21, 1989; Ord. No. 1-1993, §§ 1—4, adopted February 3, 1993; Ord. No. 15-1995, §§ 1, 2, adopted September 20, 1995 and Ord. No. 19-1997, § 1, adopted December 17, 1997.

Cross reference— Buildings and building regulations, Ch. 4; streets, sidewalks and other public places, Ch. 16; subdivisions, Ch. 17; zoning, Ch. 21

Sec. 14-51. - Removal required.

(a) It is made the duty of every owner, every tenant and every person in possession of any real property in the city to provide for and cause the removal of weeds, noxious vegetation, trash, and rubbish of all kinds from such property and along any street and sidewalk adjoining the same and to the middle of each public street, alley, or other public right-of-way.

(b) For purposes of this article, any plant identified on the State of Colorado Department of Agriculture Noxious Weed List A (subject to eradication wherever found), maintained by the Colorado Department of Agriculture pursuant to C.R.S. § 35-5.5-108 shall be considered noxious. Any plant identified on the State of Colorado Department of Agriculture Noxious Weed List B or C may be considered noxious if specifically identified as noxious by rule promulgated by the director of the city department of parks and recreation after public hearing.

(c) Any non-ornamental vegetation that has bloomed or reached a height of eight (8) inches shall be considered noxious for the purposes of this article whether or not it appears on the noxious weed list referenced above. No thistle or knapweed species contained on noxious weed list A, B, or C may be considered ornamental vegetation.

(d) It is hereby declared to be a nuisance to fail to comply with the provisions of this section 14-51.

(Ord. No. 2-2015, § 1, 2-4-15)

Sec. 14-52. - Failure to remove; notice; pre-abatement hearing, abatement.

(a) In the event of the failure of the owner, tenant or person in possession of any such real property in the city to remove the weeds, noxious vegetation, trash and rubbish, as provided in section 14-51, in addition to any citation that may issue pursuant to the provisions of section 14-56, the city manager or the city manager's designee shall give written notice of violation upon the property owner whose property is being kept contrary to the provisions of this article. Said notice shall specifically describe the nature of the violation and shall include a statement that if the weeds, noxious vegetation, trash or rubbish are not removed from the property within seven (7) days of the date of service, if service is by personal delivery, or within ten (10) days, if service is by mail and/or posting, the removal may be done by the city, and the whole cost thereof will be assessed against the property. The notice shall also advise the property owner that the owner may appeal the determination of a nuisance as contained in the notice of violation to the city manager by filing with the city manager a written request for hearing stating the reason for the appeal within that same time period provided for abatement.

(b) In the event a hearing is requested, the city manager shall set the hearing to be held within fourteen (14) days of the date of the request. The owner may appeal in person and with counsel, if so desired, and such hearing shall be duly recorded. After the hearing, the city manager shall make a determination in writing of whether the nuisance exists, and mail such determination to the property owner by regular mail at the owner's last known address, with a copy e-mailed in the event the owner has provided an email address. If a nuisance is found to exist, the property owner shall abate it within seven (7) days of the date of mailing of the city manager's written determination. The city manager's determination of any such appeal shall have no probative value in any court proceeding on any citation that may have been issued for the violation, except that, if the city manager determines a nuisance does not exist, any such court proceeding shall be dismissed. If the owner is dissatisfied with the decision of the city manager, the owner shall have the right to have the decision reviewed pursuant to Rule 106(a)(4) of the Colorado Rules of Civil Procedure, provided that such a review is sought within the time and in the manner provided by law. The decision of the city manager shall not be stayed pending any review except as provided by Rule 106(a)(4) of the Colorado Rules of Civil Procedure.

(c) Service of the notice of violation may be obtained in one (1) or more of the following manners:

(1) By personally delivering a copy of the notice to the property owner, or the owner's agent, if known.

(2) By mailing a copy of the notice by certified mail, postage pre-paid, to the property owner.

(3) By posting the property conspicuously with the notice. In the event the property is posted, a copy of the notice shall also be mailed, by regular mail, postage pre-paid, to the property owner at such owner's last known address as contained in the records of the county assessor's office.

"Property owner" shall be defined, for the purposes of section 14-52, as the individual listed, as of the date of the notice, in the records of the county assessor's office, as the current owner of the property.

(d) The cost reimbursable to the city under subpart (a) shall be increased by an additional amount, not to exceed one hundred dollars ($100.00), determined by the city manager or the city manager's designee, for costs of inspection, documentation, service of notice, and other incidental costs related to the enforcement of this section against an offending property owner. This assessment shall be a lien against each lot or tract of land from which the weeds, noxious vegetation, trash or rubbish were removed and shall have priority over all other liens, except general taxes and prior special assessments.

(Ord. No. 2-2015, § 1, 2-4-15)

Sec. 14-53. - Notice of assessment for abatement; appeal.

(a) The city manager or the city manager's designee shall cause a written notice of the assessment for costs of abatement to be mailed by certified mail to the owner of the property, at the owner's last address shown by the county assessor's records. Such notice shall state the amount assessed, the description and street address of the property assessed and that the owner may, within fifteen (15) days from the date of the notice, request in writing a hearing before the city manager of the owner's objections to the assessment.

(b) In the event such a hearing is requested, the city manager shall schedule the same to be held within fourteen (14) days of the request for a hearing. The objector may appeal in person and with counsel, if so desired, and such hearing shall be duly recorded. The city manger shall either modify, affirm, or reverse such assessment after the hearing. Any owner of real estate dissatisfied with the decision of city manager shall have the right to have the decision reviewed pursuant to Rule 106(a)(4) of the Colorado Rules of Civil Procedure, provided that such a review is sought within the time and in the manner provided by law.

(Ord. No. 2-2015, § 1, 2-4-15)

Sec. 14-54. - Failure to pay final assessment; collection.

In case such final assessment is not paid within thirty (30) days after the same has been assessed, or within thirty (30) days after the final decision by the city manager after the hearing referenced above, whichever occurs later, the city clerk shall certify the amount of the assessment to the county officer having custody of the tax list, for placement of the assessment upon the tax list for the current or next upcoming year, and such officer shall thereafter collect the same in the same manner as other taxes are collected, with an additional ten (10) percent administrative processing fee thereon; and all the laws of the state for the assessment and collection of the general taxes, including the laws for the sale of property for taxes and redemption thereof, apply to and have full force and effect for the collection of all such assessments. Any amount so collected shall be remitted to the city finance director by the county officer who is collecting.

(Ord. No. 2-2015, § 1, 2-4-15)

Sec. 14-55. - Hazardous trees, shrubs, and plants

(a) It is hereby declared a nuisance to keep, harbor or fail to abate the adverse condition of a hazardous tree, shrub or other plant within the city. It is hereby made the duty of every owner, every tenant and every person in possession of any real property in the city to remove or abate the adverse condition of a hazardous tree, shrub or other plant from his, her or its private property and from along any public way adjoining the same and to the middle of each public right-of-way contiguous thereto.

(b) "Hazardous tree, shrub or other plant," as used herein, shall mean:

(1) Any tree, plant or shrub that is diseased, infected, infested with insects, parasites or fungus, when such disease, infection or infested condition may reasonably be expected to affect other healthy trees, plants or shrubs within the city; and

(2) Any tree, shrub or plant that is dead or dying, or that contains dead or dying limbs which may pose a danger to the life, health or property of any person, when such hazardous tree, shrub or plant is located on the premises of such owner, tenant and possessor, or within the adjacent, contiguous public way up to the center of said contiguous public way.

(c) It is hereby declared a nuisance for an owner or occupant of private property to allow any branches of trees, shrubs, bushes or any other plant material growing on such property to:

(1) Overhang streets or alleys in such a manner that the branches interfere with the safe and unobstructed movement of vehicles on any street or alley, or overhang the first fourteen (14) feet of space above any street or alley;

(2) Encroach upon any public sidewalk or overhang the first eight (8) feet of space above any public sidewalk;

(3) Overhang, or encroach into public rights-of-way in such a manner as to visually obstruct motorists' views of traffic signs, traffic signals or oncoming traffic; or

(4) Become overgrown and unkempt as to be a nuisance to neighboring property owners.

(Ord. No. 2-2015, § 1, 2-4-15)

Sec. 14-56. - Abatement.

It is hereby declared unlawful to fail to abate a nuisance declared pursuant to this article. Such failure shall be subject to the procedure and charges set forth in sections 14-52, 14-53, and 14-54, and shall be subject to the penalties provided generally for offenses in this Code.

(Ord. No. 2-2015, § 1, 2-4-15)

Sec. 14-57. - Director authorized to inspect.

The city manager or the city manager's designee is hereby authorized, with reasonable cause, to enter in and upon private property within the city to inspect any trees, shrubs, plants, trash, rubbish, or parts thereof, and to inspect any dead plant materials, or parts thereof, to ascertain the condition of such trees, shrubs, plants, rubbish and trash, and dead plant materials or parts thereof, to determine whether or not there exists a nuisance, as declared in this article.

(Ord. No. 2-2015, § 1, 2-4-15)

Secs. 14-58—14-70. - Reserved.

Colorado Noxious Weeds (including Watch List), effective December 30, 2015

List A Species (25)

Common	*Scientific*
African rue	(Peganum harmala)
Bohemian knotweed	(Polygonum x bohemicum)
Camelthorn	(Alhagi maurorum)
Common crupina	(Crupina vulgaris)
Cypress spurge	(Euphorbia cyparissias)
Dyer's woad	(Isatis tinctoria)
Elongated mustard	(Brassica elongata)
Flowering rush	(Butomus umbellatus)
Giant knotweed	(Polygonum sachalinense)
Giant reed	(Arundo donax)
Giant salvinia	(Salvinia molesta)
Hairy willow-herb	(Epilobium hirsutum)
Hydrilla	(Hydrilla verticillata)
Japanese knotweed	(Polygonum cuspidatum)
Meadow knapweed	(Centaurea nigrescens)
Mediterranean sage	(Salvia aethiopis)
Medusahead	(Taeniatherum caput-medusae)
Myrtle spurge	(Euphorbia myrsinites)
Orange hawkweed	(Hieracium aurantiacum)
Parrotfeather	(Myriophyllum aquaticum)
Purple loosestrife	(Lythrum salicaria)
Rush skeletonweed	(Chondrilla juncea)
Squarrose knapweed	(Centaurea virgata)
Tansy ragwort	(Senecio jacobaea)
Yellow starthistle	(Centaurea solstitialis)

List B Species (37)

Common	*Scientific*
Absinth wormwood	(Artemisia absinthium)
Black henbane	(Hyoscyamus niger)
Bouncingbet	(Saponaria officinalis)
Bull thistle	(Cirsium vulgare)
Canada thistle	(Cirsium arvense)
Chinese clematis	(Clematis orientalis)
Common tansy	(Tanacetum vulgare)
Common teasel	(Dipsacus fullonum)
Corn chamomile	(Anthemis arvensis)
Cutleaf teasel	(Dipsacus laciniatus)
Dalmatian toadflax, broad-leaved	(Linaria dalmatica)
Dalmatian toadflax, narrow-leaved	(Linaria genistifolia)
Dame's rocket	(Hesperis matronalis)
Diffuse knapweed	(Centaurea diffusa)
Eurasian watermilfoil	(Myriophyllum spicatum)
Hoary cress	(Cardaria draba)

Houndstongue	(Cynoglossum officinale)
Jointed goatgrass	(Aegilops cylindrica)
Leafy spurge	(Euphorbia esula)
Mayweed chamomile	(Anthemis cotula)
Moth mullein	(Verbascum blattaria)
Musk thistle	(Carduus nutans)
Oxeye daisy	(Leucanthemum vulgare)
Perennial pepperweed	(Lepidium latifolium)
Plumeless thistle	(Carduus acanthoides)
Russian knapweed	(Acroptilon repens)
Russian-olive	(Elaeagnus angustifolia)
Salt cedar	(Tamarix chinensis, T. parviflora, and T. ramosissima)
Scentless chamomile	(Tripleurospermum perforata)
Scotch thistle	(Onopordum acanthium, O. tauricum)
Spotted knapweed	(Centaurea stoebe)
Spotted x diffuse knapweed hybrid	(Centaurea x psammogena = C. stoebe x C. diffusa)
Sulfur cinquefoil	(Potentilla recta)
Wild caraway	(Carum carvi)
Yellow nutsedge	(Cyperus esculentus)
Yellow toadflax	(Linaria vulgaris)
Yellow x Dalmatian toadflax hybrid	(Linaria vulgaris x L. dalmatica)

List C Species (16)

Common	*Scientific*
Bulbous bluegrass	(Poa bulbosa)
Chicory	(Cichorium intybus)
Common burdock	(Arctium minus)
Common mullein	(Verbascum thapsus)
Common St. Johnswort	(Hypericum perforatum)
Downy brome	(Bromus tectorum)
Field bindweed	(Convolvulus arvensis)
Halogeton	(Halogeton glomeratus)
Johnsongrass	(Sorghum halepense)
Perennial sowthistle	(Sonchus arvensis)
Poison hemlock	(Conium maculatum)
Puncturevine	(Tribulus terrestris)
Quackgrass	(Elymus repens)
Redstem filaree	(Erodium cicutarium)
Velvetleaf	(Abutilon theophrasti)
Wild proso millet	(Panicum miliaceum)

Watch List Species (24)

Common	*Scientific*
Asian mustard	(Brassica tournefortii)
Baby's breath	(Gypsophila paniculata)
Bathurst burr, Spiney cocklebur	(Xanthium spinosum)
Brazilian egeria, Brazilian elodea	(Egeria densa)

Common bugloss	(Anchusa officinalis)
Common reed	(Phragmites australis)
Garden loosestrife	(Lysimachia vulgaris)
Garlic mustard	(Alliaria petiolata)
Himalayan blackberry	(Rubus armeniacus)
Japanese blood grass/cogongrass	(Imperata cylindrica)
Meadow hawkweed	(Hieracium caespitosum)
Onionweed	(Asphodelus fistulosus)
Purple pampas grass	(Cortaderia jubata)
Scotch broom	(Cytisus scoparius)
Sericea lespedeza	(Lespedeza cuneata)
Swainsonpea	(Sphaerophysa salsula)
Syrian beancaper	(Zygophyllum fabago)
Water hyacinth	(Eichhornia crassipes)
Water lettuce	(Pistia stratiotes)
White bryony	(Bryonia alba)
Woolly distaff thistle	(Carthamus lanatus)
Yellow flag iris	(Iris pseudacorus)
Yellow floatingheart	(Nymphoides peltata)
Yellowtuft	(Alyssum murale, A. corsicum)

THE WATCH LIST

Colorado Noxious Weed Management Program

COLORADO DEPARTMENT OF AGRICULTURE

Report Sitings To: weeds@state.co.us | More Info: www.colorado.gov/ag/weeds | Photo Credits to www.invasive.org

Asian Mustard
(Brassica tournefortii)

- 18-36 in. tall; basal rosette up to 36 in. wide
- Plants set seed prior to April
- Seed pods up to 2 ½ in. long
- Basal rosette leaves hairy; pinnately lobed & with toothed margins
- Seeds light reddish brown or black

Baby's breath
(Gypsophila paniculata)

- 12-18 in. tall & up to 16 in. wide
- Blooms summer through fall
- Flowers clustered, delicate, white or pink, 5-parted
- Leaves linear-lance-shaped, hairy, opposite; ¾ to 4 in. long
- Seed capsules egg-shaped, less than 1/10 in., very small & blackish

Brazillian Elodea
(Egeria densa)

- Up to 6 ft. long; dense submerged aquatic perennial
- Can live rooted or free floating; up to 20' deep
- Flowers emergent on stalks with 3 white petals & 3 green sepals
- Bright green leaves in whorls of 4; linear, oblong, 1¼" w/ very finely toothed margins
- Fragmented pieces can produce new plants

Cogongrass
(Imperata cylindrica)

- Up to 6 ft. tall
- Colony-forming
- Flowers 2-8 in.; fuzzy
- Leaves ½ to ¾ in. wide with off-center whitish midrib, finely serrated margins & a sharp, pointed apex
- Rhizomes whitish, scaly & sharp

Common bugloss
(Anchusa officinalis)

- 1-2 ft. tall by 1-2 ft. wide
- Blooms June to October
- Flowers ½ in. bright blue to purple with white throats
- Stems & leaves fleshy & hairy
- Leaves narrow & slightly pointed; alternate & get smaller up stem
- Fruit 4-chambered nutlet, 1 seed each

Common reed
(Phragmites australis)

- 6-15 ft. tall perennial grass
- Spreads by rhizomes
- Forms dense thickets in or near water
- Blooms July to October
- Flowers feathery & drooping; can appear silvery or purplish
- Leaves blue-green, flat, smooth
- Native species of Phragmites also exist in Colorado

Flowering rush
(Butomus umbellatus)

- Up to 5 ft. tall
- Aquatic perennial
- Blooms late summer
- Flowers 1 in. wide
- Leaves basal, sword-like & up to 3 ft. tall by ½ in. wide
- Thick, creaping rhizomes
- Stems triangular
- Fruits brown, ½ in. long
- Tolerant to a wide temperature range

Garlic mustard
(Alliaria petiolata)

- 1-4 ft. tall
- Herbaceous biennial
- Blooms early spring
- Flowers small; 4 white petals
- Rosette leaves 1-6 in. & heart-shaped
- Mature seeds shiny black in erect, slender green pods that turn pale brown
- Garlic odor when plant parts crushed
- Highly shade-tolerant

Hairy willow-herb
(Epilobium hirsutum)

- 3-6 ft. tall; perennial
- Blooms June to August
- Flowers single, 1/2 to 1 in.
- Stems covered in soft hairs
- Seeds with white silky tuft in long seedpod
- Leaves ½ in. wide, 2-4 in. long, opposite, lance-shaped with toothed edges; attached directly to stem
- Numerous native species are found in CO wetlands

Himalayan blackberry
(Rubus armeniacus)

- Up to 15 ft. tall
- Thicket-forming shrub
- Blooms late spring to summer
- Flowers 1 in. in groups of 3-20
- Compound leaves dark green above & pale to whitish below; leaves on 1st year shoots have 5 leaflets & leaves on 2nd year side shoots have 3 leaflets

Meadow hawkweed
(Hieracium caespitosum)

- 1-3 ft. tall
- Blooms late May to June; flower heads in tight clusters; 5-30 heads per stem
- Leaves mostly basal; lance shaped, up to 6 in. long & hairy; form dense mat at base
- Stems, leaves & bracts have dense blackish hairs & exude milky sap when broken

Onionweed
(Asphodelus fistulosus)

- 1½-2½ ft. tall tufted clumps
- Blooms July through August
- Flowers ¼ to ½ in. wide
- Stems branched & hollow
- Leaves 3-14 in. long by ¼ in. wide
- Doesn't smell like onion & doesn't form bulb
- Seeds triangular in cross-section; sharp edges

Parrotfeather
(Myriophyllum aquaticum)

- Dense aquatic perennial with both submerged & emergent leaves
- Emerged leaves bright blue-green; submerged darker; 4-6 whorled at each node
- Emerged stems grow up to 1 ft. above water
- Flowers may occur; if so, white & 1/16 in. long
- Spreads by plant fragments

Purple pampasgrass
(Cortaderia jubata)

- 1-2 ft. tall by 1-2 ft. wide
- Blooms June to October
- Flowers ½ in. bright blue to purple with white throats
- Stems & leaves fleshy & hairy
- Leaves narrow & slightly pointed; alternate & get smaller up stem
- Fruits are 4-chambered nutlets with 1 seed each

Scotch broom
(Cytisus scoparius)

- 7 ft. tall by 3 ½ ft. wide
- Blooms late spring to early summer
- Flowers 1 in. & pea-like
- Trifoliate leaves dark green above; paler & fuzzy below; alternate & pinately compound; ½-1 in. wide
- Grooved stems up to 2 in. wide
- Flat seedpods with small black seeds

Sericea lespedeza
(Lespedeza cuneata)

- 3 to 6 ft. tall
- Blooms summer to fall
- Flowers in clusters of 2-4
- Leaves thin, alternate, abundant & three-parted; leaflets ½-1 in. with wedge-shaped bases; hairy
- One to many slender stems

Spiny cocklebur
(Xanthium spinosum)

- 1-4 ft. tall by 1-4 ft. wide
- Blooms June to July
- Flowers 1-1½ in.; creamy green
- Stem straight & ridgid
- Leaves alternate, up to 3 in. long & 1½ in. wide; 3-lobed; shiny
- Female flowers become burrs which are the fruits; egg-shaped

Swainsonpea
(Sphaerophysa salsula)

- Up to 5 ft. tall
- Blooms May to June
- Flowers ¼-1 in. long, pea-shaped, & in groups of 4-8
- Leaves compound pinnate, alternate; 9-25 oval leaflets with silvery hairs
- Seeds form in inflated bladder-like pods
- Woody taproot with spreading rhizomes

Syrian beancaper
(Zygophyllum fabago)

- Up to 3 ft. tall by 3 ft. wide
- Blooms May to August
- Flowers can be white, yellow or salmon color & have 10-12 orange stamens
- Stems succulent & multi-branched
- Leaves opposite, compound & with 2 thick, fleshy leaflets

Water hyacinth
(Eichhornia crassipes)

- Up to 3 ft. tall; dense floating aquatic
- Forms dense thickets in water
- Blooms July to October
- Flowers 2 in. wide in clusters at the end of a 12-in. spike
- Leaves dark green, 1½ to 4 ½ in. wide & 6 in. long
- Feathery roots

Water lettuce
(Pistia stratiotes)

- 2-3 ft. tall; dense floating aquatic
- Blooms late summer to winter
- Flowers inconspicuous; clustered on small, fleshy stalk in leaf axils
- Leaves velvety, hairy, spongy & in rosettes; 6 in. long; connected by short stolons
- Roots numerous & feathery

White bryony
(Bryonia alba)

- 12 ft. long or more; vigorous vine; can grow 6 in. per day
- Blooms mid-summer
- Flower ½ in. wide & greenish-white
- Leaves are dark green and palmately lobed; each has a corkscrew tendril for climbing
- Highly toxic seeds in round, black fruit
- Forms dense mats & shades out vegetation

Woolly distaff thistle
(Carthamus lanatus)

- 3½ ft. tall
- Blooms July to August
- Flowers 1-2 in. wide with spiny bracts
- Pale green stems hairy, rigid, upper portion branched
- Plants persist upright after they have died
- Flowers similar to yellow starthistle

Yellow flag iris
(Iris pseudacorus)

- 3-4 ft. tall wetland perennial
- Blooms late spring to early summer
- Flowers bright yellow with 3 drooping sepals & 3 smaller, upright petals, 3 in. wide & in groups of 2-10
- Leaves arise from base, flat with raised mid-rib; rhisomes grow up to 20 ft.
- Fruits occur as 2 in. brown capsules

Yellowtuft
(Alyssum murale & A. corsicum)

- Perennial forbs
- Adapted to serpentine soils
- Flowers are yellow, small & plentiful, occurring on branched umbels
- Bloom early summer
- Fruits are papery, circular to oval and flattened
- *A.murale* has narrow, gray-green leaves & *A.corsicum* has oval silvery-gray leaves

*Photos courtesy Oregon Dept. of Agriculture

Yellow floatingheart
(Nymphoides peltata)

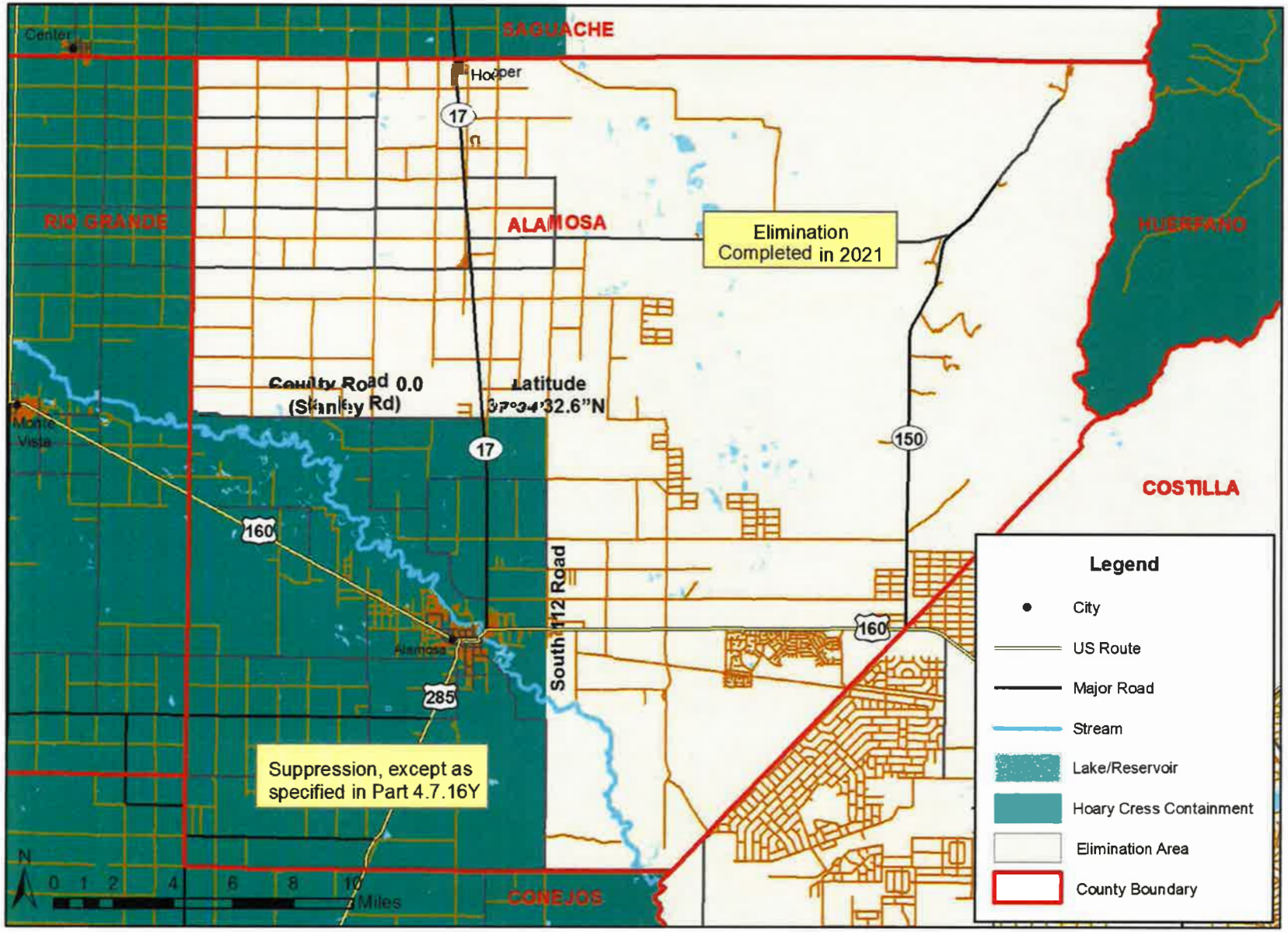
- Floating aquatic perennial
- Carpets water surface with long-stalked, heart-shaped, opposite & unequal leaves; 2-6" long & wide; arising from rhizomes
- Flowers bright yellow; 2-5 per stalk; 1" in diameter; 5 petals with fringed edges
- Flowers June to September
- Seeds flat & oval in shape; contained in beaked capsule

2015 Colorado Noxious Weed Act – Rules and Regulation Containment Figures by Counties
(Effective December 30, 2015)

Alamosa	13.02: Hoary Cress	30.01: Canada thistle

Hoary Cress *(Cardaria draba)*
Alamosa County

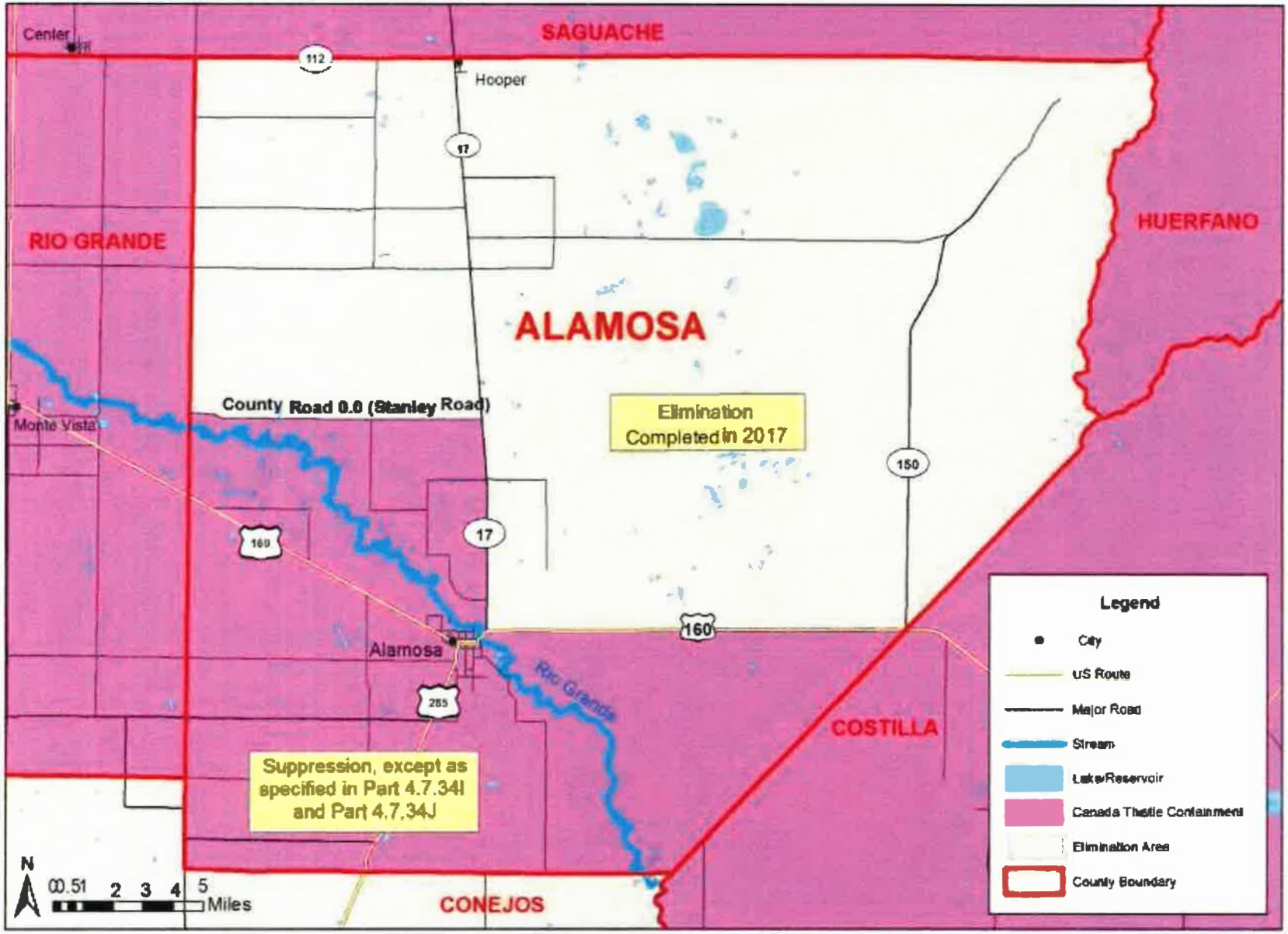
Figure 13.02



Canada thistle *(Cirsium arvense)*

Figure 30.01

Alamosa County



Alamosa

2016 Colorado Noxious Weed Statistics Summary List A & B

	# of Species Reported	Statewide Infested Acres	Counties Impacted
List A Species 14 species in CO on List A (Japanese, Bohemian, and giant knotweeds grouped)	**1**	**Unknown**	**41**
List B Species 32 species on List B (Several List B species grouped in the count; see the list below)	**12**	**719,155**	**64**
List A & B Species 46 species on List A & B	**13**	**Unknown**	**64**

List A:

List A Species Reported:	Cypress spurge

List B: **(Use the Funnel Symbol in the upper left corner to SORT the Table below)**

Species	Infested Acres	Statewide Infested Acres	# of Counties Impacted	Management Status (View Containment Map)	Data Collection Year
Absinth wormwood	0	711	16	Eliminate by 2018	2013
Black henbane	0	206	18	Eliminate by 2018	2013
Bouncingbet	1	228	24	Eliminate by 2016	2011
Bull thistle	0	2,086	43	Eliminate by 2015	2009
Canada thistle	3	129,572	55	Contain - See Figure 30.01	2012
Corn, Mayweed, and Scentless Chamomiles	0	18,594	26	Eliminate by 2016	2011
Chinese clematis	0	330	13	Eliminate by 2018	2013
Common tansy	1	473	19	Eliminate by 2016	2011
Common teasel	0	3,365	18	Eliminate by 2014	2011
Cutleaf teasel	0	1,346	7	Eliminate by 2014	2011
Dalmatian toadflax	0	18,360	32	Eliminate by 2019	2014
Dames rocket	0	175	27	Eliminate by 2014	2010

Diffuse knapweed	0	68,968	45	Eliminate by 2019	2014
Eurasian watermilfoil	4	247	11	Suppress	2009
Hoary cress	21	30,044	54	Contain: Figure 13.02	2014
Houndstongue	0	73,598	41	Eliminate by 2018	2013
Jointed goatgrass	0	15,717	28	Eliminate by 2014	2010
Leafy spurge	19	39,577	48	Suppress	2014
Moth mullein	0	339	11	Eliminate by 2014	2010
Musk thistle	1	46,490	52	Eliminate by 2015	2009
Oxeye daisy	0	15,806	38	Eliminate by 2018	2013
Perennial pepperweed	1,368	21,739	39	Suppress	2014
Plumeless thistle	0	1,182	13	Eliminate by 2018	2013
Russian knapweed	74	55,719	52	Suppress	2014
Russian olive	Not reported	65,979	36	Suppress	2012
Salt cedar	120	27,963	46	Suppress	2014
Scotch thistle	0	25,586	40	Eliminate by 2015	2009
Spotted & hybrid knapweed	8	4,921	40	Eliminate by 2020	2013
Sulfur cinquefoil	0	1,139	15	Eliminate by 2012	2008
Wild caraway	1	114	8	Eliminate by 2016	2011
Yellow nutsedge	0	15,049	12	Eliminate by 2017	2012
Yellow & hybrid toadflax	0	33,532	46	Eliminate by 2021	2014

Data Updated 1/5/16

COLORADO
Department of Agriculture
Conservation Services Division

Cypress Spurge

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Cypress spurge Identification and Management

Identification and Impacts

Cypress spurge *(Euphorbia cyparissias)* is a low growing perennial that overwinters as root and crown tissue. Cypress spurge reproduces by seed and lateral root buds. Leaves are linear, approximately 1/2 to 1 1/4 inches long and 1 to 2 mm wide. Upper stem leaves that occur near the inflorescence are yellow or yellowish-green in color. Leaves are stalkless, alternate, narrow and linear to lance-shaped. Stems are 4 to 32 inches high, hairless, green to yellowish green in color and branch in the upper portions. The leaves and stems emit a milky, toxic sap when broken. Flowers are yellowish-green usually turning reddish green towards maturity and are clustered in bunches at the ends of stems.

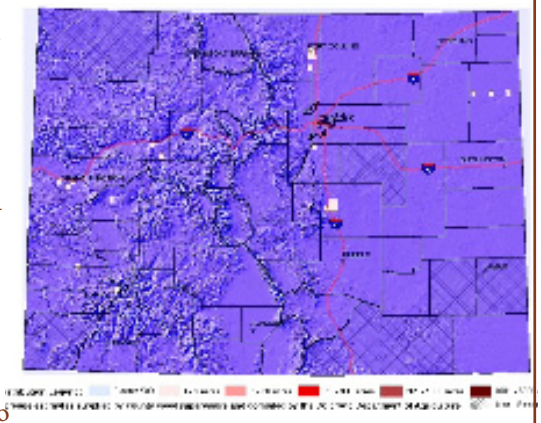
The plants milky sap is an irritant and may cause dermatitis or rashes. Although sheep may eat it, the plant is toxic to horses and cattle. Animals should not be pastured where spurges grow. Humans should be careful and avoid contacting the plant with bare skin as it can cause skin irritation for some people.

Cypress spurge is an invasive ornamental plant that is native to Eurasia. It prefers direct sunlight, but is tolerant to the shade. It commonly occurs in dry to moderately moist meadows, pastures, forest edges, roadsides, Rights-of-Way, cemeteries, and gardens. Cypress spurge is popular in xeriscaping and rock gardens and generally does not occur on intensively cultivated soils. The soil seed reserve is estimated to be at least eight years.

The key to effective control of cypress spurge is preventing the establishment of viable plant communities. When establishment has occurred, there are different control methods to consider. Like most perennial plants, exhausting the nutrient reserves in the root system is important in controlling cypress spurge. Using a combination of mechanical and herbicide treatments in combination can achieve eradication over time.

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

Map of cypress spurge infestation.



Key ID Points

1. Flowers are yellowish-green in color.
2. There are many branched stems that are covered with numerous narrow leaves.

Clockwise, from lower left, photos: Unknown, Richard Casagrande, University of Rhode Island; Stacey Leicht, University of Connecticut; Steve Dewey, Utah State University; and Kelly Uhing, Colorado Department of Agriculture.. Map by Crystal Andrews, CDA.

Updated on: 01/09

Euphorbia cyparissias

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 agents are not included in the prescribed management plans by the State for List A Species. Eradication is the management objective of all List A's. No biocontrol agent for Cypress spurge is available. For more information on biocontrol in Colorado, please contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Hand pulling or digging is a viable option when managing new, small cypress spurge infestations. Tillage may simply encourage its spread. Be sure soil is moist and extract the entire root system. When handling plants wear rubber gloves and eye protection to protect yourself from the irritating milky sap.

Integrated Weed Management:

Since Cypress spurge has been identified in small quantities around Colorado, preventing the populations from spreading is important in management of the weed. Using a combination of control methods proves to be the most effective way to control populations. Using mechanical and herbicide control methods together proves to be key in eradicating established infestations.

