Cascade Creek 0697-15-08 Well Site

Interim Reclamation Plan
COGCC Rule 304.c.(16) and 1003

Laramie Energy, LLC
760 Horizon Drive, Suite 101
Grand Junction, CO 81506

1) Introduction – Rule 304.c.(16)

The Cascade Creek (CC) 0697-15-08 Well Site Interim Reclamation Plan (IRP) was developed in compliance with COGCC Rule 304.c.(16) *Interim Reclamation Plan* as part of the 304 Rule series for Form 2A Oil and Gas Location Assessment and in accordance with applicable requirements of COGCC Rule 1003: *Interim Reclamation*.

2) Site Description

Cascade Creek 0697-15-08 Well Site

Laramie Energy, LLC (Laramie) (Operator # 10433) is pursuing a Form 2A for an Oil and Gas -Location Assessment permit in Garfield County, Colorado (**Vicinity Map - Appendix A**) for the development of the CC 0697-15-08 well site. The proposed site will be a new location developed on private property, owned by Laramie. The proposed well site will have 18 wells drilled. The site's location is centralized to Laramie's Cascade Creek operations area.

Total surface area of initial disturbance is estimated at 7.6 acres for the proposed well site. The estimated earthwork is shown in the Layout Drawings (**Appendix B**) and includes topsoil, cut, and fill estimates for pad construction and stormwater control features.

Operations will be conducted in the following stages at the CC 0697-15-08: initial grading activities, drill rig mobilization, drilling, completions and flowback, production, interim reclamation, and final grading/reclamation of the site. Phases may occur simultaneously at the site. Inspection activities will occur during the lifespan of the site.

The CC 0697-15-08 will initially generate 7.6 acres of new short-term disturbance (**Layout Drawing – Appendix B**); however, the site will be reduced by approximately 5.8 acres at the time of interim reclamation (**Proposed Interim Reclamation Plat – Appendix C**). The long-term disturbance associated with this pad will be 1.8 acres. Interim reclamation will begin after all wells are drilled and completed as planned with production facilities installed at the pad. Interim reclamation activities will take approximately 5 days to complete. During interim reclamation, the cut and fill slopes will be reshaped and contoured leaving approximately 1.8 acres of working area.

Disturbance Acreage for CC 0697-15-08 Well Site

Area	Disturbance in Acres
Area of Disturbance	7.6 acres
Working Pad Surface	3.2 acres
Area to be reclaimed during interim reclamation	5.8 acres
Production Pad Surface (long-term disturbance)	1.8 acres

Location

The site is located on Parcel #216921400026 within Garfield County, Colorado. The parcel is located 12.2 miles north of De Beque, Colorado. The site is located approximately 14 miles northeast of De Beque, Colorado and 21.8 miles northeast by access route. The site is located approximately 9.6 miles from the nearest public road, County Road 213.

Legal Description: SENE of Section 15, Township 6 South, Range 97 West, 6th P.M.
Location Coordinates: Latitude: 39.526319°; Longitude: -108.198886°
Elevation: 8514 feet

Associated Plans and Documents

The CC 0697-15-08 IRP will be utilized in collaboration with the following plans:

- BLM Seed Mixes by Habitat Type (**Appendix H**).
- Garfield County Noxious Weed Management Plan (**Appendix I**)
- Cascade Creek 0697-15-08 Topsoil Protection Plan
- Cascade Creek Stormwater Management Plan
- Cascade Creek 0697-15-08 Dust Mitigation Plan
- Laramie Energy 2021 Cascade Creek OGDP Waste Management Plan

3) Soils Description

A soils report from the Natural Resource Conservation Service (NRCS) indicates that the proposed site is composed of Parachute-Irigul complex (Map Unit 55) and Northwater-Adel complex (Map Unit 52). The access road will be comprised of Parachute-Irigul complex (Map Unit 55) and Parachute-Irigul-Rhone association (Map Unit 56) soils. The NRCS Soils Map is provided in **Appendix D**.

The Parachute-Irigul complex (Map Unit 55), 5 to 30 percent slopes, is composed of Parachute and similar soils: 60%, Irigul and similar soils: 30%, and minor components: 10%. Parachute and Irigul are colluvium over residuum weathered from sandstone and shale.

Parachute is a well drained soil with low available water storage of about 3.9 inches. Parachute is classified as hydrologic soil group C which defines the soil as having a slow infiltration rate when thoroughly wet.

Typical profile: A - 0 to 10 inches: loam
Bw - 10 to 25 inches: very channery loam
Cr - 25 to 59 inches: bedrock

The NRCS states Irigul is a well drained soil with very low available water storage of about 1.5 inches. Irigul is classified as hydrologic soil group D which defines soils as having a very low infiltration rate when wet. This means the soils in group D have a higher potential for run off.

Typical Profile: A - 0 to 6 inches: channery loam
C - 6 to 13 inches: very channery loam
R - 13 to 59 inches: bedrock

The Northwater-Adel complex is well drained and composed of Northwater and similar soils (50%), Adel and similar soils (40%), and minor components (10%).

The Northwater is derived from accumulated weathered sedimentary rock. It has a moderate available water storage of about 7.9 inches and has a water transmission rate that is low to moderately high at 0.01 to 0.57 inches per hour. The NRCS classifies Northwater as hydrologic soil group B which is defined as having moderate infiltration rate when thoroughly wet.

Typical Profile: A - 0 to 28 inches: loam
Bt - 28 to 48 inches: very channery loam
R - 48 to 60 inches: bedrock

NRCS states Adel is composed of alluvium and/or colluvium derived from sedimentary rock. Adel has a high available water storage of about 10.1 inches and a moderately high water transmission rate of 0.21 to 0.71 inches per hour. Adel is classified as hydrologic soil group C which defines the soil as having a slow infiltration rate when thoroughly wet.

Typical Profile: A1 - 0 to 20 inches: clay loam
A2 - 20 to 31 inches: loam
C - 31 to 60 inches: loam

The Parachute-Irigul-Rhone association soil unit is composed of Parachute and similar soils (35%), Irigul and similar soils (30%), Rhone and similar soil (30%) and minor components (5%). Parachute, Irigul, and Rhone all originated from accumulated weathered sandstone and shale Each have a water transmission rate that is low to moderately high at 0.01 to 0.57 inches per hour.

Parachute is a well drained soil with low available water storage of about 3.9 inches. Parachute is classified as hydrologic soil group C which defines the soil as having a slow infiltration rate when thoroughly wet.

Typical profile: A - 0 to 10 inches: loam
Bw - 10 to 25 inches: very channery loam
R - 25 to 60 inches: bedrock

The NRCS states Irigul is a well drained soil with very low available water storage of about 1.5 inches. Irigul is classified as hydrologic soil group D which defines soils as having a very low infiltration rate when wet. This means the soils in group D have a higher potential for run off.

Typical Profile: A1 - 0 to 6 inches: channery loam
A2 - 6 to 13 inches: very channery loam
R - 13 to 60 inches: bedrock

Rhone is a well drained soil with moderate available water storage of about 8.3 inches. The NRCS classifies Rhone as hydrologic soil group B which is defined as having moderate infiltration rate when thoroughly wet.

Typical Profile: A1 - 0 to 10 inches: loam
A2 - 10 to 39 inches: channery loam
C - 39 to 55 inches: very channery loam
R - 55 to 60 inches: bedrock

Soils occurring in the Project Area						
Location	**Map Unit**	**Map Unit Name**	**Composition**	**Typical Profile**		
Well Site	55	Parachute-Irigul complex	Parachute	*A - 0 to 10 inches*: **loam**	*Bw - 10 to 25 inches:* **very channery loam**	*Cr - 25 to 59 inches:* **bedrock**
			Irigul	*A - 0 to 6 inches:* **channery loam**	*C - 6 to 13 inches:* **very channery loam**	*R - 13 to 59 inches:* **bedrock**
Well Site	52	Northwater -Adel complex	Northwater	A - 0 to 28 inches: **loam**	Bt - 28 to 48 inches: **very channery loam**	R - 48 to 60 inches: **bedrock**
			Adel	A1 - 0 to 20 inches: **clay loam**	A2 - 20 to 31 inches: **loam**	C - 31 to 60 inches: **loam**
Access Road	56	Parachute-Irigul-Rhone association	Parachute	*A - 0 to 10 inches*: **loam**	*Bw - 10 to 25 inches:* **very channery loam**	*Cr - 25 to 59 inches:* **bedrock**
			Irigul	*A - 0 to 6 inches:* **channery loam**	*C - 6 to 13 inches:* **very channery loam**	*R - 13 to 59 inches:* **bedrock**
			Rhone	*A1 - 0 to 10 inches:* **loam**	*A2 - 10 to 39 inches:* **channery loam**	*C - 39 to 55 inches:* **very channery loam** *R - 55 to 60 inches:* **bedrock**

4) Pre-Disturbance Vegetation Composition

The Oil and Gas Location's dominant vegetation at the is Gambel's Oak of the shrub land plant community. The Location is native and undisturbed. Total surface area of initial disturbance is estimated at 7.6 acres for the proposed Oil and Gas Location. Site photos, taken September 27th, 2021, displaying the vegetation composition, are provided in **Appendix E**.

5) Reference Area and Vegetation Composition

The final land use will be non-crop land (rangeland). The vegetation communities present in the project area include sagebrush shrublands, mountain shrublands, and scattered aspen woodlands. Vegetation monitoring was conducted by WestWater scientists on October 6, 2021. Monitoring was conducted at the end of the growing season; however, plants were easily identifiable during the assessment. Results from the line-point intercept permanent transect showed an 82 percent foliar cover and no existing basal cover. The Vegetation Assessment is provided in **Appendix G**.

In accordance with Rule 304.b.(9).B.i., Rule 304.b.(9).B.ii., and Rule 304.b.(9).B.iii. Laramie designated a reference area for the CC 0697-15-08. Photographs depicting vegetation cover were taken on September 27th, 2021. Reference photographs and the topographic Reference Area Map are provided in **Appendix F**.

Reference Area Coordinates: Latitude: 39.523569°; Longitude: - 108.200499°

6) Known Weed Infestations

The CC 0697-15-08 is an undeveloped location with native vegetation. A weed infestation was not observed at the location.

7) Gathering Lines

The appropriate one-calls need to be made prior to digging. There is no pipeline reclamation associated with this project. Flowlines installed within the site perimeter will remain for the duration of the production phase of the project and will not be reclaimed during interim reclamation.

8) Access Road

The CC 0697-15-08 access road will be constructed on previously disturbed land. Interim reclamation will not occur for the site-specific access road. The access road will be utilized for production operations. No reclamation is proposed for the access road until final reclamation.