Cypress spurge

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands unless otherwise noted. Not all products listed are for use near homes. Please read label for exact rates. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

HERBICIDE	RATE	APPLICATION TIMING
Quinclorac (Paramount - non-crop - general use)	16 oz product/A + 2 pt/A methylated seed oil or crop oil concentrate	Apply at the flowering stage. (Spring time)
2,4-D + dicamba (Rangestar - general use)	2 qt. 2,4-D (2.0 lb/ai) + 1 qt dicamba/A (1 lb ai)	Apply at the flowering stage. (Spring time)

Colorado State University

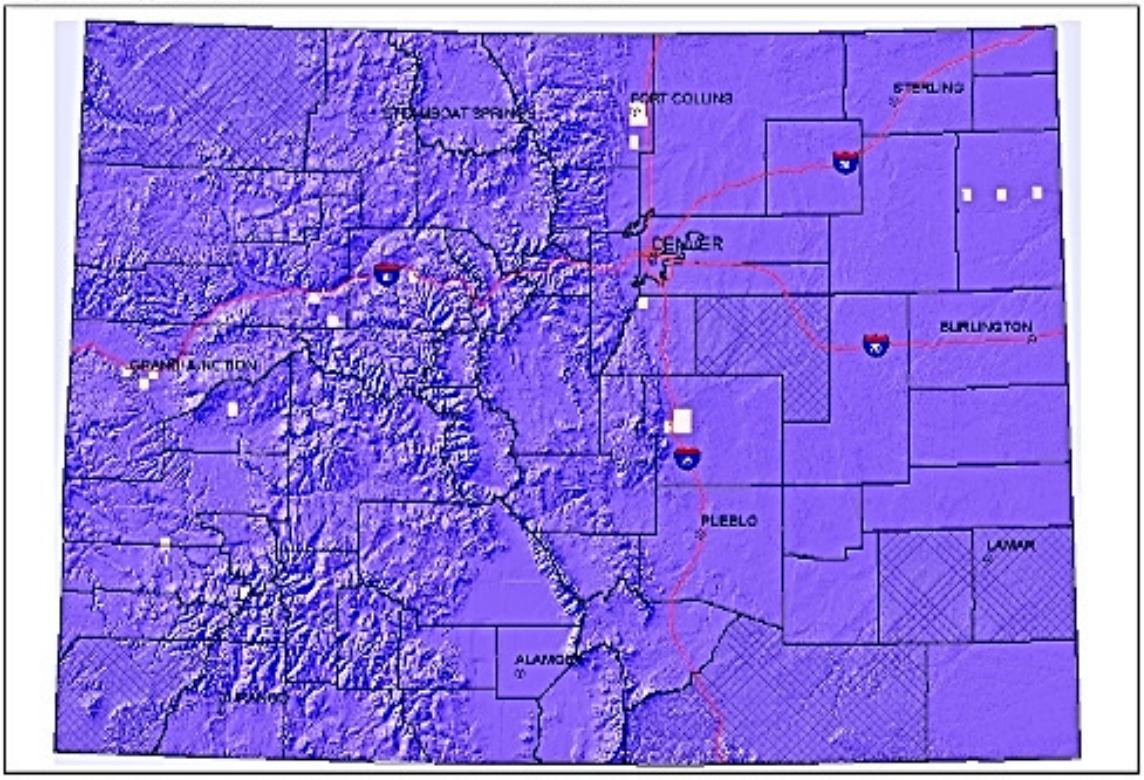
CDA CO

Cypress spurge

Euphorbia cyparissias

2006 Quarterquad Survey
Distribution and Abundance
in Colorado

38 + Infested Acres



Distribution Legend: 0 acres/QQ | 1 - 5 acres | 6 - 50 acres | 51 - 300 acres | 301 - 1000 acres | 1001 - 5000 acres

Acreage estimates supplied by county weed supervisors and compiled by the Colorado Department of Agriculture. Non - Reporting

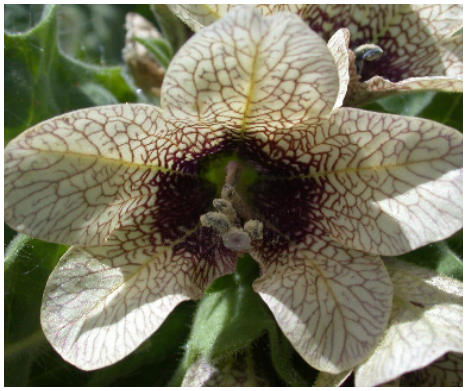
Black henbane

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Black henbane
Identification and Management



Key ID Points

1. Shallow lobed leaves that have sticky hairs.
2. Flowers have purple centers and veins.

Identification and Impacts

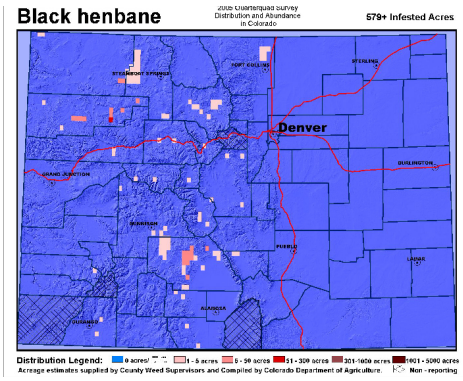
Black henbane *(Hyoscyamus niger)* was introduced from Europe as an ornamental and medicinal herb. In Colorado it is mostly found on the western slope. The plant blooms June through September and may be an annual or biennial. A mature plant reaches 1 to 3 feet in height with foliage that has a fowl odor. Leaves are shallowly lobed to coarsely toothed with sticky hairs. The outer part of the flower is brownish yellow in color with a purple center and veins. Fruits are approximately 1 inch long with 5 lobes.

All parts of Black henbane are poisonous to both livestock and humans when ingested. However; the plant is usually avoided by livestock due to the foul odor. The plant is a strong competitor for moisture and nutrients and produces a persistent litter effecting germination and growth of native plants. Black henbane invades disturbed and overgrazed sites. A good preventable measure is to guard against overuse.

Habitats for Black henbane included disturbed open spaces, roadsides, fields, waste places and abandoned gardens. It grows in most soil types but likes sandy or well drained loam soils. The seed viability or longevity is considered to be 1 to 5 years.

The key to effective control of Black henbane is guarding against disturbance and overuse, this can prove to be a good preventative measure against black henbane. Mechanical control and chemicals are the most commonly recommended method. Controlling plants in the spring or early summer prior to seed production is most effective, follow-up treatments are recommended to pick up missed or late bolting plants. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Black henbane 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 © (2 on bottom, left): Steve Dewey, Utah State University; (Top left and top center): Mary Ellen Harte, forestryimages.com and Map above by Crystal Andrews, Colorado Department of Agriculture.

Updated on:
08/08

Hyoscyamus niger

Management Recommendations

Black henbane

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 Black henbane. 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 from moist soil, so the entire tap root system can be removed. Tillage will control henbane, but is usually not recommended due to the land it occupies: rangeland, roadsides and pastures. Be sure to bag specimens carefully if removed during or after flowering.

Integrated Weed Management:

Controlling plants in the spring or early summer prior to seed production is most effective, follow-up treatments are recommended to pick up missed or late bolting plants.

Constant monitoring of site after last adult flowering plant is removed is suggested since seed viability can be up to 5 years.

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!**

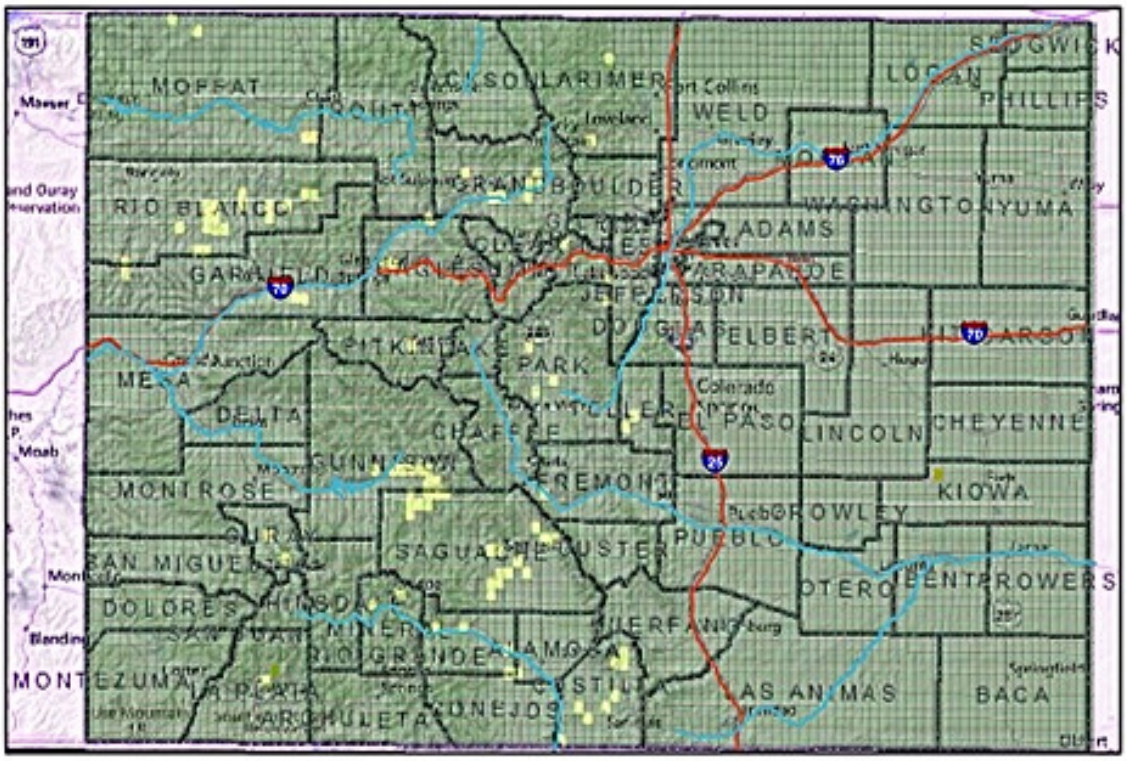
HERBICIDE	RATE	APPLICATION TIMING
Metsulfuron (Escort XP)	1 oz product/acre plus 0.25% v/v non-ionic surfactant	Surfactant absolutely necessary. Apply late bolt to early flower. (Summer to Early Fall)

Top to bottom photos, © (Top 2 photos) Stevens County (Washington State) Noxious Weed Control Board; and bottom photo David Hallinan, Bannock County Weed Superintendent, Idaho Weed Awareness Campaign.

Black Henbane
Hyoscyamus niger

2013 Quarterquad Survey
Distribution and Abundance
In Colorado

212+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres

Acreage estimates supplied by County Weed Coordinators and compiled by the Colorado Department of Agriculture.

Bouncingbet

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Bouncingbet Identification and Management

Identification and Impacts

Bouncingbet *(Saponaria officinalis)* is a perennial forb. The flowers are crowded at the ends of branches, and have five petals that are generally light pink to white and slightly notched at the apex. Flowering begins in July and continues until September. The fruits are many-seeded capsules and seeds are dull-black and roundish or kidney-shaped. Bouncingbet reproduces by seed and spreads by rhizomatous swollen nodes. Leaves are opposite, smooth, narrow, 2 to 4 inches long and have three distinct veins from the base. The stems are erect, sparingly branched, smooth, and forming. Mature plants grow up to three feet tall.

Bouncingbet can be poisonous to livestock and humans. It is generally considered unpalatable to livestock. The plant contains sapogenic glycosides that cause gastrointestinal irritation and can destroy red blood cells when absorbed in the blood streams of grazing animals.

The habitat of Bouncingbet is often found in large dense patches on hillsides, along rivers, roadsides, meadows, and waste areas. It prefers moist, well-drained soil, and full sun to partial shade and is currently found primarily in municipal areas and nearby wildlands. Bouncingbet spreads rapidly, replacing more valuable species (e.g. perennial grasses). Bouncingbet is increasingly common in Colorado, particularly in residential areas and local open spaces where it has escaped as an ornamental species. Bouncingbet was originally introduced from Europe as a garden ornamental.

The key to effective control of Bouncingbet is early detection and prevention of new infestations, since it is not yet widespread in Colorado. If infestations are discovered, they should be controlled immediately, and all seed production prevented. Since Bouncingbet usually grows in dense patches it is relatively easy to spot and treat. Be aware that this species is often found in wet areas, which may restrict the use of certain herbicides. As with all perennial weeds that have extensive root systems, the key to controlling Bouncingbet, is to eliminate seed production while depleting the nutrient reserves in the roots. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Bouncingbet 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 © Lower left by: Ohio State Weed Lab Archive, Ohio State University, Bugwood.org; Richard Old, XID Services, Inc., Bugwood.org; All others by Kelly Uhing, Colorado Department of Agriculture.

Key ID Points

1. Leaves are opposite, smooth, narrow, and 2-4 inches long.
2. Flowers have five petals and are generally light pink to white.

Updated on: 08/08

Saponaria officinalis

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
There is no biological control available for Bouncingbet. 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
Physical or mechanical control of Bouncingbet is NOT recommended because the plant reproduces clonally from its root system. Handpull or dig only single plants/new infestations when soil is moist to make certain entire root system is excavated.

Integrated Weed Management:

Since Bouncingbet usually grows in dense patches it is relatively easy to spot and treat. Be aware that this species is often found in wet areas, which may restrict the use of certain herbicides. As with all perennial weeds that have extensive root systems, the key to controlling Bouncingbet is to eliminate seed production while depleting the nutrient reserves in the roots.

Bouncingbet

HERBICIDES

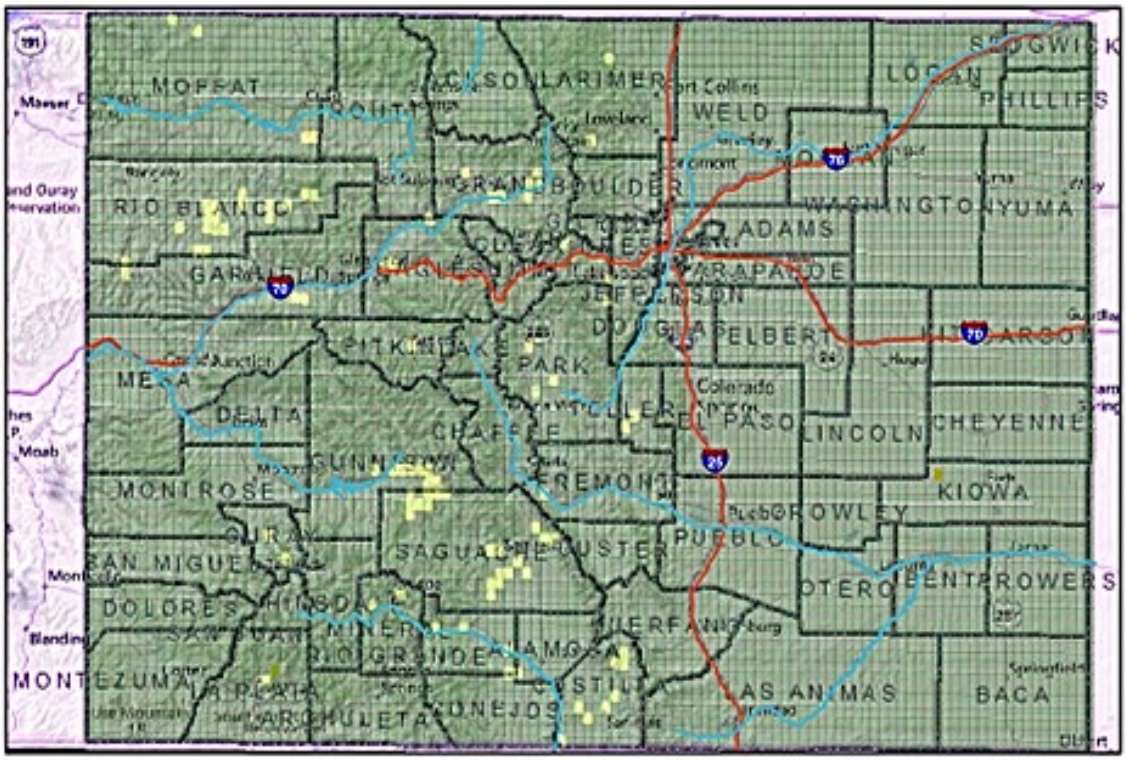
NOTE: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on equipment with an output of 30 gal/acre. Please read label for exact rates. **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

HERBICIDE	RATE	APPLICATION TIMING
Chlorsulfuron (Telar)	1 oz product/A + 0.25% v/v	Apply at bolting to bud growth stage. (Late Spring to Mid Summer)

Black Henbane
Hyoscyamus niger

2013 Quarterquad Survey
Distribution and Abundance
In Colorado

212+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres

Acreage estimates supplied by County Weed Coordinators and compiled by the Colorado Department of Agriculture.

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.

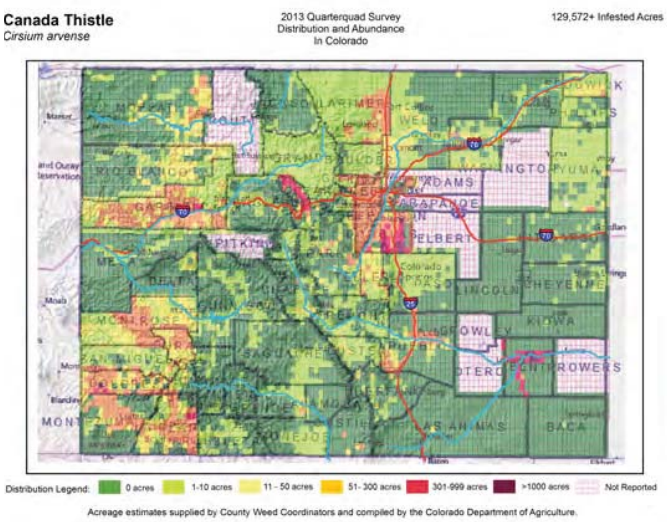
Canada thistle emerges from its root system from late April through May. It flowers in late spring and throughout the summer. It produces about 1,000 to 1,500 seeds per plant that can be wind dispersed. Seeds survive in the soil for up to 20 years. Additionally, Canada thistle reproduces vegetatively 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.

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.

2013 Quarter Quad Survey



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

Canada thistle

Cirsium arvense

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.

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/acre or 1 teaspoon/gal water	Apply in spring until flowering and/or to fall regrowth. Add 0.25% v/v non-ionic surfactant (equivalent to 0.32oz/ gal water or 1 qt/100 gal water). Can also add chlorsulfuron (Telar) at 1 oz/acre to the mix.
Clopyralid + triclopyr (Prescott; others)	3 pints product/acre or 1.25 oz/gal water	Apply in spring until flowering and/or fall regrowth. Add 0.25% v/v non-ionic surfactant.

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

Rev. 10/14

USDA

United States Department of Agriculture

Field Guide for Managing Canada Thistle in the Southwest

Forest Service

Southwestern Region

TP-R3-16-14

September 2014

Cover Photos

Top left: U.S. Forest Service
Top right: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
Lower left: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

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Canada thistle (*Cirsium arvense* (L.) Scop., synonym: *Carduus arvensis* L.)

Sunflower family (Asteraceae)

Canada thistle is an invasive plant that has been listed as a noxious weed in both Arizona and New Mexico. This field guide serves as the U.S. Forest Service's recommendations for management of Canada thistle in forests, woodlands, and rangelands associated with its Southwestern Region. The Southwestern Region covers Arizona and New Mexico, which together have 11 national forests. The Region also includes four national grasslands located in northeastern New Mexico, western Oklahoma, and the Texas panhandle.

Description

Canada thistle (synonyms: creeping thistle, Californian thistle, corn thistle) is a patch forming, creeping perennial with prickly, alternate, green leaves that are lance shaped and deeply lobed. Male and female flowers occur on separate plants (dioecious) but are quite similar in appearance. Canada thistle has an extensive, fast growing, fibrous root system that includes lateral and vertical roots extending up to 15 feet wide and deep. New shoots emerge from the root system in spring, but other flushes may also occur in fall or during the growing season with favorable soil moisture. Canada thistle reproduces from seed and by vegetative cloning via adventitious root buds. Seedlings grow slowly and are sensitive to competition, particularly if shaded.

Growth Characteristics

- Patch forming, creeping perennial.
- Weak rosette base; may have few, if any leaves.
- Alternate, lance-shaped leaves with spiny-toothed margins; upper surface waxy; sparsely wooly lower surface.
- Erect, branched, slightly hairy stem with ridges, 18 to 48 inches tall. Stems not winged.
- Pink or purple disk flowers in umbrella-shaped clusters; male and female flowers are on separate plants (species is dioecious).
- Urn-shaped flower heads; spineless, scale-like bracts.
- Extensive root system includes taproot and rhizomes.
- Reproduces via root buds, rhizomes, and seed. Seed may remain viable in soil up to 20 years.
- Allelopathic chemicals may inhibit growth of other plants.

Ecology

Impacts/threats

Canada thistle is a highly competitive, persistent plant that grows in dense, impenetrable colonies. A high density of spiny-leafed Canada thistle reduces the availability of quality forage and the diversity of flora and fauna species.

Location

Found on rangeland and disturbed or neglected sites; especially along roadsides, railways, ditchbanks, and waste areas. Canada thistle has a more limited range and more specific requirements for soil and precipitation than other thistles. It prefers areas with 16 to 30 inches of precipitation that have moist, but not waterlogged soils such as meadows and hay fields.

Spread

New shoots and roots emerge from almost anywhere along the root system, and new plants can develop from small broken pieces after disturbance by tillage. Canada thistle develops seed sparingly; however, the seeds are winged and are easily dispersed by wind, water, birds, and other animals. Seed can be spread over wide distances when it adheres to the surfaces and undercarriages of road vehicles and farm equipment or when introduced into new areas in hay that is not certified to be weed free.

Invasive Features

Canada thistle produces new shoots from roots each spring, but shoots can also develop throughout summer and fall. This is a particular problem when plants are stimulated or disturbed by mowing, tillage, or fire.

Management

A high priority in Canada thistle management is to focus on early detection and taking immediate measures to prevent establishment. Since Canada thistle allocates most of its reproductive energy into vegetative reproduction, this feature can be manipulated to the land manager's advantage. Small localized infestations occurring in otherwise healthy sites should be given first priority for control treatment(s). Initial treatment(s) should attempt to eliminate live plants and disrupt seed production as much as possible. Treated areas must be monitored, and followup treatment measures should be anticipated. Consider the following actions when planning a management approach:

- Maintain healthy plant communities to prevent or limit Canada thistle infestations.
- Check hay and straw for presence of weed seed before using them in thistle-free areas. Certified weed-free hay or pellets should be fed to horses used in back-country areas.
- Limit disturbance and/or promptly revegetate disturbed areas with desirable perennial forage species, especially perennial grasses.
- Detect, report, and eradicate new populations of thistle as early as possible.
- Map known infestations. Keep annual records of reported infestations.
- Combine mechanical, cultural, biological, and chemical methods for most effective control.
- Implement monitoring and a followup treatment plan for missed plants and seedlings.

Table 1 summarizes management options for controlling Canada thistle under various situations. Choice of individual control method(s) for Canada thistle depends on the degree and density of the infestation, current land use, and site conditions (accessibility, terrain, microclimate, other flora and fauna present, etc.). Other important considerations include treatment effectiveness, overall cost, and the number of years needed to achieve control. More than one control method may be needed for a particular site.

Special Considerations

There are at least 20 species of native thistles in the genus *Cirsium* in Arizona and New Mexico. These native thistles are noninvasive and are important constituents of their ecological communities. Since native thistles can be confused with nonnative thistles, accurate identification of thistle species should be an important first step in managing invasive, nonnative thistles.

The Sacramento Mountain range in southern New Mexico serves as habitat for the endangered Sacramento Mountains thistle (*Cirsium vinaceum*) which is protected under the Endangered Species Act of 1973. Portions of the mountain range within Otero County are also inhabited by local populations of Wright's marsh thistle (*C. wrightii*) which is a New Mexico listed endangered species and a Federal candidate for listing. Wright's marsh thistle is also found in Eddy, Chaves, Guadalupe, and Socorro Counties in New Mexico. Both thistle species occur in wetland habitats such as springs, seeps, and marshy edges of streams and ponds. To avoid harm to these species, information should be obtained from the U.S. Fish and Wildlife Service at (505) 346-2525 before implementing treatment of thistle in these types of habitats within the Sacramento Mountains and the aforementioned counties.

Physical Control

Physical methods to control Canada thistle should focus on reducing seed production and destroying the root system. These methods usually have to be repeated and must be timed properly to be most effective.

Manual Methods

Hand pulling, digging, and hoeing can be done any time of year; however, resprouting and the need to repeat these treatments should be anticipated. Given the perennial nature of this weed, hand removal is difficult and typically not very effective. Proper disposal of debris is essential in preventing spread. If flowers or seed are not present, plants may be

Table 1. Management options*

Site	Physical Methods	Cultural Methods	Biological Methods	Chemical Methods
Roadsides	Use repeat cultivation or mowing (every 7 to 21 days) to deplete stored energy in roots; repeated hand pulling or hoeing of small infestations in loose soils will also stress root energy reserves.	Train road crews to identify and report infestations along roads; implement requirements for vehicle operations.	Use biological control agents (beetle, weevil, or gall-forming fly) if release does not threaten rare or endangered native thistles. Biological control agents can only be used when thistle infestations are large enough to sustain control agent populations. Effectiveness of agents may be limited due to potential disturbance of the agent's life cycle from road operations.	Apply in spring or fall. Use truck spraying equipment. Wash under vehicle after application to prevent spread.
Rangelands and hay meadows	Mow at early bolt stage and then again every 21 days during growth season. Consider combining with herbicide treatment. Use repeated tillage at 20-day intervals starting as soon as plants emerge in late winter.	Use certified weed-free hay and seed. After passing through infested areas, inspect and remove any seed from animals, clothing, and vehicles before entering treated or uninfested areas. Reseed, fertilize, and irrigate (if possible) to make desirable plants more competitive.	Use grazing animals on young thistles as part of short-term, intensive grazing approach in the spring. Closely manage grazing to prevent overuse. Use biological control agents (beetle, weevil, or gall-forming fly) if release does not threaten rare or endangered native thistles. Biological control agents can only be used when thistle infestations are large enough to sustain control agent populations.	For extensive and dense infestations in disturbed areas with few desirable plant species present, use ground or aerial broadcast spraying. Consider using individual plant treatment (IPT) with a backpack sprayer for sparse infestations, areas interspersed with desirable native plants, or areas difficult to access.
Wilderness and other natural areas	Use repeated hand cutting or hoeing prior to seed set.	Same as above. Post signs warning visitors to inspect for seeds and remove them from animals, clothing, and vehicles when leaving an infested area.	Same as above.	Use backpack or hand-held sprayers. Broadcast spraying by aerial or ground methods may be used on thicker stands if allowed.

* Choice of a particular management option must be in compliance with existing regulations for land resource.

pulled and left onsite. If flowers or seed are present, debris should be bagged and removed from the site or else burned since seed will continue to mature within flower heads left onsite.

Mechanical Methods

Properly timed and repeated tillage with a plow or disc can provide limited control. However, ill timed or nonrecurring tillage may favor further spread and invasion. Plants should be cultivated after plants have emerged in late winter but before they reach a height of 3 inches. Cultivation should be repeated at 20-day intervals until first frost or when plants are dormant. Shallow cultivation during hot, dry weather greatly stresses plants. Tillage will exhaust carbohydrate reserves stored in roots but will not eradicate seeds. Therefore, tillage may be more effective in a combined herbicide control strategy. See the "Control Strategies" section for more information.

Mowing will reduce plant height but will not usually eliminate flower or seed production completely. Mow when plants begin to bolt and repeat as necessary to prevent seed production. Mowing is more effective when used as part of a combined strategy with herbicide treatments (see the "Control Strategies" section for more information). Many vegetation management experts do not recommend mowing

as a single treatment method as plants often produce side branches with more flowers, even with repeated mowing and proper timing.

Prescribed Fire

Burning will not destroy the root system of Canada thistle and is likely to increase thistle presence in succeeding years after a fire. Therefore, using prescribed fire as a control method is not recommended for managing this weed except to remove dead litter and debris.

Cultural Control

Early detection and plant removal are critical for preventing Canada thistle establishment. Land managers, the local public, and road crews should be educated on identification of nonnative noxious species so they can help report all suspected infestations. Vehicles, humans, and livestock should be discouraged from traveling through infested areas; and a program to check and remove seeds from vehicles and livestock should be implemented to help stop dispersal. Treated areas may be reseeded, fertilized, and irrigated (if possible) to make desirable plants more competitive.

Biological Control

Grazing

Livestock generally avoid entering dense stands of mature Canada thistle. However, prescribed grazing can be part of an effective control strategy by using a short-term, intensive grazing approach in spring before the plant begins to bolt. Canada thistle seedlings and rosettes are grazed most effectively by goats, followed by sheep, and then cattle. It is also grazed by horses, donkeys, and llamas to varying degrees. Use of grazing in combination with herbicide increases effectiveness of these control methods. See the "Control Strategies" section for more information about combined approaches.

Classical Biological Control

Numerous classical biological control agents have been introduced throughout the United States to control Canada thistle, including those listed in table 2. Biological control methods for Canada thistle primarily involve using insect larvae to impact the shoot, stem, or leaf. Control with biological agents may be most suitable for remote, otherwise inaccessible pastures and rangeland sites where mowing, cultivating, or herbicide treatment is not practical. Some agents have been found to be less effective when their life cycle is disturbed, either by the presence of livestock or by management actions involving the thistle. For further information on biological control of Canada thistle, see Winston et al. (2008) in the "References and Further Information" section of this field guide.

An important consideration for release of a biological control agent is whether the agent will impact native thistles, especially rare or endangered species. For example, recent expansion of seed head weevil (*Rhinocyllus conicus*) from early release sites has enabled the weevil to attack the endangered Sacramento Mountains thistle in southern New Mexico. The rosette weevil (*Trichosirocalus horridus*) has also recently arrived in the Sacramento Mountains, and its presence could impact the Sacramento Mountains thistle along with local populations of the Wright's marsh thistle which is a New Mexico listed endangered species and a Federal candidate for listing. To help prevent such impacts, these particular weevil species should not be released as biological control agents. Land managers should contact the New Mexico Ecological Services Field Office of the U.S. Fish & Wildlife Service at (505) 346-2525 before releasing any biological control agents within the Sacramento Mountains or Eddy, Chaves, Guadalupe, and Socorro Counties in New Mexico that can impact these endangered thistles.

Agents used for biological control in southwestern states should be adaptable to arid environments and local conditions. Public, tribal, and private land managers may obtain biological control agents for release directly from local offices of the USDA Animal and Plant Health Inspection Service (APHIS) when the agents are available. Other sources for biocontrol agents include private companies or locally developed insectaries. A permit must be obtained from APHIS before biological control agents

Table 2. Classical biological control agents

Species	Type of Agent	Site of Attack	Impact	Use/Considerations for Release
Cassida rubiginosa	beetle	foliage	Adults lay 800 eggs. Adults and larvae feed on foliage throughout the growing season.	
Rhinocyllus conicus	beetle/ weevil	seed head and upper stems	Larvae impact seed production of Canada thistle (and other thistles) by feeding within developing buds and preventing seed formation.	Since Canada thistle reproduces primarily by vegetative means, using this weevil to limit seed production will not control or limit the spread of Canada thistle. This particular weevil species should not be released as a biological control agent since it can feed on native thistles including the endangered Sacramento Mountains thistle.
Trichosirocalus horridus	beetle/ weevil	rosette shoot tip	Larvae burrow down petiole into the growth point. Heavy feeding by mature larvae results in death of rosette. As larval infestation increases, stressed thistle becomes more susceptible to competition from perennial grasses.	Released in Oklahoma and Texas; establishment not confirmed. This particular weevil species should not be released as a biological control agent since it can feed on native thistles including the endangered Sacramento Mountains thistle.
Urophora cardui	gall-forming fly	stem	Lays eggs on apical meristem of shoots; prevents flowering, reduces seed set, and may stress shoots to the point of death.	

can be transported across state boundaries. Regulations and permit applications (PPQ 526 permit forms) pertaining to interstate shipment of biological control agents can be found at http://www.aphis.usda.gov/ppq/permits/. Although biological control agents may be collected and released within a given state without a permit from APHIS, the state's Department of Agriculture or Agricultural Extension Service should be consulted for any regulations relating to movement of these agents inside the state.

Chemical Control

Canada thistle is best controlled with a selective postemergent broadleaf herbicide. Typically, the primary herbicide entry into the plant is through the leaves and stems although certain herbicides have excellent root uptake properties. Control results can vary due to weather variables and the plant's growth stage so special care should be taken to closely follow label directions for spraying.

Each herbicide product will have different and unique requirements and restrictions according to the herbicide label. Read and understand the label prior to any application. Consult the registrant if you have questions or need further detail.

Effective herbicides for Canada thistle include aminopyralid, aminocyclopyrachlor, clopyralid, and picloram mixed alone or in combination with 2,4–D or another herbicide. Herbicides listed in table 3 will impact other desirable broadleaf and woody species; therefore, caution should be taken if nontarget species need protection. Use a label recommended surfactant (0.25 to 0.5 percent v/v; equivalent to 1 to 2 quarts of surfactant per 100 gallons of spray solution) in the spray mixture. Read label instructions carefully and follow guidelines for mixing. Always follow application requirements and grazing restrictions after treatment.

Table 3. Herbicide recommendations

Common Chemical Name (active ingredient)	Product Example[1]	Product Example Rate per Acre (broadcast)	Backpack Sprayer Treatment Using Product Example[2]	Time of Application	Remarks
Aminopyralid	Milestone	5–7 ounces	3–5%	Use lower rate in fall, right after flowering but before dormancy. Use higher rate in spring for prebud to early bud stages.	Labeled for use on wildlife habitat management areas and natural areas. May be applied up to water's edge. No grazing restrictions.
Aminocyclopyrachlor + metsulfuron methyl	Streamline	4.75–9.5 ounces	Same as above.	Same as above.	Same as above.
Clopyralid	Stinger Reclaim Transline	0.67–1.3 pints	1–3%	Rosette to bud stage.	Will control top growth and inhibit regrowth. Established perennial grasses are tolerant.
Clopyralid + 2,4-D[3]	Curtail	6 pints	1–3%	Early bud growth stage or in fall at rosette.	Same as above.
Clopyralid + triclopyr	Redeem	2.5–4 pints	1–3 %	Early bud growth stage or in fall at rosette growth stage.	Same as above.
Dicamba	Clarity Banvel several manufacturers	2–3 quarts	1–3%	After bloom and before dormancy in fall.	Use higher rate for older or denser stands.
2,4-D[3]	several manufacturers	2 quarts (based on 1 quart of a 4 pounds per gallon concentration)	5–10%	In spring when thistle is 10 to 15 inches tall; prebud to early bud stage.	Less expensive but also less effective alone.

[1] Trade names for products are provided for example purposes only, and other products with the same active ingredient(s) may be available. Individual product labels should be examined for specific information and appropriate use with Canada thistle.

[2] Herbicide/water ratio - As an example, a gallon of spray water with a 3 percent mixture is made by adding a sufficient volume of water to 4 ounces of liquid herbicide until a volume of 1 gallon is reached (4 oz ÷ 128 oz/gal = 0.03 or 3 percent). For dry formulations, particulates should be added to sufficient water as specified by the label until the required concentration or volume of spray water is reached.

[3] 2,4-D is a restricted use pesticide in New Mexico only. A certified applicator's license is required for purchase and use.

[4] Restricted use pesticide - A certified applicator's license is required for purchase and use.

Spraying in fall before Canada thistle enters dormancy (before soil freezes up) usually gives the most consistent results. Spraying in spring in prebud to early bud growth stages is also effective, especially with herbicides that are mixed in combination with 2,4–D. Herbicides may be applied by backpack sprayer, ATV or UTV sprayers, or conventional boom sprayers that are pulled or attached to a tractor or truck. For individual plant treatment (IPT), wet foliage and stems thoroughly using a hand-held or backpack sprayer fitted with a cone-shaped adjustable nozzle.

Control Strategies

Strategies to contain and reduce Canada thistle populations require long-term planning and integrated management. Large infestations are difficult to eradicate; therefore, do not anticipate that Canada thistle will be effectively controlled within a single year or by using only one method. Complete control will likely require 2 to 4 years of repeated management methods. Consider the following strategies for Canada thistle control:

- **Herbicide–regrow–herbicide strategy** – This strategy can be initiated in either fall or spring. If started in spring, apply a recommended herbicide when Canada thistle is less than 15 inches tall and is in the prebud to early bud growth stages. If started or retreated in the fall, spray during rosette stage with either aminopyralid (5 to 7 ounces per acre), dicamba (2 quarts per acre), clopyralid (0.67 pint per acre), or picloram (1 quart per acre). Treated areas should be closely monitored for 2 years and resprayed if necessary. Herbicide combinations with 2,4–D are more effective in spring than when applied in fall.
- **Mow–regrow–herbicide strategy** – Mow early in spring and then repeat 2 to 4 times during growing season. In fall, allow shoots to regrow to >15 inches in height and then spray with herbicide. Clopyralid (0.67 pint per acre) and picloram (1 quart per acre) are particularly effective against Canada thistle during this time since nutrients are being translocated toward the root system. Consider reseeding with a variety of desirable perennial forage species following treatment. Periodically monitor for new seedlings and spot treat or hand remove regrowth.
- **Grazing–herbicide strategy** – Use a controlled, intensive grazing approach on infested areas in spring before Canada thistle bolts. Fencing may be necessary to confine livestock to areas of infestation. After removing livestock, apply herbicide treatment to Canada thistle before flowering stage. Repeat in fall with another herbicide treatment if necessary. Monitor for return of Canada thistle and for desirable perennial native species, especially grasses. Consider reseeding if native grasses do not naturally recover following control efforts.

Regardless of the strategy used, the key to successful Canada thistle control is to stress and eliminate root reserves. A follow-up treatment plan should be anticipated and managed within a complete restoration program. Failure to perform follow-up monitoring and adapt control methods as needed could result in recolonization by Canada thistle and a return to pretreatment levels of invasion.

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Suggested Web Sites

2,4-D Safe Handling Guide:

http://www.cdms.net/LDat/ld02B005.pdf

Dow AgroSciences labels:

Curtail: http://www.cdms.net/LDat/ld02B005.pdf

Milestone: http://www.cdms.net/LDat/ld77N006.pdf

Redeem: http://www.cdms.net/LDat/ld4KE004.pdf

Rodeo: http://www.cdms.net/LDat/ld4TN001.pdf

RoundUp Pro: http://www.cdms.net/ldat/ld07A008.pdf

Stinger: http://www.cdms.net/LDat/ld02P012.pdf

Encycloweedia Datasheets by California Department of Food and Agriculture at:

http://www.cdfa.ca.gov/phpps/IPC/weedinfo/cirsium.htm

USDA Plants Database:

http://plants.usda.gov/index.html

For more information or other field guides, contact:

USDA Forest Service
Southwestern Region
Forest Health
333 Broadway Blvd., SE
Albuquerque, NM 87102

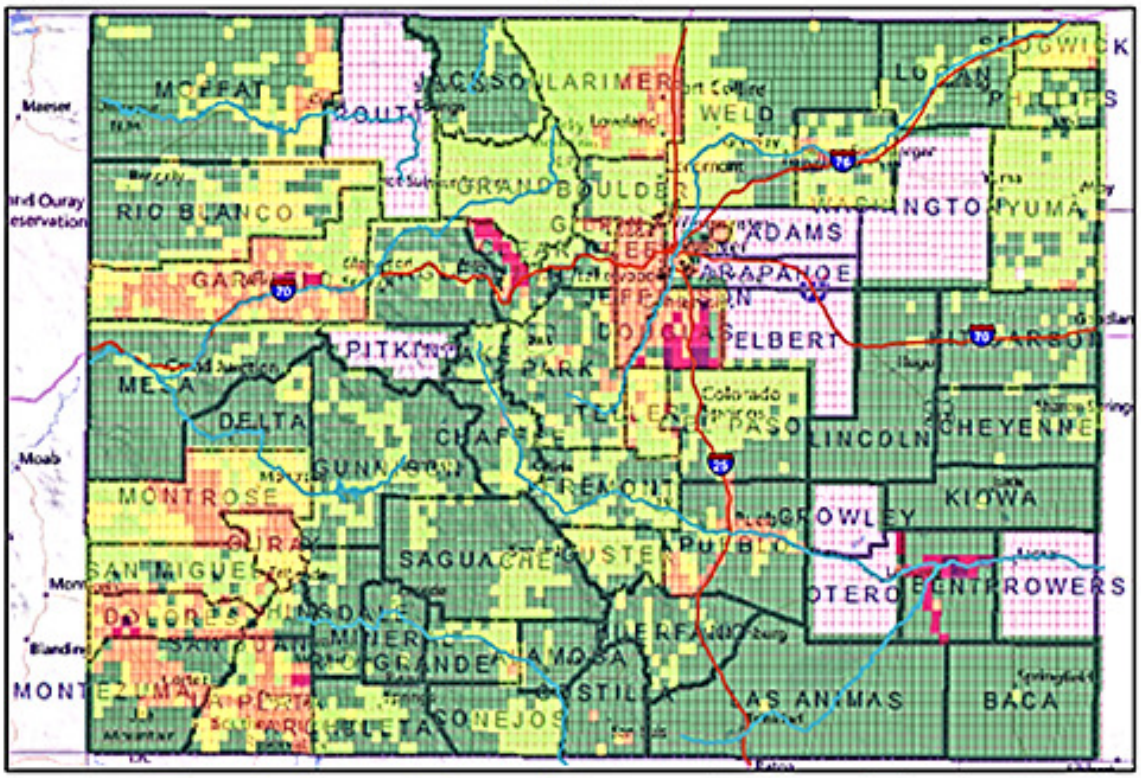
Or visit:

http://www.fs.usda.gov/main/r3/forest-grasslandhealth/invasivespecies

Canada Thistle
Cirsium arvense

2013 Quarterquad Survey
Distribution and Abundance
In Colorado

129,572+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres | 51- 300 acres | 301-999 acres | >1000 acres | Not Reported

Acreage estimates supplied by County Weed Coordinators and compiled by the Colorado Department of Agriculture.

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: 08/08

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!