9) Removal of Drilling, Completion Equipment and all Associated Debris and Waste Materials

All debris and waste will be removed per COGCC Rule 1003.a. After completion activities, Laramie will reduce the size of the well pads to the minimum surface area needed for production facilities and future workovers, while providing for reshaping and stabilization of cut and fill slopes. In brief, interim reclamation will be accomplished by grading, leveling,

and seeding with a seed mix appropriate for the area. Interim reclamation will reduce the disturbed area at the proposed well site to approximately 1.8 acres after full development.

The well location and surrounding areas(s) will be cleared of all debris, materials, and trash not required for production. Other waste and spoil materials will be disposed at a local landfill.

All equipment not required for production will be removed from the well site. To maintain compliance, any material will be disposed of in accordance with the Laramie Energy 2021 Cascade Creek OGDP Waste Management Plan (OGDP WMP). All E&P waste disposed will adhere to the applicable 900 series rules. Disposal of E&P waste and non-E&P waste is specifically addressed in the OGDP WMP, including approved waste management disposal facilities.

Summary of Interim Reclamation Activities

Reclamation and remediation for interim reclamation will include the following actions:

- Decommissioning activities: all unnecessary equipment for the production and inspection activity will be removed.
- Laramie will install Construction Stormwater BMPs around the area (~5.8 acres) to be interim reclaimed
- Laramie will restore the proposed area to pre-development conditions by re-contouring and re-vegetating the site.
- Soil from the initial grading activities will be redistributed across the site and will be reseeded with a site-appropriate approved seed mix.
- Laramie will seed the reclaimed area utilizing the BLM Colorado River Valley Field Office recommend seed mix for that elevation.
- Laramie will monitor the site to ensure that a uniform vegetative cover has been established that reflects pre-disturbance or reference area forbs, shrubs, and grasses with total percent plant cover of at least eighty percent (80%) of pre-disturbance or reference area levels, excluding noxious weeds.

10) Management of Waste Material

Drilling pits will not be constructed or utilized at the CC 0697-15-08 well site; therefore, Rule 1003.d. is not applicable to the proposed Oil and Gas Location. To maintain compliance, any material will be disposed of in accordance with the Laramie Energy 2021 Cascade Creek OGDP Waste Management Plan (OGDP WMP). All E&P waste disposed will adhere to the applicable 900 series rules. Disposal of E&P waste and non-E&P waste is specifically addressed in the OGDP WMP, including approved waste management disposal facilities.

11) Interim Reclamation Areas – COGCC Rule 1003.b

When conducting interim reclamation activities, Laramie will utilize the CC 0697-15-08 Topsoil Protection Plan and the Dust Mitigation Plan. Laramie will initiate interim reclamation activities as early as possible and will grade the site as shown in the Proposed Reclamation drawing. All interim reclamation work will begin within six (6) months after the last well on the pad is completed and the site is turned over to Production Operations.

CC 0697-15-08 Well Site Pre-Production Operational Phases Time Estimates	
Stage	**Estimated Time Interval (Days)**
Initial Grading and Construction Activities	30
Drill Rig Mobilization	4
Drilling	110
Completions and Flowback Staging and Demobilization	20
Completions and Flowback	66
Total Days of Pre-Production Activities	**230**

The CC 0697-15-08 will initially generate 7.6 acres of new short-term disturbance (3.2 acres of Working Pad Surface) (**Layout Drawing – Appendix B**); however, the site will be reduced by 5.8 acres at the time of interim reclamation (**Interim Reclamation Plan – Appendix C**). Surface The long-term disturbance associated with this pad will be 1.8 acres for production operations.

12) Compaction Alleviation – COGCC Rule 1003.c.

Compaction can reduce water infiltration and also hinder the penetration of the sprouting seed. Compacted areas of the well site surface will be ripped. Ripping will be undertaken to eighteen (18) inches unless and to the extent bed rock is encountered at a shallower depth.

13) Recontouring

The Site is located on the Roan Plateau which lies within the Piceance Creek Basin and the Colorado Plateau physiographic region. The topography of the area consists of rolling hills atop a plateau. All cellars, rat holes and other boreholes at drilling locations unnecessary for further lease operations will be back-filled to conform to surrounding terrain after the drilling rig is released. Areas not necessary for production and future work-overs will be reshaped to resemble the original landscape contour. Stockpiled topsoil will be redistributed on the area to be reclaimed and seeded.

Construction stormwater BMPs will be placed around the area (~5.8 acres) to be interim reclaimed prior to commencement of any grading/ re-contouring activities. Stormwater BMP's will be re-installed after the pad is interim reclaimed. Straw-wattles and other

stormwater structures will be reused if possible. After re-contouring of the 5.8 acres to like pre-existing contours and topsoil is redistributed, revegetation efforts will be employed.

14) Re-establish and Stabilize Drainage Features

The proposed site location is owned by Laramie, the Operator. During interim reclamation of the well site, fill material will be pushed into cuts and up over the back slope. No depressions will be left that will trap water or form ponds. Upon completion of backfilling, recontouring, and leveling, the stockpiled topsoil will be spread evenly over the areas to be reclaimed. All disturbed surfaces will be seeded with a seed mixture recommended by the BLM. Seed mixtures are determined by elevation and predominant vegetation.

Permanent stabilization will be achieved by seeding and applying mulch as necessary. All areas of disturbance will be seeded to establish permanent vegetation when topsoil is returned during the reclamation process. Mulch will be applied as necessary to enhance the seeding process or to stabilize slopes to protect the new seeding. Hydro-seeding will be utilized in areas too steep to seed with conventional drills or broadcasters. Those areas that are predominantly (90-100%) rock faces that are vertical or near vertical will be left as is and monitored for slope stability.

Stormwater BMPs for the interim reclamation are depicted in the Interim Reclamation Plan (**Proposed Interim Reclamation Drawing** - **Appendix C)**. Stormwater BMPs for this phase include sediment trap with 6-inch outlet pipe, excelsior wattle, and earth containment berm.

15) Establish Desired Self-Perpetuating Plant Community – COGCC Rule 1003.e.

After completions and flowback of the proposed 18 wells, Laramie will reclaim 5.8 acres of the original disturbance area, contouring the reclaimed area to the natural slope or topography. Prior to construction, the location was classified as non-crop (rangeland). Laramie will implement Rule 1003.e.(2). and reclaimed land will be restored to rangeland. All disturbed surfaces will be seeded with a seed mixture recommended by the BLM. Seed mixtures are determined by elevation and predominant vegetation. For the CC 0697-15-08 well site, Laramie will utilize Mixed Mountain Shrubland The composition of the seed mix is described in of the *BLM Seed Mixes by Habitat Type* (**Appendix H**).

At a minimum Laramie will apply the BLM standard of 20 pounds per acre for drill seeding and 40 pounds per acre for broadcast/hydroseeding.

16) Seedbed Preparation and Seeding (1003.e.):

All disturbed surfaces will be seeded with a seed mixture recommended by the BLM. Seed mixtures are determined by elevation and predominant vegetation.

The seedbed will be prepared by disking and roller packing following the natural contours. Seed will be drilled on contours at a depth no greater than one-half inch (0.5 inch). In areas that cannot be drilled, seed will be broadcast at double the seeding rate and harrowed into the soil. Certified weed-free seed will be used. Seeding will occur within 24 hours following completion of final seedbed preparation to reduce the potential for establishment of weeds and before crusting of the soil, which can impede germination. A seedbed will be prepared with consideration of soil roughening on the steeper slopes to inhibit erosion. If the event that seeding is unsuccessful, Laramie will apply subsequent seedings. Amendments will be utilized when deemed necessary.

Time of seeding will depend on the season of when pre-production activities are finalized, and production operations have commenced. Seeding typically occurs immediately after reclamation and while the soil is still loose; however, if elevated temperatures and dry conditions exist seeding activities may be delayed until fall.

Site Stability During Interim Reclamation Activities

Laramie will ensure site stability of reclaimed areas. The site will be stable and exhibit none of the following:

1. Large rills or gullies.
2. Perceptible soil movement or head-cutting in drainages.
3. Slope instability on or adjacent to the reclaimed area.
4. Slopes shall be stabilized using appropriate reshaping and earthwork measures, including proper placement of soils and other materials.

17) Fencing

Laramie is currently fencing reclaim areas within the Cascade Creek Operations area with the highest likelihood of having livestock impacts to determine if livestock exclusion will increase and expedite vegetation establishment. If fencing is deemed to be advantageous, Laramie will review each site individually and determine if fencing will be beneficial to that site's reclamation. If the site is fenced, Laramie will incorporate wildlife friendly (as determined by CPW) fencing around those areas that are interim reclaimed.

18) Management of Invasive Plants (COGCC Rule 1003.f.)

Laramie will maintain weed control at the Oil and Gas Location in accordance with COGCC Rule 1003f. *Weed Control*. Ongoing post-interim reclamation maintenance and monitoring activities will take place when interim reclamation grading, and contouring have been completed. Such post activities include, but are not limited to, inspection and maintenance of protective vegetation and the monitoring of erosion prevention design measures. This

will be performed by Laramie and/or a consultant. Laramie will utilize the Garfield County Noxious Weed Management Plan (**Appendix I**).

Weed control measures will be conducted in compliance with the Colorado Noxious Weed Act, C.R.S. §35-5.5-115 and the current rules pertaining to the administration and enforcement of the Colorado Noxious Weed Act. Field personnel will monitor the site for weeds. If weeds are present on site, the Operations Supervisor will be notified, and a certified weed sprayer will inspect the site for noxious and invasive weeds and if discovered will treat them accordingly.

19) Reclamation Monitoring, Inspection, Maintenance, and Reporting

Inspections will be conducted to ensure that proper revegetation. Inspections will be conducted annually during growing season to determine the status of the reclaim and revegetation until at least 80% cover is established. Additional seed application or amendments will be applied if deemed necessary. Due to the arid climate and elevation, successful native vegetation establishment for interim reclamation takes at least three to five years in the Cascade Creek and Roan Plateau region area based on discussions with BLM Resource Specialists.

20) Interim reclamation completion notice, Form 4. - Rule 1003.e.(3).

Laramie will comply with Rule 1003.e.(3) and will submit a Sundry Notice, Form 4, describing interim reclamation mitigation efforts and plans. Photographs will be submitted, as described in Rule 1003.e.(3), to document interim reclamation status.

21) Site-Specific Interim Reclamation BMPs:

- All interim reclamation work will begin within six (6) months after the last well on the pad is completed and the site is turned over to Production Operations.
- Compacted areas of the well site surface will be ripped. Ripping will be undertaken to eighteen (18) inches unless and to the extent bed rock is encountered at a shallower depth.
- Laramie will properly characterize and dispose of all waste (i.e. the specific landfill/waste disposal location allows for acceptance of the waste stream) during interim reclamation activities.
- Laramie will apply a BLM approved seed mix.
- Areas of interim reclamation will be re-contoured to blend with natural surrounding topography. Subsoil will be applied first follow by topsoil. Each soil layer will be packed separately.
- Annual reclamation inspections will be conducted during growing season until at least 80% cover is established.
- Laramie personnel visit the site at least weekly. The personnel will monitor for weeds and if discovered, they will notify the Operations Supervisor. The Operations

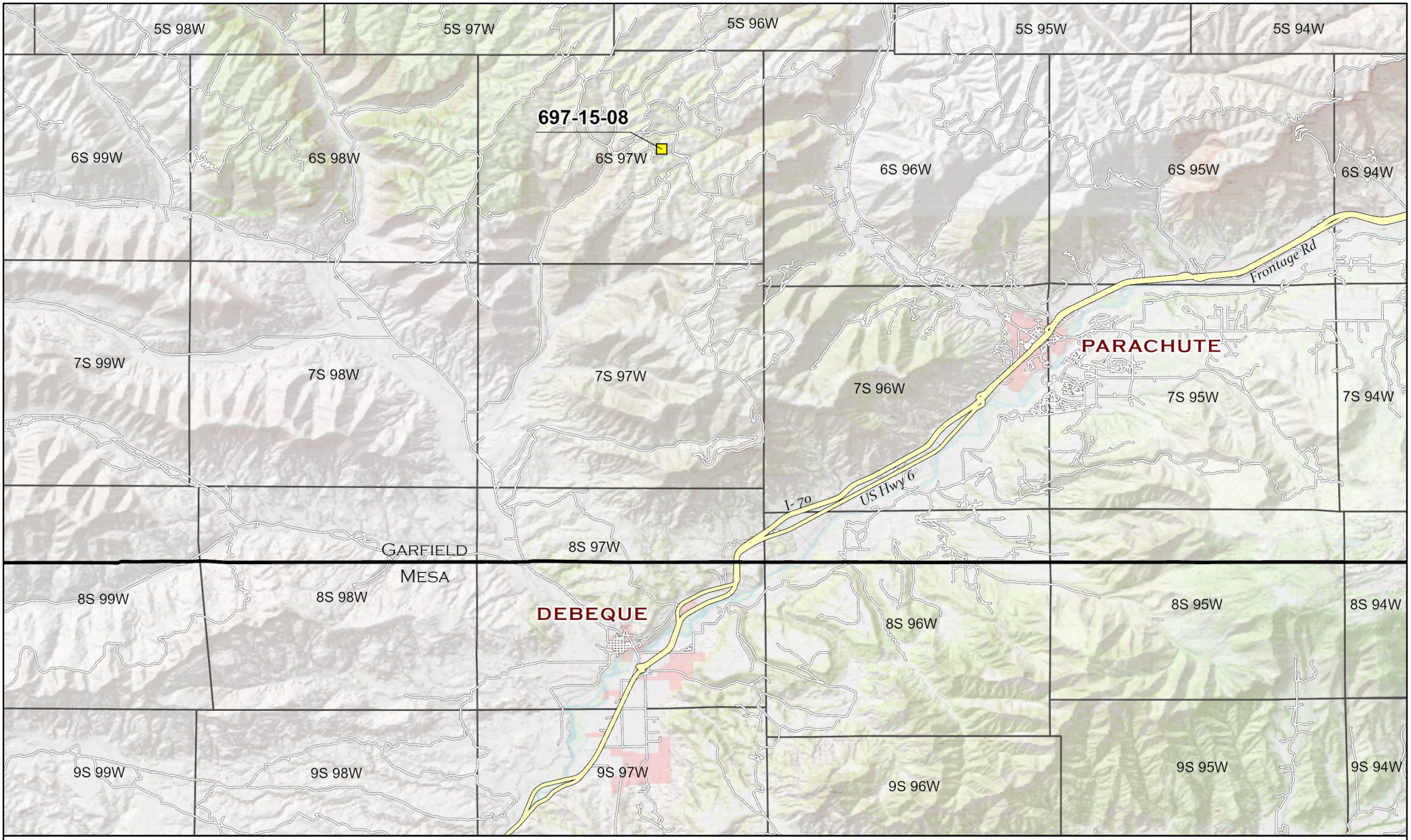
supervisor will notify a certified weed sprayer to inspect the site. If noxious or invasive weeds are detected the weeds will be treated accordingly. Weeds that are not invasive or noxious will be treated on an as needed basis.

- At a minimum Laramie will apply the BLM standard of 20 pounds per acre for drill seeding and 40 pounds per acre for broadcast/hydroseeding.

Appendix List	
Appendix A	Vicinity Map
Appendix B	Layout Drawings
Appendix C	Proposed Interim Reclamation Drawing
Appendix D	NRCS Soils Map
Appendix E	Location Photographs
Appendix F	Reference Area Map and Photos
Appendix G	Vegetation Assessment
Appendix H	BLM Seed Mixes by Habitat Type
Appendix I	Garfield County Noxious Weed Management Plan

Appendix A

Vicinity Map



LEGEND

- Site Location

0 3.5 7 mi

1 inch = 3.5 mi

N W E S

Project No:	021-036
Map By:	NDB
Date:	4/13/2021

Vicinity Map
Cascade Creek 697-15-08 Pad
Laramie Energy
SENE, Section 15, T6S R97W, 6th P.M.
Garfield County, Colorado

ENTRADA CONSULTING GROUP
330 Grand Avenue, Unit C
Grand Junction, CO 81501
970-549-1015

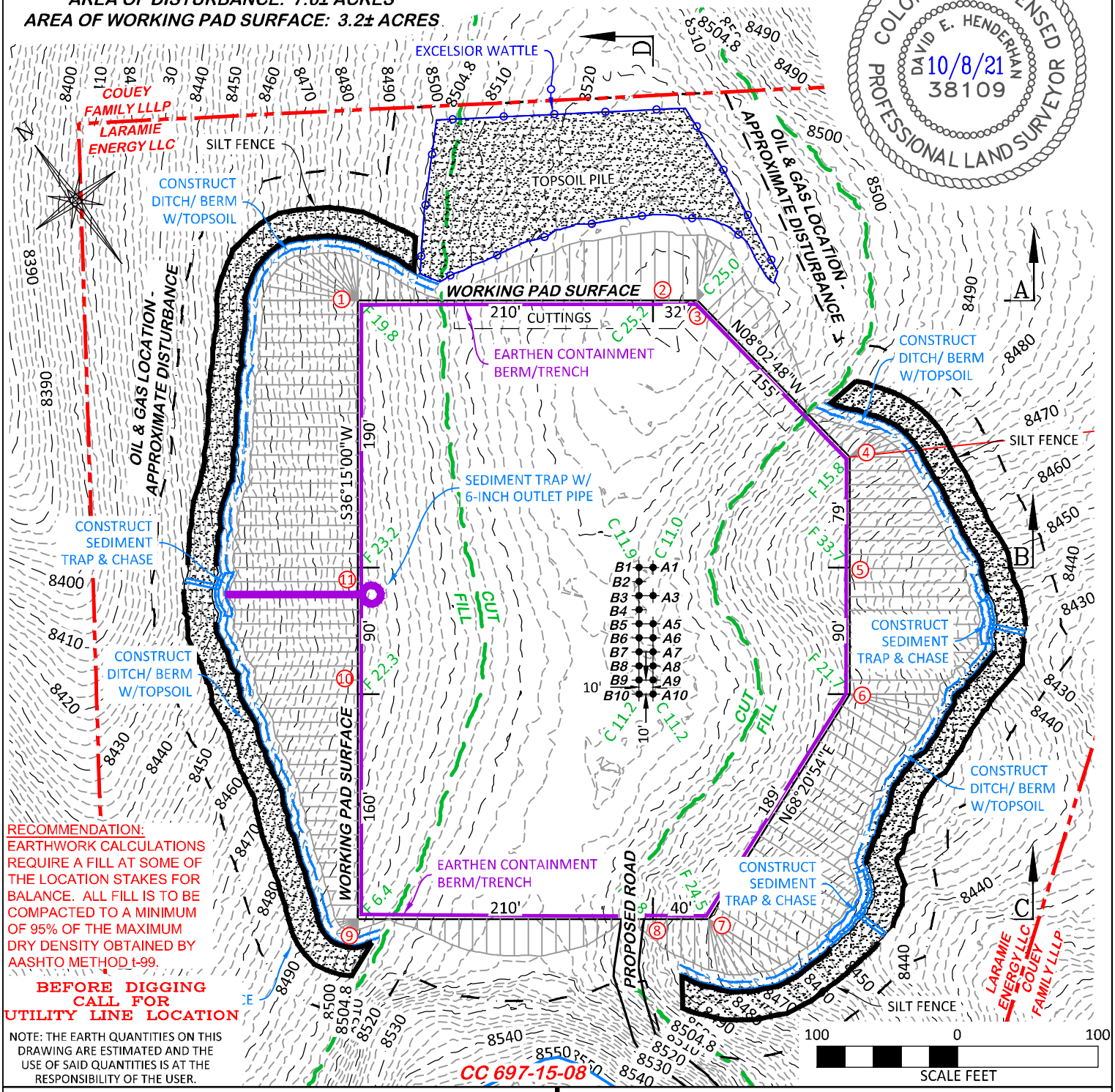
Figure
1

Appendix B

Layout Drawings

UNGRADED ELEVATION: 8515.8'
FINAL ELEVATION: 8504.8'
AREA OF DISTURBANCE: 7.6± ACRES
AREA OF WORKING PAD SURFACE: 3.2± ACRES

COLORADO LICENSED
DAVID E. HENDERHAN
10/8/21
38109
PROFESSIONAL LAND SURVEYOR



RECOMMENDATION:
EARTHWORK CALCULATIONS REQUIRE A FILL AT SOME OF THE LOCATION STAKES FOR BALANCE. ALL FILL IS TO BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY OBTAINED BY AASHTO METHOD t-99.

BEFORE DIGGING CALL FOR UTILITY LINE LOCATION

NOTE: THE EARTH QUANTITIES ON THIS DRAWING ARE ESTIMATED AND THE USE OF SAID QUANTITIES IS AT THE RESPONSIBILITY OF THE USER.