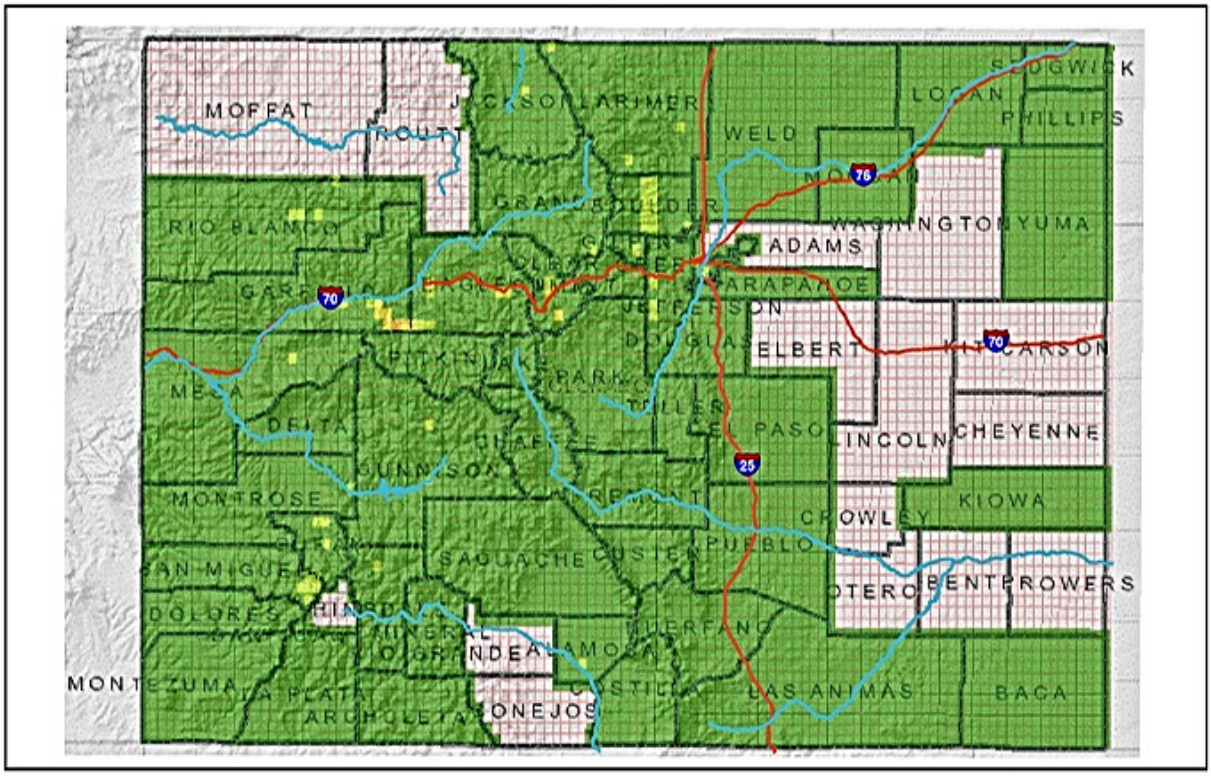
HERBICIDE	RATE	APPLICATION TIMING
Metsulfuron (Escort XP)	1 oz product/ac. + 0.25% v/v non-ionic surfactant	Apply to when in bolting to bud growth stages. (Late Spring to Mid Summer)

Common Tansy

Tanacetum vulgare

2011 Quarterquad Survey
Distribution and Abundance
In Colorado

473+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres | 51- 300 acres | Not Reported

Acreage estimates supplied by County Weed Supervisors and compiled by the Colorado Department of Agriculture.

Eurasian watermilfoil

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Eurasian watermilfoil Identification and Management

Identification and Impacts

Eurasian watermilfoil *(Myriophyllum spicatum)* is an attractive plant with feathery underwater foliage that is native to Northern Europe and Asia. Eurasian watermilfoil spreads most commonly by stem fragmentation and runners. The plant roots on the bottom, but survives and is spread as free floating plants waiting to take root. Eurasian watermilfoil also spreads by seeds. The leaves each have 12 to 21 pairs of leaflets and are 1 inch long. The plant is typically submersed with stems to 4 m long, becoming emerged only while flowering or after stream or canal draw down when moisture is present. The flowers occur from June to September and are pinkish and whorled with emerged bract like leaves just below each whorl. The leaves are bract like, opposite, 1 to 3 mm long, lanceolate, smooth margined to finely toothed. Fruits are 4 ribbed or grooved and ultimately break apart into 4, one seeded nutlets. Eurasian watermilfoil starts spring growth before other native aquatic plants making it very invasive. The plant forms very dense mats of vegetation on the surface of the water that interferes with power generation and irrigation by clogging water intakes. These mats also interfere with recreational activities (e.g. swimming, fishing, skiing, boating, etc.) and creates a mosquito habitat and reduces native vegetation.

Key ID Points

1. Usually 12+ pairs on each leaf.
2. Grows in water only.
3. Mature leaves are arranged in whorls of 4 around the stem.

Habitats for Eurasian watermilfoil include: ponds, lakes, rivers, streams, canals, and ditches. Usually the plant inhabits slow moving water areas but can infest fast moving water, such as streams and rivers.

The key to effective control of Eurasian watermilfoil is typically prevention of uncontrolled monocultures of this aquatic weed. Chemical and mechanical controls are well developed, but provide short to medium-term control. Monitoring of waterways and the recreational use are keys to slowing the spread of Eurasian watermilfoil. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Eurasian watermilfoil 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.

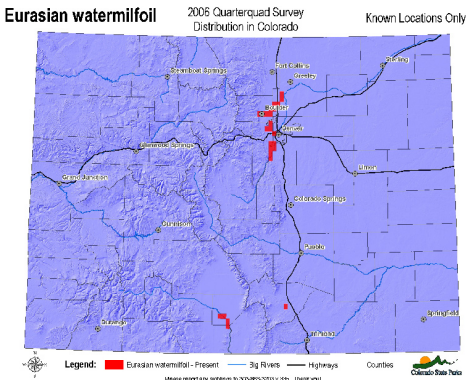


Photo s © Kelly Uhing, Colorado Department of Agriculture; and map above by Crystal Andrews, Colorado Department of Agriculture.

Updated on: 08/08

Myriophyllum spicatum

Management Recommendations

Eurasian watermilfoil

CULTURAL
Prevention of Eurasian watermilfoil is the best cultural control. Other methods of cultural controls are possible in theory, but are very time consuming and expensive.

BIOLOGICAL
There is biological control available for Eurasian watermilfoil, but it is not yet approved for Colorado. The biological control is reared on a different strand of watermilfoil than found in Colorado. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Hand pulling, raking, harvesting are effective at reducing current abundance of plants and is useful to clear channels or maintain access. However; it is not a very good long term control and is very expensive, labor intensive, and several removals are needed each year.

Integrated Weed Management:

Prevention of uncontrolled monocultures of this aquatic weed is the best control method. Chemical and mechanical control are well developed, but provide short to medium-term control. Monitoring of waterways and the recreational use are keys to slowing the spread of Eurasian watermilfoil.

HERBICIDES

NOTE: The following are recommendations for herbicides that can be applied to bodies of water. Recommendations are unique with aquatic weed species, and need to be based on water body type, and water volume. 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 (Aqua-kleen, Navigate or DMA 4 IVM, * Aquatic approved*)	Determined by herbicide concentration within the water column. *Read the Label*	Actively growing plants or manufactors specified recommendations. *Read the Label*
Fluridone (Sonar or Avast)	Determined by herbicide concentration within the water column. *Read the Label*	Actively growing plants or manufactors specified recommendations. *Read the Label*
Triclopyr (Renovate 3)	Determined by herbicide concentration within the water column. *Read the Label*	Actively growing plants or manufactors specified recommendations. *Read the Label*

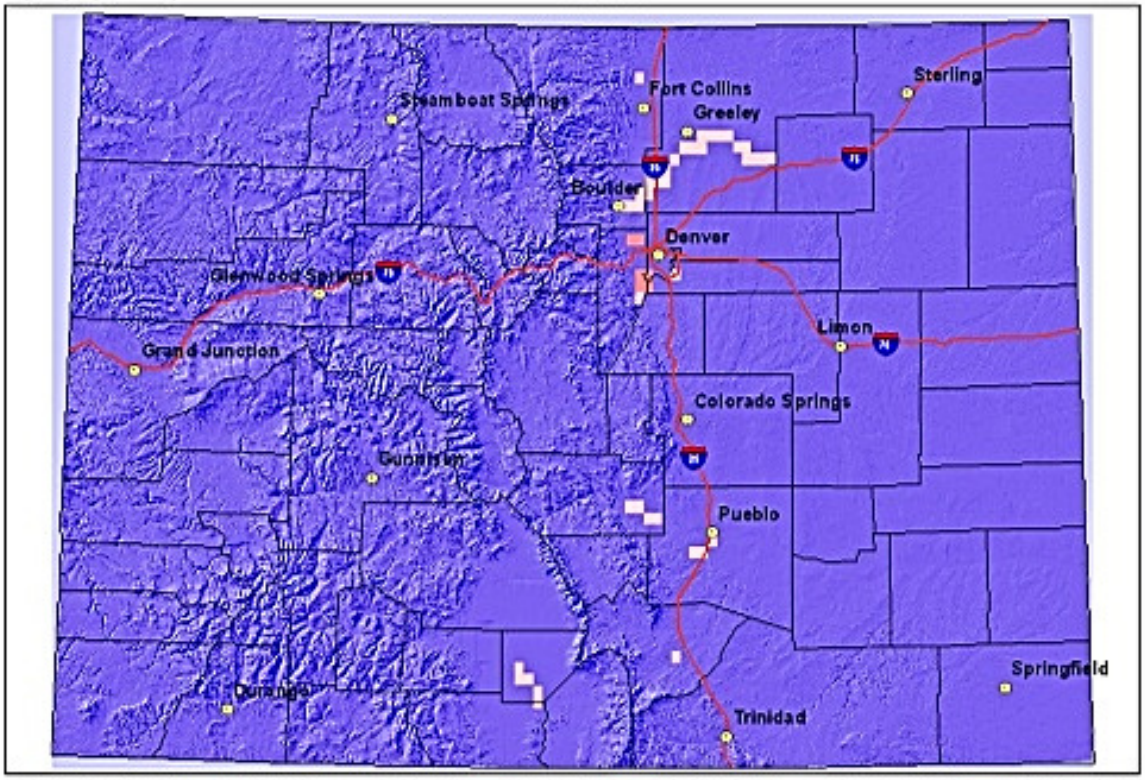
Top to bottom photos, © Leslie J. Mehrhoff, University of Connecticut, Bugwood.org; Richard Old, XID Services, Inc., Bugwood.org; and Kelly Uhing, Colorado Department of Agriculture.

Eurasian watermilfoil

Myriophyllum spicatum

2009 Quarterquad Survey
Distribution and Abundance
in Colorado

247+ Infested Acres



Distribution Legend: 0 acres/QQ | 1 - 5 acres | 6 - 60 acres | 61 - 300 acres | 301 - 1000 acres | 1001 - 5000 acres

Acreage estimates supplied by county weed supervisors and compiled by the Colorado Department of Agriculture.

Hoary cress

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Hoary cress
Identification and Management

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.

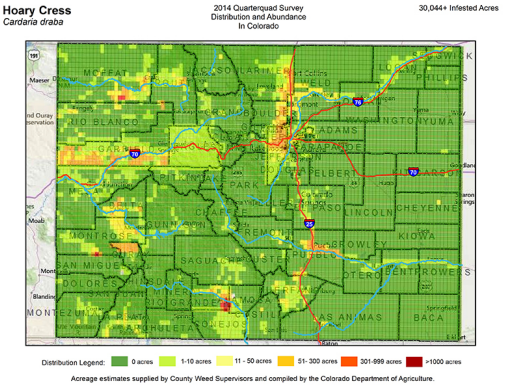
Identification and Impacts

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.

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, 303-239-4100.



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

Updated on: 05/09

Cardaria draba

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. 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.

Hoary cress

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
Metsulfuron (Escort XP)	1 oz. product/acre 0.25 v/v non-ionic surfactant	Apply at the early bud growth stage; i.e. "broccoli" growth stage. (Early Spring to Early Summer)
Chlorsulfuron (Telar)	1 oz. product/acre 0.25 v/v non-ionic surfactant	Apply at the early bud growth stage; i.e. "broccoli" growth stage. (Early Spring to Early Summer)
Imazapic (Plateau)	12 fl. 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)

Colorado State University

CDA

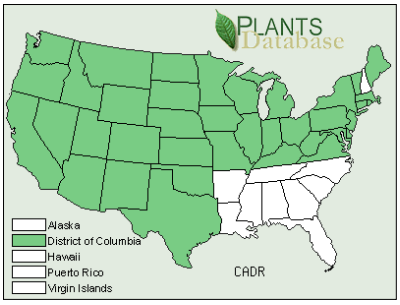
Whitetop *Cardaria draba* (L.) Desv.

Synonyms: *Lepidium draba* L. and *Lepidium draba* L. ssp. *draba* L.

Common Names: whitetop, hoary cress, whiteweed, peppergrass, heart-podded hoarycress, hoary cardaria

Native Origin: Central Europe and Western Asia

Description: A stout, erect perennial in the mustard family (*Brassicaceae*) that can grow up to 2 feet tall. The plant is leafy below and branching above with grayish stems. The arrowhead shaped leaves are grayish-green in color, covered with fine hairs and feel soft to the touch. Basal leaves form a rosette in early spring, tend to be more slender but larger than stem leaves, and narrow into a short petiole. Upper leaves clasp the stem. Flower pedicels (stalks) diverge slightly from the stem and are white with four petals about 0.1 inches long, clumped at the top of the stem and flat-looking in appearance. The seedpods are heart shaped and contain one or two oval, reddish-brown seeds. The root system consist of deeply penetrating vertical and lateral roots with thick, corky bark, large food reserves, and numerous underground buds from which rhizomes and aboveground shoots arise. Reproduction occurs from seeds or from buds on underground rhizomes.



Habitat: It prefers soils with neutral to alkaline pH and disturbed sites, including excessively grazed areas. It can be found in a variety of non-shaded habitats such as fields, meadows, pastures, open grasslands, waste areas, roadsides, gardens, feed lots, watercourses, along irrigation ditches, and at the edge of riparian habitats.

Distribution: This species is reported from states shaded on Plants Database map. It is reported invasive in AZ, CA, CO, ID, OR, MT, WA, and WY. It is also a prohibited noxious weed in Michigan.

Ecological Impacts: The plants can spread rapidly. A single plant can eventually form a large colony, producing a dense monoculture that can crowd out native species. In the absence of a competitor, a single plant can spread over an area 12 feet in diameter in one year. Types of disturbance which promote colonization and spread include grazing, irrigation, and cultivation. The species also contains compounds of glucosinolates, which can be toxic to some animals.


Whitetop infestation

Control and Management:

- **Manual**- pulling and grubbing should be done within 10 days of plant emergence and before flowering and seed set; till and repeat tilling to remove root systems; clean all equipment before moving from the infested site; flooding can be used because seeds lose viability after being in wet soil for one month; mowing can help control infestation by reducing seed production in existing plants but will not eradicate existing populations.
- **Chemical**- Successful control usually requires repeated applications with foliar herbicides. It can be effectively controlled using any of several readily available general use herbicides. Metsulfuron can be used on rosettes but it is ineffective after the plants start to bloom. 2,4-D is effective on mature plants. Chemicals provide the most control when applied at the rosette state or flowering stage when carbohydrates are moving from above to below ground and herbicides are more likely to be transported to the roots. Follow label and state requirements.

References: www.forestimages.org, http://plants.usda.gov, www.nps.gov/plants/alien/list/a.htm www.invasivespeciesinfo.gov/plants/whitetop.shtml, www.usgs.nau.edu/swepic/factsheets/cadrsf_info.pdf, www.fs.fed.us/database/feis/plants/forb/carspp/botanical_and_ecological_characteristics.html, http://tncweeds.ucdavis.edu/esadocs/documnts/card_sp.pdf

Produced by the USDA Forest Service, Forest Health Staff, Newtown Square, PA. WOW 10-09-06
Invasive Plants website: http://www.na.fs.fed.us/fhp/invasive_plants

USDA

United States Department of Agriculture

Field Guide for Managing Whitetop in the Southwest

Forest Service

Southwestern Region

TP-R3-16-20

September 2014

Cover Photos

Top left: Chris Evans, Illinois Wildlife Action Plan, Bugwood.org
Top right: Steve Dewey, Utah State Universit, Bugwood.org
Lower right: Chris Evans, River to River CWMA, Bugwood.org

Printed on recycled paper

Whitetop (*Cardaria draba (*L.) Desv., formerly known as *Lepidium draba*)

Mustard family (Brassicaceae)

Whitetop is listed as a noxious weed in Arizona and New Mexico. This field guide serves as the U.S. Forest Service's recommendations for management of whitetop in forests, woodlands, and rangelands associated with its Southwestern Region. The Southwestern Region covers Arizona and New Mexico, which together have 11 national forests. The Region also includes four national grasslands located in northeastern New Mexico, western Oklahoma, and the Texas panhandle.

Description

Whitetop (synonyms: heart-podded hoary cress, whiteweed, peppergrass, hoary cardaria) is an introduced, creeping, broadleaved, perennial plant that grows up to 2 feet tall. It is similar in appearance to two closely related *Cardaria* species: *C. chalepensis* (lens-podded hoary cress) and *C. pubescens* (globe-podded hoary cress). These three exotics are members of the mustard family (Brassicaceae) and are often grouped together because they invade similar sites and are equally difficult to control. The primary distinguishing characteristic between these species is the type and shape of the fruit, which is an indehiscent (remaining closed at maturity) pod called a silicle. *C. draba* has heart-shaped pods that become flattened with prominent veins as they dry. *C. chalepensis* has oval or lens-shaped pods that do not become flattened and veins are not prominent. *C. pubescens* has globose, hairy purplish pods that remain inflated when dry.

Growth Characteristics

- Perennial herbaceous plant; typically grows 16 to 20 inches tall.
- Deep, long-lived taproots that store carbohydrates; extensive creeping root system.
- Plants have a gray-green, soft-hairy appearance; grayish stems grow upright or along ground without rooting at the nodes (procumbent); lower portion of plant tends to be hairier and have more leaves; branching occurs primarily in upper portion of plant.
- Leaves alternate; rosette leaves and basal leaves of mature plants taper to a petiole. When mature, lower leaves are long and slender; upper leaves are obovate with smooth to slightly toothed margins; arrowhead-like lobes of leaves clasp the stem; leaves covered with short, white hairs.
- Many white, 4-petalled flowers occur in a flat-topped inflorescence (corymb of racemes); flowers have 6 stamens; 1 pistil; sepals are green; petals are spoon shaped.
- Indehiscent fruits are heart-shaped, 2-chambered silicles with a distinct beak (a persistent style) on the end opposite the notch; one ovoid, reddish-brown seed per chamber.

Ecology

Impacts/threats

Whitetop produces low quality forage, and dense infestations can crowd out desirable plants and reduce animal diversity. The foliage contains glucosinolates, which are toxic to cattle and decompose into allelopathic compounds that can impede germination and growth of desirable plants.

Location

Whitetop favors unshaded, disturbed areas with moderately moist, alkaline soils. It is widely distributed across the western U.S. and can be found along roadsides or irrigation ditches, and in rangeland meadows, subirrigated pastures, and hay fields. Whitetop grows on a wide range of soil types, from those that are moderately saline to acidic soils with low moisture.

Spread

A single plant produces up to 4,800 seeds that are viable for up to 3 years in the soil. In warmer climates, whitetop may produce several seed crops during a growing season. Seed is dispersed by water, wind, and animals; seed may move great distances as a contaminant in other types of seed. New shoots are commonly grown from root fragments, which can be spread long distances as a contaminant in displaced soil,

hay bales used for erosion control, or alfalfa hay. Seed or root fragments may adhere to surfaces and undercarriages of vehicles and road maintenance equipment.

Invasive Features

Whitetop has a deep taproot and a creeping lateral root system. Extensive carbohydrate reserves are stored within the roots, which enable shoots to emerge early and grow rapidly in the spring. Root fragments less than 1-inch long may resprout to form new shoots. Because whitetop is adaptable to a wide range of habitats, invasions of whitetop often occur in sensitive areas, which can limit control options.

Management

Early detection and removal of new infestations soon after discovery is the most effective weed management strategy for whitetop control. Because of its extensive creeping rootstock, large populations are a challenge to eradicate if not an impossibility once established. Small or isolated infestations on otherwise healthy sites should be given high priority for treatment, followed by treatment of whitetop in corridors with a high likelihood for spread, such as waterways and irrigation structures. In areas where whitetop has become well established, containment should become a management priority. Containment can be achieved by managing the outside perimeter to prevent further spread. Whatever the approach, whitetop management will likely require several consecutive years of treatment with an integrated approach to reduce its impact to the plant community. The following actions should be considered when planning an overall management approach:

- Maintain healthy plant communities to limit whitetop infestations. This may involve using improved grazing management to prevent excessive grazing and reseeding areas with desirable grasses and forbs after disturbance.
- Detect, report, and map known infestations. Keep annual records of reported infestations.
- Practice prevention and eradicate new populations of whitetop as early as possible.
- Periodically check areas where hay bales are used to control erosion or where soils have been imported for presence of whitetop.
- Use certified weed-free hay; use pellets to feed horses in back-country areas.
- Implement annual monitoring and a followup treatment plan for missed plants and seedlings.
- Combine mechanical, cultural, biological, and chemical methods for the most effective whitetop control.

Table 1 summarizes some management options for controlling whitetop under various situations. Choice of individual control method(s) for whitetop depends on many factors including the current land use and site condition; accessibility, terrain, and climate; density and degree of whitetop infestations; and nontarget flora and fauna present. Other considerations include treatment effectiveness, cost, and the number of years needed to achieve control. More than one control method may be needed for a particular site.

Physical Control

Although labor intensive and costly, physical methods that are consistently and repeatedly used can be effective at controlling whitetop. Effectiveness of physical methods is usually improved when combined with herbicide control.

Manual Methods

Hand removal – Hand digging or grubbing may be feasible for small, isolated populations or for plants located in sensitive areas such as riparian corridors. Ideally, the entire root system should be dug out before seed forms. Debris should be disposed of by burning piled plants or by bagging and then depositing the bags in a landfill.

Mechanical Methods

When using machinery to manage whitetop, equipment should be cleaned after use to prevent movement of seeds or root fragments into uninfested areas.

Table 1. Management options*

Site	Physical Methods	Cultural Methods	Biiological Methods	Chemical Methods
Roadsides, fence lines, or noncrop areas	Mow at late bud to early flower stage; apply herbicide to resprouts. Remove small patches by hand pulling.	Clean machinery following activity in infested areas. Train road crews and the public to identify and report infestations; map reported populations.	Biological control agents are currently unavailable.	Spray at bud to early flower stage. For ground application, use truck-mounted or tractor-pulled spraying equipment. Wash under vehicle after application to prevent spread.
Rangelands, pastures, or riparian corridors	For seedlings, use initial deep cultivation followed by repeat cultivation at a 4- to 5-inch depth every 5 to 10 days during the growth season; repeat for 2 to 4 consecutive years. Prescribed burning is NOT recommended.	Use certified weed-free seed and hay. Monitor areas where soil was imported or hay bales were used for erosion control. Reseed with competitive, desirable plants.	Prescribed grazing with sheep or goats may be considered in combination with other methods; slightly toxic to cattle. Closely manage grazing to prevent overuse of desirable species. Biological control agents are currently unavailable.	For extensive and dense infestations, use ground or aerial broadcast spraying. For sparse infestations, use backpack or hand-held sprayer.
Wilderness, other natural areas, and/ or small infestations	Hand dig or grub small patches; remove as much of the root as possible; bag and dispose of debris appropriately.	Educate the public to identify and report infestations. After passing through infested areas, inspect and remove any seed or root fragments from animals, clothing, and vehicles.	Same as above.	Use backpack or hand-held sprayers or use wick method for IPT. Broadcast spraying may be used on thicker stands, if allowed.

* Choice of a particular management option must be in compliance with existing regulations for land resource.

Mowing – By itself, mowing is not recommended as it can contribute to further spread and increased densities of whitetop. In agronomic lands or areas with level ground where mowing is practical, cutting the weed in combination with later well-timed herbicide applications will improve control effectiveness. Mow whitetop early in the growth season when it is at flower bud stage. Allow the shoots to resprout and then apply herbicide when plants again reach flower bud stage. Mowing causes the plant to produce larger leaves that are perpendicular to the ground which allows better access of herbicide into the lower third of leaves. An alternative is to spray plants in late summer/early fall and then mow in the spring. New shoots will likely be produced, and repeat spraying is usually necessary for further control.

Tillage – Cultivation is effective with seedlings and in areas where the population is not yet well established. Till plants below the depth of lateral and vertical roots, and plan to repeat cultivation shortly after new shoots emerge. This may require tillage that is needed every 10 to 15 days for 6 to 8 weeks during the growing season which may be followed by less frequent tillage. Speed of eradication depends upon timing and frequency of cultivation, and this practice usually has to be repeated for at least 2 consecutive years. Even infrequent cultivation before seed set can reduce whitetop infestation. Combining tillage with well-timed herbicide use can further improve effectiveness.

Prescribed Fire

Since 75 percent of whitetop's total biomass is below ground, populations rebound rapidly following fire. Therefore, this practice is not recommended as a control method. Burning is an acceptable means to dispose of plant debris.

Flooding

When feasible, flooding an area with 6 to 8 inches of water for 2 months can be an effective control method.

Cultural Control

Prevention is key to controlling whitetop, and early detection and plant removal are critical for reducing its spread. Educating land managers, the local public, and others to identify nonnative noxious species is important so they can help report all suspected infestations. Weed screens for irrigation ditches should be considered as a means of preventing seed dispersal via waterways. Reseeding with desirable shrub and perennial grass species that are competitive with whitetop should be considered for areas not recovering naturally following suppression efforts.

Biological Control

Grazing

Although palatability is low, goats and sheep will graze whitetop from rosette until the early flowering stage. Whitetop reportedly is toxic to cattle if consumed in great enough quantity, but livestock generally make very little use of this weed.

Table 2. Herbicide recommendations

Common Chemical Name (active ingredient)	Product Example[1]	Product Example Rate per Acre (broadcast)	Backpack Sprayer Treatment Using Product Example[2]	Time of Application	Remarks
Chlorsulfuron	TelarXP	1 ounce	1–2%	Bud to early bloom.	Selective; safe for labeled grasses; provides 1–2 years control. Not for use near waterbodies. Use 0.25% v/v NIS[3]. If area is mowed before herbicide applied, lower rate is effective.
Metsulfuron methyl	Escort, Ally	0.75–1 ounce	1%	Same as above.	Selective; safe for most perennial grasses. Not for use near irrigation water. Add 0.25% v/v NIS[3]. May apply in fall if part of plant is still green.
Chlorsulfuron + metsulfuron	Cimmaron Plus	1.25 ounces	1%	Same as above.	Broad spectrum; most broadleaved plants and certain grasses are susceptible; absorbed through foliage and roots; preemergent and postemergent activity. Add 1/16% – 1/18% v/v NIS[3]; a 1 to 2 inches of rainfall is required after application to move herbicide into root zone.
Aminopyralid + metsulfuron	Chaparral	2.5–3.33 ounces	1%	Spring (rosette to bolt) or fall (seedling to rosette).	Broad spectrum; most broadleaved plants (including legumes and woody plants) and certain grasses are susceptible. Not for use near surface water. Tank mix with 2,4-D for bolt to early flower stages. Add 0.25% v/v NIS[3].
Glyphosate	Rodeo, RoundUp Pro, others	3 quarts Rodeo 4 quarts RoundUp Pro	Rodeo: 0.75–2% + NIS3 RoundUp Pro: 2%	Flower bud stage.	Nonselective. Rodeo is labeled for use in or near aquatic areas. If infestation is dense, mow and then apply glyphosate when regrowth reaches flower bud stage.

Table 2. Herbicide recommendations (continued)

Common Chemical Name (active ingredient)	Product Example[1]	Product Example Rate per Acre (broadcast)	Backpack Sprayer Treatment Using Product Example[2]	Time of Application	Remarks
2,4-D ester or amine4	several products available	2 quarts	1–5%	Before bud stage.	Selective; acceptable for use in/near aquatic areas. Apply annually for 2 years or more to control established stands. If infestation is dense, mow first and then spray regrowth.
Imazapyr	Arsenal, Habitat, others	2–3 pints	0.5–5%	Flower bud to flowering stage; apply to actively growing plant parts.	Nonselective; preemergent and postemergent; broad-spectrum control. Habitat is labeled for use near water. In addition to overspray, nontarget plants may be killed or injured by root transfer of imazapyr between intertwined root systems. Add 0.25% v/v NIS for postemergent use.
Imazapic	Plateau	12 fluid ounces	5%	Same as above.	Selective herbicide but may retard growth of some grasses. This herbicide is the preferred alternative to imazapyr if protection of desirable plants is needed.

[1] Trade names for products are provided for example purposes only, and other products with the same active ingredient(s) may be available. Individual product labels should be examined for specific information and appropriate use with whitetop.

[2] Herbicide/water ratio - As an example, a gallon of spray water with a 3 percent mixture is made by adding a sufficient volume of water to 4 ounces of liquid herbicide until a volume of 1 gallon is reached (4 oz ÷ 128 oz/gal = 0.03 or 3 percent).

[3] NIS is an abbreviation for nonionic surfactant which is an additive commonly recommended by herbicide labels for postemergent foliar application of herbicides.

[4] 2,4-D is a restricted use pesticide in New Mexico only. A certified applicator's license is required for purchase and use.

Classical Biological Control

Biological control research is underway; however, there are currently no classical biological control agents approved by USDA for management of whitetop. The following species are being studied for whitetop control: *Ceutorhynchus cardariae* (a gall-forming weevil), *C. turbatus* (a seed-feeding weevil), *Melanobaris semistriata* (a root-mining weevil), and *Psylliodes wrasei* (a shoot-mining flea beetle).

Chemical Control

Whitetop grows in many different crop and rangeland situations, which complicates the choice for best chemical control. Herbicides commonly used to control mustards generally work well on whitetop; but these chemicals often control a wide range of other broadleaf plants as well, some of which may be desirable. For example, legumes such as alfalfa are sensitive to most herbicides that are effective with whitetop and could be lost if sprayed. All herbicides recommended in table 2 will effectively control whitetop when properly applied. Chlorsulfuron or metsulfuron methyl provide effective whitetop control in noncropland areas, but timing is important. Spraying should be done in early spring or preferably in the fall before winter dormancy. 2,4-D (ester or amine) can provide fair to good control or provide suppression when sprayed in early spring. Glyphosate, imazapic, or imazapyr formulations are acceptable for use in areas near water. Monitoring and followup applications at a minimum of several years are recommended to attain long-term control. Herbicide applications should be made during

the flower bud to early flowering stage when carbohydrate root reserves are lowest.

Each herbicide product will have different requirements and restrictions according to the label. Read and understand prior to any application. To prevent development of resistance in whitetop from repeated treatments, the label should be consulted for guidelines on rotating herbicide active ingredients. Consult the registrant if you have questions or need further detail.

Herbicides may be applied in several ways including backpack, ATV or UTV sprayers, or conventional boom sprayers that are pulled or attached to a tractor or truck. For sparse populations, one person or a small team can spray or wick whitetop in an area using the individual plant treatment (IPT) method. Spray plants directly by wetting the foliage and stems to the point of dripping while using an adjustable spray nozzle attached to a hand-held or backpack sprayer. To suppress whitetop in riparian areas while allowing desirable plant species to reestablish, wick individual plants with 100 percent solution of 2,4-D for several consecutive years. Where water is not present year-round, chlorsulfuron may be used as long as the herbicide has time to degrade in the soil before water returns.

Control Strategies

Because each treatment situation is unique, the strategy adopted for whitetop control must involve careful planning and a long-term commitment to management actions. Combining methods, as outlined in this guide, should always be considered in a long-term approach to control whitetop. As an example, combining physical methods with chemical control can be an effective option.

Regardless of the strategy used, components of a successful whitetop control program should include repeated treatments, monitoring of treated areas, and measures taken to control missed plants, resprouts, and newly emerged seedlings. Monitoring should be conducted in early spring and late summer to find rosettes that form the leading edge of expanding infestations. To enhance long-term control, efforts should be made to encourage return of desirable plants such as shrubs and perennial grasses that will compete with whitetop for water, nutrients, and space.

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Suggested Web Sites

CABI database:

http://www.cabi.org/?page=1017&pid=2257&site=170

For information on invasive species:

http://www.invasivespeciesinfo.gov/

http://www.invasive.org/weedus/index.html

For information about calibrating spray equipment:

NMSU Cooperative Extension Service Guide A-613 Sprayer Calibration at http://aces.nmsu.edu/pubs/_a/A-613.pdf

Herbicide labels online:

http://www.cdms.net/LabelsMsds/LMDefault.aspx

For more information or other field guides, contact:

USDA Forest Service
Southwestern Region
Forest Health
333 Broadway Blvd., SE
Albuquerque, NM 87102

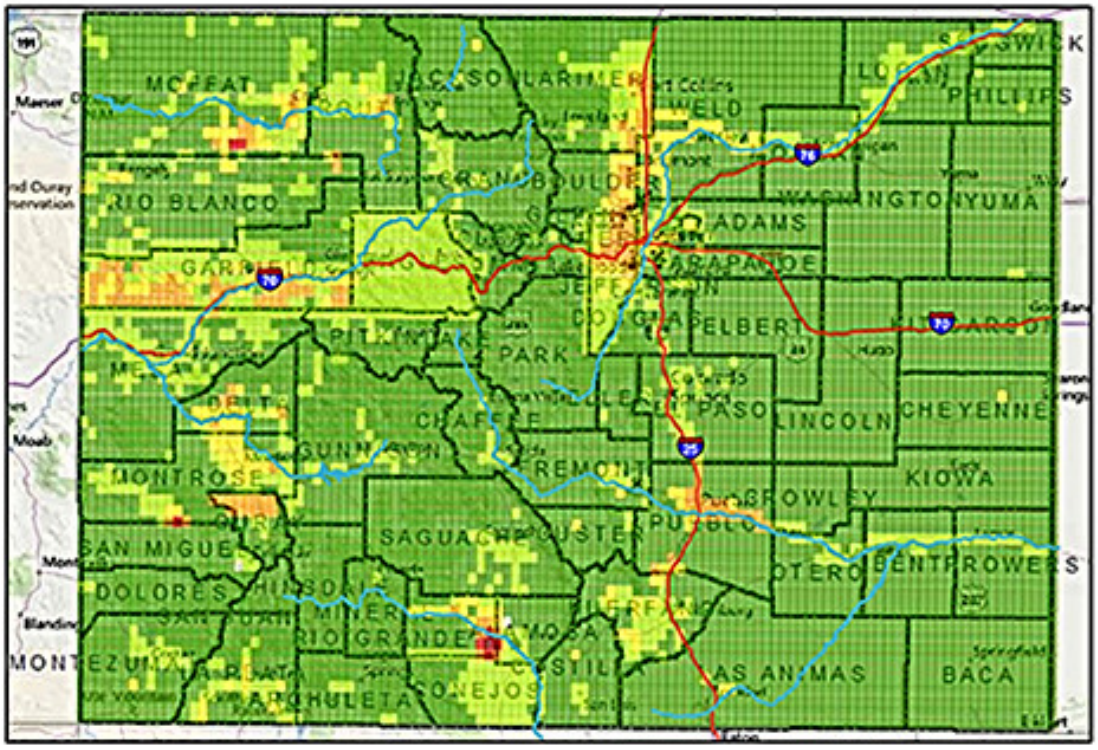
Or visit:

http://www.fs.usda.gov/main/r3/forest-grasslandhealth/invasivespecies

Hoary Cress
Cardaria draba

2014 Quarterquad Survey
Distribution and Abundance
In Colorado

30,044+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres | 51- 300 acres | 301-999 acres | >1000 acres

Acreage estimates supplied by County Weed Supervisors and compiled by the Colorado Department of Agriculture.

Leafy spurge

Euphorbia esula

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.

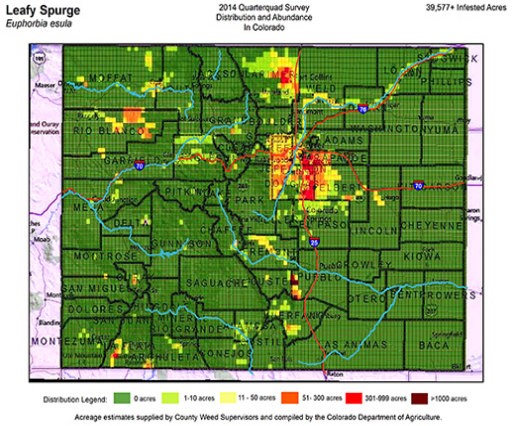
Identification and Impacts

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.



Updated on: 08/08

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.

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.

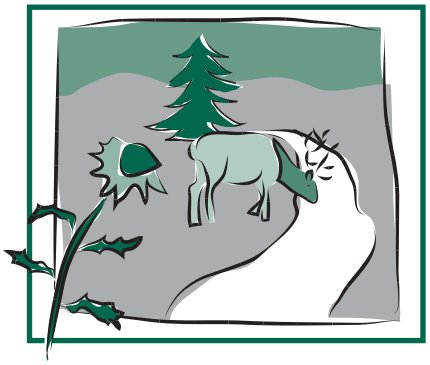
Leafy spurge

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
Fosamine (Krenite S)	1.5 gal/acre or 6.5 oz/gal water	Spring only, during bloom to post-bloom stage. Add non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.
Imazapic (Plateau)	12 oz/acre or 0.4 oz/gal water	Fall only treatment prior to hard freeze. Add a methylated seed oil surfactant (MSO) @ 0.32oz/gal water or 1 qt./100 gal water.
2,4-D Amine	2-3 qts/acre or 2-3 oz/gal water	Apply early spring and fall. Prevents seed formation only. Retreatment will be necessary. DO NOT apply when outside temperatures will exceed 85 degrees. Add non-ionic surfactant @ .32oz/gal water or 1qt/100 gal water.

Colorado State University
Extension



Leafy Spurge

Fact Sheet No. **3.107** Natural Resources Series | **Range**

by K.G. Beck*

Leafy spurge (*Euphorbia esula L.*) is a creeping, herbaceous perennial weed of foreign origin that reproduces from seed and vegetative root buds. It can reduce rangeland cattle carrying capacity by 50 to 75 percent. About half of this loss is from decreased grass production. Cattle won't graze in dense leafy spurge stands and these areas are a 100 percent loss to producers.

A 1990 survey found 44,000 acres in Colorado infested with leafy spurge. In 2002, the Colorado Department of Agriculture conducted a follow-up survey and found more than 73,800 infested acres of leafy spurge (Figure 1).

Leafy spurge is an erect plant that grows 1 to 3 feet tall. Leaves are bluish-green with smooth margins, 0.25 inch to 0.5 inch wide, and 1 inch to 4 inches long (Figures 2 and 3).

Umbel flowers are surrounded by heart-shaped, showy, yellow-green bracts. (An umbel looks like the stays of an umbrella if it is held upside down. Figure 4.) Flowers occur in many clusters toward the top of the plant (Figure 5). Seeds are round to oblong, about 1/12 inch long, gray or mottled brown with a dark line on one side.

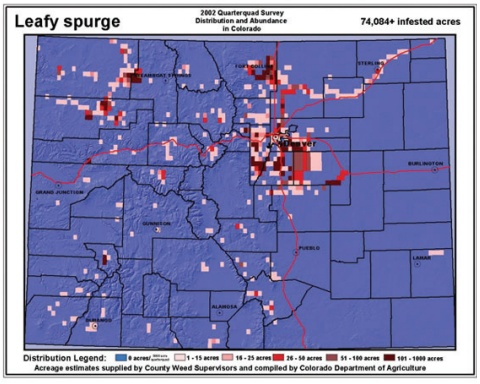


Figure 1: Leafy spurge distribution in Colorado, 2002.

Leafy spurge contains a white milky latex in all plant parts. Latex distinguishes leafy spurge from some other weeds (e.g., yellow toadflax), particularly when plants are in a vegetative growth stage.

Leafy spurge has an extensive root system that is abundant in the top foot of soil, and it may grow 15 feet deep or more. Roots contain substantial nutrient reserves that allow the weed to recover from stress, including control efforts. Many vegetative buds along roots grow into new shoots. This contributes to its persistence and spread.

Phenology

Leafy spurge shoots originate in early spring from crown tissue just below the soil surface and from sporadic buds along the root system. Leafy spurge is very competitive, one of the first plants to emerge each spring, and uses moisture and nutrients that otherwise would be available for more desirable vegetation.

Flowering occurs primarily in April and May but may occur through fall. Bracts emerge about two weeks before flowers and give leafy spurge the appearance of flowering. For optimum herbicide application timing, it is important to recognize true flower emergence.

Each flowering shoot produces an average of 140 seeds. Seeds are expelled up to 15 feet when capsules dry. They are viable up to eight years in soil. Water, birds, animals and people aid seed dispersal. Seeds readily float and waterways are good sources for new infestations.

Peak seed germination generally occurs in May (Figure 6). Seedlings quickly acquire the ability to reproduce vegetatively by developing buds on roots within 10 to 12 days after emergence. Perennial leafy spurge is more difficult to control than seedlings.