CC 697-15-08

ESTIMATED EARTHWORK BANK

ITEM	TOPSOIL	CUT	FILL	EXCESS
PAD	7,869 BCY	37,178 BCY	45,151 BCY	(15,842) BCY
PIT		NONE		NONE
TOTALS	7,869 BCY	37,178 BCY	45,151 BCY	(15,842) BCY

ESTIMATED EARTHWORK LOOSE (25% SWELL)

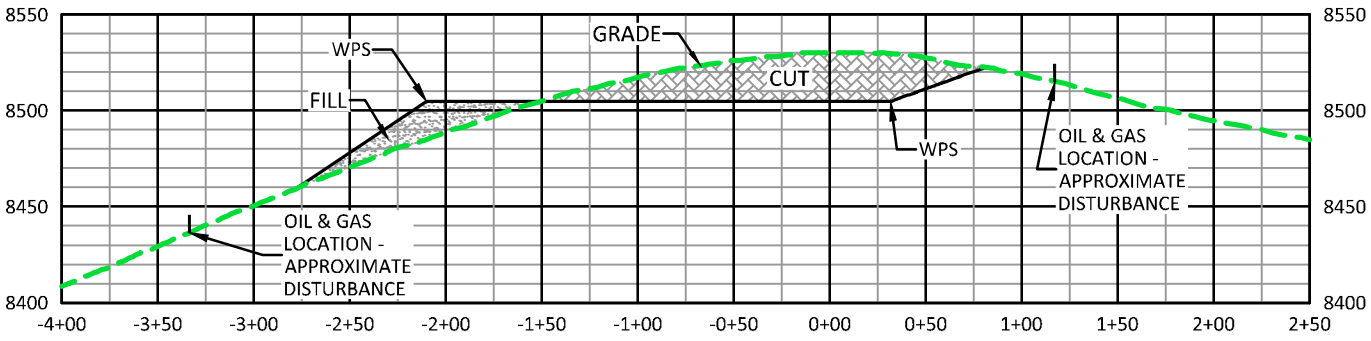
ITEM	TOPSOIL	CUT	FILL	EXCESS
PAD	7,869 BCY	46,473 LCY	45,151 LCY	(6,547) LCY
PIT		NONE		NONE
TOTALS	7,869 BCY	46,473 LCY	45,151 LCY	(6,547) LCY

LAYOUT DRAWING 1 OF 7

DRG GRIFFIN & ASSOCIATES, INC.
(307) 362-5028
1414 ELK ST., ROCK SPRINGS, WY 82901

DRAWN: 12/8/2020 - DEH	SCALE: 1" = 100'
REVISED: 10/4/2021 - DEH	DRG JOB No. 22026
COGCC RULE REVISIONS	304B(7)BI CONST

CONSTRUCTION LAYOUT DRAWING
ESTIMATED EARTHWORK
LARAMIE ENERGY, LLC.
CC 697-15-08
SENE, SECTION 15, T.6 S., R.97 W., 6th P.M., GARFIELD COUNTY, COLORADO



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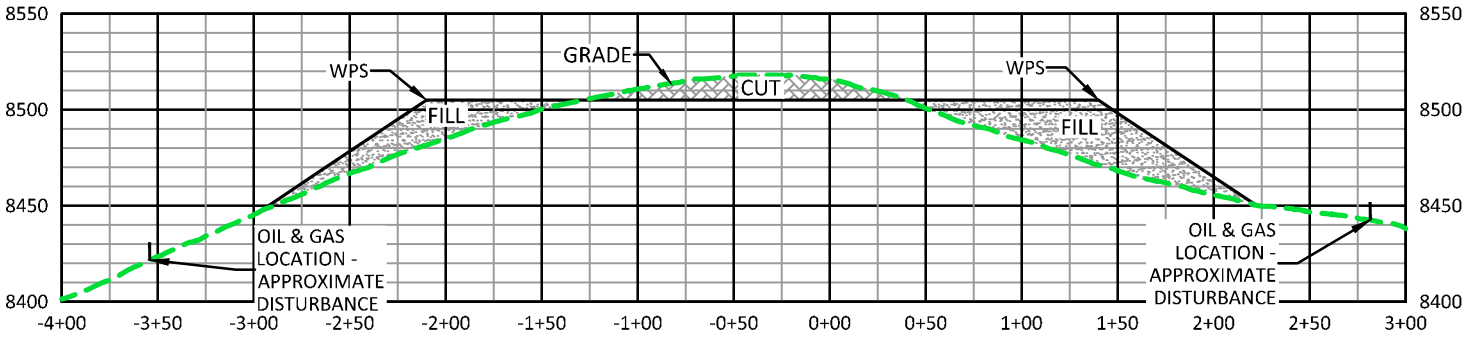

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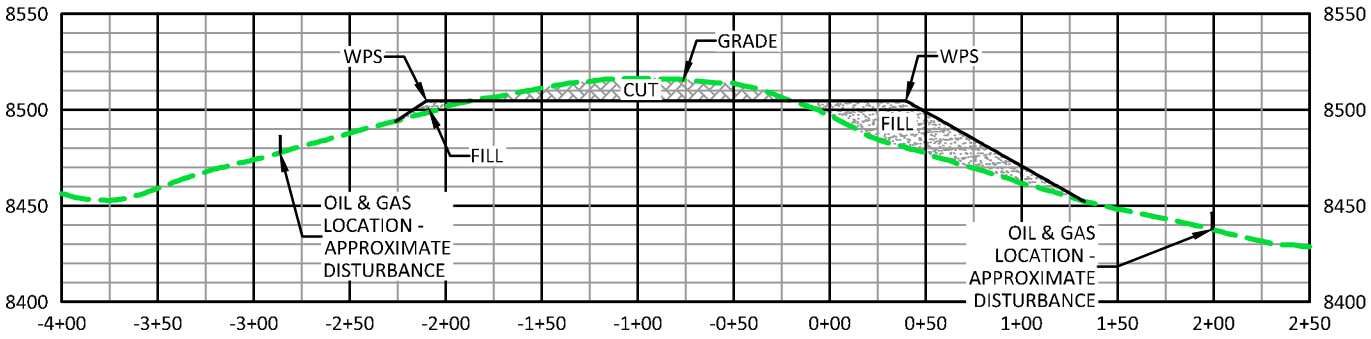

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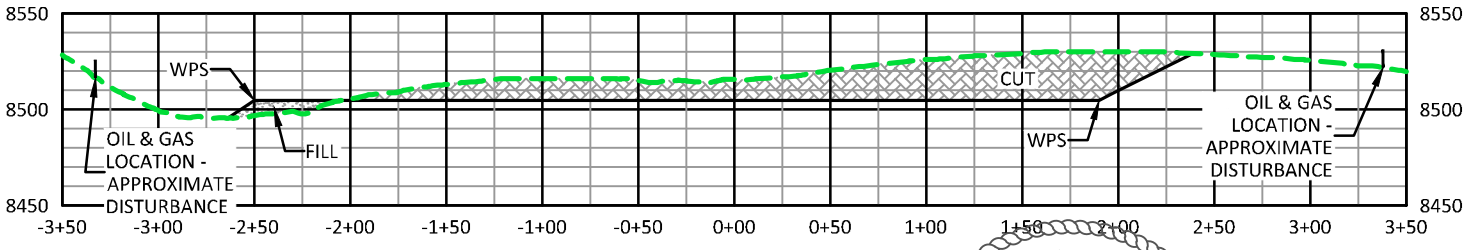


D

CUT SLOPES 2:1
FILL SLOPES 1.5:1

RECOMMENDATION:
EARTHWORK CALCULATIONS REQUIRE A FILL AT SOME OF THE LOCATION STAKES FOR BALANCE. ALL FILL IS TO BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY OBTAINED BY AASHTO METHOD t-99.

COLORADO LICENSED
DAVID E. HENDERHAN
10/8/21
38109
PROFESSIONAL LAND SURVEYOR

CC 697-15-08

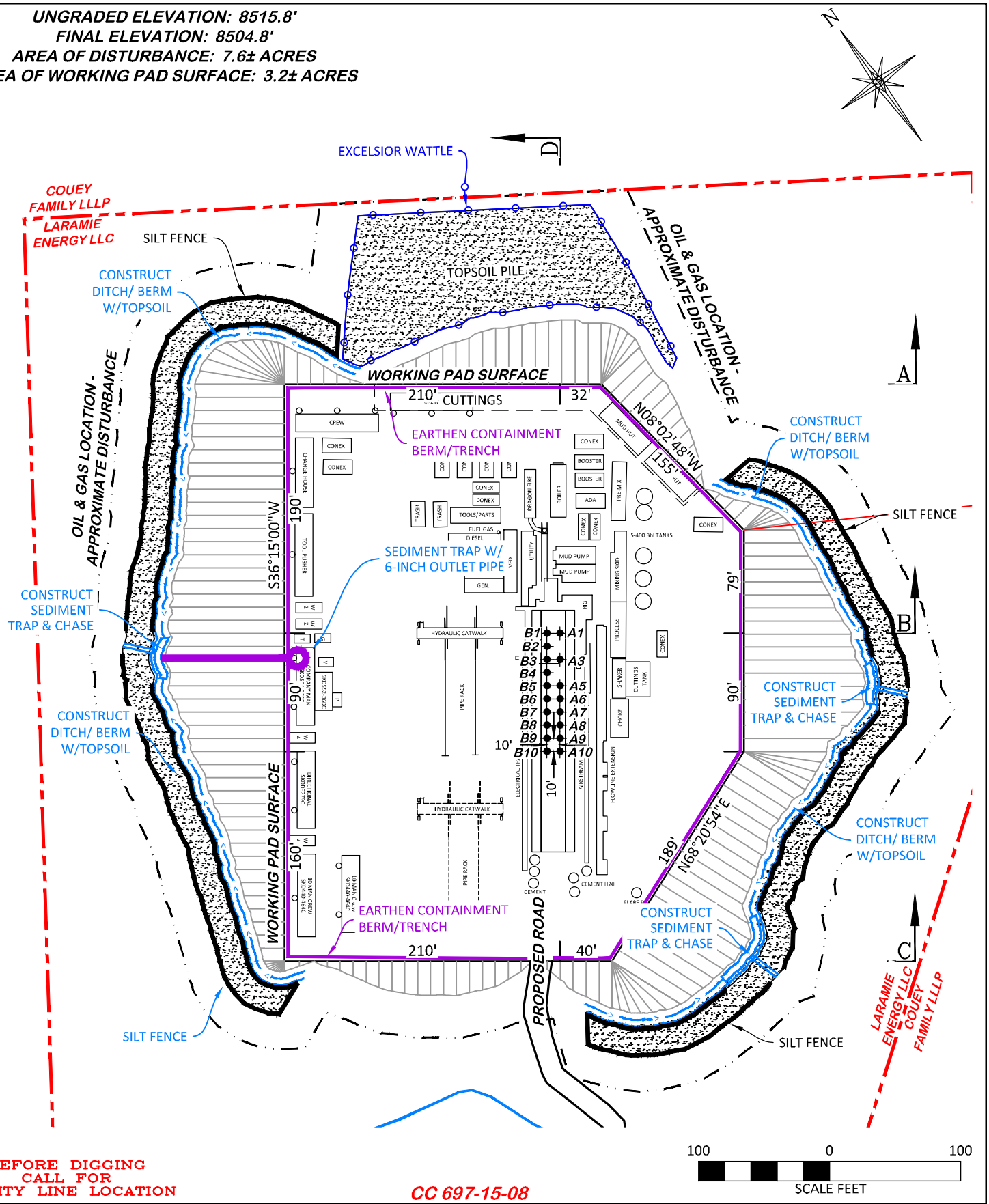
DRG GRIFFIN & ASSOCIATES, INC.
(307) 362-5028
1414 ELK ST., ROCK SPRINGS, WY 82901