Colorado State University Extension weed science specialist and professor, bioagricultural sciences and pest management. 11/2013

Quick Facts

- Leafy spurge (*Euphorbia esula L.*) is a creeping perennial that reproduces from seed and vegetative root buds.
- It can reduce cattle carrying capacity of rangeland or pastures by 50 to 75 percent.
- Leafy spurge is difficult to control. Its extensive root system has vast nutrient stores that let it recover from control attempts.
- Combine control methods into a system to achieve best results.

www.ext.colostate.edu

Figure 2: Leafy spurge stems and leaves.

Figure 3: Leafy spurge in bolting growth stage; note leafy spurge seedlings.

Figure 4: Leafy spurge in the early flower stage; note the heart-shaped bracts beneath developing flowers.

Management

Leafy spurge is difficult to manage and can recover from almost any control effort. Therefore, a management scheme that combines control methods over four to five years is recommended. Even after that time, monitor infestations for recurrence and adopt a maintenance program.

Cultural control. Vigorous grass growth is an important aspect of leafy spurge control. Over-grazing stresses grasses and makes them much less competitive with weeds, leafy spurge in particular. Irrigation, where applicable, may favor grass growth and make it more competitive with leafy spurge.

Chemical control. For optimum leafy spurge control, proper timing of herbicide application is imperative. Research from North Dakota-State University indicates that Tordon 22K (picloram) 2,4-D, Banvel/Vanquish/Clarity (dicamba) are most effective when applied in spring when true flowers emerge (not just bracts). Fall application to leafy spurge regrowth also is good timing for these herbicides. Refer to Table 1 for rates and application timings and always read the herbicide label before using the product.

Tordon is one of the most effective herbicide for leafy spurge control. Treat large, readily accessible areas for three to four consecutive years. For more remote locations, Tordon can be spot sprayed at 2/quarts/A but not more than 50% of an acre can be treated in any year. Monitor infestations after treatment and retreat with 1 quart/A of Tordon when shoot control is less than 75 percent.

Tordon may be tank-mixed with 2,4-D to provide adequate control. Apply 1 to 1.5 pints of Tordon with 1 to 1.5 quarts/A of 2,4-D in spring when leafy spurge flowers. When this application is made for three to five consecutive years, leafy spurge shoot control is generally 80 to 90 percent and cattle will feed in the area again.

Plateau (imazapic) can be used to control leafy spurge in pastures, rangeland, and non-crop areas. It can be used safely around trees but may temporarily injure cool-season perennial grasses. Apply Plateau in fall while milky latex still is present in the plant. Add a methylated seed oil to the spray solution. A liquid nitrogen fertilizer solution may be added to the spray mixture to increase weed control, but it may increase cool-season perennial grass injury. Injury tends to increase with late fall applications.

Perspective control of leafy spurge is similar to Tordon. CSU research indicates that multiple years of treatment with Perspective may be necessary but not always as consecutive year applications–a single application may control leafy spurge for two growing seasons and then a repeat application may be needed.

Table 1. Herbicide rates and application timings to control leafy spurge.

Herbicide	Rate (Product/A)	Application timing	Comments
Tordon	1 quart	Spring at flowering growth stage; or fall	May need treatment 3 to 4 years
Plateau	8 to 12 fl oz	Early fall (August through October) before loss of latex	Use higher rate for older and dense stands; adds 1.5 to 2 pint/A of methylated seed oil; high rate or consecutive year treatments may injure cool season grasses
Paramount	16 oz	Spring at prebloom (yellow bract stage) or in fall	Add 1.5 pt/A of a methylated seed oil or 2 pt/A of a crop oil concentrate
Perspective	5.5 oz	Spring at flowering growth stage; or fall	Methylated seed oil or crop oil concentrate may aid leaf absorption of Perspective at 0.5 to 1% v/v; or use of a non-ionic surfactant at 0.25 to 0.5% v/v also is recommended
Banvel, Vanquish, or Clarity (dicamba)	2 quarts	Spring at flowering growth stage; or fall	Fall applications most consistent results; may need re-treatment 2 to 4 years
Roundup	1 quart each application; 2 quarts total	Apply sequentially; first application first of June and second one month later	Must be combined with grass seeding

Be certain to monitor treated sites for leafy spurge recovery and retreat when control appears to be 70% or less. A methylated seed oil or crop oil concentrate may aid leaf absorption of Perspective and often improves control. However, a non-ionic surfactant also can be used instead of the seed or crop oil.

Paramount (quinclorac) is a highly selective herbicide and can be used to control leafy spurge in pastures, rangeland and non-crop areas. CSU research indicates that Paramount caused the least injury to desirable/native forbs and shrubs. It should be used in conjunction with a methylated seed oil or crop oil concentrate.

Banvel/Vanquish/Clarity also is effective against leafy spurge. When applied in spring at flowering for three consecutive years. Often control is not very good in the first year but improves over the next two years. At that time, a maintenance schedule that uses low rates of Banvel/Vanquish/Clarity + 2,4-D (4 to 8 ounces + 0.5 to 1 quart/A), or Tordon + 2,4-D (1 pint + 1 quart/A) as needed can be used to keep infestations under control. **Note: Avoid using soil-active herbicides such as Tordon, Perspective, or Banvel/ Vanquish/Clarity near windbreak plants or other desirable woody vegetation.** Plant injury or death can occur. Also, do not allow any herbicide to drift onto desirable woody vegetation for the same reasons.

Roundup (glyphosate) is most effective when applied sequentially at one month intervals, coupled with fall grass seeding. Make the first application at the beginning of June and a second application one month later. Occasionally, leafy spurge will recover from these Roundup treatments. An application of 2,4-D (2.0 quart/A) in September can control regrowth. Sow perennial grasses in later fall as a dormant seeding (seed later enough that grass seedlings will not emerge until following spring).

Biological control. Sheep or goats can be used to help control leafy spurge. Research from Montana State University indicates sheep may consume up to 50 percent of their diet as leafy spurge. Introduce sheep to leafy spurge in early spring when the weed is succulent. Goats will consume leafy spurge at almost any time during the growing season.

Rotate pastures to prevent seed production and allow desirable forage plants to regain vigor. If livestock graze leafy spurge after seed formation, hold animals in a corral for at least seven days before moving them to an uninfested area. This reduces viable seed passage. Sheep or goats followed by fall herbicide treatment may be an effective, integrated means to use infested ground and control the weed.

The Colorado Department of Agriculture insectary has four flea beetles (*Apthona nigriscutis*, black-dot flea beetle; *A. cyparissiae*, brown-dot spurge flea beetle; *A. czwalinae*, black spurge flea beetle; and *A. flava*, copper spurge flea beetle) available for release. Their larvae feed on leafy spurge root hairs and within roots, while adults feed on foliage. Other insects may become available in the future. Most likely, a combination of insects will be necessary to adequately control leafy spurge. Insects would be most advantageous in areas where herbicide use is difficult or risky.

Recent research completed by Colorado State University showed that six to eight sheep per acre grazing for 10 days in July over a period of five years decreased leafy spurge density about 90 percent. When flea beetles grazed simultaneously in July with eight sheep per acre for 10 days over five years, leafy spurge density was decreased to zero.

Habitat requirements of the flea beetles vary. While all requirements are not well understood, it is known that *A. nigriscutis* prefers open, dry sites and coarse soils low in organic matter. *A. cyparissiae* prefers soils higher in moisture than

Figure 5: Leafy spurge nearing seed set growth stage; note three-lobed seed capsules above bracts.

Figure 6: Leafy spurge seedlings.

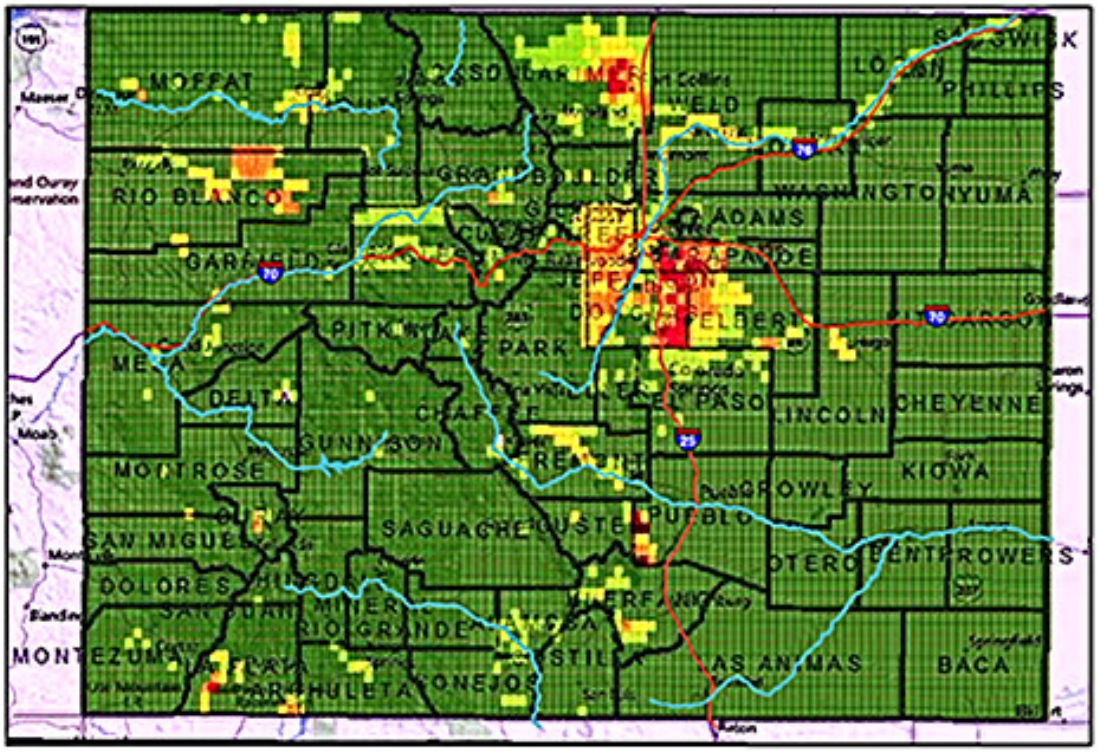
A. nigriscutis, but still prefers moderately coarse-textured soils such as sandy loams and open sites. *A. flava* does well in coarse soils with high water tables in open and shaded conditions. *A. czwalinae* prefers moist, clay soils.

Regardless of the management system used, a combination of methods is essential to return leafy spurge-infested ground to a productive state. The key to control leafy spurge or any creeping perennial is to exhaust the root nutrient stores, causing it to collapse. Persistence is imperative to gain control.

Leafy Spurge
Euphorbia esula

2014 Quarterquad Survey
Distribution and Abundance
In Colorado

39,577+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres | 51- 300 acres | 301-999 acres | >1000 acres

Acreage estimates supplied by County Weed Supervisors and compiled by the Colorado Department of Agriculture.

Musk thistle

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Key ID Points

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

Updated on:
08/08

Musk thistle
Identification and Management

Identification and Impacts

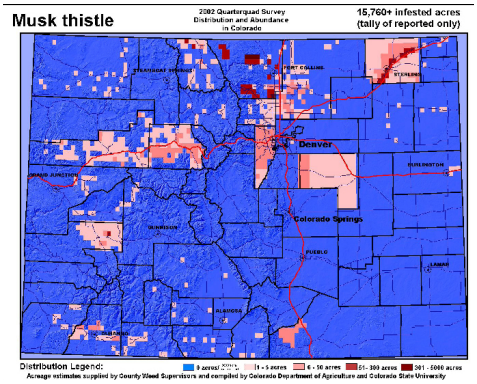
Musk thistle *(Carduus nutans)* is a non-native biennial forb that reproduces solely by seed. A biennial is a plant that completes its lifecycle within two years. During the first year of growth, musk thistle appears as a rosette in spring or fall. During the second year in mid to late spring, the stem bolts, flowers, sets seed, and the plant dies. Musk thistle produces many flower heads. The terminal, or tallest, shoots flower first, then lateral shoots develop in leaf axils. A robust plant may produce 100 or more flowering heads. A prolific seed producer, musk thistle can produce up to 20,000 seeds per plant, only one-third being viable. Because musk thistle reproduces solely from seed, the key for successful management is to prevent seed production.

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

Habitats for Musk thistle include disturbed, overgrazed areas. Once a pasture is infested, the livestock carrying capacity for that area is significantly decreased. The plant may also occur on rangeland, roadsides, ditches, riparian areas, and trails.

The key to effective control of Musk thistle is to prevent the plant's seed production, Planting desirable grasses and forbs to out compete Musk thistle can also be effective. Dense Musk thistle stands can be treated by spot treatments of herbicides and by a persistent mechanical program. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Musk 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.



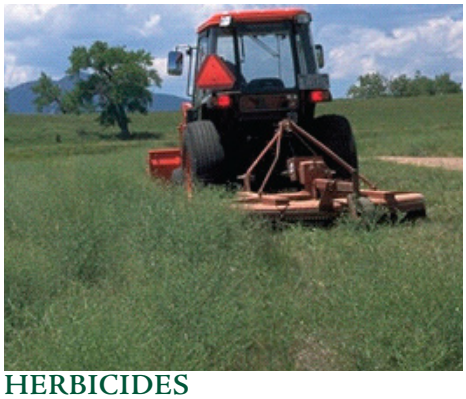
Photos © Kelly Uhing, Colorado Department of Agriculture; map above by Crystal Andrews, Colorado Department of Agriculture.

Carduus nutans

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
Livestock tend to avoid grazing on musk thistle, although horses and cattle have been known to eat the flowerheads. Biological control insects, such as the seed head weevil and the crown weevil are effective on large infestations. When used together, these insects provide fair to good control. Contact the Insectary, 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 Musk thistle. Mowing or chopping is most effective when Musk thistle plants are at full-bloom. Be sure to properly dispose of the flowering cut plants since seeds can mature and become viable after the plant has been cut down.

Integrated Weed Management:

The key to managing Musk thistle is to prevent seed production. Dense Musk thistle stands can be treated by spot use of herbicides and by a persistent mechanical program. Due to the long seed viability of musk thistle, up to 10 years, control methods may have to be repeated for many years to completely eliminate an infestation.

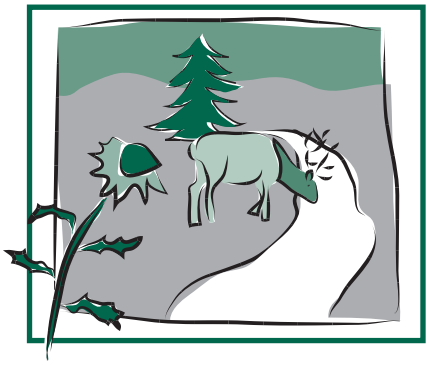
Musk thistle

HERBICIDES

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 fl. oz./acre + 0.25% v/v non-ionic surfactant	Apply in spring rosette to early bolting growth stages or in fall to rosettes.
Metsulfuron (Escort XP)	1 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.)
Chlorsulfuron (Telar)	1 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.)

Colorado State University
Extension



Musk Thistle

Fact Sheet No. **3.102** Natural Resources Series | **Range**

by K.G. Beck*

Musk thistle is an aggressive weed of foreign origin that occurs in pastures, rangeland, roadsides and non-crop areas (Figure 1). It is a biennial weed, although occasionally it is an annual. Because musk thistle reproduces solely from seed, the key for successful management is to prevent seed production. Over 46,000 acres are infested with musk thistle in Colorado (Figure 2).

Germination and seedling establishment are correlated with moisture and light. Thus, more seeds germinate and establish plants in open pastures and other degraded areas.

Vigorously growing grass competes with musk thistle, and fewer thistles occur in pastures where grazing is deferred. However, musk thistle also can become a problem in pasture or rangeland that is in good condition.

Phenology

Seedlings normally emerge early in spring, develop into rosettes and spend the first season in this growth stage. Seedling emergence also can occur in fall. All seedlings grow into rosettes and overwinter in that stage. Rosettes are usually large and compact with a large, corky taproot that is hollow near the crown (Figure 3). Leaves have consistent shape, sometimes expressing a frosted appearance around the leaf margins, and often have a cream-colored midrib (Figure 4).

Early in spring of the second year, overwintered rosettes resume growth. Shoots begin to elongate (bolt) in late March through May, depending on weather and elevation (Figure 5). Musk thistle flowers (Figure 6) and starts to produce seed 45 to 55 days after it bolts. Musk thistle has very large bracts beneath flowers that are armed with sharp spines and shoots beneath flowers are almost devoid of leaves.

*Colorado State University Extension weed science specialist and professor, bioagricultural sciences and pest management. 11/2013

Figure 1: Musk thistle infestation in the Colorado foothills.

Musk thistle dies after it sets seed. It spends approximately 90 percent of its life cycle in a vegetative growth stage. Musk thistle's tolerance to most herbicides increases after it bolts.

Reproduction and Spread

Musk thistle is a prolific seed producer. One plant can set up to 20,000 seeds. However, only one-third of the seeds are viable. Musk thistle produces many heads. The terminal, or tallest, shoots flower first, then lateral shoots develop in leaf axils. A robust plant may produce 100 or more flowering heads.

Musk thistle flowers over a seven- to nine-week period. It begins to disseminate seed from a head about two weeks after it first blooms. It is common to observe musk thistle with heads in several stages of floral development and senescence. Thus, musk thistle sets seed over an extended time period.

Most seed is dispersed within the immediate vicinity of the parent plant. This leads to a clumped pattern of seedling development and results in intraspecific competition and mortality. Wind and water are good dissemination methods and seeds are also spread by animals, farm machinery and other vehicles. Less than 5 percent of seed remains attached to the pappus when it breaks off the flowering head and floats away on wind currents.

Quick Facts

- Musk thistle is a biennial weed that reproduces only from seed.
- The key to successful musk thistle control is to prevent seed production.
- Apply herbicides such as Milestone, Transline, Vanquish/Clarity or 2,4-D to musk thistle rosettes in spring or fall. Apply Escort or Telar up to the early flower growth stage.
- Combine control methods into a management system for best results.

www.ext.colostate.edu

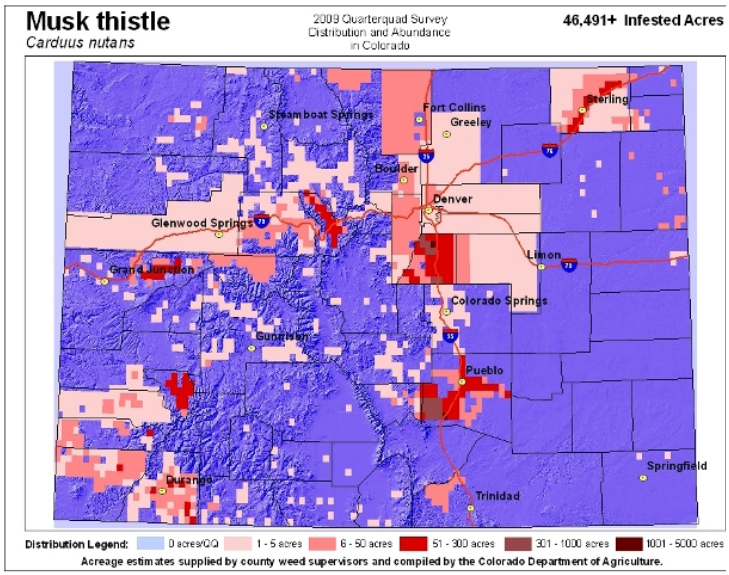


Figure 2: Musk thistle distribution in Colorado, 2009.

Figure 3: Musk thistle rosettes.

Figure 4: Musk thistle leaves; note cream-colored mid-rib and frosted appearance around leaf margins.

Figure 5: Musk thistle in bud growth stage; note large bracts below developing flower.

Management

Cultural control. Maintaining pastures and rangeland in good condition is a primary factor for musk thistle management. To favor pasture and rangeland grass growth, do not overgraze. Fertilize only when necessary and according to soil testing recommendations. To successfully manage musk thistle, prevent seed formation.

Mechanical control. Musk thistle will not tolerate tillage and can be removed easily by severing its root below ground with a shovel or hoe. Mowing can effectively reduce seed output if plants are cut when the terminal head is in the late-flowering stage. Gather and burn mowed debris to destroy any seed that has developed.

Chemical control. Several herbicides are registered in pasture, rangeland and noncrop areas to control musk thistle. Milestone (aminopyralid), Transline (clopyralid), Banvel/Vanquish/Clarity (dicamba), 2,4-D, or Banvel/Vanquish/Clarity plus 2,4-D are commonly used. Apply these herbicides in spring or fall to musk thistle rosettes. Refer to Table 1 for rates and application timings and always read the herbicide label before using the product. Applications during the reproductive growth stages with these herbicides (bud through flowering) will not eliminate viable seed development.

Escort (metsulfuron) or Cimarron X-tra (metsulfuron + chlorsulfuron) also can be used in pastures, rangeland, and non-crop areas. Research from Colorado State University and the University of Nebraska shows that chlorsulfuron or metsulfuron prevents or dramatically reduces viable seed formation when applied in spring, up to early flower growth stages. The latest time to apply these herbicides is when developed terminal flowers have opened up to the size of a dime. Add a good agricultural surfactant at 0.25 percent v/v to Escort or Cimarron X-tra treatments or control is inadequate (equivalent to 1 quart of surfactant per 100 gallons of spray solution).

Table 1. Herbicide rates and application timings to control musk thistle.

Herbicide	Rate (Product/A)	Application timing	Comments
Milestone	3 to 5 fl oz	Spring at rosette growth stage; or in fall	Use higher rate for older or dense stands; may be used to edge ponds or streams
Transline	0.67 to 1.33 pints	Spring at rosette to early bolting growth stages; or in fall	Use higher rate for older or dense stands
Banvel, Vanquish, or Clarity (dicamba)	1 to 2 pints	Spring rosette growth stage; or in fall	Use higher rate for older or dense stands
Cimarrron X-tra	0.5 oz	Spring rosette to early bud growth stages; or to fall rosettes	Add non-ionic surfactant at 0.25% v/v
Escort	0.5 oz	Spring to rosette to early bud growth stages; or to fall rosettes	Add non-ionic surfactant at 0.25% v/v

Biological control. The Colorado Department of Agriculture has established a weevil, *Trichosirocalus horridus*. This weevil attacks the crown area of musk thistle rosettes and kills or weakens the plant before it bolts. This weevil is being distributed throughout Colorado by the Department of Agriculture. It tends to be more effective than the seed head weevil.

The musk thistle seed head weevil, *Rhinocyllus conicus*, can be found throughout Colorado. The female deposits her eggs on the back of developing flowers and covers them with chewed leaf tissue. After eggs hatch, larvae bore into the flower and destroy developing seed. The seed head weevil reduces seed production by 50 percent on the average. If used alone, however, it is not an effective management tool. Certain herbicides or mowing can be combined with the seed head weevil if these are used during late flowering stages. This allows the weevils to complete their life cycle and ensures their presence in subsequent growing seasons. The musk thistle seed head weevil is not being redistributed anymore because it attacks many different species of thistles, including native thistles.

Figure 6: Musk thistle flower; note large bracts and lack of leaves on shoot below flower.

Integrating Control Methods

To combine chemical and biological control methods, apply herbicides when they won't interfere with insect development. That is, allow the control insects to complete their life cycle. Or use herbicides in areas that aren't sensitive to their use and biological control in areas where herbicides are impractical or environmentally unsafe.

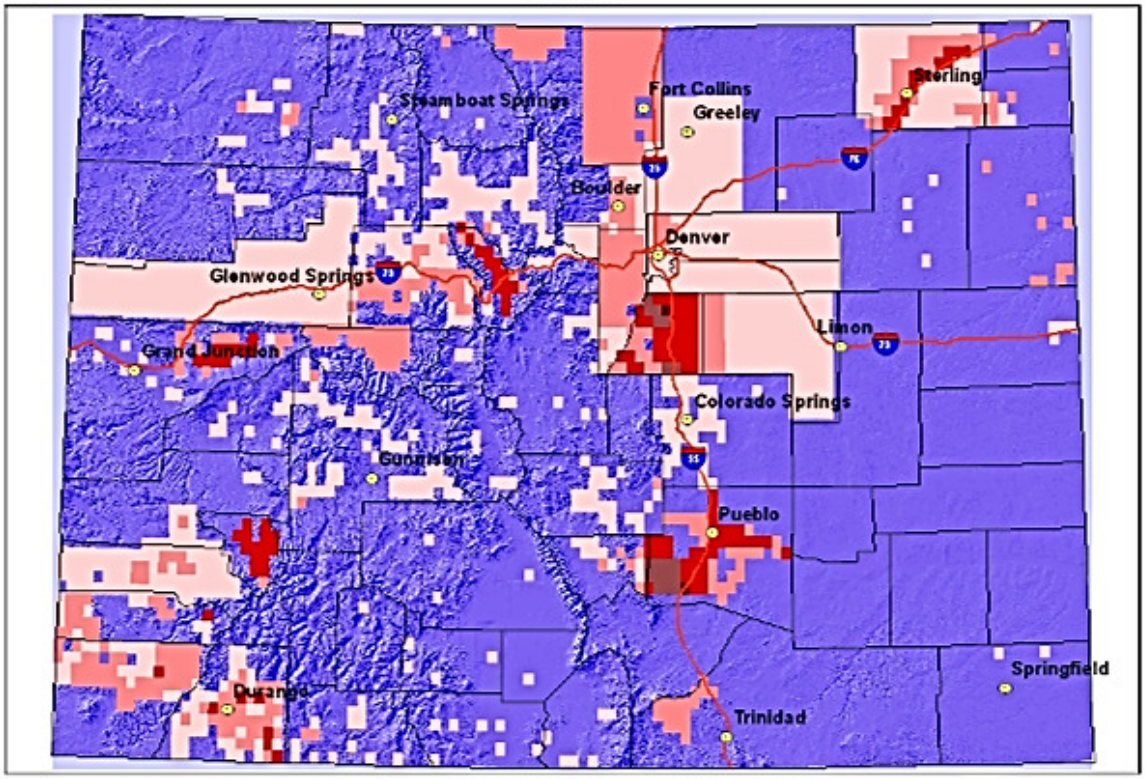
Cultural methods that favor desirable plant growth can be combined with chemical or biological control by superimposing proper grazing management and seeding.

Musk thistle

Carduus nutans

2009 Quarterquad Survey
Distribution and Abundance
in Colorado

46,491+ Infested Acres



Distribution Legend: 0 acres/QQ | 1 - 5 acres | 6 - 50 acres | 51 - 300 acres | 301 - 1000 acres | 1001 - 5000 acres

Acreage estimates supplied by county weed supervisors and compiled by the Colorado Department of Agriculture.

Perennial pepperweed

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Perennial pepperweed Identification and Management

Identification and Impacts

Perennial pepperweed (*Lepidium latifolium*) is an extremely invasive perennial forb introduced from Europe and Asia in 1900 as a containment in sugar beet seed. Pepperweed reproduces both by seed and vegetatively by roots and shoots. Root fragments as small as 0.5 inch can grow into new plants. A serious threat, pepperweed alters ecosystems by acting as a "salt pump" absorbing salts from deep in the soil. The plant then excretes the salt through the leaves and deposits it on the surface soil. Since most desirable plants do not tolerate high saline concentrated soils, the entire plant composition and diversity of the area changes.

Growing 1 to 5 feet high, pepperweed has tiny white flowers. The flowers have four spoon-shaped petals in dense, rounded clusters on branch tips of erect stems. Stems emerge from deep, thick, woody root stocks that can penetrate 10 feet into the soil. Leaves of the mature plant are alternate, and lance or oblong in shape with serrated edges that are slightly wavy. They are glabrous (not hairy) and green to gray-green in color, with a distinctive white midrib. Upper leaves are smaller than basal leaves and have no stalks.

Perennial pepperweed invades a wide variety of habitats, from intermountain, mountainous areas and marshes. It is frequently found in riparian areas, wetlands, marshes, irrigation ditches, canals, and floodplains. If introduced, it can also invade roadsides, hay and alfalfa fields and rangeland. It readily invades disturbed and bareground areas. It can thrive in either low or high-saline soils. Large monocultures and dense litter layers prevent native plants from regenerating. Pepperweed displaces native plants and wildlife habitats, reduces food quality for wildlife and reduces agricultural and pasture production.

Perennial pepperweed rarely produces seedlings in the field, even with extensive seed crops. Research is underway, but the lack of seedlings may be due to seeds rapidly losing viability in the field (but not in the laboratory). Reproduction is primarily from deep, perennial roots and root pieces which break off and sprout new plants. However, preventing seed production is still recommended until further research is done.

The key to effective control of Perennial pepperweed is preventing establishment of large populations. Early detection and removal of plants if found, is the key to prevention. Planting desirable and competing grasses and forbs can aid in limiting the spread of Perennial pepperweed. Herbicide treatments are a good option if used during the bud to flowering stage of the plant. Once established, containment is key. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Perennial pepperweed 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 courtesy of Kelly Uhing, Colorado Department of Agriculture.

Key ID Points

1. White flowers in dense round clusters at branch tips.
2. Leaves are waxy with a white midrib.

Updated on: 08/08

Lepidium latifolium

Perennial pepperweed

Management Recommendations

CULTURAL
Prolonged spring flooding of new growth will kill pepperweed. Grazing is not recommended because the plant may be toxic. Reestablishing the native or desired plants can take years, so repeat plantings must be repeated, but it can aid in controlling populations. Contact your local Natural Resources Conservation Service for seed mix recommendations.

BIOLOGICAL
Biological control is not a viable option because 11 other species of native Lepidium are on the Endangered species list, and the risk to these species as well as agricultural species is too great. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Due to the deep, brittle root, most mechanical methods are not recommend, and can actually propagate, spread and increase the density of pepperweed. Hand pulling can also bring seeds to the soil surface, and spread pieces of root, which will sprout. However, spring mowing combined with chemical treatments can be effective.

Integrated Weed Management:

Because of the deep roots and persistence of pepperweed, it is critical to combine repeated herbicide application with monitoring and revegation of the area. Control of Perennial pepperweed can be difficult, so prevention is the best option. Early detection, eradication and containment of small populations and their source are vital.

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
Chlorsulfuron (Telar)	1 oz product/ac. + 0.25 v/v non-ionic surfactant	Apply when plant is in bolting to early flower growth stages. (Early Spring to Early Summer)
Metsulfuron (Escort XP)	1 oz product/ac. + 0.25 v/v non-ionic surfactant	Apply when plant is in botling growth stage. (Spring)
Imazapyr (Plateau)	12 fl oz/ac. + 2 pt/ac. methylated seed oil	Apply when plant is in flower to late flower growth stages. (Early Summer to Mid Summer)

NOTE: Herbicides, when applied at the flower bud stage, are extremely effective to control pepperweed. **Repeat applications for up to five years. However, the waxy leaf surface and the dense growth of this weed can make it difficult to obtain adequate coverage with the herbicide, so apply the chemical carefully and thoroughly for effective control.**

Top photo, © Kelly Uhing, Colorado Department of Agriculture. *Calophasia lunula* larva photo © Bob Richard, USDA APHIS, Invasive.org. Root system, Nature Conservancy.

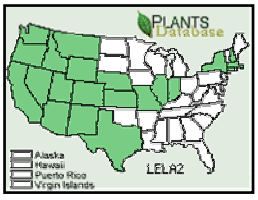
Perennial Pepperweed *Lepidium latifolium* L.

Common Names: tall whitetop, giant whiteweed, perennial peppergrass, slender perennial peppercress, broadleaf or broadleaved pepperweed, ironweed and other names

Native Origin: southeastern Europe and southwestern Asia

Description: A herbaceous perennial in the Mustard family (Brassicaceae). Plants are multiple stemmed and grow in stiffly erect masses 3 to 8 feet tall. Leaves are lanceolate, bright green to gray green, and entire or toothed. Basal leaves are stalked, up to 1 foot long and 3 inches wide and have serrate margins. Leaf size decreases up the stem. Flowering occurs from early summer to fall. Abundant small white 4-petaled flowers are borne in dense clusters near the stem tips. The fruits are small, flattened pods about 1/10th inch long, each containing 2 seeds (1 per chamber). Fruits remain on the plant, dropping irregularly throughout the winter. The base of the stem is semi-woody. The creeping roots enlarge at the soil line, forming a woody crown. The plant mainly propagates clonally from its brittle rhizome-like roots that grow to a length of up to 6 feet.

Habitat: Perennial pepperweed occurs in riparian (stream) areas, coastal wetlands, marshes, roadsides, railways, ditches, hay meadows, pastures, cropland, and waste places.



Distribution: It occurs in a few states along the eastern seaboard, in several Midwestern states, and in all far western states. Infestations have been reported in coastal, intermountain and mountainous areas in New England, all the states west of the Rocky Mountains. It also occurs in Canada and Mexico.

Ecological Impacts: Perennial pepperweed a highly invasive plant that alters the ecosystem it grows in. It can invade a wide range of habitats including riparian areas, wetlands, marshes, and floodplains. It adapts readily to natural and disturbed wetlands. It may occur as spotty, scattered populations, or as large, dense, nearly monospecific stands. These dense stands have potential to displace native plants and animals, threatened and endangered species, decrease plant diversity, and reduce nesting frequency of waterfowl in or near wetlands.

Control and Management: Deep-seated rootstocks make pepperweed difficult to control.

- **Manual**- Physical and mechanical control methods such as mowing and disking are unlikely to control perennial pepperweed because new plants quickly regenerate from roots and root crowns. Very small patches can be controlled by hand removal if the process is repeated often for several years and plants are not allowed to mature.
- **Chemical**- Foliar application methods have been effective (Telar®- a selective herbicide or a glyphosate such as Roundup® - nonselective herbicide)

Natural Enemies- Several general herbivorous insects are feed on perennial pepperweed (e.g. *Lygus* spp) and a white rust *(Albugo sp.)* infects large numbers of flowers and limits seed production, but do not prevent the clonal expansion of the creeping root system.

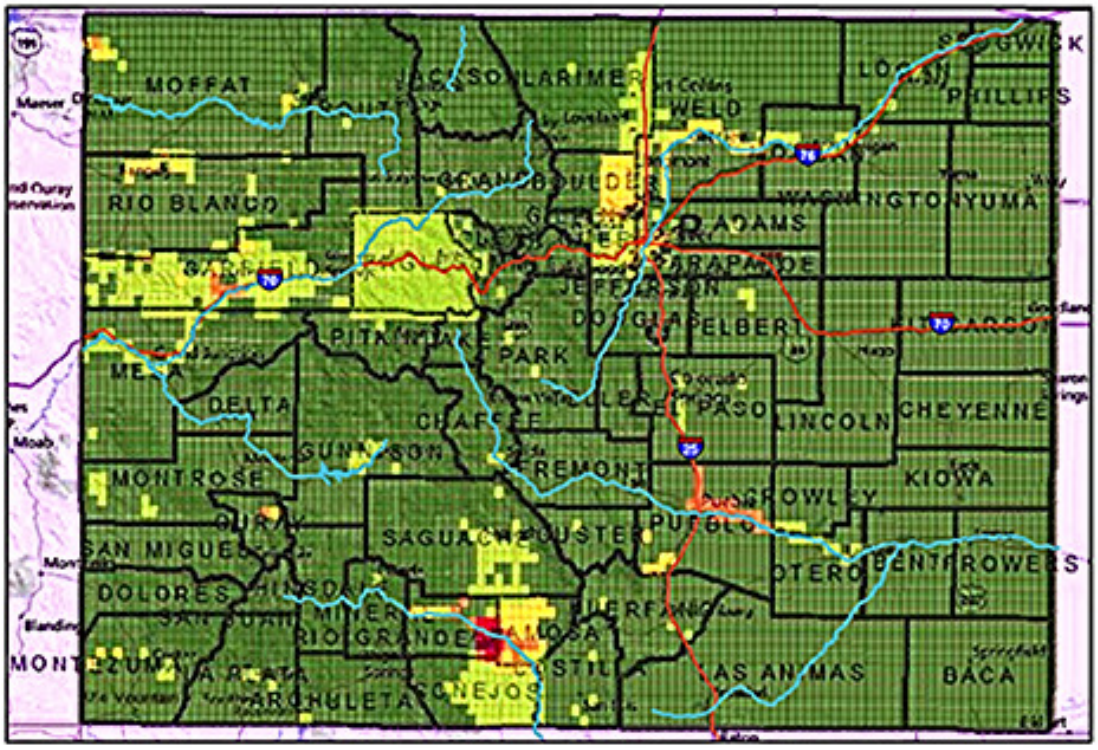
References: www.fs.fed.us/database/feis/plants/forb/leplat/all.html, http://plants.usda.gov www.nps.gov/plants/alien/fact/lela1.htm,
ELEMENT STEWARDSHIP ABSTRACT-http://tncweeds.ucdavis.edu/esadocs/documnts/lepilat.html

Produced by the USDA Forest Service, Forest Health Staff, Newtown Square, PA. WOW 08-14-05
Invasive Plants website: http://www.na.fs.fed.us/fhp/invasive_plants

Perennial Pepperweed
Lepidium latifolium

2014 Quarterquad Survey
Distribution and Abundance
In Colorado

21,739+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres | 51- 300 acres | 301-999 acres | >1000 acres

Acreage estimates supplied by County Weed Supervisors and compiled by the Colorado Department of Agriculture.

Russian knapweed

Acroptilon repens

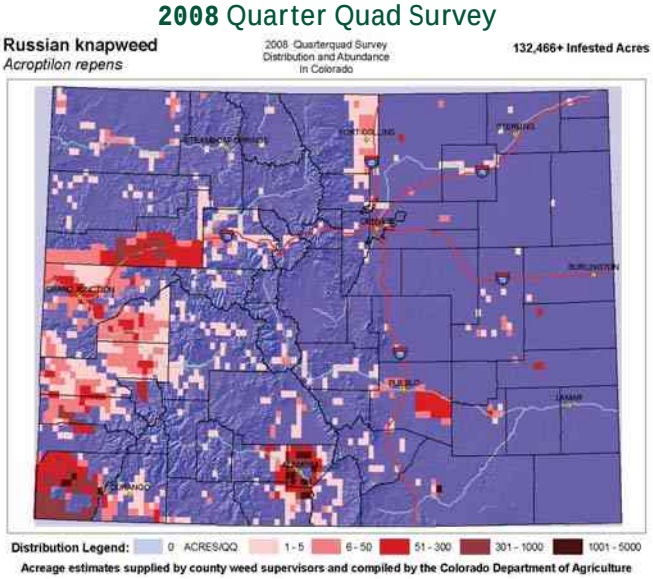
Russian knapweed (*Acroptilon repens*) is a non-native, deep-rooted perennial that spreads by aggressive, creeping, horizontal roots (rhizomes) and seeds. The roots are brown to black with a scaly appearance. Russian knapweed can grow up to 3 feet in height. The stems and leaves are covered with short gray hairs. The ŠÏ×ÅÒÓ ÁÒÅ ÕÒÎÝÓÈÁÐÅÄÄ ÐÉÎË ÔÏ ÐÕÒÐÌÅ 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 ŠÏ×ÅÒÓ 2ÕÓÓÉÁÎ ËÎÁÐ×ÅÄÄ Å Í ÅÒÇÓ in early spring after soil temperatures remain above freezing. It produces ŠÏ×ÅÒÓ ÆÒÏ Í *ÕÎÅ ÔÏ !ÕÇÕÓÔ ÁÎÄ ÓÅÔÓ 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 ÓÈÏ ÏÓÑ !ÕÇÕÓÔ ÔÈÒÏÕÇÈ ÔÈÅ ×ÉÎÔÅÒ that can grow to become independent plants. Once rosettes emerge in the ÓÐÒÉÎÇ ÒÅ Í ÁÉÎÉÎÇ ÒÏ Ï ÂÕÄÓ ÓÌÏÕÇÈ Ï ã until they develop again in late summer. !ÄÄÉÓÏ ÎÁÌÌÝ ÒÏ Ï Ó ÆÒÒÅÇ Í ÅÎÔÓ ÃÁÎ 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.

ÔÈÅ Í ÏÓÔ ÅãÅÃÔÉÖÅ Í ÅÔÈÏÄ Ï Æ Ã Ï ÎÔÒÏÌ 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 ÂÅ ÅãÅÃÔÉÖÅ 2ÕÓÓÉÁÎ ËÎÁÐ×ÅÄÄ ÃÁÎ ÂÅ 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 .ÏÆÉÏÕÓ 7ÅÄ !ÃÔ)Ô 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 !ÇÒÉÃÕÌÔÕÒÅ# Ï ÎÓÅÒÖÁÔÉÏ Î Services Division, σπσζψφωζωπσπ8

© 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

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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 ãáî âå áî åææåãôéöå ãõìôõòáì ãïîôòïì ïæ 2õóóéáî ëîáð×ååä. #ïîôáãô your local Natural Resources Conservation Service for seed mix recommendations.