DRAWN: 12/8/2020 - DEH	SCALE: H - 1" = 80' V - 1" = 80'
REVISED: 10/4/2021 - DEH	DRG JOB No. 22026
COGCC RULE REVISIONS	304B(7)BI XSEC

LAYOUT DRAWING 2 OF 7

CONSTRUCTION LAYOUT DRAWING
CROSS SECTIONS
LARAMIE ENERGY, LLC.
CC 697-15-08
SENE, SECTION 15, T. 6 S., R. 97 W., 6th P.M.,
GARFIELD COUNTY, COLORADO

UNGRADED ELEVATION: 8515.8'
FINAL ELEVATION: 8504.8'
AREA OF DISTURBANCE: 7.6± ACRES
AREA OF WORKING PAD SURFACE: 3.2± ACRES



BEFORE DIGGING
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UTILITY LINE LOCATION

CC 697-15-08

100 0 100
SCALE FEET

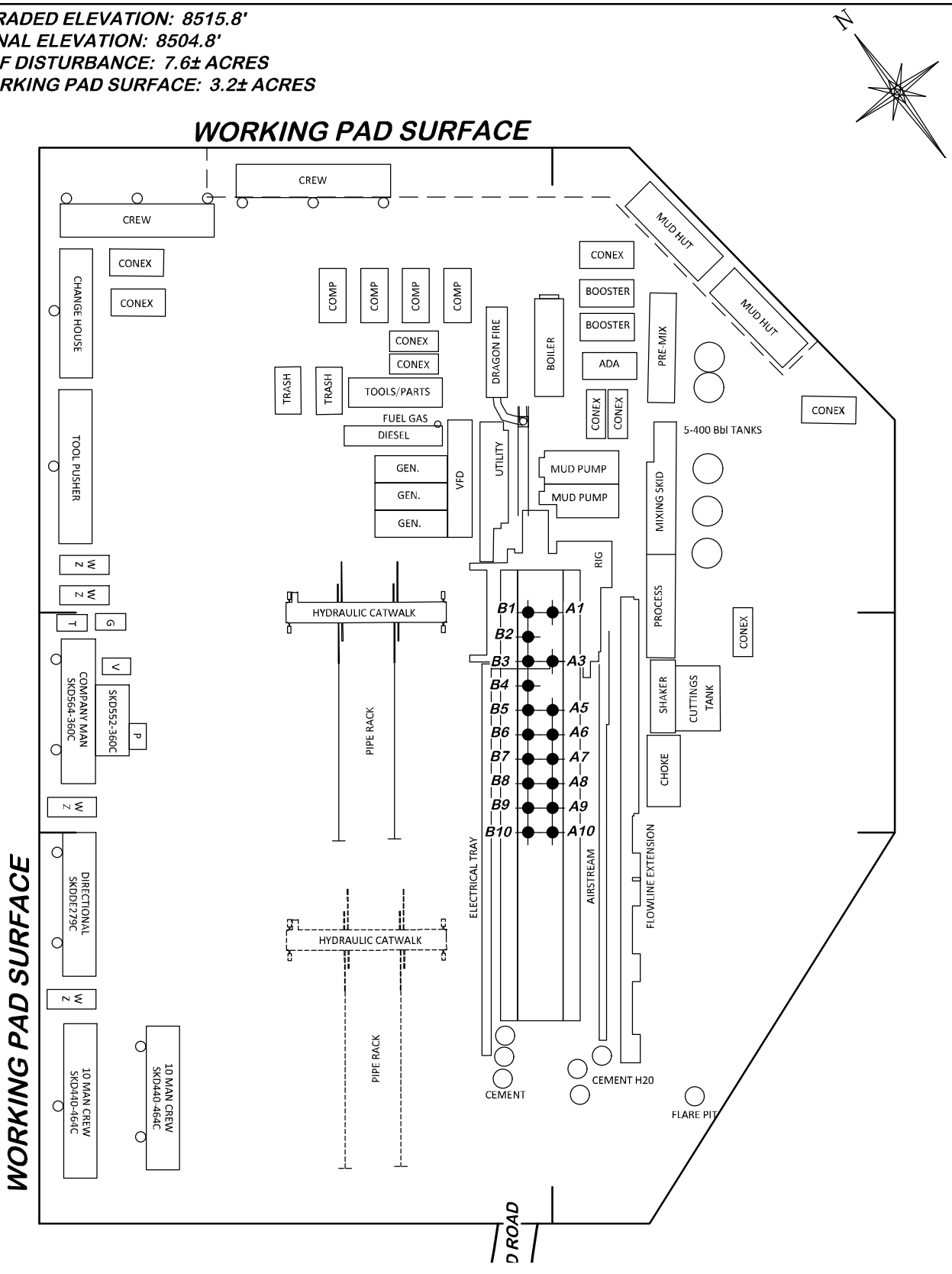
DRG RIFFIN & ASSOCIATES, INC.
(307) 362-5028
1414 ELK ST., ROCK SPRINGS, WY 82901

DRAWN: 12/8/2020 - DEH	SCALE: 1" = 100'
REVISED: 10/4/2021 - DEH	DRG JOB No. 22026
COGCC RULE REVISIONS	304B(7)BII RIG

LAYOUT DRAWING 3 OF 7

PRELIMINARY RIG LAYOUT
LARAMIE ENERGY, LLC.
CC 697-15-08
SENE, SECTION 15, T. 6 S., R. 97 W., 6th P.M., GARFIELD COUNTY, COLORADO

UNGRADED ELEVATION: 8515.8'
FINAL ELEVATION: 8504.8'
AREA OF DISTURBANCE: 7.6± ACRES
AREA OF WORKING PAD SURFACE: 3.2± ACRES



60 0 60
SCALE FEET

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LAYOUT DRAWING 4 OF 7

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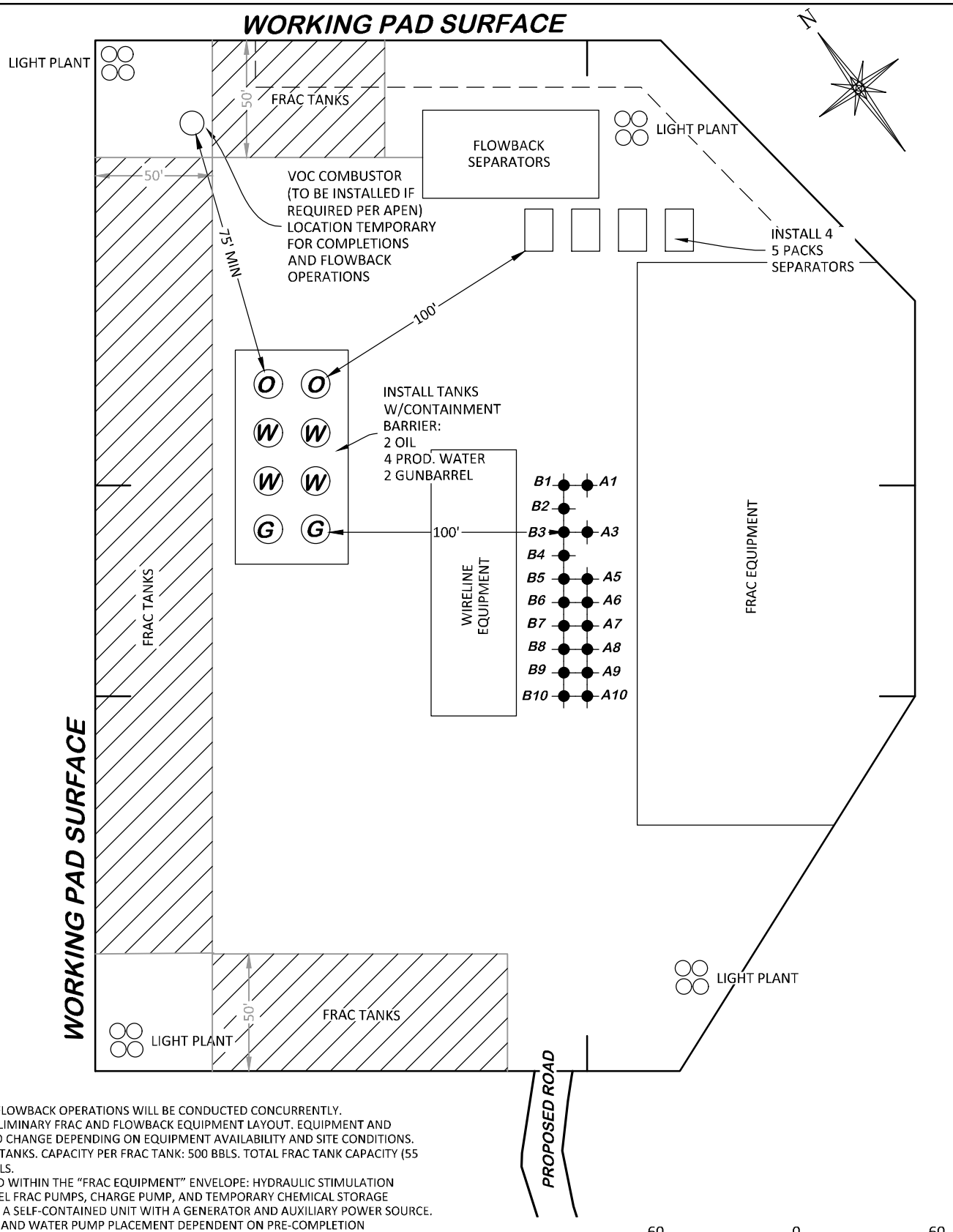
DRAWN: 12/8/2020 - DEH	SCALE: 1" = 60'
REVISED: 10/4/2021 - DEH	DRG JOB No. 22026
COGCC RULE REVISIONS	304B(7)BII RIG DET