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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.

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The following are recommendations for herbicides that can be áððìéåä ôï òáîçå áîä ðáóôõòåìáîäó. !ì×áùó òåáä, õîäåòóôáîä, áîä follow the label directions. Please read label for exact rates. The èåòâéãéäå ìáâåì éó ôèå ,!7Á

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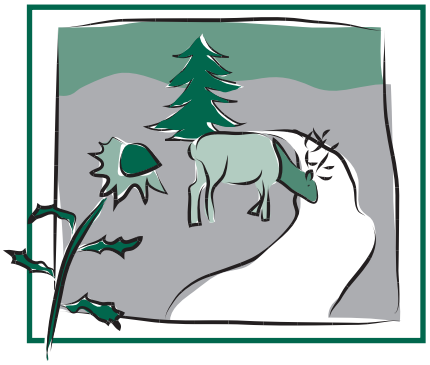

Russian Knapweed

Fact Sheet No. 3.111 Natural Resources Series|Range

by K.G. Beck*

Russian knapweed (*Acroptilon repens*) is a creeping, herbaceous perennial of foreign origin that reproduces from seed and vegetative root buds. Shoots, or stems, are erect, 18 to 36 inches tall, with many branches. Lower leaves are 2 to 4 inches long and deeply lobed (Figure 1). Upper leaves are smaller, generally with smooth margins, but can be slightly lobed (Figure 2). Shoots and leaves are covered with dense gray hairs.

e solitary, urn-shaped ower heads occur on shoot tips and generally are 1/4 to 1/2 inch in diameter with smooth papery bracts. Flowers can be pink, lavender or white (Figure 3). Russian knapweed has vertical and horizontal roots that have a brown to black, scaly appearance, especially apparent near the crown.

Figure 1: Russian knapweed rosette emergence in early spring.

e weed forms dense, single species stands over time due to competition and allelopathy (biochemicals it produces that inhibit the growth of other plants). A 2008 survey conducted by the Colorado Department of Agriculture showed Colorado with more than 132,400 acres infested with Russian knapweed (Figure 4). Russian knapweed is toxic to horses.

*Colorado State University Extension weed specialist and professor, bioagricultural sciences and pest management. 11/2013

Figure 2: Russian knapweed shoot and leaves; note hairs and lobed leaves.

Phenology, Biology and Occurrence

Russian knapweed emerges in early spring, bolts in May to June (elevation dependent) and owers through the summer into fall. It produces seeds sparingly, approximately 50 to 500 per shoot. Seeds are viable for two to three years in soil. Its primary method of reproduction is from vegetative propagation, with seed of secondary importance. Roots from a recently established plant expand rapidly and may cover up to 12 square yards in two growing seasons.

Russian knapweed is native to southern Ukraine, southeast Russia, Iran, Kazakhstan and Mongolia. It grows on clay, sandy or rocky prairies and sunny meadows; on saline soils; or clay, rocky or sandy shores of lakes and rivers; and on rocky and clay slopes of hills and bottomlands. It is a weed of cultivated land, dry pastures and degraded noncropland (waste places) in its native land.

Quick Facts

- Russian knapweed is a creeping perennial that reproduces from seed and vegetative root buds.
- Russian knapweed emerges in early spring, bolts in May to June, and owers through the summer into fall.
- Russian knapweed is toxic to horses.
- The key to Russian knapweed control is to stress the weed and cause it to expend nutrient stores in its root system.
- The best management plan includes cultural controls combined with mechanical and/or chemical control techniques.

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Figure 3: Russian knapweed flower; note smooth papery bracts that lack any spines.

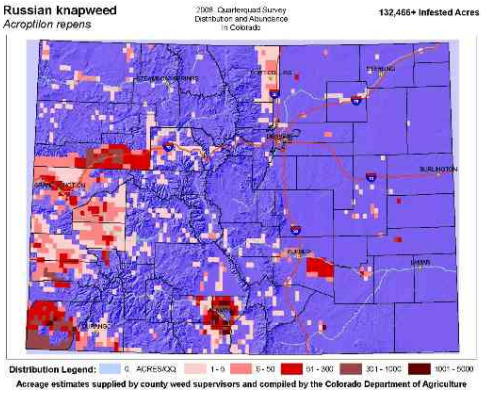

Figure 4: 2008 distribution of Russian knapweed in Colorado.

Figure 5: Russian knapweed root buds on crowns in fall; note black/brown scaly appearance to root crowns—a key identifying characteristic.

Russian knapweed grows in most western states. In Washington, it is common on heavier, often saline soils of bottomlands and grows in pastures, hayfields, grainfields and irrigation ditches. In Colorado, Russian knapweed is not restricted to certain soils and occurs in pastures, agronomic crops, roadsides, waste places and rangeland. Stands may survive 75 years or longer.

Management

Like other creeping perennials, the key to Russian knapweed control is to stress the weed and cause it to expend nutrient stores in its root system. An integrated management plan should be developed that places continual stress on the weed. Currently, the best management plan includes cultural control combined with mechanical and/or chemical control techniques. A single control strategy, such as mowing or a herbicide, usually is not sufficient.

Russian knapweed typically invades degraded areas, dominating the plant community and desirable plants (e.g. perennial grasses). Seeding competitive, perennial grass species (cultural control) after Russian knapweed has been stressed by other control measures (set-up treatments) is essential. Set-up treatments may include chemical or mechanical methods.

Cooperative research between Colorado State University and the University of Wyoming showed that chemical set-up treatments were superior to mowing. Curtail (clopyralid + 2,4-D), Escort (metsulfuron), and Roundup (glyphosate) were used to suppress Russian knapweed. Then perennial grasses were sown in late fall as a dormant seeding. Curtail (3 quarts per acre) (A) or Escort (1 ounce/A) were applied at the bud-growth stage. Roundup was applied twice at 1 quart/A, first at the bud-growth stage and again about 8 weeks later. Curtail controlled Russian knapweed best and Roundup failed to control it. None of the herbicides injured seeded grasses. Grasses established similarly among herbicide suppression treatments, even though Russian knapweed control varied. However, where Escort or Roundup was used to suppress Russian knapweed, additional herbicide treatments would be necessary to achieve acceptable control.

While two mowings eight weeks apart (first at bud growth stage), suppressed Russian knapweed during that year, the weed recovered vigorously the subsequent growing season. Perennial grasses established in the mowing treatments but much less than in herbicide treatments. Seeding desirable forbs and shrubs also may be effective to prevent Russian knapweed reinvasion, but research is necessary to test this hypothesis.. Two mowings per year for several years may control Russian knapweed better than in our experiments, but further research also is needed to test this hypothesis. Currently no biological control is available for this weed. Tillage often is necessary to overcome the residual allelopathic effects of Russian knapweed, but more recent research shows that an effective herbicide treatment that kills much of the root system also appears to ameliorate allelopathy.

> When integrating chemical and cultural control, avoid using herbicide rates that injure grasses because effective competition will be reduced.

Chemical control. In most circumstances, an herbicide alone will not effectively manage Russian knapweed. However, there may be situations where desirable plants within a Russian knapweed infestation may compete effectively with the weed if it is stressed with a single weed management technique.

Russian knapweed is controlled by Milestone (aminopyralid), Transline (clopyralid), Curtail, (clopyralid + 2,4-D), and Telar (chlorsulfuron). Refer to Table 1 for rates and timing recommendations and always read the herbicide label before using the product. Russian knapweed is very susceptible to fall-applied herbicides. It displays a distinct cycle of root bud development. In late summer (August into

Figure 6: Russian knapweed emerged rosettes in fall.

early September) Russian knapweed begins to develop buds on its roots that will emerge to form rosettes that fall or the following spring (Figures 5 and 6). Root buds continue to grow throughout the winter but once rosettes emerge in spring, remaining root buds slough o and no buds occur on roots until this cycle begins again in late summer. is active root bud growth and development in fall through winter may be the reason that Russian knapweed is susceptible to herbicides applied in fall and winter.

Cultural control. Russian knapweed tends to form monocultures and usually eliminates other plants. erefore, sowing desirable plant species is necessary a er the weed is controlled. Smooth brome will compete with Russian knapweed. Research shows that streambank wheatgrass, thickspike wheatgrass, crested wheatgrass and Russian wildrye established a er Russian knapweed was suppressed with herbicides. Sod-forming perennial grasses, like streambank or thickspike wheatgrasses, help prevent reinvasion better than bunch grasses like crested wheatgrass. More recent CSU research also shows that slender wheatgrass and western wheatgrass also compete e ectively with Russian knapweed a er it is suppressed.

If the Russian knapweed stand is not too old and grasses are still present, stimulating grass growth by irrigation (where possible) should increase grass competition with knapweed and keep the weed under continual stress.

Table 1. Herbicide used to control Russian knapweed.

Herbicide	Rate (Product/A)	Application timing	Comments
Milestone	5 to 7 f oz	Spring and summer at bud to fowering growth stages; or late in fall	Use higher rate for older stands; late treatments in fall to dormant plants very effective; Milestone may be used to edge of ponds or streams
Transline	1 to 1.33 pints	Spring after all shoot have emerged, bud to mid-fower growth stages; late in or fall	Use higher rate for older or dense; late treatments in fall to dormant plants very effective
Curtail	3 to 4 quarts	Spring after all shoots have emerged, bud to mid-fower growth stages; late in or fall	Use higher rate for older or dense; late treatments in fall to dormant plants very effective
Telar	1 oz	Spring bud to fowering growth state; or late in fall	Late treatments in fall to dormant plants are very effective; temporary injury to cool season grasses may occur from fall treatments

USDA

United States Department of Agriculture

Field Guide for Managing Russian Knapweed in the Southwest

Forest Service

Southwestern Region

TP-R3-16-13

February 2015

Cover Photos

Upper left: Steve Dewey, Utah State University, Bugwood.org
Upper right: Steve Dewey, Utah State University, Bugwood.org
Bottom center: Steve Dewey, Utah State University, Bugwood.org

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Russian knapweed (*Rhaponticum repens* L., formerly *Acroptilon repens* L.

Sunf ower family (Asteraceae)

Russian knapweed is an invasive plant that has been listed as a noxious weed in Arizona and New Mexico. This f eld guide serves as the U.S. Forest Service's recommendations for management of Russian knapweed in forests, woodlands, and rangelands associated with its Southwestern Region. The Southwestern Region covers Arizona and New Mexico, which together have 11 national forests. The Region also includes four national grasslands located in northeastern New Mexico, western Oklahoma, and the Texas panhandle.

Description

Russian knapweed (synonyms: Turestan thistle, creeping knapweed, mountain bluet, Russian cornf ower, hardheads) is an introduced, long lived, creeping perennial. This invasive weed is the most widely distributed of the various knapweed species. It is widespread in northern states including Colorado, Montana, and Wyoming and is currently becoming more common in New Mexico and Arizona. Russian knapweed can be distinguished from other knapweeds by its scaly, brown to black, spreading rhizomes and by its unique f owering bract features.

Growth Characteristics

- Long lived, creeping perennial; slow to establish but can spread rapidly once present; diff cult to eradicate.
- Grayish-green rosette base; dense hairs; emerges in early spring.
- Erect branching stem, 18 to 36 inches tall, covered with cobwebby hairs.
- Brown to black, scaly rhizomes; long lived, deep vertical root system (grows to 20 feet deep or more).
- Flowers from June to September; pink to lavender, thistle-like, terminal f owers; urn-shaped f ower heads, 0.25 to 0.5 inch in diameter; rounded bracts with papery tips.
- Reproduces mainly vegetatively via root buds near each scale on the rhizome; forms dense patches of cloned plants. Also produces seed (50 to 500 seeds per plant; viable for 2 to 3 years).
- Releases allelopathic chemicals that can inhibit growth of other plants; contains sesquiterpene lactones that are toxic to horses.
- Relatively shade intolerant.

Ecology

Impacts/threats

In dense stands, Russian knapweed develops into a near monoculture due to its ability to out-compete resident vegetation. Such monocultures can contribute to reduced wildlife presence and a decline in species diversity. This knapweed is toxic to livestock (especially horses), and its presence reduces forage availability.

Location

Russian knapweed adapts to a variety of soil types, including poorly drained and alkaline/saline soils. It prefers areas with moist but not excessively wet soils. It readily invades pastures, degraded croplands, alfalfa f elds, rangeland, roadsides, riparian and runoff areas, river bottoms, drainages, and irrigated f elds. Large populations are distributed extensively throughout northern New Mexico, and smaller populations are present in most central and southern counties of the State. In Arizona, Russian knapweed is a concern in northeastern and southeastern counties.

Spread

Although Russian knapweed produces seed, it spreads mainly through vegetative propagation that arises from adventitious buds along a creeping, perennial root system. Root fragments of 1 inch or more in length can produce new plants if the fragments are buried in soil to a depth no greater than 6 inches. Seed or root fragments may be introduced into new areas via waterways such as irrigation ditches, streams, or rivers. Russian knapweed may also spread through transported hay that is not certif ed to be weed free or through attachment of propagules that adhere to the

undercarriages of off-road vehicles and road maintenance equipment.

Invasive Features

Russian knapweed's competitiveness is believed to be related to its ability to release harmful allelopathic chemicals that can inhibit growth of other plants. As a possible result of allelopathic effects, revegetation efforts following Russian knapweed control are often hampered unless measures are taken to mitigate soil condition. The weed can also cause as much as an eightfold increase in zinc concentration in nearby soil surface layers as compared to upper layers of soils without knapweed.

Management

Russian knapweed is quite diff cult to control once established. Prevention, early detection, and eradication are the best management tools for controlling this noxious weed. Initial treatments to control Russian knapweed should attempt to remove as much of the knapweed population as possible, and secondary treatments will be necessary to remove remaining plants. Small knapweed stands on otherwise healthy sites should be eradicated f rst. Large knapweed infestations should be controlled and then eradicated when possible. The perimeter of large infestations should generally be treated f rst to prevent the infestation from spreading. As with other creeping perennial weeds, treated knapweed plants should be stressed suff ciently by control methods to cause depletion of stored nutrients in root systems. The following actions should be considered when planning an overall management approach:

- Maintain healthy plant communities and the presence of ground litter to prevent or limit knapweed infestations. This may involve using improved grazing management to prevent excessive grazing, and reseeding areas with desirable grasses and forbs after disturbance.
- Detect, report, and map known infestations. Keep annual records of reported infestations.
- Eradicate new populations of Russian knapweed as early as possible.
- Combine mechanical, cultural, biological, and chemical methods for most effective knapweed control.
- Implement a monitoring and followup treatment plan for missed plants and seedlings.
- Use certif ed weed-free seed and hay; use pellets for horses used in back-country areas.

Table 1 summarizes management options for controlling Russian knapweed under various situations. Choice of individual control method(s) for Russian knapweed depends on the degree and density of infestation, current land use, and site conditions (accessibility, terrain, microclimate, other f ora and fauna present, etc.). Other important considerations include treatment effectiveness, overall cost, and the number of years needed to achieve control. More than one control method may be needed for a particular site.

Physical Control

A number of mechanical control methods for Russian knapweed have been examined, but most have shown limited effectiveness. In general, mechanical control methods need to be combined with chemical spraying for long-term management of Russian knapweed.

Manual Methods

Hand pulling or digging – Hand pulling or hoeing can be effective for small, less established infestations of Russian knapweed if repeated annually over multiple years. Removal is generally easier and more effective in late spring when soil is moist and plants are beginning to bolt (but before seed set). It is very important to pull up all parts of the plant, especially the roots. Wear gloves and properly dispose of debris by burning or bagging and burying in a landf ll to prevent spread.

Mechanical Methods

Tillage – Shallow cultivation or tillage without herbicide spraying as a followup treatment should be avoided since

Table 1. Management options*

Site	Physical Methods	Cultural Methods	Biological Methods	Chemical Methods
Roadsides, fence lines, or noncrop areas	Mow at 2 to 3 week intervals during growing season but before seed set. Follow up with an herbicide application in the fall.	Avoid driving vehicles and equipment through infested areas; wash if travel through these areas is unavoidable. Educate road crews and others to identify and report infestations.	A gall-forming nematode (*Subanguina picridis*) may be available in some western states including New Mexico.	Use truck or tractor-mounted spraying equipment to broadcast treat. Wash underneath vehicle after application to prevent spread.
Rangeland, pasture, or riparian corridors	Deep cultivation (12 inches) repeated over 3 years can be effective. Shallow cultivation/tillage is not recommended as severed root fragments may regrow. Burning is ineffective and may contribute to further knapweed dominance.	Use certif ed weed-free seed and hay. Use pellets for horses in backcountry areas. Check animals, clothing, and vehicles for seeds. Always evaluate the need to reseed with native perennial grass when considering knapweed control.	Closely manage grazing to prevent overuse. Consider grazing heavily infested sites in late summer or early fall rather than spring. Maintain litter cover to reduce knapweed germination. A gall-forming nematode (*Subanguina picridis*) may be available in some western states including New Mexico.	In areas diff cult to access, an ATV-mounted sprayer or backpack unit may be the most practical application methods. Wash underneath vehicle after application to prevent spread.
Wilderness, other natural areas, and/ or small infestations	Hand pulling, hoeing, or digging must remove all root stock to be effective; wear gloves for pulling; pull when soil is moist; most effective on newly established plants.	Use certif ed weed-free seed and hay. Use pellets for horses in backcountry areas. Check animals and clothing for seeds. Post signs warning visitors to remove seeds after passing through infested areas. Always evaluate the need to reseed with native perennial grass when considering knapweed control.	Same as above.	Use backpack or hand-held sprayers. Broadcast spraying with ground methods may be used on thicker stands if allowed. Remove seed from clothing to prevent spread.

* Choice of a particular management option must be in compliance with existing regulations for land resource.

this practice often leads to an increase in knapweed dominance. Disking or plowing cuts roots into fragments that can survive desiccation and promote further spread. See the “Control Strategies” section for more information.

Mowing – If repeated continually throughout the growth season, mowing will suppress shoots and f owers; however, mowing will not reduce Russian knapweed populations.

Prescribed Fire

Burning as a single control method is not recommended. New plants from roots are quickly produced after f re which often leads to increased dominance by Russian knapweed. However, f re may be used as a secondary treatment in combination with other control methods, such as disposal of debris.

Cultural Control

Prevention, early detection, and plant removal are critical for preventing Russian knapweed establishment. Land managers, road crews, and the local public should be educated on identif cation of knapweed species so that they can help report all suspected infestations. Vehicles, humans, and livestock should be discouraged from traveling through infested areas. A program to check and remove seed from vehicles and livestock after travel through infested areas

should be implemented to help stop dispersal. To prevent seed from being transported by irrigation canals, use weed screens on irrigation water intakes inside infested areas if possible.

Reseeding with native perennial grass after disturbance should always be considered in controlling knapweed. Tillage should be used before reseeding to alleviate any remaining allelopathic effects from Russian knapweed on soil condition.

Biological Control

Grazing

Livestock (including cattle, sheep, and goats) normally will not graze Russian knapweed due to its bitter f avor; however, animals may graze the weed lightly during early growth. The weed is especially toxic to horses and should not be grazed by them. The time of grazing preferred for pastures infested with Russian knapweed should occur during late summer, early fall, or winter. Use grazing to encourage perennial grass growth and competition against Russian knapweed. Reduce grazing pressure in early spring when grasses are f rst starting to grow and allow grasses to tiller and produce seed. Utilization of knapweed by livestock should be carefully monitored, and heavy grazing should be avoided.

Classical Biological Control

Table 2 lists some potential biological control agents that can affect Russian knapweed. Although biological control agents may weaken Russian knapweed populations, they have not been shown to reduce them. A gall nematode (*Subanguina picridis)* has been released in northwestern New Mexico to help control Russian knapweed. It forms galls on stems, leaves, and root crowns. Several other biocontrol agents such as a gall-forming wasp (*Aulacida acroptilonica*) and a rust fungus (*Puccinia acroptili*) are currently being evaluated but have not yet been released.

Agents used for biological control in southwestern states should be adaptable to arid environments and local conditions. Public, tribal, and private land managers may obtain biological control agents for release directly from local off ces of the USDA Animal and Plant Health Inspection Service (APHIS) when the agents are available. Other sources for biocontrol agents include private companies or locally developed insectaries. A permit must be obtained from APHIS before biological control agents can be transported across state boundaries. Regulations and permit applications (PPQ 526 permit forms) pertaining to interstate shipment of biological control agents can be found at http://www.aphis.usda.gov/ppq/permits/. Although biological control agents may be collected and released within a given state without a permit from APHIS, the state's Department of Agriculture or Agricultural Extension Service should be consulted for any regulations relating to movement of these agents inside the state.

Table 2. Classical biological agents

Species	Type of Agent	Site of Attack/ Impact	Use/Considerations for Release	Remarks
Subanguina picridis	gall-forming nematode	stems, leaves, and root crowns	Readily spreads for long distances without assistance.	Successfully established in Washington, Colorado, Montana, Oregon, Utah, and Wyoming.
Aulacidea acroptilonica	gall-forming wasp	stems	Currently being researched	
Puccinia acroptili	rust fungus	roots	Currently being researched	

Chemical Control

Russian knapweed is best controlled with a selective, postemergent herbicide. Typically, the main herbicide entry into the plant is through the leaves and stems; but certain herbicides can enter through the roots. Control results can vary due to weather and plant growth stage. Herbicides generally provide signif cant reduction of a knapweed population with a single application; however, followup treatment should always be anticipated.

All herbicides recommended in table 3 will effectively control Russian knapweed when properly applied. Selective herbicides used for effective control of Russian knapweed include picloram, aminocyclopyrachlor, aminopyralid, and clopyralid. Picloram is a restricted-use pesticide and should not be used near waterways or whenever the water table is near the surface. Glyphosate or imazapyr can be used for followup spot treatment, but these treatments may create a bareground situation.

Precautions should be taken if nontarget plants (including woody species) need to be protected. This includes situations where spray drift, soil erosion, or water movement potentially could occur. Each herbicide product will have different requirements and restrictions according to the label. Read and understand prior to any application. To prevent development of resistance in Russian knapweed for repeated treatments, the label should be consulted for guidelines on rotating herbicide active ingredients. Consult the registrant if you have questions or need further detail.

The most effective period to spray Russian knapweed generally is in the fall (preferably after a frost) when rosettes begin to emerge or mature plants appear dormant (grey stems, no leaves). Spraying earlier may provide only short-term control. Herbicides may be applied by backpack sprayers, ATV or UTV sprayers, or conventional boom sprayers that are pulled or attached to a tractor or truck. In situations where Russian knapweed is dense and widespread, aerial application by f xed wing or helicopter aircraft should be considered.

Table 3. Herbicide recommendations (continued)

Common Chemical Name (active ingredient)	Product Example[1]	Product Example Rate per Acre (broadcast)	Backpack Sprayer Treatment Using Product Example[2]	Time of Application	Remarks
Aminocyclopyrachlor + metsulfuron methyl	Streamline	4.75–9.5 ounces	Same as above.	Same as above.	A selective blend of active ingredients labeled for noncrop use (includes natural areas such as wildlife management areas, wildlife habitats, recreation areas, campgrounds, trailheads, and trails). Persistent; selective for broad-leaved plants and certain brush species; may cause temporary injury to some grass species. Can be used in riparian areas. May also be used on public, private, and tribal lands as part of an early detection and rapid response (EDRR) in treating infestations of invasive weed species.
Aminopyralid	Milestone	4–6 f uid ounces	5–10%	Spring and summer at bud to f owering growth; or in late fall on dormant plants.	May be used in combination with 2,4-D. Use higher rate on older stands; late fall treatment of dormant plants can be very effective. Add 0.25–0.5 percent nonionic surfactant for mature plants or for adverse conditions. Labeled for use up to water's edge. No grazing restrictions.
Clopyralid	Curtail	1–2 quarts	1–3%	Bud to full bloom or in late fall after frost.	May be used in combination with 2,4-D. Can be used on rangeland, irrigated pasture, or meadows but not directly to water. Wait 30 days to reseed perennial grasses.
	Reclaim, Transline	1–1-1/3 pints	1–3%		
Glyphosate	RoundUp, many products	4–4.8 quarts	2%	Late bud to early f ower; late summer or fall.	Use primarily as followup spot treatment. Direct spray or use a wipe method when desirable plants are present.
Imazapyr	Arsenal	2 pints	1%	Anytime plants are growing or in the fall after frost.	Use primarily as followup spot treatment. Direct spray or use a wipe method when desirable plants are present. In addition to overspray, nontarget plants may also be killed or injured by root transfer of imazapyr between intertwined root systems.

[1] Trade names for products are provided for example purposes only, and other products with the same active ingredient(s) may be available. Individual product labels should be examined for specif c information and appropriate use with Russian knapweed.

[2] Herbicide/water ratio - As an example, a gallon of spray water with a 3 percent mixture is made by adding a suff cient volume of water to 4 ounces of liquid herbicide until a volume of 1 gallon is reached (4 oz/gal ÷ 128 oz/gal = 0.03 or 3 percent). For dry formulations, particulates should be added to suff cient water as specif ed by the label until the required concentration or volume of spray water is reached.

[3] Restricted use pesticide - A certif ed applicator's license is required for purchase and use of these pesticides.

[4] 2,4-D is a restricted use pesticide in New Mexico only.

Control Strategies

The key to successful Russian knapweed control is long-term planning, integrated management, monitoring treated areas on an annual basis, and possibly reseeding in order to encourage competition from desirable plants, especially perennial native grasses. Planning and treatments to control Russian knapweed should be designed to meet specif c site conditions. An integrated management strategy that combines control methods as necessary should be implemented to contain, reduce, or eradicate Russian knapweed populations. As discussed in the "Management" section of this guide, Russian knapweed populations growing in small isolated patches on otherwise healthy sites should have f rst priority for treatment. For heavily infested areas, plants at the perimeter should be treated f rst. The larger, denser cores of the infested area should be addressed in the f nal stage of treatment. Failure to perform followup monitoring and treatment may result in recolonization of Russian knapweed and a return to a pretreatment level of invasion.

The following strategies should be considered to contain and reduce populations of Russian knapweed:

- **Mechanical–herbicide strategy** – One example of a combined control strategy is to mow or disk at 2 to 3 week intervals during growing season, then apply herbicide to knapweed regrowth in the fall. Consider reseeding the area shortly thereafter with competitive perennial grasses. Perform followup monitoring and spot treat any new or regrowing plants. Grazing should be managed to favor establishment of desirable perennial grasses.
- **Individual plant treatment for sparse infestations or followup** – Use a backpack sprayer, wiper, or sponge applicator per the herbicide label to administer spot treatment in the fall. For individual plant treatment (IPT), the foliage should be wetted thoroughly (apply until it begins to run off). When using picloram or another postemergent herbicide, spray an extra 10 to 15 feet around the infested area to ensure control of root, sprouts, and/or seedlings. A wiping or direct spray method using a 2 percent glyphosate solution may be used when plants are in bloom but before seed matures. This approach is most appropriate when other desirable broadleaved plants are present. Areas treated with glyphosate can be reseeded after 3 days.
- **Strategy for an infestation with an adequate grass understory present** – Spray selective herbicide in autumn to control Russian knapweed and allow native grasses to return naturally in the next growing season. Defer grazing on areas sprayed for one or more growing season to allow grasses to increase and gain a competitive advantage. Monitor sprayed areas carefully for 2 or 3 years and spot spray returning Russian knapweed plants.
- **Strategy for an infested site with little grass understory** – Consider planting with a mixture of native grass, shrub, and forb seed. Control Russian knapweed f rst by herbicide spraying in fall and later cultivate to bury allelopathic plant residue. Follow up with planting by late fall to allow seed to take advantage of any early spring moisture that may be available. To use less seed and ensure more successful establishment, consider seeding with a grain drill. A no-till, rangeland drill may be necessary on particularly rocky, steep, or hard sites. Select native perennial grass species according to individual site conditions and moisture availability. Periodically monitor the next growing season for newly emerged Russian knapweed seedlings and spot treat them.

Adaptive Management

A persistent commitment over many years is required for successful control of Russian knapweed. Therefore, realistic goals and objectives should be established to manage Russian knapweed infestations occurring extensively throughout a given landscape. To improve

long-term success, consider using an adaptive management strategy with the overall goal of restoring desirable plant communities. The stepwise process for adaptive management involves:

1. Assessment of the overall weed problem,
2. Establishing management goals and objectives,
3. Implementation of control strategies,
4. Monitoring the effectiveness of management actions,
5. Evaluating actual outcomes in relation to expected results, and
6. Adjusting practices as necessary.

Steps of this process should be repeated in sequence as part of a continuous learning cycle that improves management planning and strategy by learning from the outcomes of previous management actions. In general, an adaptive management strategy may be considered to be successful if:

1. Stakeholders are actively involved and remain committed to the process,
2. Monitoring and assessment are used to adjust and improve management decisions, and
3. Management goals and/or objectives for the resource are being achieved.

References and Further Information

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Suggested Web Sites

For information on invasive species:

http://www.invasivespeciesinfo.gov/

http://www.invasive.org/weedus/index.html

For information about calibrating spray equipment:

NMSU Cooperative Extension Service Guide A-613 Sprayer Calibration at http://aces.nmsu.edu/pubs/_a/A-613.pdf

Herbicide labels online:

http://www.cdms.net/LabelsMsds/LMDefault.aspx

For more information or other f eld guides, contact:

USDA Forest Service
Southwestern Region
Forest Health
333 Broadway Blvd., SE
Albuquerque, NM 87102

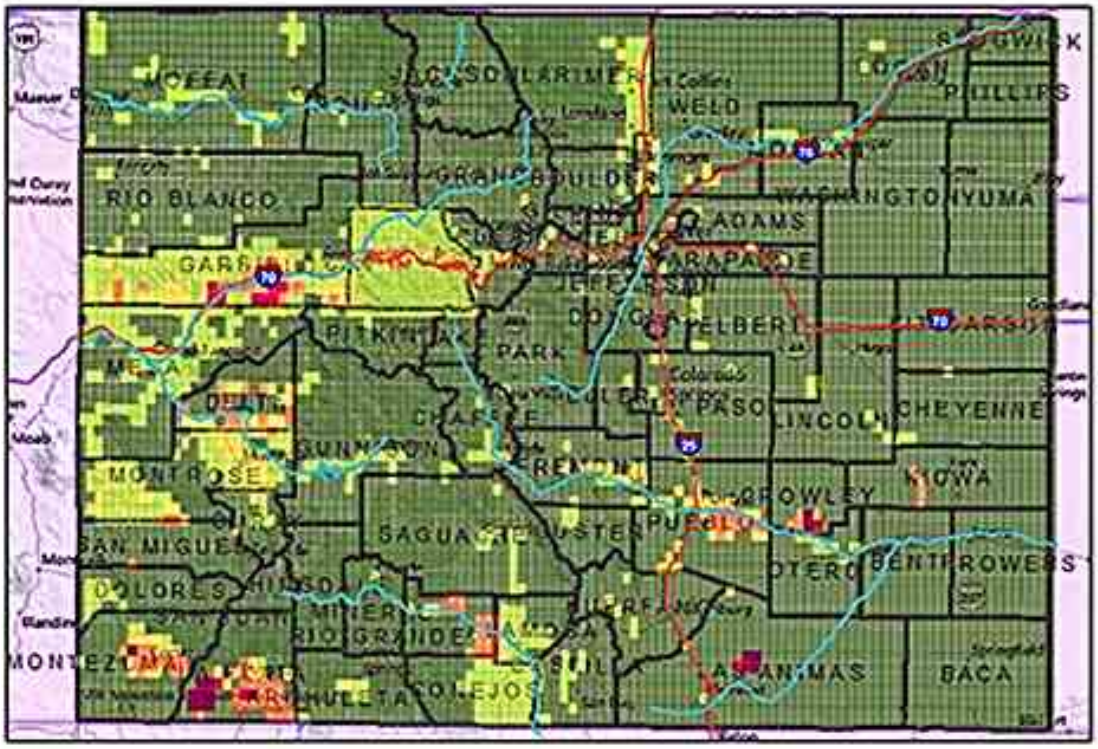
Or visit:

http://www.fs.usda.gov/main/r3/forest-grasslandhealth/invasivespecies

Russian Knapweed
Acroptilon repens

2014 Quarterquad Survey
Distribution and Abundance
In Colorado

55,721+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres | 51- 300 acres | 301-999 acres | >1000 acres

Acreage estimates supplied by County Weed Supervisors and compiled by the Colorado Department of Agriculture.

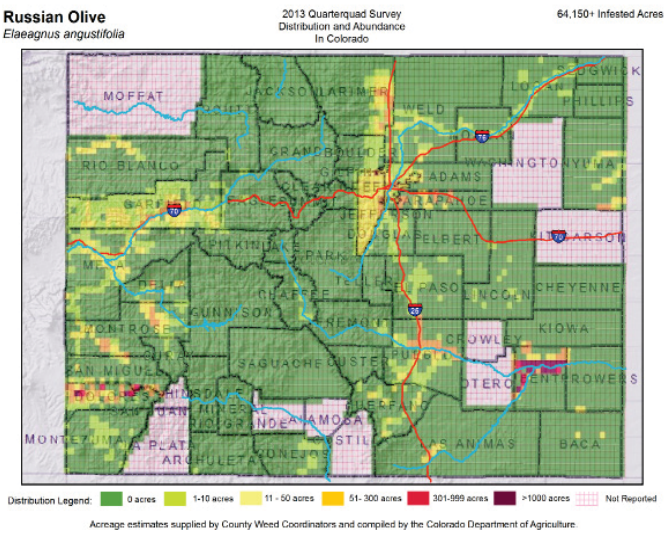
Russian Olive Identification and Management

List B

Russian olive (*Elaeagnus angustifoilia*) is a perennial tree or shrub that is native in Europe and Asia. The plant has olive-shaped fruits, silver color at first then becoming yellow-red when mature. Russian olive can reproduce by seed or root suckers. Seeds are readily spread by birds and can remain viable for up to 3 years. Spring moisture and slightly alkaline soil tend to favor seedling growth. The plant's extensive root system sprouts root suckers frequently. The tree can reach up to 30 feet in height with branches that have 1 to 2 inch thorns. Leaves are 2 to 3 inches long, alternate, narrow, and have simple blades with smooth edges. The leaf's lower surface is silvery white, while the upper surface is light green in color. Flowers are 4 small sepals in light yellow clusters, fragrant, and appear May through June. Fruits mature from September to November. Russian olive twigs are flexible, reddish, and have surfaces coated with gray and scaly pubescence, becoming smooth.

Once thought to be a beneficial windbreak tree, it since has been deemed detrimental to the environment. Russian olive can grow in a variety of soil and moisture conditions, but prefers open, moist, riparian zones. It is shade tolerant and can be found along streams, floodplains, fields and open areas up to approximately 8,000 feet in elevation. Russian-olive can outcompete native plants, interfere with natural plant succession and nutrient cycling, and tax water reserves. Because Russian olive is capable of fixing nitrogen in its roots, it can grow on bare, mineral substrates and dominate riparian vegetation. Although Russian olive provides a plentiful source of edible fruits for birds, ecologists have found that bird species richness is actually higher in riparian areas dominated by native vegetation.

The key to effective control of Russian olive is preventing establishment of the trees or shrubs. If plants are already present, control options include cut-stump treatments and mechanical mowing. These treatments depend on size and location of the plant. Details on the back of this sheet can help you create a management plan compatible with your site ecology.



Russian olive 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.

© Patrick Breen, OSU

© Patrick Breen, OSU

Key ID Points

1. Leaves are silvery white.
2. Branches have 1 to 2 inch thorns.
3. Yellow-red fruits on mature plants.
4. Mature trees have shedding, reddish-brown bark.

Russian olive

Elaeagnus angustifoilia

List B

Integrated Weed Management Recommendations

Russian olive

Elaeagnus angustifolia

Integrated weed management offers the most effective combination of control efforts through the "cut stump" treatment. Trees are cut down with a hatchet or chainsaw, then immediately treated with an approved herbicide on the surface of the cut stump. The most effective timing is late summer/early fall for herbicide transfer into the roots.

© John Randall, TNC

© James Miller, USFS

© Chris Ness, Adams County

© Scott Peterson, USDA

CULTURAL

Replace Russian olives with native trees. Prevent establishment of new trees by removing seedlings and saplings before they mature. Contact your local Natural Resources Conservation Service for recommendations of other possible trees or shrubs.

BIOLOGICAL

Tubercularia canker is an unapproved biocontrol. However, it overwinters on infected stems and spreads via rain-splash, animals, or pruning implements to open wounds in the bark. Infected tissue becomes discolored or sunken. Entire stems may be girdled and killed, and the disease can deform or kill stressed plants over time.

MECHANICAL

Saplings can be pulled with a weed-wrench or cut with brush-cutters. Trees can be girdled or cut with chainsaws. However, stump sprouting commonly occurs after cutting down the tree; and stump excavation without removing all parts of the roots can result in root sprouting. Treating cut-stumps with an herbicide can eliminate sprouting. Stump burning is practical when conditions support a long, hot fire and most effective in summer or early fall. Saplings are most sensitive to mechanical treatment.

CHEMICAL

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

HERBICIDE	RATE	APPLICATION TIMING
Triclopyr (Garlon 4, Remedy)	Undiluted (100% solution)	Apply to the cambial layer of the tree immediately after the cut-stump treatment.
Imazapyr + Water (Habitat + Water or Arsenal + Water)	Diluted by mixing 8 to 12 fl. oz / 1 gallon of water	Apply to the cambial layer of the tree immediately after the cut-stump treatment.
Imazapyr (Habitat or Arsenal)	4 to 6 pt./acre	Broadcast spray/spraying individual trees; low or high volume spray.

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

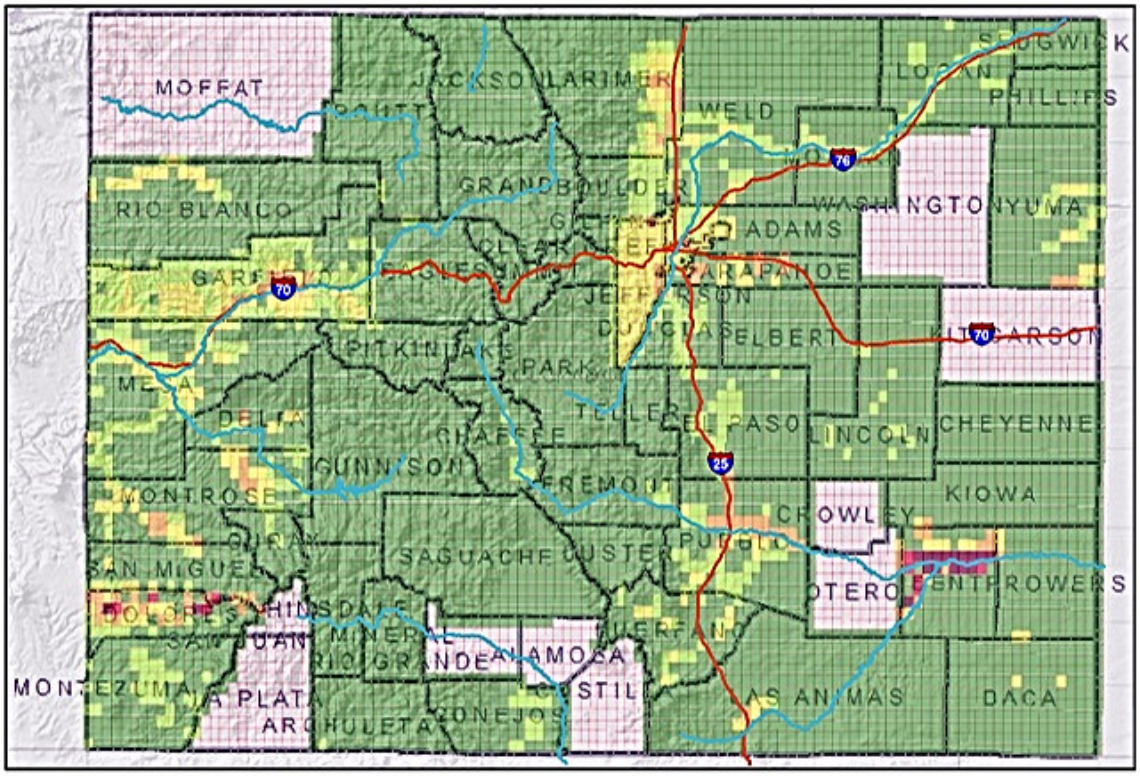
Rev. 9/2013

Russian Olive

Elaeagnus angustifolia

2013 Quarterquad Survey
Distribution and Abundance
In Colorado

64,150+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres | 51- 300 acres | 301-999 acres | >1000 acres | Not Reported

Acreage estimates supplied by County Weed Coordinators and compiled by the Colorado Department of Agriculture.