RIG DETAIL
LARAMIE ENERGY, LLC.
CC 697-15-08
SENE, SECTION 15, T. 6 S., R. 97 W., 6th P.M., GARFIELD COUNTY, COLORADO



NOTES:
1. COMPLETIONS AND FLOWBACK OPERATIONS WILL BE CONDUCTED CONCURRENTLY.
2. EXHIBIT DEPICTS PRELIMINARY FRAC AND FLOWBACK EQUIPMENT LAYOUT. EQUIPMENT AND LAYOUT ARE SUBJECT TO CHANGE DEPENDING ON EQUIPMENT AVAILABILITY AND SITE CONDITIONS.
3. FIFTY-FIVE (55) FRAC TANKS. CAPACITY PER FRAC TANK: 500 BBLS. TOTAL FRAC TANK CAPACITY (55 FRAC TANKS): 27,500 BBLS.
4. EQUIPMENT LOCATED WITHIN THE "FRAC EQUIPMENT" ENVELOPE: HYDRAULIC STIMULATION CONTROL TRAILER, DIESEL FRAC PUMPS, CHARGE PUMP, AND TEMPORARY CHEMICAL STORAGE
5. EACH LIGHT PLANT IS A SELF-CONTAINED UNIT WITH A GENERATOR AND AUXILIARY POWER SOURCE.
6. ACTUAL WATER LINE AND WATER PUMP PLACEMENT DEPENDENT ON PRE-COMPLETION ALIGNMENT OF FRAC TANKS.
7. OPERATOR WILL UTILIZE HEAT PUMPS FOR WINTER OPERATIONS BASED ON LOCATION SPACING.
8. FLOWBACK SUPPORT TRAILER IS LOCATED WITHIN "FLOWBACK SEPARATORS" ENVELOPE.
9. PLEASE REFER TO THE CONSTRUCTION LAYOUT DRAWING FOR STORMWATER CONTROL MEASURES.

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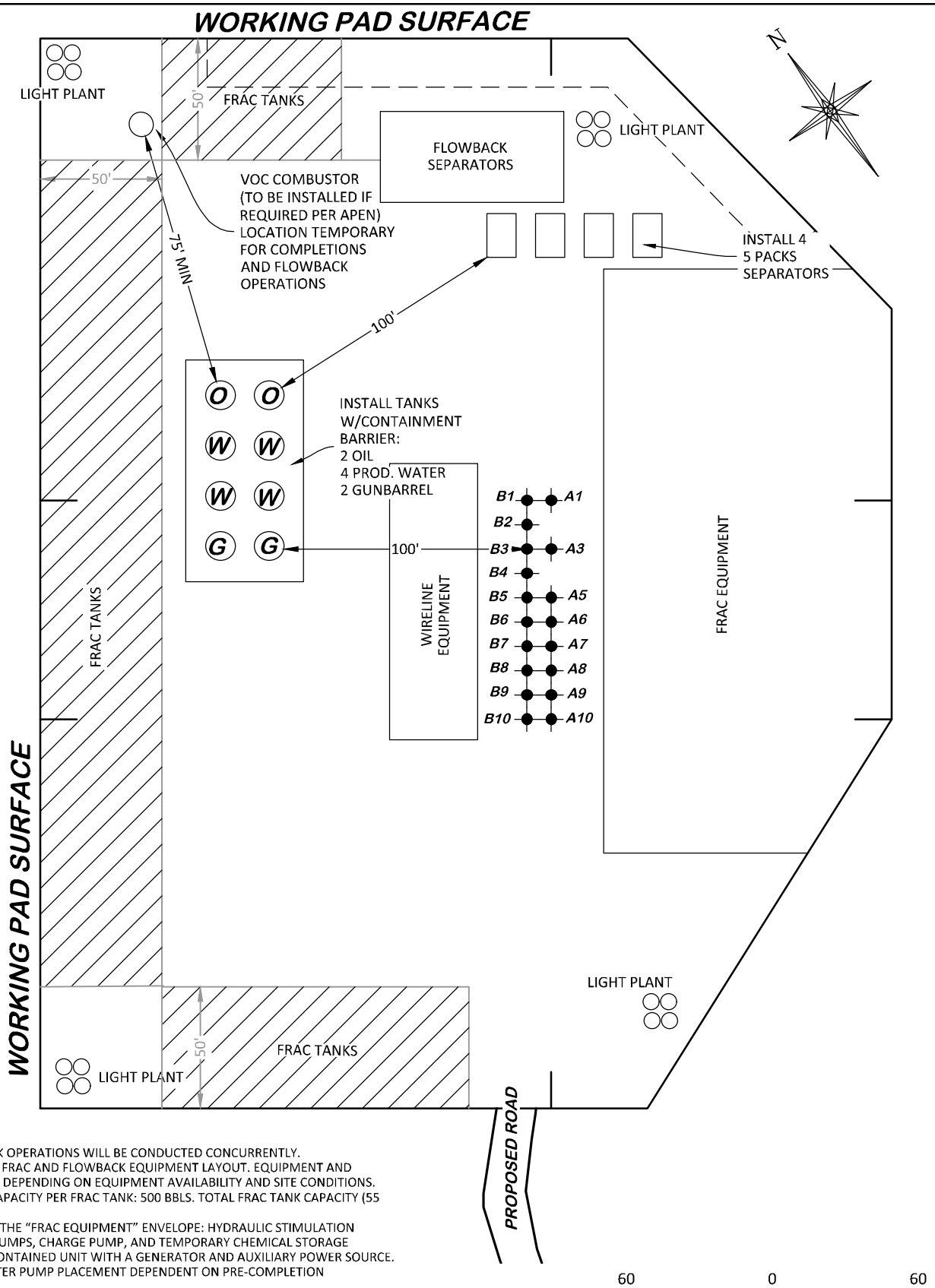
1414 ELK ST., ROCK SPRINGS, WY 82901

DRAWN: 7/28/2021 - DEH	SCALE: 1" = 60'
REVISED: 10/12/2021 - DEH	DRG JOB No. 22026
COGCC RULE REVISIONS	304b(7)Biii COMP

LAYOUT DRAWING 5 OF 7

PRELIMINARY WELL COMPLETIONS AND STIMULATION LAYOUT
LARAMIE ENERGY, LLC.
CC 697-15-08
SENE, SECTION 15, T. 6 S., R. 97 W., 6th P.M., GARFIELD COUNTY, COLORADO



NOTES:
1. COMPLETIONS AND FLOWBACK OPERATIONS WILL BE CONDUCTED CONCURRENTLY.
2. EXHIBIT DEPICTS PRELIMINARY FRAC AND FLOWBACK EQUIPMENT LAYOUT. EQUIPMENT AND LAYOUT ARE SUBJECT TO CHANGE DEPENDING ON EQUIPMENT AVAILABILITY AND SITE CONDITIONS.
3. FIFTY-FIVE (55) FRAC TANKS. CAPACITY PER FRAC TANK: 500 BBLS. TOTAL FRAC TANK CAPACITY (55 FRAC TANKS): 27,500 BBLS.
4. EQUIPMENT LOCATED WITHIN THE "FRAC EQUIPMENT" ENVELOPE: HYDRAULIC STIMULATION CONTROL TRAILER, DIESEL FRAC PUMPS, CHARGE PUMP, AND TEMPORARY CHEMICAL STORAGE
5. EACH LIGHT PLANT IS A SELF-CONTAINED UNIT WITH A GENERATOR AND AUXILIARY POWER SOURCE.
6. ACTUAL WATER LINE AND WATER PUMP PLACEMENT DEPENDENT ON PRE-COMPLETION ALIGNMENT OF FRAC TANKS.
7. OPERATOR WILL UTILIZE HEAT PUMPS FOR WINTER OPERATIONS BASED ON LOCATION SPACING.
8. FLOWBACK SUPPORT TRAILER IS LOCATED WITHIN "FLOWBACK SEPARATORS" ENVELOPE.
9. PLEASE REFER TO THE CONSTRUCTION LAYOUT DRAWING FOR STORMWATER CONTROL MEASURES.

60 0 60
SCALE FEET

CC 697-15-08

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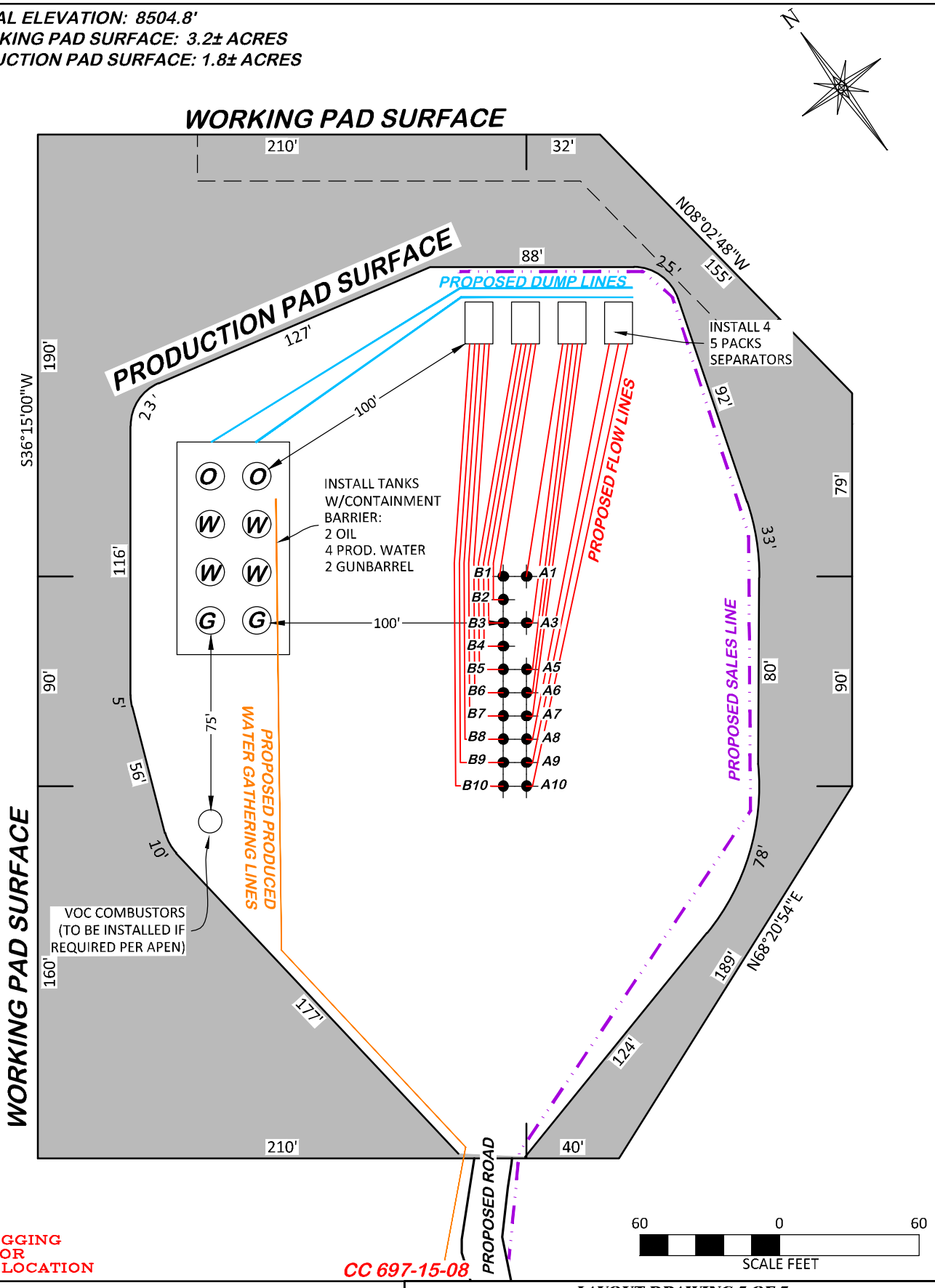
DRAWN: 7/28/2021 - DEH	SCALE: 1" = 60'
REVISED: 10/12/2021 - DEH	DRG JOB No. 22026
COGCC RULE REVISIONS	304b(7)Biv FLOWBACK

LAYOUT DRAWING 6 OF 7

FLOWBACK EQUIPMENT LAYOUT
LARAMIE ENERGY, LLC.
CC 697-15-08
SENE, SECTION 15, T. 6 S., R. 97 W., 6th P.M., GARFIELD COUNTY, COLORADO

FINAL ELEVATION: 8504.8'
AREA OF WORKING PAD SURFACE: 3.2± ACRES
AREA OF PRODUCTION PAD SURFACE: 1.8± ACRES



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(307) 362-5028

DRAWN: 4/30/2021 - DEH	SCALE: 1" = 50'
REVISED: 10/4/2021 - DEH	DRG JOB No. 22026
COGCC RULE REVISIONS	304B(7)BV FACILITY

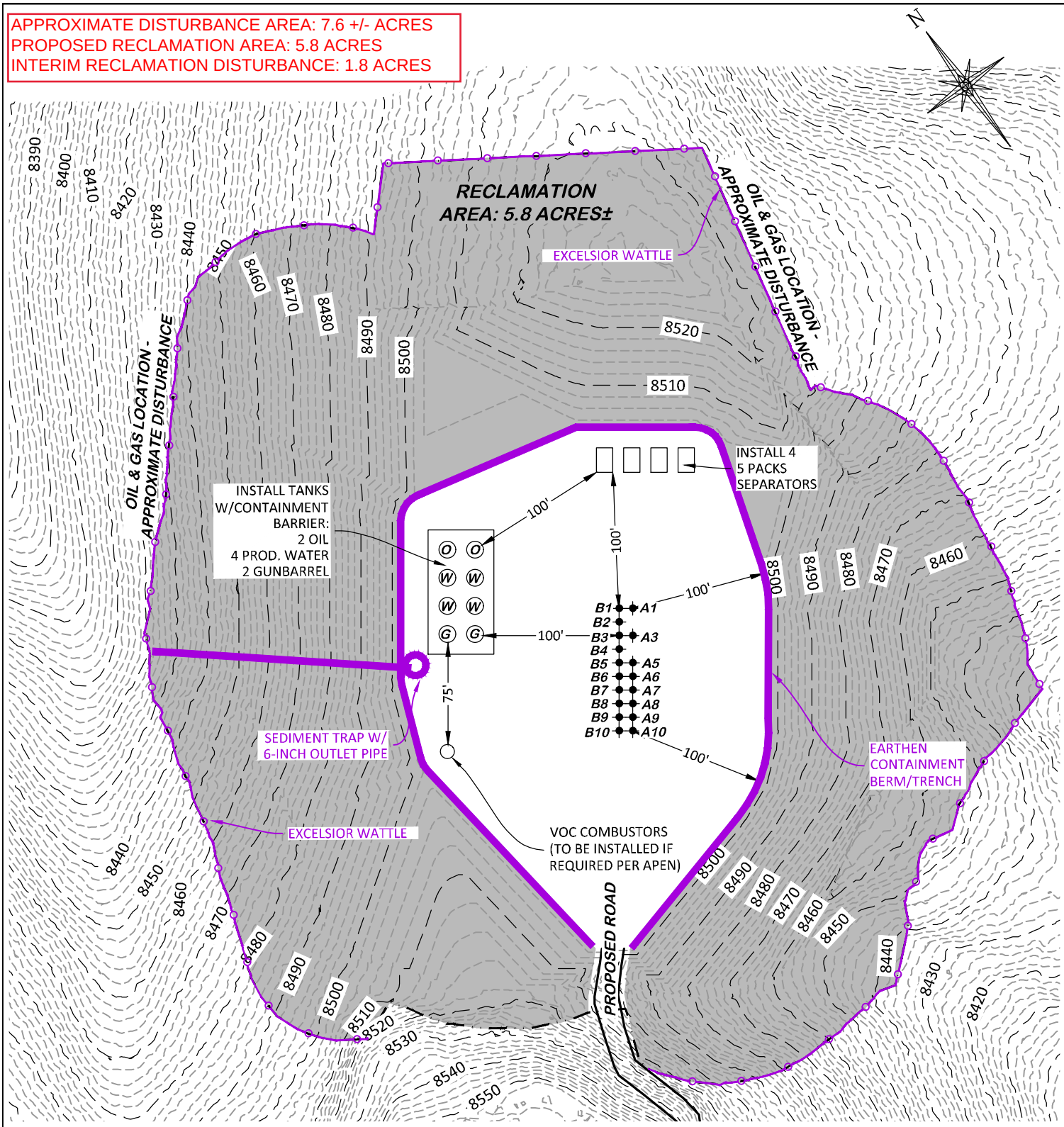
LAYOUT DRAWING 7 OF 7

PRELIMINARY FACILITY LAYOUT
LARAMIE ENERGY, LLC.
CC 697-15-08
SENE, SECTION 15, T. 6 S., R. 97 W., 6th P.M.,
GARFIELD COUNTY, COLORADO

Appendix C

Proposed Interim Reclamation Drawing

APPROXIMATE DISTURBANCE AREA: 7.6 +/- ACRES
PROPOSED RECLAMATION AREA: 5.8 ACRES
INTERIM RECLAMATION DISTURBANCE: 1.8 ACRES



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UTILITY LINE LOCATION

CC 697-15-08

100 0 100
SCALE FEET

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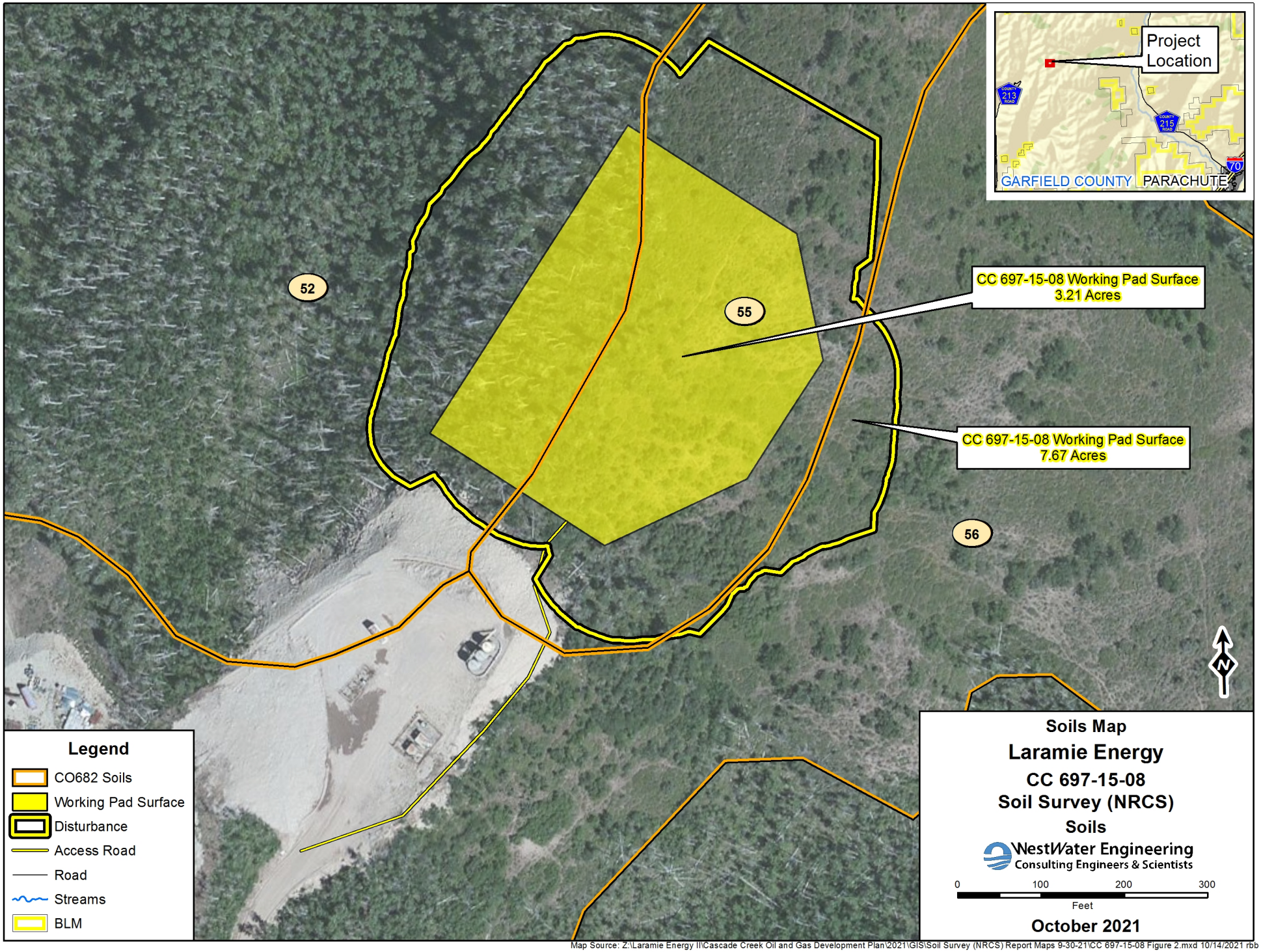
DRAWN: 12/8/2020 - DEH	SCALE: 1" = 100'
REVISED: 10/4/2021 - DEH	DRG JOB No. 22026
COGCC RULE REVISIONS	304C(16) RECLAMATION