Saltcedar

Tamarix spp.

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Saltcedar Identification and Management

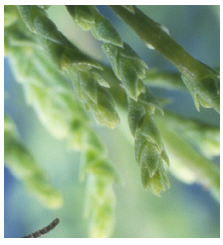
Identification and Impacts

Saltcedar, or tamarisk (*Tamarix spp.*), is a non-native deciduous evergreen shrub or small tree that grows from 5 to 20 feet tall. The bark on saplings and stems is reddish-brown. The leaves are small, scale-like and bluish-green in color. Tiny pink to white flowers have five petals and grow on slender racemes. Saltcedar reproduces by seeds as well as vegetatively. A mature plant can produce up to 600,000 seeds per year. Seeds are viable for up to 45 days under ideal conditions. Saltcedar buds break dormancy in February or March. Flowering occurs anytime between April and August. Ideal conditions for saltcedar seedling survival are saturated soil during the first few weeks of life, a high water table, and open sunny ground with little competition from other plants.

Saltcedar was introduced from central Asia, northern Africa, and southern Europe for ornamental purposes and for stream bank stabilization. It is now widespread in the United States. Saltcedar crowds out native stands of riparian and wetland vegetation. Saltcedar increases salinity of surface soil, rendering the soil inhospitable to native plant species. Saltcedar can be found along floodplains, riverbanks, streambanks, marshes, and irrigation ditches. It's heavy use of water has contributed to the intensity of the drought.

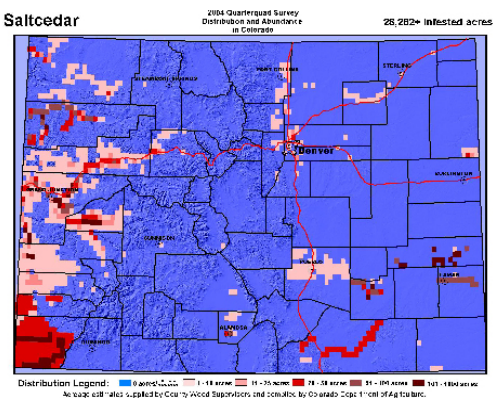
The most effective method of control for saltcedar is to prevent its establishment through proper land management. Monitor susceptible areas for new infestations. An integrated weed management approach has proven to be an effective control when dealing with saltcedar. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Saltcedar 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, please visit www.colorado.gov/ag/csd and click on the Noxious Weed Program link. Or call the State Weed Coordinator of the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Key ID Points

1. Saltcedar is a tall shrub or small tree that has white to pink flowers in clusters called racimes.
2. Leaves are small and scaly.



Plant and flower photos © Kelly Uhing. Leaf photo © USDA Aphis PPQ. Infestation photo above, © Steve Dewey, Invasive.org. Tamarisk branch © Stevens County, WA Noxious Weed Control Board

Updated on:
08/08

Management Recomendations

CULTURAL
After a saltcedar infestation is managed, revegetation is necessary in order to protect the soil resource and reduce the threat of reinvasion. Seeded grasses, willow stakes, and cottonwood cuttings can reduce the chances of saltcedar reinvading managed sites.

BIOLOGICAL
The saltcedar leaf beetle (*Diorhabda elongata*) larvae and adults feed on foliage. This causes stem dieback and potential death of the plant if defoliation is consistent. The leaf beetle should be available for limited distribution. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture, 970-464-7916.

MECHANICAL
A bulldozer or prescribed fire can be used to open up large stands of saltcedar. These methods must be followed up with a herbicide treatment of the resprouts when they are 1 to 2 meters tall. Chainsaws, or loppers for smaller plants, are effective for cut-stump treatments to smaller infestations or in environmentally-sensitive management areas.

Integrated Weed Management:

Select the appropriate control method based on the size of the area and other environmental or cultural considerations. Re-seed controlled areas with desirable species to protect the soil resource and to prevent or slow saltcedar reinvasion. Follow up control efforts the same growing season and for several years afterwards.

Saltcedar

HERBICIDES: The following are recommendations for herbicides that can be applied to range and pasturelands. Rates are approximate and based on hand-held 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
Triclopyr (Garlon 4 *approved aquatic label*)	Foliar - 2-4 qts./acre Cut-stump - undiluted 100% Basal bark treatment 1:3 of herbicide:natural oil	Foliar treatments - late spring to early fall Cut-stump - anytime except when snow is present Basal bark - anytime except when snow is present
Glyphosate (Rodeo *approved aquatic label* **nonselective, will kill all vegetation it contacts**)	Cut-stump - undiluted 100%	Treat anytime except when snow is present. Treat the cambium immediately after being cut. Thoroughly wet the surface, but not to the of run-off.
Imazapyr (Arsenal or Habitat *Habitat is approved for use in aquatic sites*)	Cut-stump - 8-12oz/gal water Foliar - 0.5-6.5oz/gal water + nonionic surfactant or methylated seed oil	Cut-stump - anytime except spring during heavy sap flows. Foliar - late spring to late summer. Spray entire crown and 70% of plant. Avoid spray solution run-off. After application, do not disturb saltcedar for 2 years or overall control will be reduced.

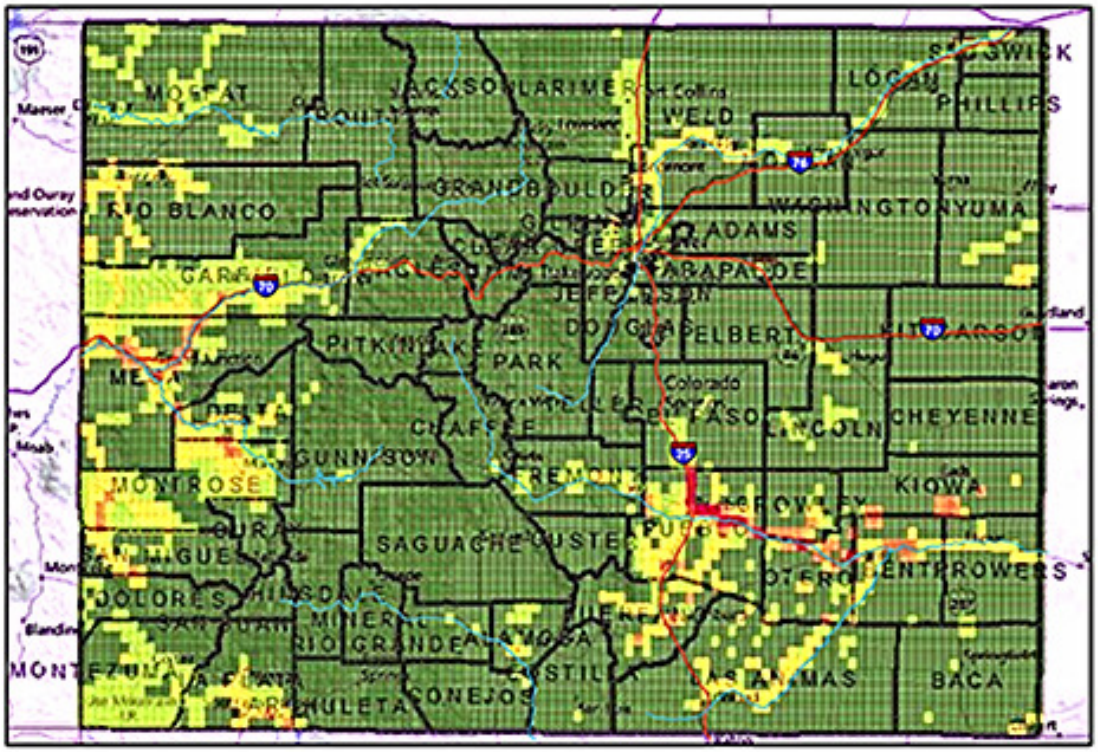
Colorado State University

CDA

Salt Cedar
Tamarix spp.

2014 Quarterquad Survey
Distribution and Abundance
In Colorado

28,990+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres | 51- 300 acres | 301-999 acres | >1000 acres

Acreage estimates supplied by County Weed Supervisors and compiled by the Colorado Department of Agriculture.

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.

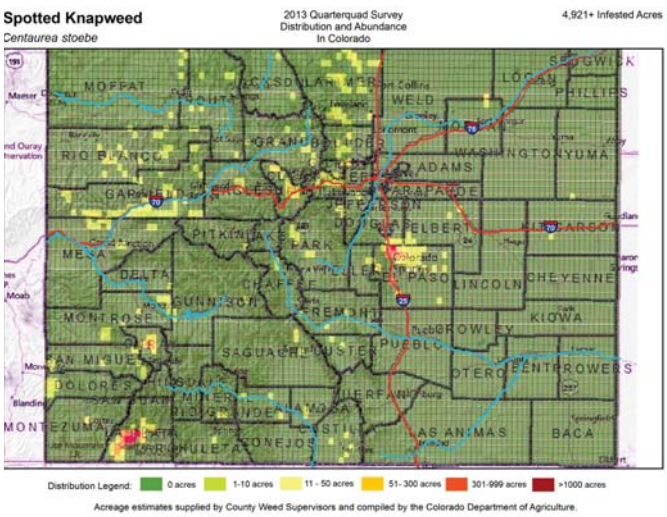
Flowers bloom from June to October and seed-set usually occurs by mid-August. Spotted knapweed can also reproduce vegetatively from lateral roots.

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
Aminopyralid (Milestone)	5-7 ounces/acre or 1 teaspoon/gal water	Spring at rosette to early bolt stage and/or in the fall to rosettes. Add 0.25% v/v non-ionic surfactant (equivalent to 0.32oz/gal water or 1 qt/100 gal water).
Clopyralid (Transline, Stinger)	2/3 to 1 pint/acre	Apply to spring/fall rosettes before flowering stalk lengthens. Add 0.25% v/v non-ionic surfactant.
Clopyralid + 2,4-D (Curtail)	2-3 qts. product/acre	Apply in spring and fall to rosettes. Add 0.25% v/v non-ionic surfactant.

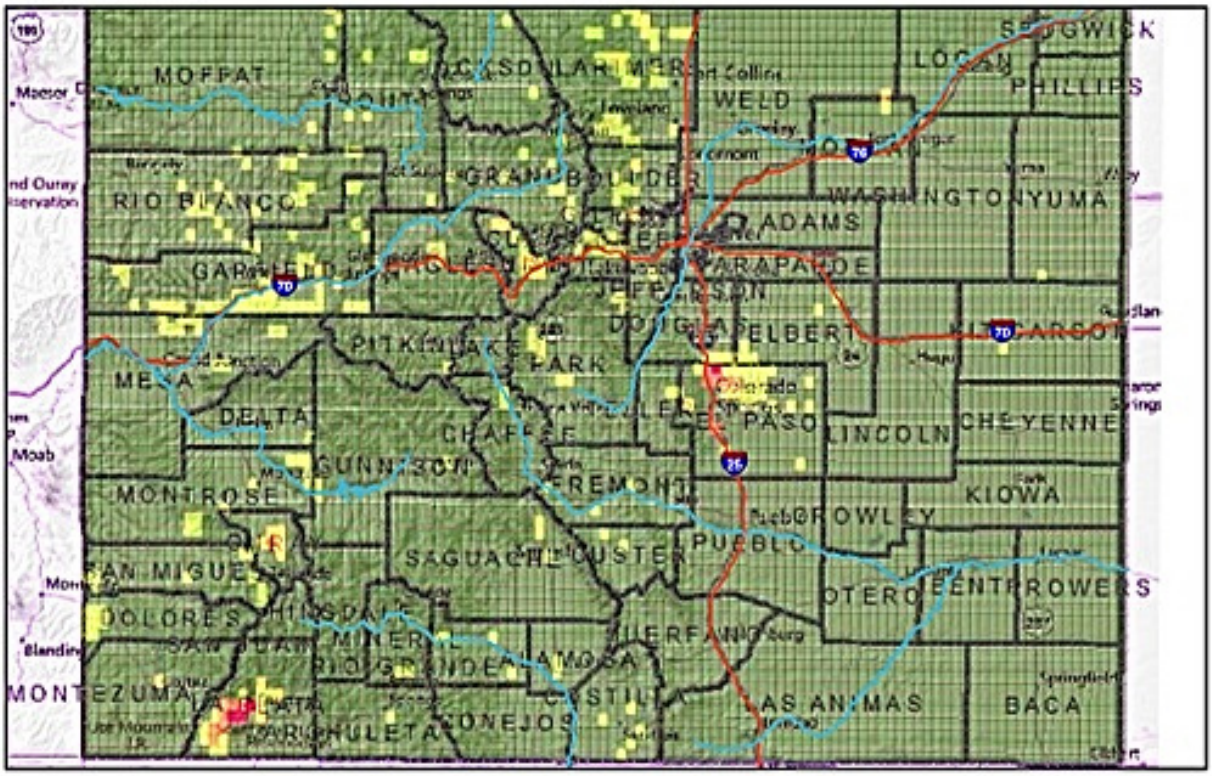
Colorado Department of Agriculture - Conservation Services
305 Interlocken Parkway
Broomfield, CO 80021
(303) 869-9030
www.colorado.gov/ag/weeds

Rev. 10/14

Spotted Knapweed
Centaurea maculosa

2013 Quarterquad Survey
Distribution and Abundance
In Colorado

4,921+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres | 51- 300 acres | 301-999 acres | >1000 acres

Acreage estimates supplied by County Weed Supervisors and compiled by the Colorado Department of Agriculture.

Wild caraway

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

1. First year rosettes have carrot-like leaves and slender tuber.
2. Mature plants have hallowed stems & small white or pink flowers in umbrella-like clusters.

Updated on: 08/08

Wild caraway Identification and Management

Identification and Impacts

Wild caraway (*Carum carvi*) is a biennial or sometimes perennial forb. It produces a low growing rosette in the first year, then the flowering stalk bolts the second year of growth, it can sometimes bolt a third year. Wild caraway is a prolific seed producer; under ideal conditions each plant can produce several thousand seeds. Stem leaves are finely divided, and resemble those of carrots in shape but tend to droop more. Shoot leaves are alternate and normally oblong or oval in shape. Flowers are white or pinkish in color, small, and occur in terminal or lateral loose clusters at the top of stems. Each flower produces two seeds that are narrow, oblong, brown, and have five distinct tan, linear, ribs. Mature plants are 1 to 3 feet tall and have one or more shoots emerging from a single taproot. Shoots are slender, erect, branching, and normally hollow.

Habitats for Wild caraway include: mountain meadows, hayfields, irrigation ditches, roadsides, and disturbed areas. The plant prefers full sun and well drained soils. Wild caraway was originally planted as spice crop, but escaped and has proven to be extremely invasive.

The key to effective control of Wild caraway is eliminating seed production by cutting or pulling plants before seed set. Herbicides should also be applied in rosette stage or before seed set. Later in the season, cut seed heads to prevent seeds from maturing. Try to minimize disturbance caused by these control measures; restore and maintain native vegetation in such areas. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Wild caraway 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 © Mary Ellen (Mel) Harte, bugwood.org.

Carum carvi

Management Recommendations

Wild caraway

CULTURAL
Wild caraway plants are sensitive to root disturbance and could be eliminated by tilling, although such practices are not likely to be suitable for natural areas. Best preventive practices include the elimination of seed production, and maintaining healthy native communities.

BIOLOGICAL
There is not any biocontrol species available to control Wild caraway. Biocontrol takes many years of research and development. For more information, contact the Colorado Department of Agriculture's Insectary in Palisade, Colorado at 970-464-7916.

MECHANICAL
Hand-pulling of bolting stalks is effective at preventing seed production, but at maturity the seed heads are extremely fragile and shatter easily. At this stage, a plastic bag can be carefully placed over the mature plant, and closed tightly around the stem while hand-pulling. Carefully done, this method can remove seed without accidentally spreading it. Collected seed should be disposed of in landfill-bound garbage or thoroughly burned. This plant's response to repeated mowing is to stay short (mowing height) and bloom.

Integrated Weed Management:

Eliminate seed production by cutting or pulling Wild caraway plants before seed set. Later in the season, cut seed heads to prevent seed from maturing. Try to minimize disturbance caused by these control measures; restore and maintain native vegetation in such areas. Applying herbicide in the rosette stage or early in bud to flower stage will assist in the contol of Wild caraway.

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)	1.0 oz of product/acre + 0.25 % v/v non-ionic surfactant	Apply at bolting to bud growth stages. (Spring to Early Summer)
2,4-D	2 qt/acre	Apply at rosette to bud growth stages. (Spring or Fall rosettes, Spring to Early Summer bud)

Above photos © (Top & Bottom): Mary Ellen (Mel) Harte, Bugwood.org; (Middle) Whitney Cranshaw, Colorado State University, Bugwood.org.

Colorado State University

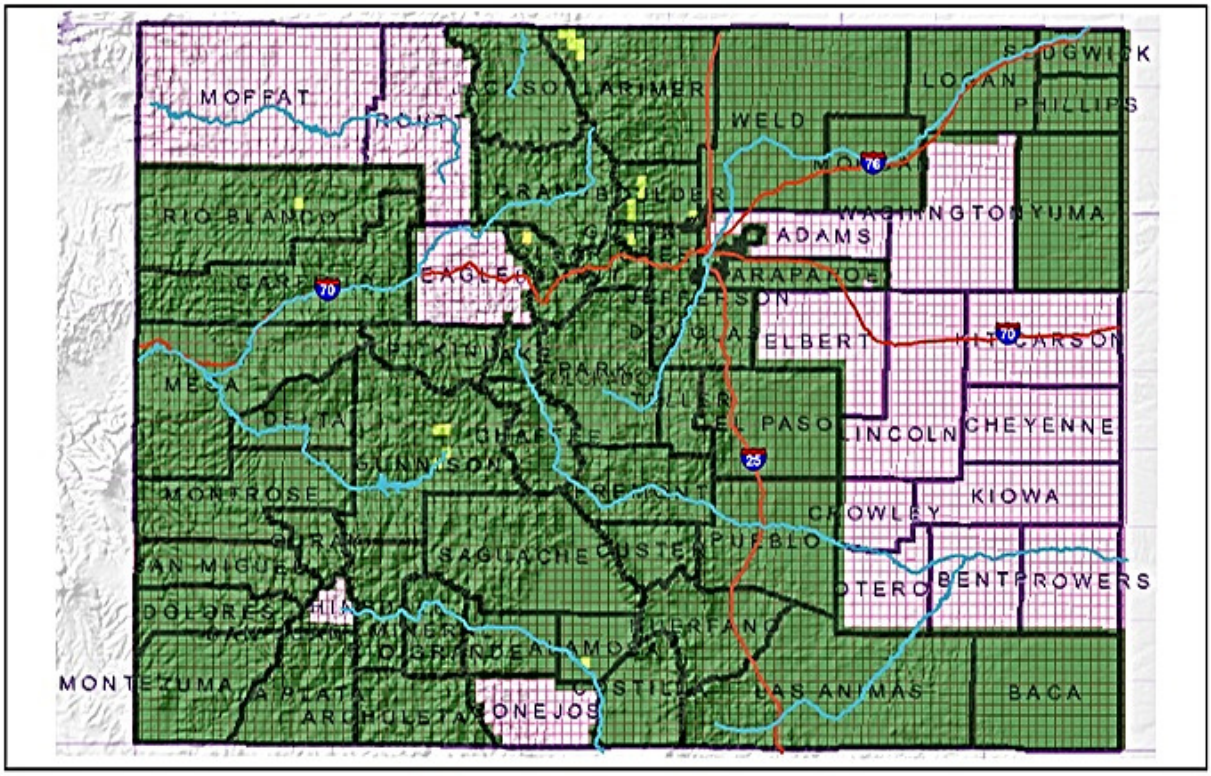
COLORADO DEPARTMENT OF AGRICULTURE

Wild Caraway

Cerum carvi

2011 Quarterquad Survey
Distribution and Abundance
In Colorado

114+ Infested Acres



Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres | Not Reported

Acreage estimates supplied by County Weed Supervisors and compiled by the Colorado Department of Agriculture.

Downy brome-Cheatgrass

Bromus tectoram

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Key ID Points

Identification and Management

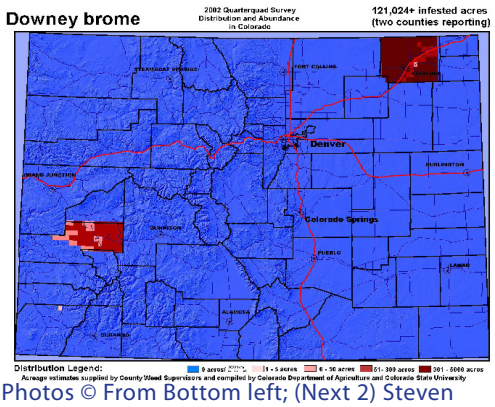
Identification and Impacts

Downy brome or Cheatgrass (Bromus tectorum) is an annual or winter annual, native to the Mediterranean region. Cheatgrass ranges in height from 2 to 36 inches. Each plant contains multiple stems that are erect in nature. The inflorescences are born and the end of the stems, and are multi-branched. They appear in a slender, dense, and usually drooping manner. At maturity, they appear greenish purple in color. The spikelets are slender, 3/8 to 3/4 of an inch long and are nodding. The awns on the end of the spikelets are usually 3/8 to 5/8 of an inch long. The sheaths of the leaves are flat blades and densely covered in with soft hairs. Cheatgrass reproduces solely by seed. The root system is fibrous and fleshy.

Habitats for Cheatgrass include; roadsides, waste areas, misused pastures, rangelands, cultivated fields, and eroded sites. When plants are green animals will graze as forage. When the plant dries, the sharp seed can injure grazing animals getting caught in the mouth, nose, and eyes of the animal. It is a competitive grass with native grasses and forbs, because it germinates in the fall and will over winter as a seedling. In the spring it will bolt and produce seed, using valuable moisture and shading desirable plants. Once Cheatgrass reaches maturity and dries, it becomes a major fire hazard. Large infestations can increase fire frequency in rangelands. Seed viability ranges 2 to 5 years for cheatgrass, increasing the chances of taking over a disturbed site.

The key to effective control of Cheatgrass preventing the establishment of the plant through proper grazing and management techniques. If the plant has become established, using an integrated management approach can prove to be an effective control method. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Cheatgrass 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 © From Bottom left; (Next 2) Steven Dewey, Utah State University; Richard Old XIV Services Inc.; Chris Evans, River to River CWMA; All Bugwood.org; Map Crystal Andrews, Colorado Department of Agriculture

Updated on:
08/09

Management Recommendations

CULTURAL
Preventing the establishment of Cheatgrass by planting desirable grasses and forbs can prove to be an effective control method. Properly maintaining grazing lands will also reduce the risk of infestations. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes.

BIOLOGICAL
Research is currently being conducted on certain molds to be used as a biocontrol. But currently there is not any approved biological control agents approved for the use on Cheatgrass. For more information please contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Fire, tillage, mowing and grazing have been proven to help reduce plant populations once established. The key to effective control is to prevent seed production and/or spread.

Integrated Weed Management:

Preventing the establishment of Cheatgrass through proper grazing management techniques proves to be the most effective control method. If infestations are already established using a combination of mechanical and chemical control methods proves to be effective control options, following these treatments with cultural control methods will reduce the size of infestations.

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
Imazapic	4-10 oz/Acre	Fall application prior to a hard freeze is optimum or during early spring growth. Add non-ionic surfactant 0.32oz/gal water or 1qt./100 gal water.
Glyphosate *Non-selectiveherbicide*	4-5 qts/Acre or 4-5 oz/gal water	Apply in fall or early spring. Add non-ionic surfactant 0.32oz/gal water or 1 qt./100 gal water.

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

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

Downybrome-Cheatgrass

Colorado State University

CDA

Field bindweed

Convulvulus arvensis

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Key ID Points

1. Leaves are shaped like arrowheads.
2. Flowers are funnel-shaped, white to pink, and have two small bracts one inch below the flower base.

Field bindweed Identification and Management

Identification and Impacts

Field bindweed (*Convolvulus arvensis*) is a non-native deep-rooted perennial that reproduces from seed and creeping, horizontal roots (rhizomes). Field bindweed stems are prostrate (grows low to the ground) and twining, and grow up to 6 feet long. Leaves are distinguishable by their arrowhead shape. The flowers are bell or trumpet-shaped, white to pink in color, and are about 1 inch long. Field bindweed seeds can remain viable in the soil for up to 40 years.

Field bindweed emerges from its root system in the spring. Flowering occurs from June to September and until the first fall frost. The number of seeds produced per plant ranges from 25 to 300 and seed production is variable depending on environmental conditions. Field bindweed is an extremely difficult noxious weed to control because, in part, of its taproot that may go 20 feet deep into the soil, and which repeatedly gives rise to numerous long rhizomes.

Field bindweed is a problem throughout Colorado. It is one of the most competitive perennial weeds. It is widespread in cultivated areas, pastures, lawns, gardens, roadsides, and waste areas from 4,000 to 8,000 feet in elevation.

To successfully manage field bindweed, containment and persistence in controlling existing stands are necessary in order to exhaust the root system and deplete the soil seed bank. This weed needs to be continually stressed, forcing it to exhaust root nutrient stores and eventually die. Of all control methods, prevention is most important. Maintain healthy pastures and rangeland and continually monitor your property for new infestations. A healthy cover of desirable perennial plants will assist in discouraging field bindweed establishment.

Field bindweed 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 jursidictions managing this species.

On the back of this sheet are field bindweed management recommendations. For more information, visit www.ag.state.co.us/csd/csdhome.html. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

White flower © Mary Ellen Harte, Invasive.org.
All other photos © Kelly Uhing.

Management Recomendations

CULTURAL
Establishment of selected grasses can be an effective cultural control of field bindweed. 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.**

Bindweed mite damage

BIOLOGICAL
The bindweed gall mite, *Aceria mahlerbae*, has proven to be effective in reducing field bindweed infestations. This is an option for large infestations. To obtain a mite release, contact the Colorado Department of Agriculture, 970-464-7916.

MECHANICAL
Cutting, mowing, or pulling has a negligible effect unless the plants are cut below the surface in the early seedling stage. Well-established populations have a large seed bank in the soil that can remain viable for over 40 years.

Integrated Weed Management:

Field bindweed requires active management once it is established because of its potential to regenerate rapidly. Even small infestations should be viewed as a serious threat and managed aggressively.

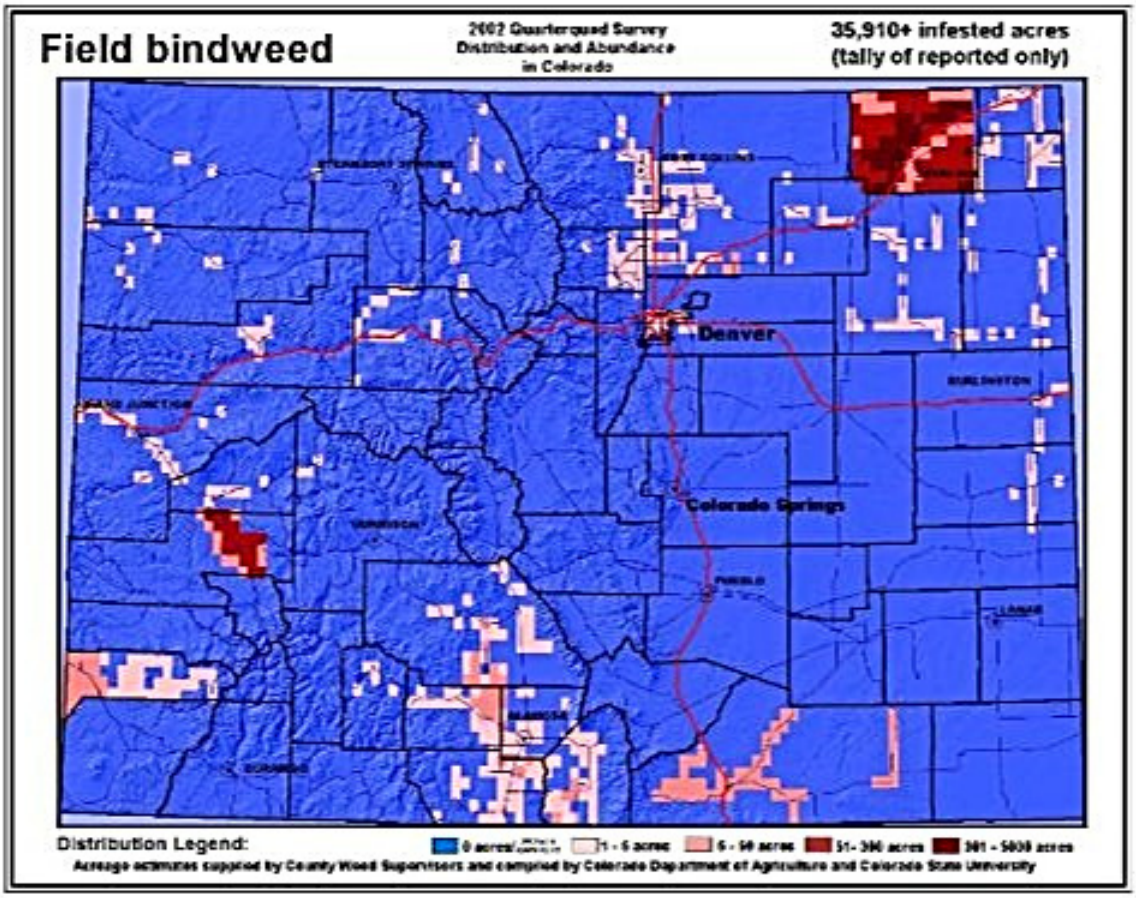
Contain and persistently control infestations in order to exhaust the root system and deplete the soil seed bank.

Maintain a healthy cover of perennial plants to discourage field bindweed establishment.

Field bindweed

HERBICIDES: 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
Clarity + 2,4-D Amine	1 qt./acre or 1 oz/gal water	Just after full-bloom and/or fall. DO NOT apply near or under trees/shrubs or where soils have rapid permeability. DO NOT apply when outside temperatures will exceed 85 degrees. Add non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.
Roundup Ultra *non-selective herbicide, will kill all vegetation*	4 - 5 qts./acre or 4 - 5 oz/gal water	Apply at full-bloom and/or fall. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water. Use caution when applying near grasses or other desirable vegetation.


Field bindweed
2002 Quarterquad Survey
Distribution and Abundance
in Colorado
35,910+ infested acres
(tally of reported only)
Denver
Colorado Springs
Distribution Legend:
0 acres
1 - 5 acres
6 - 50 acres
51 - 300 acres
301 - 5000 acres
Acreage estimates supplied by County Weed Supervisors and compiled by Colorado Department of Agriculture and Colorado State University

Puncturevine

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

Puncturevine (*Tribulus terrestris*) in a summer annual forb, and is native to Europe. The plant is prostrate or ascending, spreading into mat forming cover. The stems are trailing and can grow to 1 1/2 to 5 feet long. Leaves are formed into leaflets, with each leaflet containing 5 to 8 oval leaves. The leaves are hairy and opposite. The flowers appear in July through October. They have five petals and are yellow in color. Each flower node will produce a fruit, at maturity the fruit will break into 5 seed capsules. Each seed capsule will produce 2-4 seeds. Each capsule is hard and contains many spines, almost tack like. The shape of the seed capsule has been referred to as a "goathead." The seeds will propagate after the first moisture of the spring and then any wet period following. Seeds can stay viable for 4 to 5 years.

Habitats for Puncturevine include, but are not limited to roadsides, pastures, waste areas, cultivated fields, yards, and disturbed sites. The seed capsules can cause injury to humans, animals, and tires. Seeds can be found in hay, which may cause injury to animals. The capsules can also become entangled in wool, and decrease the quality. Due to the spiny nature of the plant, spreading seed over large areas is fairly easy.

The key to effective control of Puncturevine is preventing the plants to produce seed. Puncturevine can easily be dug up, making sure to get all the roots and to bag any flowering parts. Chemical and biological controls can also be effective as treatment options. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Puncturevine 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 and click on the Noxious Weed Program link. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Photos © From Bottom left; Steve Dewey, Utah State University, Bugwood.org; All other Kelly Uhing, Colorado Department of Agriculture

Tribulus terrestris

Management Recommendations

Puncturevine

CULTURAL
Cultural control for Puncturevine is a difficult task, since seed reserves can stay viable for 4 to 5 years. Preventing the plants from establishing, by eliminating bareground can assist in the process. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes.

BIOLOGICAL
There are two biological controls available for control of Puncturevine; *Microlarinus lareynii*, a seed feeding weevil, and *Microlarinus lypriformis*, a stem boring weevil. 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. This is helpful unless infestations are too large. The key to effective control is to prevent seed production and/or spread.

Integrated Weed Management:

Using a combination of control options can be effective in the control of Puncturevine. The plants are hard to eradicate, due to the seed viability of 4 to 5 years in the soil. Constant monitoring and management can be helpful.

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
Glyphosate (Roundup) *Non-selectiveherbicide*	1.6% solution or 2 oz./gal water	Apply in early plant growth stages, emergance and rosettes.
2,4 D and Dicamba (Outlaw)	1-2 pints/Acre or 0.5-1.0 oz/gal water	Spring at emergence of seedlings continue through growing season. Add non-ionic surfactant 0.32 oz./gal water or 1 qt./100 gal water.
Chlorusulfuron (Telar)	1-3 oz./Acre	Apply pre-emergance or early post-emergance.
Pendimethalin (Pendulum)	2.1-4.2 qts/Acre	A pre-emegance spray.

Photos © Top to Bottom; (middle) Neal Spencer, USDA Agricultural Research Service European Labratory, Bugwood.org; (other 2)Kelly Uhing, Colorado Department of Agriculture

Quackgrass

Colorado Department of Agriculture
Conservation Services

305 Interlocken Pkwy
Broomfield, CO 80021
303-869-9030

Quackgrass Identification and Management

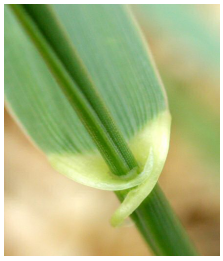
Identification and Impacts

Quackgrass (Elymus repens) is a perennial grass that is native to Europe. It grows from underground rhizomes to an unmowed height of 1 to 4 feet with erect stems. The rhizomes are yellowish-white, sharp pointed and somewhat fleshy. Both the leaf sheath and blade are hairless or sparsely hairy. The seeds germinate in the fall and spring and plants can produce seeds more than 1 time per season. Spikelets are in 2 long rows and borne flatwise to the stem. The florets have short, straight awns or are awnless. The leaves of Quackgrass are constricted near the tips. Leave blades are 0.25 to 0.5 inches wide, flat, pointed, with small ear-like appendages at the junction of the blade and the sheath. Quackgrass's flowers appear from June through August and resemble wheat head in a slender spike. Each Quackgrass plant produces about 25 seeds. These seeds remain viable for 3 to 5 years in the soil.

The habitat of Quackgrass includes: crops, pasture, rangeland, roadsides, ditches, gardens, yards, and any disturbed moist area. It is a rapid invader that does stabilize eroding soils, but take over good areas for other plants. Since it adapts to moist soils the optimal growth temperature is 68-77 degrees Fahrenheit. Quackgrass only moderately tolerates shade.

The key to effective control of Quackgrass is preventing the establishment of dense stands, once it becomes established it is hard to control. Using an integrated weed management approach proves to be the best control. Using a combination of cultural, mechanical and chemical controls can have an effect, with Quackgrass. Herbicide treatments are an option if used when plants are young, generally in the spring. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Quackgrass is designated as a "List C" species in 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, 303-869-9030.



Key ID Points

1. The yellowish-white rhizomes (root systems).
2. The leaves ear-like appedages at the sheath node.

Photos © (Clockwise from lower left): Ohio State Weed Lab, Ohio State University; (Unknown) weeds.hotmeal.net; (Unknown) Shawnee County Kansas; (Next two) Steven Dewey,

Elymus repens

Updated on:
08/08

Quackgrass

CULTURAL
Cultural methods for Quackgrass include outcompeting when in crop fields, but preventing the establishment of new infestations by minimizing disturbance, and maintaining healthy native communities proves to be successful. Contact your local Natural Resources Conservation Service for seed mix recommendations.

BIOLOGICAL
Currently, there are no biocontrol agents available for Quackgrass. Biocontrol takes many years of research and development. For more information, contact the Colorado Department of Agriculture's Insectary in Palisade, Colorado at 970-464-7916.

MECHANICAL
Mechanical treatments are tricky when dealing with Quackgrass. Tilling proves to be the best method, but it can also aid in the spread of the rhizometous nature of the plant. If tilling is the only option till towards the center of the infestation, so spreading doesn't occur outward and till when the roots can be exposed to high or freezing temperatures. This will kill the roots and minimize regrowth.

Integrated Weed Management:

Using a combination of control methods proves to be the most effective method when dealing with Quackgrass. Using a mechanical and chemical approach seems to be most effective. Always revegetate with desirable grasses and forbs after treatments. Once infestations of Quackgrass become established control and containment become more difficult.

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.* **Always read, understand, and follow the label directions. The herbicide label is the LAW!**

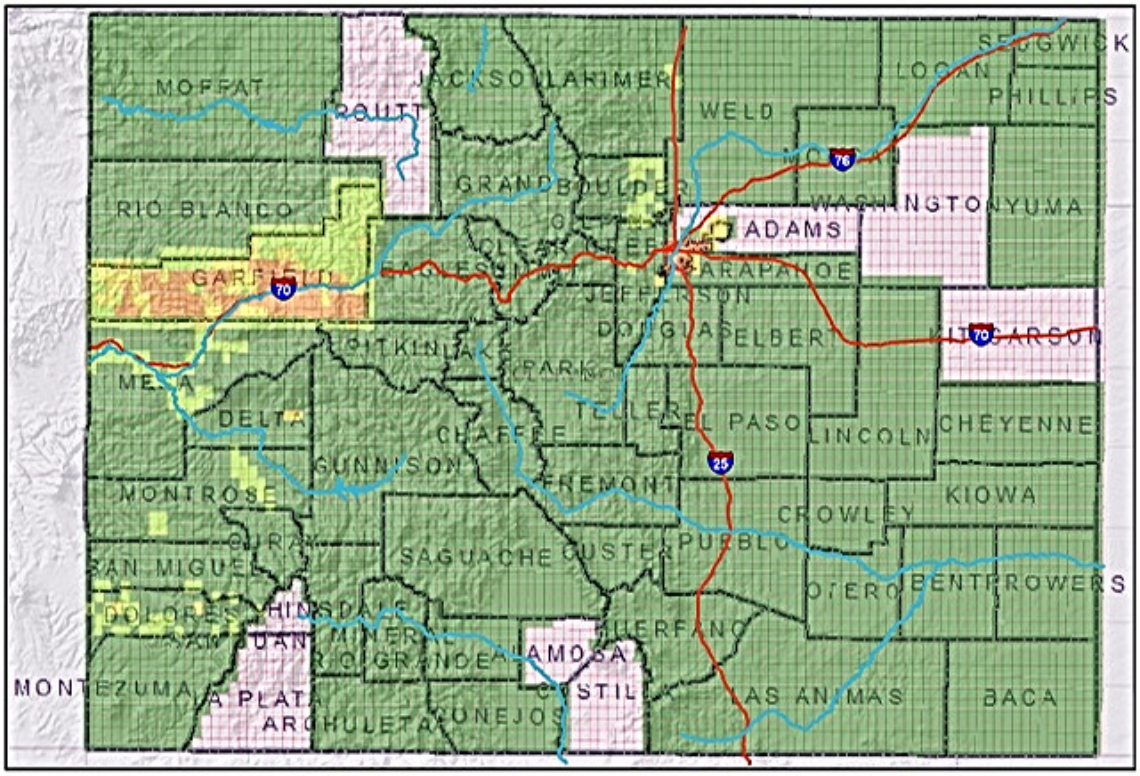
HERBICIDE	RATE	APPLICATION TIMING
Glyphosate (Roundup)	2 to 3 qt/acre or a 2% solution	Apply when grass is 8 of more inches tall.
Clethodim (Select 2EC)	8 to 16 fl. oz. of product /acre + 1% v/v crop oil concentrate	Apply when grass is 4 to 12 inches tall and repeat, if necessary, when 4 to 12 inches tall. *Select can be used in many crops, including alfalfa, and in non-crop areas.

Above photos © (Top to Bottom): (Unknown) Washington State University; Whitney Cranshaw, Colorado State University, Bugwood.org; and W. S. Curran, Penn State University.

Quackgrass
Elytrigia repens

2013 Quarterquad Survey
Distribution and Abundance
In Colorado

16,841+ Infested Acres



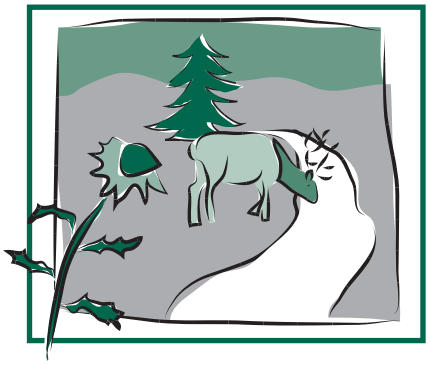
Distribution Legend: 0 acres | 1-10 acres | 11 - 50 acres | 51- 300 acres | Not Reported

Acreage estimates supplied by County Weed Coordinators and compiled by the Colorado Department of Agriculture.

Colorado State University Extension

Identification and Management of Kochia and Russian Thistle

Fact Sheet No. **6.314** Natural Resources Series | **Forestry**



by S. Bokan, K. Crumbaker, and G. Beck*

Weed Description

Kochia (*Kochia scoparia L.*) and Russian thistle (*Salsola tragus L.*) are troublesome annual weeds of rangelands, pastures, fields, disturbed areas, gardens, roadsides, ditchbanks, and small acreages. Both species are non-native to the United States. Kochia, a native of Asia, was introduced from Europe. Russian thistle originated in Russia and was brought to the U.S. in the late 1800's as a contaminant of North Dakota flax seed. Kochia is found in all western states except Alaska. Russian thistle is found in every state in the U.S., except Alaska and Florida. Both plants reproduce only from seed; therefore preventing seed-set is important for successful management. Competition from desirable plant species will limit Russian thistle and kochia establishment and site dominance.

Kochia is a summer annual plant, with many branches forming pyramidal or conical shaped bushes 6 ft. tall or greater. Leaves are small, fuzzy and gray-green in color. Leaves on older plants are alternate, linear shaped and 0.5 to 2 in. long and often hairy. The stems are highly branched and green or red tinged. When the seedlings germinate in the spring, infestations appear to be a gray-green mat. Kochia typically will germinate many times during the growing season, often beginning in March with last flushes occurring from August to early September. Flowers are inconspicuous. Seeds are dispersed when the plant matures and stems break off at the base; the plant then becomes a tumbleweed.

Russian thistle, a large, bushy, prickly summer annual weed, can grow to 3 ft. tall. The stems are erect, many-branched and normally have red or purple striping. When seedlings first emerge they look similar to grass seedlings. The leaves are alternate, small, narrow and appear scale-like with a stiff spine. The flowers, accompanied by a pair of spiny, floral bracts, are green and very inconspicuous. Russian thistle dries out and becomes a tumbleweed, spreading seeds as it rolls with the wind across landscapes.

S. Bokan, Colorado State University Extension, small acreage coordinator; K. Crumbaker, agent, agriculture and natural resources;G. Beck, Extension specialist, weed science, and professor; 12/12

Livestock Poisonings

Nitrate, oxalate, sulfates, saponins, and alkaloids are found in kochia at levels that can cause poisoning in cattle and sheep. While it can be used as forage in some areas, other forage species should also be available to avoid the possibility of livestock poisoning. The likelihood of poisoning increases as the plant matures or when drought stressed.

Russian thistle can accumulate toxic levels of nitrates which can cause acute respiratory difficulty and sudden death in cattle and sheep. Russian thistle contains oxalates, which may result in kidney failure in cattle and sheep if ingested.

Uses and Values

Kochia may provide good forage quality when the plant is young, however, the forage quality declines as the plant matures. The value to wildlife is shared by many species. Deer and pronghorn eat the foliage; seeds are consumed by songbirds and upland game birds. Kochia also provides loafing and nesting cover for upland game birds.

Russian thistle is fair forage when the plant is young. When the plant matures, it becomes unpalatable due to the spike-like inflorescence. When mature, Russian thistle provides excellent cover for pheasants, while small mammals and songbirds will feed on the seeds and foliage.

Quick Facts

- Read and comply with all herbicide labels, organic or nonorganic, for application rates, mixing instructions, protective equipment, re-entry period, grazing or harvest restrictions and other safety information.
- Kochia and Russian thistle, which are summer annuals, are troublesome annual weeds of rangelands, pastures, fields, disturbed areas, gardens, roadsides, ditchbanks, and small acreages. If uncontrolled, they become tumbleweeds that can disperse seeds over a large area.
- Nitrate, oxalate, sulfates, saponins, and alkaloids are found in kochia at levels that can cause poisoning in cattle and sheep. The likelihood of poisoning increases as the plant matures or when drought stressed.
- Russian thistle can accumulate toxic levels of nitrates which can cause acute respiratory difficulty and sudden death in cattle and sheep.

www.ext.colostate.edu

Figure 1. Russian thistle seedling.

Figure 2. Kochia seedlings.

Figure 3. Mature kochia.

Integrated Weed Management Recommendation

The first step to controlling either of these plants is to keep current plants from producing seed that is added to the seed repository in soils. Limit disturbances such as tractor, animal and people traffic through infested areas to decrease its spread. Remove tumbleweeds from fence lines to keep plants from continuing to spread seed.

Kochia has a shallow taproot and can be easily pulled or hoed out at early growth stages. If it has already started producing seed, it is best to collect the plants and dispose of them, preventing further soil infestation. In fields, light tillage can disrupt the young plants from the soil. Mowing or cutting are limited options and must be timed to prevent the plant from regrowing and producing seed. Kochia will continue to produce seed on branches below mowing levels. Maintaining healthy pastures or fields will keep kochia from establishing.

Herbicides that will control kochia effectively include fluroxypyr (sold under the trade names of Vista and Starane), dicamba, and glyphosate. Fluroxypyr and dicamba are selective herbicides that will control broadleaf weeds and typically not injure grasses. 2,4-D, that is often applied for kochia control, is not effective. Glyphosate is a non-selective herbicide that injures or kills most vegetation contacted. Glyphosate is especially effective for controlling large kochia. Kochia biotypes resistant to glyphosate have been found, particularly in wheat-growing regions. Control from herbicides is best when applied when plants are small and in the 2-6 in. stage rather than on small fuzzy seedlings with little leaf surface area. Use of a non-ionic surfactant is recommended to allow the herbicide to penetrate the hairs and reach the leaf surface. Methylated seed oil at 1 to 2 qt/A is recommended when using fluroxypyr to control large kochia plants.

Organic herbicides, such as those containing acetic acid or clove oil, can be used to control kochia. These organic herbicides are contact materials and largely non-selective, but will not control perennials. They are corrosive to both skin and respiratory systems. Read the label before purchasing or using the product. Due to the hairs on the kochia leaves, the use of surfactants will aid organic herbicide absorption.

Russian thistle is easily pulled or hoed out, at early growth stages. If plants have already started producing seed, it is best to collect the plants and dispose of them to prevent new contributions to the soil seed reserve. Pulling the plants at later stages may require wearing gloves for comfort, due to the spike-like inflorescence. In fields, light tillage can disrupt the young plants from the soil. Mowing is a limited option that must be timed to prevent the plant from being able to regrow and produce seed, and is best done when the plant is beginning to bloom. Desirable plants may be damaged if mowing is too low. Maintaining healthy pastures or fields will prevent the establishment of Russian thistle.

Herbicides that will control Russian thistle include 2,4-D, dicamba, or glyphosate (sold under the trade name Roundup). Dicamba and 2,4-D are selective herbicides that will control many broadleaf weeds but usually do not injure grasses. Glyphosate is a non-selective herbicide that can injure or kill most vegetation contacted. Chemical control is best applied in the spring when plants are rapidly growing.

Organic chemicals can be used, such as those containing acetic acid or clove oil. These organic herbicides are contact materials and largely non-selective, but will not control perennials. They are also corrosive to skin and respiratory systems. Read the label before purchasing or using the product.

For best results on a stand where both species are present, use a mixture of dicamba plus 2,4-D, or dicamba plus fluroxypyr (Vista).

Read and comply with all herbicide labels, organic or nonorganic, for application rates, mixing instructions, protective equipment, re-entry period, grazing or harvest restrictions and other safety information.

References

on next page

Table 1. Herbicide Treatments

Kochia	Dicamba: Banvel, Clarity, Vanquish 1-2 pt/A	Fluroxypr: Vista 1-2 pt/A; use higher rate for large plants	
Russian thistle	Dicamba: Banvel, Clarity, Vanquish 1-2 pt/A	2,4-D 1 qt/A	Glyphosate: Roundup 1-1.5 qt/A

References

Knight, Anthony P., Walter, Richard G., 1st Edition, 2001, A Guide to Plant Poisoning of Animals in North America.

Stubbendieck, James, Geir Friisoe, Margaret Bolick, 3rd Edition, 2003, Weeds of Nebraska and the Great Plains, Nebraska Department of Agriculture.

Whitson, Tom, Larry Burrill, Steven Dewey, David Cudney, B. Nelson, Richard Lee, Robert Parker, 9th Edition, 2006, Weeds of the West, the Western Society of Weed Science.

Colorado State Parks, Best Management Practice, Weed Profile, Russian thistle, http://parks.state.co.us/SiteCollectionImages/parks/Programs/ParksResourceStewardship/Russian%20Thistle.pdf.

Larimer County Weed District, 4th edition, Weed Management Reference Guide, www.larimer.org/weeds/weed_management_guide.pdf.

USDA NRCS, Plants Database, Plant Guide Kochia http://plants.usda.gov/plantguide/pdf/pg_basc5.pdf.

Noxious Weed Management Pocket Guide

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Colorado State University Extension | USDA NRCS
Sustainable Small Acreages

Third Edition - Jan 2013

This brochure was created to increase awareness of Noxious Weeds, the importance of identification, the importance of a weed management program, and some methods of weed control based on local, state and national research-based information.

How do I control weeds on my property?

1. Identify the weeds on your property.
2. Once a weed is identified, understand the life cycle of the weed
   - winter or summer annual
   - biennial
   - simple or creeping perennial
3. Understand the types of controls
   - Preventative
   - Cultural
   - Mechanical
   - Biological
   - Chemical
4. Develop a weed management plan
   - planning saves money and increases effectiveness
   - include long term monitoring to address any reinfestations.
   - timing is a critical part of successful weed control. Regardless of which combination of control methods are used, implementing those control methods at the correct stage of weed development will increase the chances for successful weed control in the shortest period of time, with the least cost.

It takes consistent persistence to win the war on weeds!

What are noxious weeds?

Noxious weeds are non-native plants that disrupt native vegetation because they have no natural controls and are able to adapt to varied conditions. As a result of the Colorado Noxious Weed Act, these weeds have been placed on three separate lists (weed names are color-coded corresponding to the list they are on):

List A plants: Eliminated everywhere

List B plants: Spread should be stopped

List C plants: Control is recommended

Palisade Insectory - Home of Colorado's Biological control program (CO Dept of Ag)

Effective management occurs over time and requires repeated exposure to the recommended techniques and control methods. After years of investment in mitigating the weeds on your property, eventually you can succeed.

This brochure is not meant to be all inclusive or restrictive, but offers guidelines and recommendations. References and photos for this guide are thanks to the following sources:

CO Dept. of Ag. - Noxious Weed Management Program
http://www.colorado.gov/ag/weeds

CO Weed Management Association - Noxious Weed Info.
http://www.cwma.org/

USDA Plants Database - Plants information
http://plants.usda.gov/java/

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Weed Control Methods

Preventive: Prevention is the first and, perhaps, the most important step in a weed control program. In addition, prevention is probably the most cost-effective method of weed control. Methods include: maintaining healthy pastures, using weed-free crop seed, weed-free manure and hay, and clean harvesting and tillage equipment, as well as the elimination of weed infestations in areas bordering cropland, and in irrigation ditches and canals.

Cultural: Methods include, and are not limited to: Establishing and managing an adequate population of desirable vegetation to compete with the weeds; utilizing livestock (cattle, goats, sheep) when possible; mulching; burning; and even plastic weed barriers.

Mechanical: Methods include, and are not limited to: Hand-pull, hoe, mow and tillage.

Biological: Biological weed control involves the utilization of natural enemies for the control of specific weed species. Biological weed control is never 100% effective, and can take 5 to 10 years for success. However, this method can be successful especially when combined with other control methods.

Chemical: Always **read the label** before using any herbicide! Weed control with herbicides is an effective tool for many target weed species. However, there are several aspects to consider when choosing a chemical program. These include: ID of target weed; herbicide selection; timing of application; desirable crops or plant species near control areas; the number of applications per year, and the number of years for treatment. Sprayer calibration methods can be obtained from your local Extension office.
(*Sprayer Calibration Fundamentals*)
http://www.ext.colostate.edu/pubs/farmmgt/05003.html

Always add a nonionic surfactant @ 0.32 oz/gal (1qt/100 gal) unless otherwise noted.

Bull thistle

Cirsium vulgare (Savi) Tenore

Keys to Id

- Leaves are prickly-hairy above and cottony below.
- Heads cobwebby-pubescent
- Flowers are composite and purple



Identification

- Lifecycle: Biennial
- Growth form: Forb/herb
- Flower: Flowers are 1.5-2 in wide and clustered at the ends of branches. The flower bracts are somewhat tapered and covered with spines (Whitson et al. 1996).
- Seeds/Fruit: Seeds are capped with a circle of plume-like white hairs.
- Leaves: Leaves are alternate. Bull are the only thistles in Colorado that are prickly hairy on the top surface of the leaves. They are cottony-hairy on the undersides.
- Stems: In mature plants the leaves extend down, clasping the stem and are divided into segments (i.e. strongly decurrent).

Control

- *Mech:* sever the root below the soil surface
- *Bio: Urophora stylata*, a fly predator, can be used to help control this thistle.

HERBICIDE	RATE	TIMING
Clopyralid + 2,4-D (Curtail)	0.2 + 1.0 to 0.3 + 1.5 oz	Apply to rosettes in spring or fall.
Dicamba (Banvel, Vanquish, or Clarity)	0.5 + 1.0 oz	Apply to rosettes in spring or fall
2,4-D or 2,4-D + dicamba (Rangestar)	1.5 to 2.0 1.0 + 0.5 oz	Apply to rosettes in spring.

Canada thistle

Cirsium arvense (L.) Scop.

Keys to Id

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



Identification

- Lifecycle: Perennial
- Growth form: Perennial forb
- Flower: Flowerheads are purple and borne in clusters of 1-5 per branch. Heads are only about 3/4 in wide. June-Oct.
- Seeds/Fruit: One-seeded fruits (achenes) are straw or light brown, straight or slightly curved
- Leaves: Leaves are spiny, alternate, oblong or lance-shaped, with the base leaves stalkless and clasping, or extended down along the stem.
- Stems: Mature plants range from 2-4 ft tall.
- Roots: Two types of roots, horizontal and vertical. The horizontal roots produce numerous shoots, while vertical roots store water and nutrients in their many small branches.
- Seedling: Early spring growth appears as rosettes with spiny-tipped, wavy leaves.
- Other: The floral bracts are spineless.

Control

- *Mech:* Mowing can be effective if done every 10 to 21 days throughout the growing season.
- *Bio:* Cattle, goats, and sheep will graze when plants are young and succulent in the spring.

HERBICIDE	RATE	TIMING
Aminopyralid (Milestone)	5-7 ounces/acre 1 t./gal water	Spring at the pre-bud growth stage and/or to fall regrowth.
Chlorsulfuron (Telar DF)	1-3 ounces/acre 0.50 gr/1 gal water	Spring during bud to bloom stage and/or to fall regrowth.
Clopyralid + 2,4-D (Redeem)	3 pints/acre 1.25 oz/gal water	Apply from rosette to bud stage when all plants have emerged.

Musk thistle

Carduus nulans

Keys to Id

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


Identification

- Lifecycle: Biennial, or sometimes winter annual
- Growth form: Forb
- Flower: Heads are terminal, solitary, 1 1/2-3 in wide, and usually nodding. Deep rose, violet or purple, occasionally white. Flowers are subtended by broad, spine-tipped bracts. May-July.
- Seeds/Fruit: One-seeded oblong fruit (achene) about 0.2 inches long, shiny, yellowish-brown with a plume (pappus) of white hair-like bristles.
- Leaves: Alternate, dark green, deeply lobed, and spiny margined. The leaves extend onto the stem giving a winged appearance. Basal rosettes are well developed, leaves elliptical to lanceolate, 6-14 in, smooth to densely hairy.
- Stems: Mature plants can grow as tall as 6 ft. It can appear solitarily or with several stems from one base, and is highly branched above.
- Roots: Fleshy taproot

Control

- *Mech:* sever the root below the soil surface. Mowing is most effective when plants are at full-bloom.
- *Bio:* seed head weevil and the crown weevil are effective on large infestations.

HERBICIDE	RATE	TIMING
Aminopyralid (Milestone)	5 fl. oz./acre	Spring rosette to early bolting or in fall to rosettes.
Metsulfuron (Escort XP)	1 oz. product/acre	Spring from rosette through very early flower stage.
Chlorsulfuron (Telar)	1 oz. product/acre	Spring from rosette through early flower stage.

Scotch thistle

Onopordum acanthium L.

Keys to Id

- Flower heads cluster 2-5 and are purple
- Leaves are alternate, stalk-less and hairy underneath.



Identification

- Lifecycle: Biennial
- Growth form: Forb
- Flower: Heads are numerous, 1-2 inches in diameter, with spine-tipped bracts.
- Seeds/Fruit: One-seeded fruit (achene) is wrinkled, brown to grayish-black, tipped with a plume (pappus) of slender bristles.
- Leaves: Leaves are alternate, large, irregularly lobed, and have sharp yellow spikes. Rosette leaves may be up to 2 feet long and 1 foot wide. Upper and lower leaf surfaces are covered with a thick mat of cotton-like or woolly hairs, giving the foliage a gray-green color.
- Stems: Mature plants can grow up to 12 feet tall, and have a large, fleshy taproot. Stems are numerous, branched, and have broad spiny wings.
- Roots: Thick fleshy taproot
- Seedling: Forms rosette

Control

- *Mech:* sever the root below the soil surface. Mowing is most effective when plants are at full-bloom.
- *Bio:* none currently effective

HERBICIDE	RATE	TIMING
Picloram (Tordon 22K)	1 pint/acre	Apply spring or fall in the rosette stage.
Aminopyralid (Milestone)	7 fl. oz./acre	Apply spring or fall in the rosette stage.
Metsulfuron (Cimarron X-tra)	2 oz./acre	Apply rosette to early bolt stages of growth. (Spring)

Diffuse knapweed

Centaurea diffusa Lam

Keys to Id

- Floral bracts have yellow spines with teeth like a comb and a distinct terminal spine
- Flowers are white or lavender
- Seedlings have finely divided leaves

Identification

- Lifecycle: Biennial or short-lived perennial
- Growth form: Forb
- Flower: Broadly urn-shaped, 0.6-0.8 in tall, terminal solitary or in clusters of 2-3. Floral bracts are yellowish with a brownish margin, fringed on the sides, and terminating in a slender bristle or spine. The heads contain two types of flowers, ray flowers (white, rose-purple, to lavender) around the edges surrounding tubular disk flowers. June-Aug.
- Seeds: Seeds are light brown to black.
- Leaves: Basal leaves are stalked and divided into narrow, hairy segments. Stem leaves are smaller, alternate, less divided, stalkless, and become bract-like near the flower clusters.
- Stems: Upright, 4-24 in tall, highly branched, angled, with short, stiff hairs on the angles.
- Seedling: Finely divided leaves; covered by short hair

Control

- *Mech:* sever the root below the soil surface. Mowing is most effective when plants are at full-bloom.
- *Bio:* livestock, seedhead weevil (*Larinus minutus*), and the root weevil fly (*Cyphocleonus achates*)

HERBICIDE	RATE	TIMING
Aminopyralid (Milestone)	5-7 oz/acre 1 t./gal water	Spring at rosette to early bolt stage and/or in the fall to rosettes.
2,4-D Amine (temp must be below 85°)	1 qt./acre 1 oz/gal water	Spring/fall rosettes - before flowering stalk lengthens.
Clopyralid + Triclopyr (Redeem R&P)	1.5-2 pints/acre 0.75 oz/gal	Rosette to early bolt stage of growth and/or in the fall to rosettes.

Spotted knapweed

Centaurea maculosa L.

Keys to Id

- Floral bracts have black tips, with comb-like spines of equal length.
- Flowers are pink to purple, but rarely white.
- Leaves are pinnately divided.

Identification

- Lifecycle: Biennial or short-lived perennial
- Growth form: Forb
- Flower: Flowering heads are solitary at the ends of branches. The floral bracts are stiff and tipped with a dark comb-like fringe. The flowers are pinkish-purple or rarely cream colored.
- Seeds: Have a tuft of persistent bristles.
- Leaves: Alternate rosette leaves are up to 6 in long, and deeply lobed. The principal stem leaves are pinnately divided, have smooth margins, and become smaller toward the top of the shoot.
- Stems: Mature plants are 1-3 ft tall, single stemmed
- Roots: Spotted knapweed has a stout taproot.
- Seedling: Rosettes of spotted and diffuse knapweed are nearly indistinguishable. Leaves are narrow and 1-2 times pinnately divided

Control

- *Mech:* remove all roots below the soil surface. Mowing is most effective when plants are at full-bloom.
- *Bio:* Seed head and Root weevils (*Larinus minutes* and *Cyphocleonus achates*)

HERBICIDE	RATE	TIMING
Aminopyralid (Milestone)	5-7 ounces/acre or 1 t./gal water	Spring at rosette to early bolt stage and/or in the fall to rosettes.
Clopyralid (Transline, Stinger)	2/3 - 1 pint/acre	Apply to spring/fall rosettes - before flowering stalk lengthens.
Clopyralid + 2,4-D (Curtail)	2-3 qts./acre	Apply in spring and fall to rosettes.

Russian knapweed

Acroptilon repens (L.) De Candolle

Keys to Id

- Distinguished by the pointed papery tips of the floral bracts.
- The roots are dark brown and have scale leaves.

Identification

- Growth form: Perennial forb
- Flower: Heads are urn-shaped, solitary, and composed of disk flowers. Floral bracts are broad, ovoid, entire, and greenish at the base with papery, finely hairy edges. The petals are pink or purple.
- Seeds: Oval, grayish or ivory, with long white bristles (pappus) at the tip when young.
- Leaves: Alternate. Lower stem leaves are narrowly oblong to lance-shaped, and deeply lobed. The upper leaves are oblong, toothed, and become progressively smaller. Rosette leaves are lance-shaped, tapering at both ends, broadest at the tip.
- Stems: Mature plants are between 18-36 inches tall. The stems are erect, thin, stiff, branched, and when young are covered with soft, short, gray hair.
- Roots: Well-developed, recognizable by their black color and presence of small scale leaves.
- Seedling: The seed leaves are oval, with shallow toothed or smooth edges. The surface of the leaves looks grayish-green, but is not hairy.

Control

- *Mech:* Mowing repeatedly before the plants bolt during the summer, then herbicide in the fall.
- *Bio:* gall midge *(Jaapiella ivannikovi)*

HERBICIDE	RATE	TIMING
Aminopyralid (Milestone)	4-6 ounces/acre	Bud and flowering stage and to dormant plants in the fall.
Picloram (Tordon 22K) *Restricted Use	1 qt./acre 1 oz/gal water	Apply in spring to bud/early flower stage or fall rosette.
Chlorsulfuron (Telar)	1-3 oz/acre 2/3 gr./gal water	Apply in spring from pre-bloom to bloom and to fall rosettes.

Houndstongue

Cynoglossum officinale

Keys to Id

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

Identification

- Lifecycle: Biennial
- Growth form: Forb
- Flower: Flowers are reddish-purple, with five petals, arranged in panicles in the upper leaf axils.
- Seeds/Fruit: The fruit is composed of four prickly nutlets each about 1/3 inch long
- Leaves: Alternate, 1-12 inches long, 1-3 inches wide, rough, hairy, and lacking teeth or lobes. Basal leaves are elliptical and tapered at the base.
- Stems: Produces a single flowering stem. Stem is erect, stout, heavy, 1.5-3 ft tall, branched above.
- Roots: Thick, black, woody taproot.
- Seedling: Forms a rosette in the first year

Control

- *Mech:* Cut or pull, and remove entire root crown when in the rosette stage. Remove the accumulated dense litter layer to stimulate germination of desired plants. Mow or cut flowering stems before seed nutlets develop
- *Bio:* none currently available in Colorado

HERBICIDE	RATE	TIMING
Metsulfuron Methyl + Chlorsulfuron (Cimarron X-tra)	2.0 oz. / acre	Apply in spring rosette to early bud growth stages.
Picloram + 2,4-D (Grazon P+D) *Restricted Use	4 pints / acre	Apply in spring rosette stage.

Leafy spurge

Euphorbia esula L.

Keys to Id

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



Identification

- Lifecycle: Perennial
- Growth form: Forb
- Flower: Numerous small clusters of small yellowish-green enclosed by paired heart-shaped yellow-green bracts. May-July.
- Seeds: Oblong, grayish to purple, in a capsule.
- Leaves: Alternate, narrow (1/4" wide), 1-2.5" long.
- Stems: Erect and unbranched (except at flower), thickly clustered, can reach 3 ft tall
- Roots: Extensive lateral root system.
- Seedling: Seed leaves (cotyledons) are linear to lanceolate, with entire margins.
- Other: The entire plant contains white, milky latex. Foliage of the plant is smooth and hairless.

Control

- *Mech:* Mowing will reduce seed production, repeat every 2 to 4 weeks during the growing season
- *Bio:* Both sheep and goats can be effective grazers. Flea beetles (*Aphthona* spp.), are effective especially when combined with grazing and/or herbicides

HERBICIDE	RATE	TIMING
Picloram (Tordon 22K *Restricted Use*)	1 qt./acre 1 oz/gal water	Spring, just after full-bloom and/or fall.
Imazapic (Plateau)	12 oz/acre 0.4 oz/gal water	Fall only treatment prior to hard freeze.
2,4-D Amine	2-3 qts/acre 2-3 oz/gal water	Early spring and fall. Prevents seed formation

Oxeye daisy

Chrysanthemum leucanthemum L.

Keys to Id

- Creeping perennial; Daisy-like; grows 10 inches to 2 feet tall.
- White ray flower on yellow disk; 2" diameter.


Identification

- Lifecycle: Perennial, short-lived
- Growth form: Forb
- Flower: Heads are solitary at the ends of branches. Heads are white ray flowers & yellow disk flowers.
- Seeds/Fruit: Fruits have about 10 ribs.
- Leaves: Alternately arranged leaves become progressively smaller upward along the stem. The upper leaves become stalk-less and toothed. Basal and lower stem leaves are 2-5"long, spoon-shaped. Stems: Mature plants are 10-24 in tall with erect, smooth to sparsely hairy stems.
- Roots: Shallow, branched rhizomes.
- Other: Oxeye daisy is easily confused with the ornamental Shasta daisy which has a root ball and is a more robust plant with larger flowers.

Control

- *Mech:* Hand pull or dig when soil is moist and infestations are small, be sure to pull up all roots.
- *Bio:* Goats or sheep can be effective. There are no insect biological controls currently available.

HERBICIDE	RATE	TIMING
Metsulfuron (Escort XP)	1 oz/acre	Surfactant is absolutely necessary. Apply at flowering growth stage. (Summer)
Chlorsulfuron (Telar)	1 oz/acre	Surfactant is absolutely necessary. Apply at flowering growth stage. (Summer)

Purple loosestrife

Lythrum salicaria L.

Keys to Id

- Showy pinkish-purple flowers bloom in long vertical racemes
- Smooth Lance-shaped leaves
- Four sided stem.


Identification

- Lifecycle: Perennial
- Growth form: Forb or woody sub-shrub
- Flower: Purple/magenta with 5-7 petals arranged in long vertical racemes.
- Seeds/Fruit: Fruits are many-seeded capsules, seeds are small and ovoid.
- Leaves: Simple, entire, opposite or whorled
- Stems: Annual stems arise from a perennial root-stock. Stems are erect, 1.5-8 feet tall. Plants become taller and bushier as the rootstock matures.
- Roots: Short rhizomes and taproot.
- Other: Sometimes confused with fireweed (*Epilobium* spp.), which have 4-petaled flowers.

Control

- *Mech:* Hand removal, prior to seed set, of isolated individuals on small infestations. Remove the entire rootstalk. Flowerheads must be cut and disposed of properly before a herbicide is applied.
- *Bio:* Inappropriate, as eradication is the goal, a root feeding weevil (*Hylobius transversovittatus*)

HERBICIDE	RATE	TIMING
Triclopyr (Garlon 3A)	1-2 qts./acre 1.3-2.5 oz/gal water	Summer. If plants are flowering, cut and properly dispose of flower heads before
Glyphosate* (Rodeo - aquatic safe) *nonselective	1-2 qts./acre 1.3-2.5 oz/gal water	Summer during the flowering stage. Cut and properly dispose of flowerheads before applying Rodeo.

Hoary Cress (Whitetop)

Cardaria draba

Keys to Id

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


Identification

- Lifecycle: Perennial
- Growth form: Forb
- Flower: Numerous white flowers with four petals, plant has white, flat-topped appearance. May-June.
- Seeds/Fruit: Seed capsules are heart shaped, and contain two reddish-brown seeds.
- Leaves: Alternate, blue green, and lance-shaped. Lower leaves are stalked, while the upper leaves have two lobes clasping the stem.
- Stems: Mature plants reach 2 ft tall with erect stems
- Roots: Rhizomatous; 29-32 inches deep

Control

- *Mech:* Mowing several times before the plants bolt stresses it and allows for better chemical efficacy
- *Bio:* none currently available

HERBICIDE	RATE	TIMING
Metsulfuron (Escort XP)	1 oz/acre	Apply at the early bud growth stage; i.e. "broccoli" growth stage. (Early Spring to Early Summer)
Chlorsulfuron (Telar)	1 oz/acre	Apply at the early bud growth stage; (Early Spring to Early Summer)
Imazapic (Plateau)	12 fl. 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)

Yellow Starthistle

Centaurea solstitalis

Keys to Id

- Winged stems
- Yellow ray & disk flowers
- Stiff spines at flower base
- Plant has a unique blue-green color

- Lifecycle: Winter annual
- Growth form: Forb
- Flower: Heads are yellow, located singly at the ends of branches, distinguished by sharp, straw-colored thorns, which are up to 0.75 inches long.
- Seeds: two types: plumed and plumeless.
- Leaves: Basal leaves are deeply lobed while the upper leaves are entire and sharply pointed.
- Stems: Mature plants are 2-3 feet tall and have rigid, branching, winged stems that are covered with cottony hairs.
- Roots: Taproot.
- Seedling: Oblong, tongue-shaped cotyledons

Control

- *Mech:* Hand pull, make certain to pull all the roots. Remove all parts of plant including dry skeletons. Mowing is NOT advised.
- *Bio:* Inappropriate, as eradication is the goal, none currently approved for use in CO.

HERBICIDE	RATE	TIMING
Picloram (Tordon 22K)	1.5 pint/acre	Apply during rosette growth stage or when actively
Aminopyrlid (Milestone)	5 fl oz/acre	Apply during rosette and bolting growth stages.
Clopyralid (Transline)	0.67 pint/acre	Apply during rosette to mid-bolt growth stages.

Yellow toadflax

Linaria vulgaris P. Miller

Keys to Id

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

Identification

- Lifecycle: Perennial
- Growth form: Forb
- Flower: Bright yellow and resemble snapdragons, singly on ends of branches, sharp thorns below.
- Seeds: Capsules are round-ovate, and two-celled. Seeds are brown or black, circular, and surrounded by a notched wing.
- Leaves: Soft, lance-shaped, and pale green. Mainly alternate; lower leaves appear to be opposite.
- Stems: Mature plants are 1-3 feet tall with 1-25 smooth erect floral stems covered with cottony hairs
- Roots: Deep taproot, long horizontal roots that can develop adventitious bud sprouts.
- Other: Closely related to Dalmatian toadflax (whos leaves are shorter, wider, and clasp the stem.)

Control

- *Mech:* Hand pulling, digging, or tilling is NOT recommended for eradication.
- *Bio: Calophasia lunula,* a predatory noctuid moth, *Eteobalea intermediella,* a root boring moth and *Mecinus janthinus,* a stem boring weevil are currently available in CO.

HERBICIDE	RATE	TIMING
Picloram (Tordon 22K*) *Restricted	1.5 qts/acre 1 oz/gal	Apply at mid-flowering to late fall
Chlorsulfuron (Telar)	1.25 oz/acre added to Tordon	Apply at mid-flowering to late fall (Aug thru Sept)

Field Bindweed

Convolvulus arvensis

Keys to Id

- Flowers are funnel-shaped, white to pink, and have two small bracts one inch below the flower base.
- Leaves are shaped like arrowheads.

Identification

- Lifecycle: Perennial
- Growth form: Forb
- Flower: bell or trumpet-shaped, white to pink in color, and are about 1 inch long, small bracts below
- Seeds/Fruit: Seeds can remain viable for 40 years.
- Leaves: Alternate, arrowhead shaped.
- Stems: Prostrate, many feet in length
- Roots: Rhizomatous with deep taproot

Control

- *Mech:* Cutting, mowing, or pulling has a negligible effect unless the plants are cut below the surface in the early seedling stage.
- *Bio:* The bindweed gall mite, *Aceria mahlerbae, and bindweed moth, Tyta luctuosa* are effective in CO.

HERBICIDE	RATE	TIMING
Clarity + 2,4-D Amine (temp must be below 85°)	1 qt/acre 1 oz/gal water	Just after full-bloom and/or fall. DO NOT apply near or under trees/ shrubs or where soils have rapid permeability.
Tordon 22K* *Restricted Use	1 qt/acre 1 oz/gal water	Just after full-bloom and/or fall. DO NOT apply near or under trees/ shrubs or where soils have rapid permeability.
Roundup Ultra* *non-selective herbicide	4-5 qts/acre 4-5 oz/gal	Apply at full-bloom and/or in fall.

Perennial Pepperweed

Lepidium latifolium

Keys to Id

- Dense clusters of white flowers.
- Leaves and stem - covered with waxy layer.

Identification

- Lifecycle: Perennial, member of the mustard family.
- Growth form: Forb
- Flower: White; packed in dense clusters near the ends of branches. May-Aug.
- Fruit: Nearly round, very small and sparsely hairy.
- Leaves: Alternate, lance-shaped, may be toothed, bright-green to gray-green, basal leaves are larger than the upper leaves.
- Stems: Mature plants are 1-3 ft tall.
- Roots: Deep-seated roots.
- Other: The leaves and stem are covered with a waxy layer.
- Exotics: Do not have clasping bases, unlike Hoary cress leaves with clasping bases.

Control

- *Mech:* Hand pull/dig is not effective. Instead, mow in spring before seed-set and combine with chemical treatments.
- *Bio*: none currently available, eradication is goal in Mesa County. Do NOT graze—toxicity is high.

HERBICIDE	RATE	TIMING
Chlorsulfuron (Telar)	1 oz / acre	Bolting to early flower. (Early Spring to Early Summer)
Metsulfuron (Escort XP)	1 oz / acre	Bolting growth stage. (Spring)
Imazapyr (Plateau)	12 fl oz / acre + 2 pt / ac. seed oil	Flower to late flower growth stages. (Summer)

Kochia

Kochia scoparia (L.) Roth

Keys to Id

- Grooved branches
- Erect stems can reach 5 ft.
- Small green flower lacks petals

Identification

- Lifecycle: Summer annual
- Growth form: Forb
- Flower: Head is a spike, formed by clusters of inconspicuous, green, petal-less, stalk-less flowers that grow in the axils of reduced leaves.
- Seeds: egg shaped, flattened, and very small.
- Leaves: Alternate, simple, linear to lance shaped.
- Stems: Multi branched from base, erect, reddish tint
- Roots: Taproot.
- Seedling: Cotyledons are very narrow, essentially linear in outline, dull green in color, and covered with hairs.
- Other: seeds spread prolifically by tumbleweed mechanism over vast distances

Control

- *Mech:* Till seedlings early in spring. Mow or slash plants before flowering to reduce seed production.
- *Bio:* None known.

HERBICIDE	RATE	TIMING
Most Effective	***When Combined***	***With Mechanical***
Dicamba (Banvel, Vanquish, or Clarity)	As specified on the label	Apply early in growth before flowering stage
Glyphosate* *nonselective	1-2 qts/acre 1.3-2.5 oz/gal water	"Burndown" apply early in growth before flowering stage

Poisonous Plants

These plants are poisonous to domestic livestock

Western Whorled Milkweed

Asclepias subverticillata

Keys to Id

- Whorled linear leaves
- Greenish white flower
- Slender seed pod
- Milky latex sap

Showey Milkweed

Asclepias speciosa

Keys to Id

- Opposite elliptical leaves
- Pink/white crown like flower
- Erect stem can reach 5 ft.
- Milky latex sap

Control

- *Mech:* Hand pulling, digging, to remove all parts of plant when found in grazing pasture land, combine with chemical treatment option.
- *Chemical:* Dicamba (Banvel, Oracle, Clarity) with any 2,4-D Amine product. Rate: Mix one ounce of each product into one gallon of water (1 oz/gal)

Winter Annuals

Select problem landscape plants

Cheatgrass - Downy brome

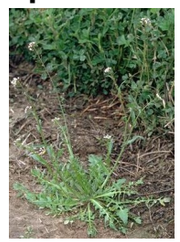
Bromus tectorum

Keys to Id

- Drooping seedhead
- Densely hairy leaves
- Greens early spring
- Changes to purple/tan in early summer

Mustards - Sheperd's-purse

Capsella bursa-pastoris



Keys to Id

- Lobed basal leaf
- Deeply toothed leaf
- Long, slender flower stalk
- Terminal flower cluster
- Small white 4-pedal flowers

Mustards - Tumble mustard

Sisymbrium altissimum

Keys to Id

- Coarse deeply divided leaf
- Narrow lobed upper leaf
- Stem erect and branched
- Small yellow 4-pedal flowers
- Tumbles in the wind

Control

- *Cultural*: Maintain healthy stand of natives/desired perennials, carefully manage grazing to ensure protection of desired plant species.
- *Mech:* Cutting or mowing has a negligible effect, repeated hand pulling must be done to include as much of the remaining root system as possible.
- *Bio:* Domestic livestock grazing, when timed correctly can help reduce invasives over time.
- *Chemical*: Glyphosate herbicides applied at the recommended label rate to young seedlings will be effective when combined with other control methods.

Backyard Weed Control Tips

Weeds (or undesirable vegetation) are a concern anytime they compete with the desired vegetation of your landscape or garden area. Weeds are opportunistic and will occupy any space that they can readily invade. Know that tolerating a few weeds can allow a healthy, functioning, attractive sustainable system.

Proper management, whether it be healthy turfgrass, adequate native plantings, or adequate mulch depth, can help to severely limit the impact that invasive and weed plants have.

The best weed control is prevention!

An integrated management approach to weed prevention will allow for the best results to reduce any weed concerns on your property. This takes time and attention over the long term to achieve successful results.

Some Additional Resources:

CSU Ext, Small Acreage Management Webpage
http://www.ext.colostate.edu/sam/

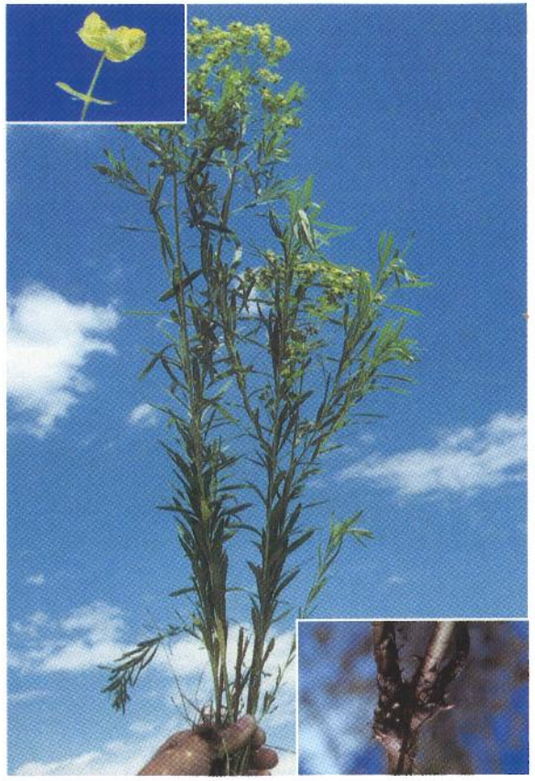
CMG Garden Notes #351, Weed Management
http://www.cmg.colostate.edu/gardennotes/351.pdf

CSU Ext, Preparation of small spray quantities of pesticides
http://www.ext.colostate.edu/pubs/garden/07615.pdf

CSU Ext, Weed Management for small rural acreages
http://www.ext.colostate.edu/pubs/natres/03106.pdf

CSU Ext. Yard and Garden Publications
http://www.ext.colostate.edu/pubs/pubs.html#garden

Leafy Spurge, *Euphorbia esula*, L. -Creeping perennial



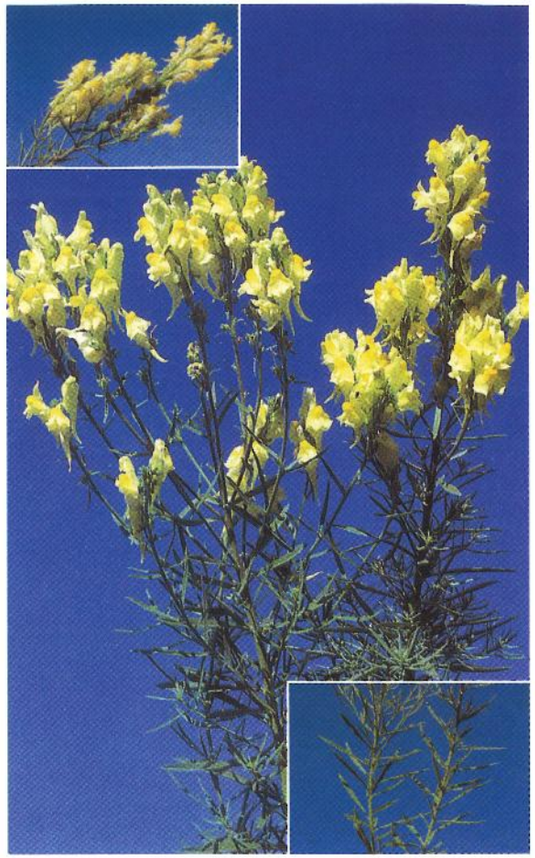
Biological Control: Flea beetles - *aphthona Nigriscuitis, A. flava, A.cyparissiae, A. czwalinae; Long horned beetle - Oberea erythrocephala*; Gall midge - *Spurgia esulae*. Grazing with sheep and goats planned to maintain healthy native vegetation.

Cultural control: Prescribed burn in spring.

Chemical control: *Campaign* - 40-54 oz./ac. or 12-16 cc/gal. water at bud.
Banvel - 2 qt./ac. or 19 cc/gal. water at bud.
Clarity - 2 qt./ac. or 19 cc/gal. water at bud.
Plateau - 8-12 oz./ac. or 2.5-3.5 cc/gal. water at late summer.

Integrated Management: Grazing/Burning in spring, spraying, and planting with mixture of early, mid and late season grasses with shallow, intermediate and deep roots.

Yellow Toadsflax, *Linaria vulgaris*, L. Creeping perennial



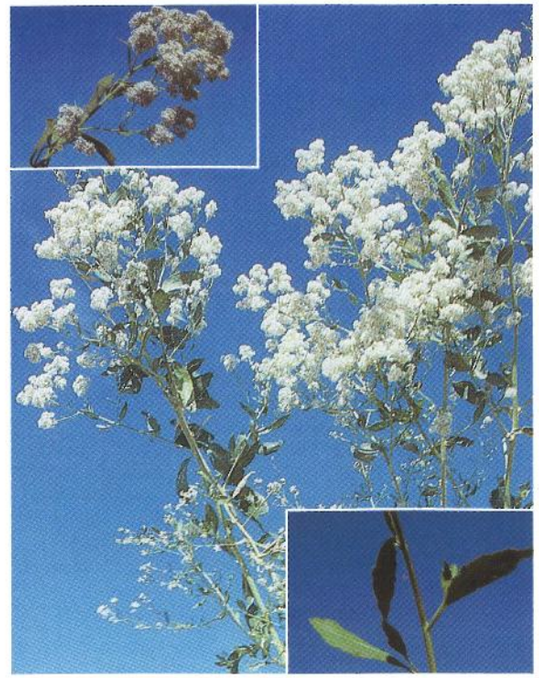
Biological control: Beetle - *Brachypterolus pulicarius*; Moth - *Calophasia lunula*.

Cultural control: Repeated mowing before seed sets. In cropland, two years of intensive clean cultivation, 8-10 times the first year and 4-5 times the second year.

Chemical control: *Banvel* - 1-2 pt./ac. or 5-10 cc/gal. water at flower.
Campaign - 40-54 oz./ac. or 12-16 cc/gal. water at flower.
Roundup Ultra - 2-3 pt./ac. or 15 cc/gal. water at flower.

Integrated management: Mowing combined with chemical application.

Tall Whitetop, Perennial Pepperweed, *Lepidium latifolium L.* – Creeping perennial



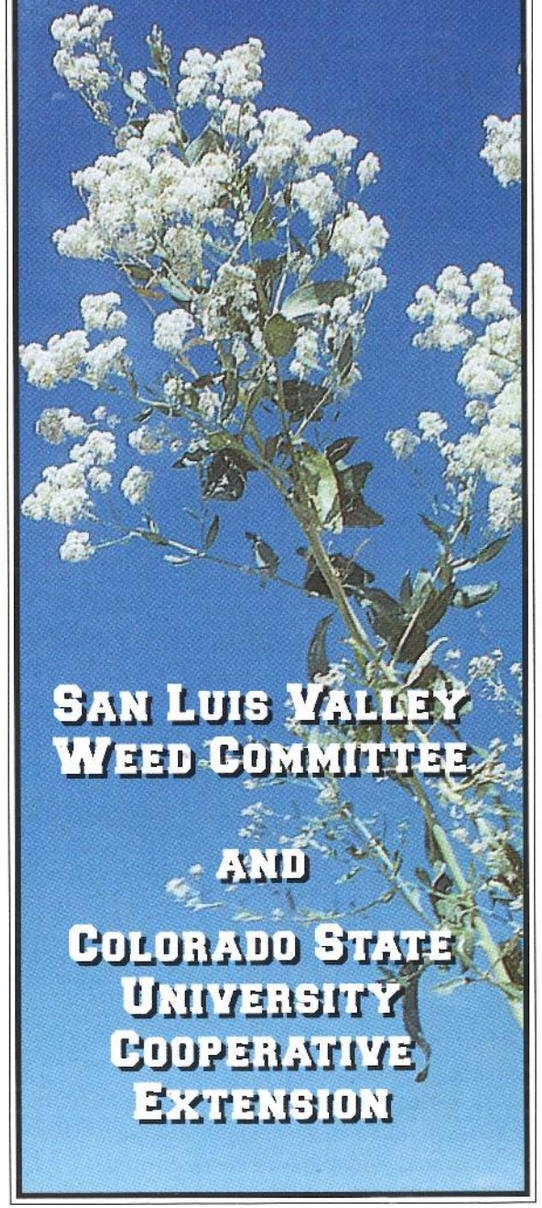
Biological: Cattle, sheep and goat grazing of early spring growth and regrowth will significantly reduce density and seed production. Planned grazing facilitates the maintainance of grass health and vigor.

Cultural: Spring mowing and/or burning offers limited control.

Chemical: *Campaign*: 40-54 oz./ac. or 12-16 cc/gal. water at early bud to flower.
Plateau: 8-12 oz./ac. or 2.5-3.5 cc/gal. water before bud.
Banvel: 2 qt./ac. or 19 cc/gal. water before bud.
Roundup Ultra: 3 pt./ac. or 15 cc/gal. water at bud or fall prior to first hard freeze.
2,4-D (4# product): 4-6 pt./ac.or 19-29 cc/gal. water applied in early spring growth then followed by 4-6 pt./ac. or 19-29 cc/gal. water on regrowth.

Integrated management: Grazing spring growth, repeated mowing and fall chemical application, along with reseeding competitive grasses the following spring, are the most effective ways to control Tall Whitetop.

Noxious Weed Management



San Luis Valley Weed Committee

and

Colorado State University Cooperative Extension

Vision Statement:
Noxious weeds are managed cooperatively throughout the San Luis Valley regardless of geographic or political boundaries (by 2020).

Mission Statement:
The Weed Management Area Steering Committee (San Luis Valley) is a local/state/federal/ partnership created to promote awareness and management of noxious weeds through local and regional initiatives.

Partners include, but certainly are not limited to: Alamosa, Saguache, Conejos, Rio Grande and Costilla Counties, Northwest Weed and Pest District, San Luis Lakes State Park, Conejos Peaks RD, Saguache RD, Great Sand Dunes National Park, BLM, Alamosa, Baca and Monte Vista National Wildlife Refuges and CSU Cooperative Extension.

For additional information, please contact your respective weed Supervisor:

Rio Grande County
Darrel Plane — Phone: 852-4804
P.O. Box 750 — FAX: 852-4804
Monte Vista, CO 81144

Saguache County
USDA NRCS Office — Phone: 754-3400
550 Worth — FAX: 754-3109
Center, CO 81125

Alamosa County
Danny Rios — Phone: 589-4848
P.O. Box 178 — FAX: 589-4848
Alamosa, CO 81101 — ext - 114

Conejos County
Fred Velasquez — Phone: 274-5933
P.O. Box 65 — FAX: 274-3222
LaJara, CO 81140

Costilla County
Ashley Pryor — Phone: 672-9226
Box 100
San Luis, CO 81152

All photos courtesy of "Weeds of the West", Tom D. Whitson, Editor

Timing is a critical part of successful weed control. Implementing control measures at the correct state of weed development will increase the chances for successful weed control in the shortest period of time and with the least cost.

For example, the ideal time to mechanically or chemically control annual, biennial or simple perennial weeds is prior to flower stalk initiation (small seedlings or rosette stage). They are easier to kill at this stage and thus eliminating additional seed production.

Keys to Control

Keys to controlling weeds will vary depending on the weed. Some keys to consider include:

- Use an aggressive monitoring program
- Produce stress on the plants to make them use up root reserves
- Minimize soil disturbance
- Manage lands to minimize the amount of bare soil
- Eliminate seed production
- Reseed infested areas
- Reduce soil seed bank
- Hand pull weeds
- Hand chop at ground level
- Mow weeds
- Repeat appropriate treatments within a year or over several years as needed.

For additional information on weed control, contact the respective County Weed Supervisor or the Colorado State University Cooperative Extension Office.

Weed Control Methods

Preventative: Prevention is the first step and perhaps the most important step in a weed control program. In addition, prevention is probably the most cost-effective method of weed control. Preventative weed control includes weed-free crop seed, weed-free manure and hay, clean (weed-free) harvesting and tillage equipment, and the elimination of weed infestations in areas bordering cropland, irrigation ditches and canals.

Cultural: Cultural is the promotion of plant competition, ie, establishing and managing an adequate population of desirable vegetation to compete with the weeds.

Mechanical: Includes, but not limited to; hand pulling, hoeing, mowing and tilling.

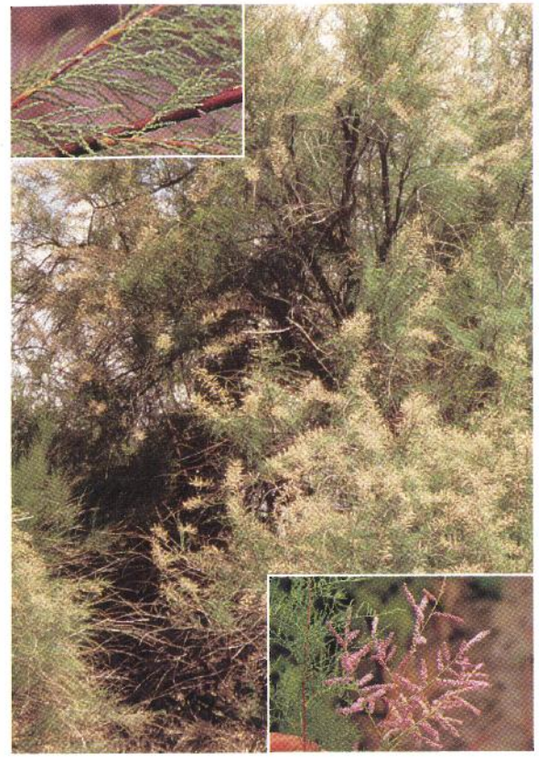
Biological: Biological weed control involves the utilization of natural enemies. Cattle, sheep and goat grazing of early spring growth and regrowth will significantly reduce density and seed production of noxious weeds. Planned grazing facilitates the maintainance of grass health and vigor. Biological weed control is never 100% effective and can take 5-10 years for success. Biological weed control is compatible with most cultural, mechanical and chemical methods.

Chemical: Always Read the Label before using any herbicide.

Use extreme caution near streams, irrigation ditches, or areas with a high water table.

Colorado State University Cooperative Extension,
USDA Natural Resources Conservation Service
and San Luis Valley Counties Cooperating.
Cooperative Extension programs are available
to all without discrimination.

Saltcedar, *Tamarix ramosissima Ledeb, Tamarix parviflora DC.*



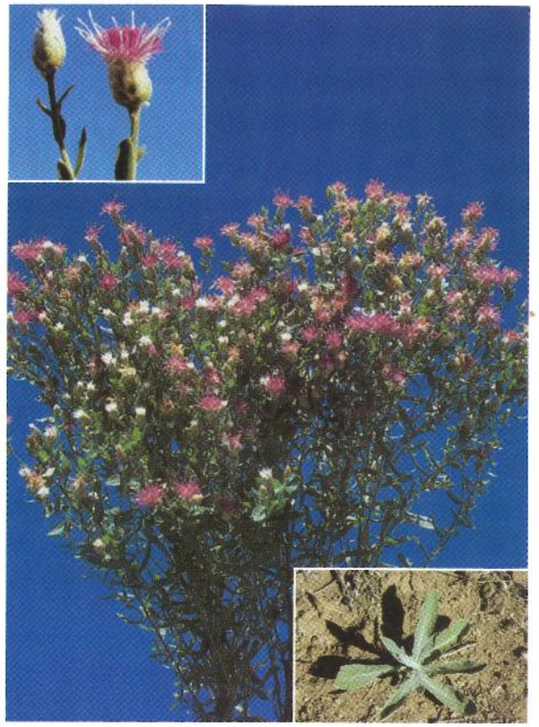
Biological Control: None Available.

Cultural Control: Root plow 35 to 60 cm deep with a cutting blade with fins to pull up roots. Bulldozing or prescribed burning with the re-growth being sprayed.

Chemical Control: Treat when actively growing. Remedy RTU for basal bark or cut stump treatments.
PastureGard: Broadcast treat 1.33 to 2.67 oz/gal or 40 to 80cc/gal. during growth.
Crossbow: Spot treat 1.33 to 2oz/gal or 40-60cc/gal water during growth. Broadcast treatment 1 to 5 oz/gal or 30-150cc/gal.
Habitat: 1.3oz/gal or 39cc/gal. Spot spray and use surfactant.
Garlon4: 26oz/gal to 51oz/gal.

Integrated management: Herbicides, burning or mechanical treatment followed by herbicides, cutting stems and apply herbicides, basal bark spraying, digging or pulling.

Russian Knapweed, *Acroptilon repens*
L.- Creeping perennial



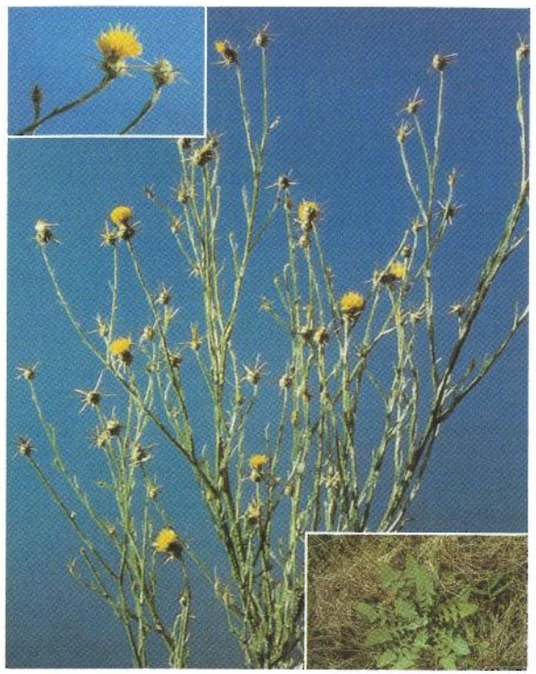
Biological control: Nematode – *Subanguina picridis.* Grazing with goats. ***Poisonous to horses.***

Cultural control: Prescribed burning/mowing to remove old growth, mowing again prior to flower. Reseeding to competitive grass.

Chemical control: *Curtail* - 3-4 qt./ac. or 66-88 cc/gal. of water at early bud or fall regrowth.
Redeem R&P - 3-4 pt./ac. or 33-44 cc/gal. water at bud or fall regrowth.
Clarity - 1-2 qt./ac. or 10-19 cc/gal. water at bud.
Banvel - 2 qt./ac. or 19 cc/gal. water at bud.
Roundup Ultra - 4 qt./ac. or 80 cc/gal. water at bud.
Plateau - 8-12 oz./ac. or 2.5-3.5 cc/gal. water at fall regrowth.

Integrated Management: Prescribed burning/mowing/grazing with goats in spring, mowing/spraying at flower stage on regrowth, and spraying prior to first hard frost in. Reseed infested area to competitive grasses.

Yellow Starthistle, *Centaurea solstitalis*
L. Biennial



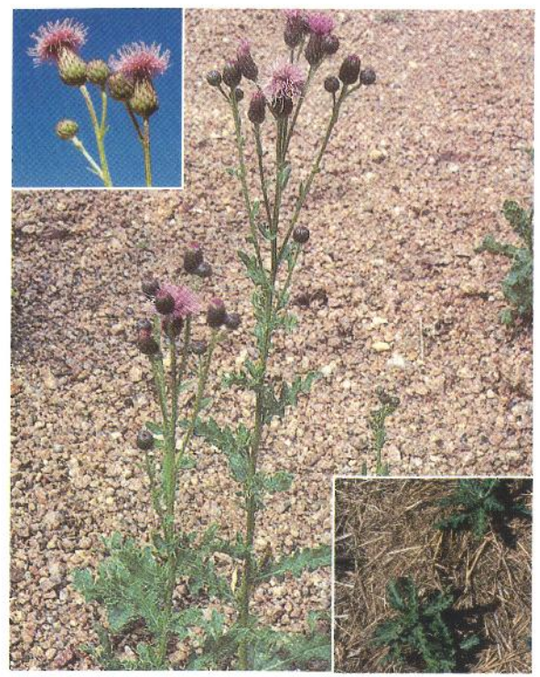
Biological control: Weevils - *Eustenopus villosus, Bangasternus orientalis.* Cattle, sheep and goats will graze before spines appear. ***Poisonous to horses.***

Cultural control: Mowing/burning at bud stage, tillage is effective when combined with reseeding. Burning at early flower stage.

Chemical control: Weed Master - 4-6 pt./ac. or 30 cc/gal. water at flower.
Roundup Ultra - 2 qt./ac. or 80 cc/gal. water at flower.
Campaign - 40-54 oz./ac. or 12-16 cc/gal. water at rosette.
Banvel - 1-2 pt./ac. or 5-10 cc/gal. water at rosette.
Clarity - 8-32 oz./ac. or 2.5-9.5 cc/gal. water at rosette.
Curtail - 2-3 qt./ac or 44-66 cc/gal water at rosette.
Plateau - 8-12 oz./ac. or 2.5-3.5 cc/gal. water at rosette.
Stinger - 1/4-1/2 pt./ac. or 2.7-5.4 cc/gal. water at rosette.
2,4-D(4# product) - 2-4 pt./ac. or 10-19 cc/gal. water at rosette.
Redeem R&P - 1.5-2 pt./ac. or 17-22 cc/gal. water at rosette.

Integrated management: Grazing/mowing/burning combined with chemical application and reseeding/maintaining native grasses.

Canada Thistle, *Cirsium arvense*
L. Creeping perennial



Biological Control: Weevils – *Larinus planus, Ceutorhynchus litura;* Beetle – *Cassida rubiginosa;* Gall fly – *Urophora cardui*

Cultural Control: Mowing is effective if done once a month. Prescribed burning in spring slows spread by reducing number of mature plants, decreasing seed production, and stimulating native grass growth.

Chemical Control: with good soil moisture and active plant growth.
Curtail - 2-3 qt./ac or 44-66 cc/gal. water at rosette to bud.
Stinger - 1/3-2/3 pt/ac. or 3.5-7.3 cc/gal. water at rosette to bud.
Clarity - 2 qt./ac. or 19 cc/gal. water at rosette.
Roundup Ultra - 2-3 qt./ac. or 80 cc/gal. of water at bud.
Redeem R&P - 3-4 pt./ac. or 33-44 cc/gal. water at rosette or fall regrowth.
2,4-D (4# product) - 4-6 pt./ac. or 19-29 cc/gal. water at rosette.

Integrated Management: A combination of repeated mowing and chemical application beofre the first hard freeze in the fall.

Musk Thistle, *Carduus nutans,*
L. Biennial

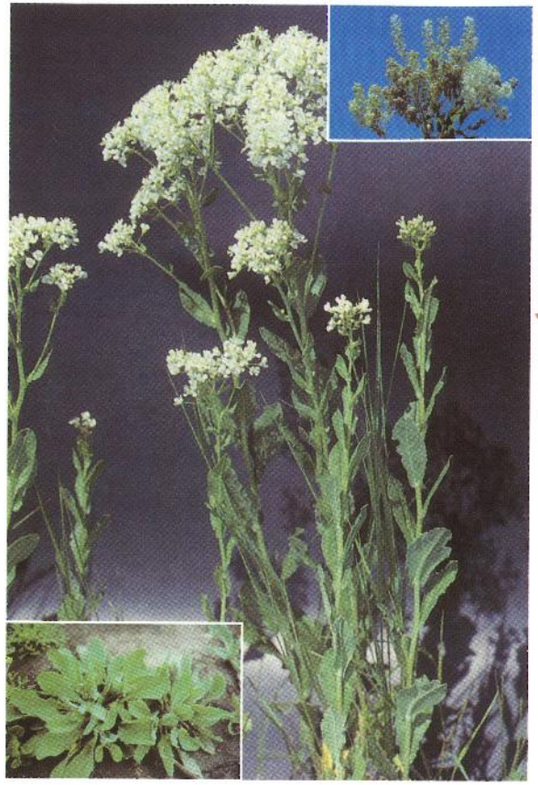
Biological control: Weevils – *Rhinocyllus conicus, Trichosirocalus horridus*

Cultural control: repeated mowing after flowering before seed sets.

Chemical control: *Weed Master* - 2 pt./ac. or 30 cc/gal. water at rosette.
Campaign - 40-54 oz./ac. or 12-16 cc/gal. water at rosette.
Stinger - 4-8 oz./ac. or 2.7-5.4 cc/gal. water at rosette.
Clarity - 8-32 oz./ac. or 3-9.5 cc/gal. water at rosette.
Banvel - 1-2 pt./ac. or 5-10 cc/gal. water at rosette.
Curtail - 2-3 qt./ac. or 44-66 cc/gal. water at rosette.
Plateau - 8-12 oz./ac. or 2.5-3.5 cc/gal. water at rosette.
Redeem R&P - 16-24 oz./ac. or 17-22 cc/gal. water at rosette.
2,4 –D (4# product) - 2-4 pt./ac. or 10-19 cc/gal. water at rosette.

Integrated management: Use a combination of mowing and chemical treatments for effective control.

Hoary Cress, Short Whitetop, *Cardaria draba*,
L. Creeping perennial



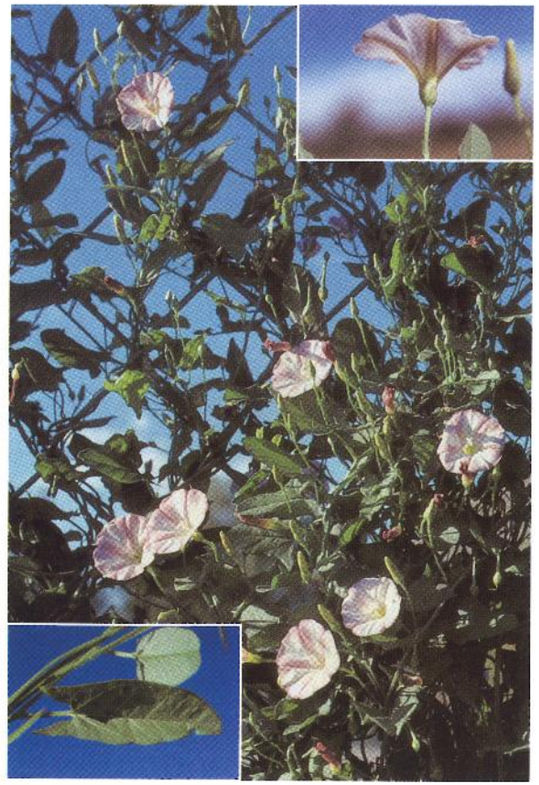
Biological Control: Graze with sheep/goats.

Cultural Control: Mowing during bud stage in spring and continue when plants rebud. Planting competitive grass/maintaining maximum native vegetation.

Chemical Control:
Weed Master - 4-6 pt./ac. or 30 cc/gal. water at early bud stage.
Plateau - 8-12 oz./ac. or 2.5-3.5 cc/gal. water at bud.
Roundup Ultra - 3 pt./ac. or 15 cc/gal. water at flower.
2,4-D Amine (4# product) - 4-6 pt./ac. or 19-29 cc/gal. water at bud growth stage and repeat on regrowth.

Integrated management: Mow 2-3 times at bud stage, apply chemicals in fall before first hard freeze and reseed to competitive grasses the next spring.

Field Bindweed, *Convolvulus arvensis,*
L. Creeping perennial



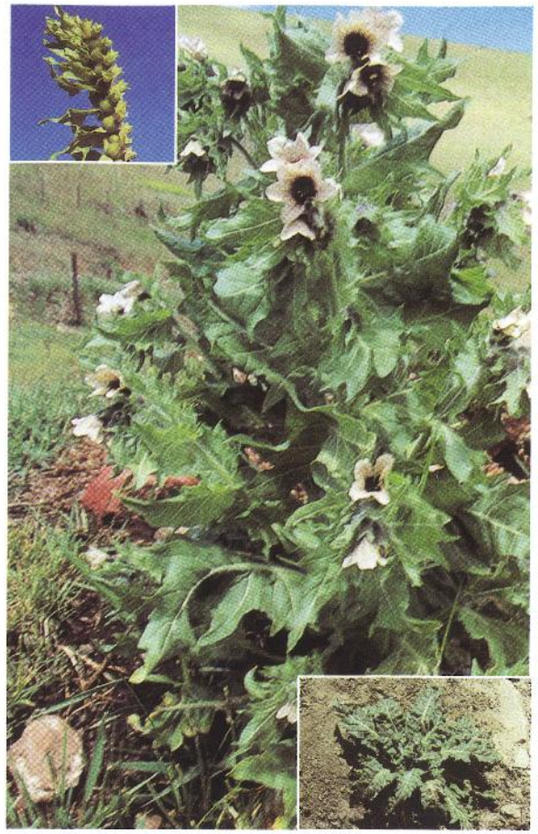
Biological Control: Grazing

Cultural Control: None available

Chemical control:
Roundup Ultra - 4-5 qt./ac. or 80 cc/gal. water in fall prior to killing frost.
Weedmaster - 4-6 pt./ac. or 30 cc/gal. water at flower.
Banvel - 2 qt./ac. or 19 cc/gal. water at flower
Clarity - 2 qt./ac. or 19 cc/gal. water at early flower.
Plateau - 8-12 oz./ac. or 2.5-3.5 cc/gal. water at flower.
2,4-D (4# product) - 4-6 pt/ac. or 19-29 cc/gal. water at flower and repeat.

Integrated management: Grazing combined with chemical application and reseeding to competitive grasses will help control this weed species.

Black Henbane, *Hysoscymas niger,*
L. Biennial



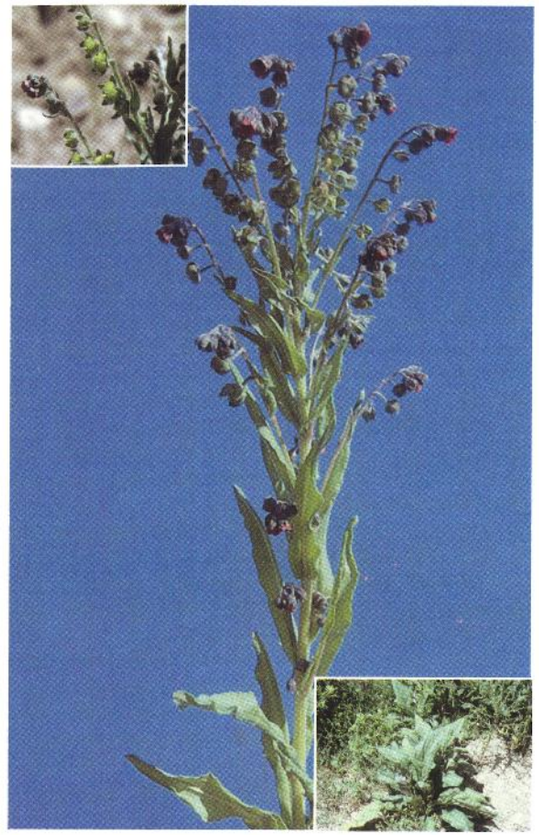
Biological Control: None available

Cultural control: Mowing before seed production.

Chemical control:
Banvel - 1 qt./ac. or 10 cc/gal. water at rosette.
Clarity - 1 qt./ac. or 10 cc/gal. water at bud
2,4-D (4# product) - 2-4 pt./ac. or 10-19 cc/gal. water at rosette.
Stinger - 1/4-1/2 pt./ac. or 3-5.5 cc/gal. water at 5 leaf stage or less.

Integrated Management: Chemical treatment and reseeding to grasses will control Black Henbane.

Houndstongue, *Cynoglossum officinale,*
L. Biennial



Biological control: None available

Cultural control: Mowing second year plants during flowering.

Chemical control:
Banvel - 1 qt./ac. or 10 cc/gal. water at rosette.
Clarity - 1 qt./ac. or 10 cc/gal. water at rosette.
2,4 – D (4# product) - 2-4 pt./ac. or 10-19 cc/gal. water at rosette.
Stinger - 4-8 oz./ac. or 3-5.4 cc/gal water at rosette.

Integrated management: Use a combination of mowing and chemical treatments for effective control.

SUGGESTED HERBICIDE USAGE

WEED	HERBICIDE (Brand Name/active ingredient)	TIME TO APPLY
Black Henbane (B)	Banvel, Vanquish (dicamba)	Spring Rosette
	Clarity (dicamba)	Spring Bud
	2,4-D Amine	Spring Rosette
	Stinger/Reclaim/Transline (clopyralid)	5 leaf stage or less
	Escort XP (metsulfuron)	Summer to Early Fall - late bolt to early flower
Bouncingbet (B)	Telar XP (chlorsufluron)	Late Spring to Mid Summer - bolting to bud growth
		Selective, safe for labeled grasses
		Not for use near waterbodies
Canada Thistle (B)	Milestone (aminopyralid)	Spring (pre-bud) until flowering and/or fall regrowth
*spring and fall control	Prescott/Redeem (clopyralid + triclopyr)	Spring until flowering and/or fall regrowth
	Rangestar (2,4-D + dicamba)	Spring - prebud/early bud/after bloom
	Banvel, Vanquish, Clarity (dicamba)	rosette growth stage
		after bloom and before domancy in fall
	Telar XP (chlorsufluron)	Spring bud to bloom stage and/or fall regrowth
	Stinger/Reclaim/Transline (clopyralid)	Rosette to bud stage
	Curtail (clopyralid + 2,4-D)	Early bud growth stage or in fall at rosette
		Rosette to bud stage
	2,4-D	Spring thistle 10"-15" tall; prebud to early bud
	RoundUp Ultra (glyphosate)	bud
	Redeem R&P (clopyralid + triclopyr)	Rosette or fall regrowth/Early bud growth stage or in fall at rosette
	2,4-d (4# product)	Rosette
Common Tansy (B)	Escort XP (metsulfuron)	Late Spring to Mid Summer - bolting to bud growth
Cypress Spurge (A)	Paramont (quinclorac)	Spring - flowering stage
	Rangestar (2,4-D + dicamba)	Spring - flowering stage
Downy Brome - C	Plateau (imazapic)	during early spring growth
		fall application prior to hard freeze
	Glyphosate	early spring or fall
Eurasian Watermilfoil (B)	Aqua-kleen, Navigate, DMA 4 IVM (2,4-D)	Actively growing plants
	Sonar, Avast (fluridone)	Actively growing plants
	Renovate 3 (triclopyr)	Actively growing plants

DRAFT

SUGGESTED HERBICIDE USAGE

Field Bindweed - C	Clarity + 2,4-D Amine	Just after full bloom or fall Do not apply under/near trees and shrubs
	RoundUp Ultra (glyphosate)	At full bloom or fall prior to killing frost Nonselective
	Weed Master (dicamba + 2,4-D)	at flower
	Banvel, Vanquish, Clarity (dicamba)	at flower
	Plateau (imazapic)	at flower
Hoary Cress (B) *before or at very early bloom most effective `	Plateau (imazapic)	Late Spring to Mid Summer - late flower to post flower Selective but may retard growth of some grasses
	Escort XP, Ally (metsulfuron)	Early Spring to Early Summer - early bud growth to early bloom Selective, safe for most perennial grasses Not for use near irrigation water
	Telar XP (chlorsufluron)	Early Spring to Early Summer - early bud growth Selective, safe for labeled grasses Not for use near waterbodies
	Cimmaron Plus (chlorsulfuron + metsulfuron)	Early Spring to Early Summer - early bud growth to early bloom Broad spectrum - absorbed thru foliage and roots preemergent and postemergent activity
	Chaparral (aminopyralid + metsulfuron)	Spring (rosette to bolt) or fall (seedling to rosette) Broad spectrum - not for use near surface water
	Rodeo, RoundUp Pro, RoundUp Ultra (glyphosate)	Flower bud - nonselective Rodeo OK for use in or near aquatic areas
	Arsenal, Habitat (imazapyr)	Bud to flowering Nonselective - broad spectrum preemergent and postemergent activity Habitat labeled for use near water
	2,4-D ester or amine4	before bud - bud growth stage Selective - Acceptable for use in/near aquatic areas
	Weed Master (dicamba + 2,4-D)	early bud Selective
Kochia (Watch)	Banvel, Clarity, Vanquish (dicamba)	best when plants are small 2-6 inch range before flowering Selective
	Vista, Starane (fluroxpyr)	best when plants are small 2-6 inch range before flowering Selective
	Glyphosate	Early in growth before flowering Nonselective

SUGGESTED HERBICIDE USAGE

Leafy Spurge (B)	Krenite S (fosamine)	Spring only during bloom to post-bloom
		OK around water
	Plateau (imazapic)	Fall only prior to hard freeze before loss of latex
		Selective but may retard growth of some grasses
	Banvel, Vanquish, Clarity (dicamba)	Spring at flowering or fall
	2,4-D Amine	Early Spring to fall - prevents seed formation only
		Selective - prevents seed formation only
		Acceptable for use in/near aquatic areas
	Paramont (quinclorac)	spring at prebloom or in fall
	RoundUp, RoundUp Ultra (glyphosate)	1st app early June, 2nd app one month later
	Campaign (glyphosate + 2,4-D)	Bud
	Crossbow (2,4-D + triclopyr)	Bud
Musk Thistle (B)	Milestone (aminopyralid)	Spring rosette to early bolting or fall rosettes
	Escort XP (metsulfuron)	Spring rosette to early bud growth/very early flower or fall rosettes
	Telar XP (chlorsufluron)	Spring from rosette thru early flower
		Selective, safe for labeled grasses
		Not for use near waterbodies
	Banvel, Vanquish, Clarity (dicamba)	Spring rosettes or fall
	2,4-D or amine4	Rosettes in spring or fall
		Selective - Acceptable for use in/near aquatic areas
	Stinger, Transline (clopyralid)	Spring rosette to early bolting or in fall
	Cimarron X-tra (chlorsulfuron + metsulfuron)	Spring rosette to early bud growth or fall rosettes
	Weed Master (dicamba + 2,4-D)	Rosette
	Campaign (glyphosate + 2,4-D)	Rosette
	Curtail (clopyralid + 2,4-D)	Rosette
	Plateau (imazapic)	Rosette
		Selective but may retard growth of some grasses
	Redeem R&P (clopyralid + triclopyr)	Rosette

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SUGGESTED HERBICIDE USAGE

Perennial Pepperweed (B) *applying during flower bud stage extremely effective	Plateau (imazapic)	Summer - flower to late flower Apply flowerbud to flowering stages or fall rosettes Selective
	Telar XP (chlorsufluron)	Early Spring to Early Summer - bolting to early flower Selective - do not apply near water
	Escort XP (metsulfuron)	Spring - bolting stage Flowerbud to flowering Selective
	Campaign (glyphosate + 2,4-D)	Early bud to flower
	Banvel, Vanquish, Clarity (dicamba)	Before bud
	Rodeo, RoundUp Ultra (glyphosate)	Bud or fall prior to first hard freeze Nonselective
	2,4-D (4# product)	Early spring followed by another application on regrowth Anytime plants are actively growing; best results at flowerbud to flowering stages
	Raptor (imazamox)	Spring rosettes
	Stalker, Arsenal, Chopper, Habitat (imazapyr)	Anytime plants are actively growing; best results at flowerbud to flowering stages Nonselective - do not apply near water
	Pursuit (imazethapyr)	Spring or fall rosettes
Pucturevine - C	RoundUp Ultra (glyphosate)	Early plant growth, emergence and rosettes Nonselective
	Outlaw (dicamba + 2,4-D)	Spring - emergence of seedlings continue thru growing season
	Telar, Telar XP (chlorsufluron)	Pre-emergance or early post-emergance
	Pendulum (pendimethalin)	Pre-emergance
Quackgrass - C	RoundUp (glyphosate)	when grass is 8 or more inches tall
	Select 2EC (clethodim)	when grass is 4-12 inches tall and repeat

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SUGGESTED HERBICIDE USAGE

Russian Knapweed (B) *Highly susceptible to fall applied herbicides	Milestone (aminopyralid)	apply in fall when above ground stems die back and root buds are highly susceptible spring and summer - bud to flowering
	Stinger/Reclaim/Transline (clopyralid)	spring after all shoots have emerged, bud to mid flower growth late fall after frost
	Curtail (clopyralid + 2,4-D)	spring after all shoots have emerged, bud to mid flower growth late fall after frost
	Telar XP (chlorsufluron)	spring - prebloom to bloom late fall rosettes Selective, safe for labeled grasses Not for use near waterbodies
	Arsenal (imazapyr)	anytime plants are growing or in the fall after frost
	RoundUp (glyphosate)	late bud to early flower late summer or fall
	Prescott/Redeem R&P (clopyralid + triclopyr)	Spring - bud Fall - regrowth
	Banvel, Vanquish, Clarity (dicamba)	rosette growth stage Spring - bud After bloom and before domancy in fall
	RoundUp Ultra (glyphosate) Plateau (imazapic)	Spring - bud Fall - regrowth Selective but may retard growth of some grasses
Russian Olive (B)	Garlon 4, Remedy (triclopyr)	apply to cambial layer of tree immediately after the cut-stump treatment
	Habitat + water, Arsenal + water (imazapyr+water)	apply to cambial layer of tree immediately after the cut-stump treatment
	Habitat, Arsenal (imazapyr)	broadcast spray
Saltcedar (B)	Garlon 4 (triclopyr)	foliar treatments - late spring to early fall cut stump - anytime except when snow is present basal bark - anytime except when snow is present
	Rodeo (glyphosate)	Nonselective Ttreat anytime except when snow is present
	Arsenal, Habitat (imazapyr)	cut stump - anytime except spring during heavy sap flows foliar - late spring to late summer

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SUGGESTED HERBICIDE USAGE

Spotted Knapweed (B)	Milestone (aminopyralid)	spring - rosette to early bolt fall - rosettes
	Banvel, Vanquish, Clarity (dicamba)	spring/fall rosettes before flowering stalk lengthens
	Rangestar (2,4-D + dicamba)	spring/fall rosettes before flowering stalk lengthens
	Redeem R&P (clopyralid + triclopyr)	spring/fall rosettes before flowering stalk lengthens
	Transline, Stinger (clopyralid)	spring/fall rosettes before flowering stalk lengthens
	Curtail (clopyralid + 2,4-D)	spring/fall rosettes
Wild Caraway (B)	Escort XP (metsulfuron)	Spring to early summer - bolting to bud growth
	2,4-D ester or amine4	Spring to early summer - rosette to bud growth Spring/fall rosettes Selective - acceptable for use in/near aquatic areas