INTERIM RECLAMATION PLAN

PROPOSED INTERIM RECLAMATION
LARAMIE ENERGY, LLC.
CC 697-15-08
SENE, SECTION 15, T. 6 S., R. 97 W., 6th P.M.,
GARFIELD COUNTY, COLORADO

Appendix D

NRCS Soils Map



Map Source: Z:\Laramie Energy II\Cascade Creek Oil and Gas Development Plan\2021\GIS\Soil Survey (NRCS) Report Maps 9-30-21\CC 697-15-08 Figure 2.mxd 10/14/2021 rbb

Appendix E

Location Photographs

AERIAL LOCATION PHOTO

AERIAL PHOTO SOURCE
AERIAL PHOTOGRAMMETRY
TAKEN 6/8/2011

LOCATION PHOTOS
9/27/2021

S W N

LOCATION AREA LOOKING WEST

N E S

LOCATION AREA LOOKING EAST

CC 697-15-08

DRG RIFFIN & ASSOCIATES, INC.
(307) 362-5028
1414 ELK ST., ROCK SPRINGS, WY 82901

DRAWN: 12/8/2020 - DEH	SCALE: NONE
REVISED: 9/30/2021 - DEH	DRG JOB No. 22026
MISC. REVISIONS	13 LOC PHOTO

LOCATION PHOTOS

LARAMIE ENERGY, LLC.
CC 697-15-08
SENE, SECTION 15, T. 6 S., R. 97 W., 6th P.M.,
GARFIELD COUNTY, COLORADO

Appendix F

Reference Area Map and Photos

AERIAL REFERENCE PHOTO

AERIAL PHOTO SOURCE
AERIAL PHOTOGRAMMETRY
TAKEN 6/8/2011

REFERENCE AREA PHOTOS
9/27/2021

S W N

REFERENCE AREA LOOKING WEST

N E S

REFERENCE AREA LOOKING EAST

CC 697-15-08

DRG RIFFIN & ASSOCIATES, INC.
(307) 362-5028
1414 ELK ST., ROCK SPRINGS, WY 82901

DRAWN: 12/8/2020 - DEH	SCALE: NONE
REVISED: 9/30/2021 - DEH	DRG JOB No. 22026
MISC. REVISIONS	14 REF PHOTO

REFERENCE AREA PHOTOS

LARAMIE ENERGY, LLC.
CC 697-15-08
SENE, SECTION 15, T. 6 S., R. 97 W., 6th P.M.,
GARFIELD COUNTY, COLORADO

Appendix G

Vegetation Assessment

LARAMIE ENERGY
CASCADE CREEK 0697-15-08 WELL PAD LOCATION
VEGETATION ASSESSMENT

Cover Photo: Reference vegetation transect.

Prepared for:
Laramie Energy, LLC
760 Horizon Drive, Suite 101
Grand Junction, CO 81506

Prepared by:

WestWater Engineering
2516 FORESIGHT CIRCLE, #1
GRAND JUNCTION, COLORADO 81505

October 2021

INTRODUCTION

Laramie Energy, LLC. requested that WestWater Engineering (WestWater) conduct a vegetation assessment for the Cascade Creek 0697-15-08 well pad location. The project would be located on private surface in Garfield County, Colorado in Section 15, Township 6 South, Range 97 West, Sixth Principal Meridian.

PROJECT AREA DESCRIPTION

The proposed CC 0697-15-08 well pad and access road would be located on a ridge at the upper elevations of the Roan Plateau. The terrain surrounding the project consists primarily of northerly sloping ridge tops and steep adjacent hillsides. Elevation in the project area is approximately 8,525 feet. The current primary uses of the land are natural gas development, rangeland, and wildlife habitat. The historical and current land use description at the site (per COGCC descriptions on Form 2A) is Rangeland.

The vegetation communities present in the project area include sagebrush shrublands, mountain shrublands, and scattered aspen woodlands. Common plants observed in the project area are described in Table 1.

Table 1. Common plant species occurring in the project area.

Common Name	*Scientific Name*	Abundance*	Habitat Type
Grasses			
Intermediate wheatgrass	*Thinopyrum intermedium*	xxx	Reclaimed/disturbed area
Kentucky bluegrass	*Poa pratensis*	xx	Mountain shrub, aspen woodland
Muttongrass	*Poa fendleriana*	xx	Mountain shrub, aspen woodland
Tall Wheatgrass	*Thynopyrum ponticum*	xx	Reclaimed/disturbed area
Sandberg bluegrass	*Poa secunda*	xx	Mountain shrub, aspen woodland
Slender Wheatgrass	*Elymus trachycaulus*	xx	Reclaimed/disturbed area
Smooth Brome	*Bromus inermis*	xxx	Reclaimed/disturbed area
Forbs			
American vetch	*Vicia americana*	xxx	Mountain shrub
Arrowleaf balsamroot	*Balsamorhiza sagitta*	x	Mountain shrub, aspen woodland
Badlands mule-ears	*Scabrethia scabra*	xxx	Mountain shrub
Bluntseed sweetroot	*Osmorhiza depauperata*	xxx	Mountain shrub, aspen woodland
Canadian white violet	*Viola canadensis*	xxx	Aspen woodland
Common dandelion	*Taraxacum officinale*	xx	Mountain shrub, aspen woodland

Table 1. Common plant species occurring in the project area.

Common Name	*Scientific Name*	Abundance*	Habitat Type
Common yarrow	*Achillea millefolium*	xxx	Reclaimed/disturbed area, mountain shrub, aspen woodland
Lambstongue ragwort	*Senecio integerrimus*	xxx	Mountain shrub
Larkspur	*Delphinium sp.*	xxx	Mountain shrub, aspen woodland
Silvery lupine	*Lupinus argenteus*	xxx	Mountain shrub, aspen woodland
Stinging nettle	*Urtica dioica*	xx	Mountain shrub, aspen woodland
Western valerian	*Valeriana occidentalis*	xxx	Mountain shrub
Woods' Rose	*Rosa woodsii*	xxx	Mountain shrub, aspen woodland
Shrubs/Trees			
Chokecherry	*Prunus virginiana*	xx	Mountain shrub, aspen woodland
Gambel's oak	*Quercus gambelii*	xx	Mountain shrub
Mountain mahogany	*Cercocarpus montanus*	xxx	Mountain shrub
Mountain snowberry	*Symphoricarpos oreophilus*	xxx	Mountain shrub
Quaking aspen	*Populus tremuloides*	xxx	Mountain shrub, aspen woodland
Rocky mountain maple	*Acer glabrum*	xx	Mountain shrub, aspen woodland
Rubber rabbitbrush	*Ericameria nauseosa*	x	Reclaimed/disturbed area, mountain shrub
Utah serviceberry	*Amelanchier utahensis*	xxx	Mountain shrub
Wyoming sagebrush	*Artemisia tridentata* ssp. *wyomingensis*	x	Mountain shrub
Yellow rabbitbrush	*Chrysothamnus viscidiflorus*	x	Mountain shrub

*Abundance:
xxx= High frequency; with uniform distribution across project area.
xx= Moderate frequency; occurrence scattered throughout project area.
x= Infrequent; only a small number of individuals noted within project area.

VEGETATION ASSESSMENT

Sampling methods

The vegetation sampling protocol used involves a modified "line point-intercept method" based on the National Park Service Fire Monitoring Handbook (USDI National Park Service 2003) and Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems, Volume 1: Core Methods (Herrick et al 2015). The line point-intercept method uses the contact of a point to measure cover. The theory behind this method is that if an infinite number of points are placed

in a two-dimensional area, the exact cover of a plant species can be determined by counting the number of points that intersect that species.

One reference transect was established within the near the well pad in a similar vegetation community. The following techniques were used to collect the sample data:

1. Each sample site was randomly selected within an area representative of the vegetative community being affected by the project.
2. The transect was designated Transect 1 (reference).
3. A metal rebar stake was placed in the ground to anchor a 50-meter measuring tape (0-meters) and the tape extended across the vegetation on the site. A second rebar stake was placed and anchored the 50-meter end of the tape.
4. The beginning and ending point of the transect was recorded using a GPS receiver. Azimuths from the 0-meter to the 50-meter point were recorded.
5. Photographs were taken along the transect that recorded vegetation condition from 0 to 50-meters.
6. Point count data were collected at 1.0-meter intervals along a 50-meter tape measure using a thin, straight metal rod for a total of fifty samples taken along the transect.
7. The first plant species encountered was recorded in the "Top Layer" column. Subsequent species and litter were recorded in the "Lower Canopy Layers" columns. Each species was recorded by 4 letter code (first two letters each of genus and species); unique species were recorded only once per sample point.
8. Ground cover was recorded as a species code (for a basal intercept), rock, bedrock, moss, soil, embedded litter, or duff as defined by the sampling protocol.
9. Other species of vegetation incidentally observed in the sample area were recorded (in addition to those recorded during sampling).

Identification of plant species was aided by using pertinent published field guides (Ackerfield 2015, Whitson et al. 2006, Weber and Wittmann 2012).

Results

Vegetation monitoring was conducted by WestWater scientists on October 6, 2021. Monitoring was conducted at the end of the growing season; however, plants were easily identifiable during the assessment. Percent foliar cover and percent basal cover results from the line-point intercept permanent transect are provided in Table 2, along with UTM locations and magnetic azimuth from 0-meters to 50-meters for each transect.

Table 2. Percent foliar and basal cover for vegetation monitoring transect.

Transect 1 – Reference Transect		
Transect Location (UTM Zone 12, NAD83 datum) 0-meter terminus: 4378625N, 740637E 50-meter terminus: 4378581N, 740608E Azimuth (true north): 62°		
Group	**% Foliar Cover**	**% Basal Cover**
Native Perennial Graminoids	16	
Introduced Perennial Graminoids	0	
Native Annual Graminoids	0	
Introduced Annual Graminoids	0	
Native Perennial Forbs	2	
Introduced Perennial Forbs	0	
Native Annual/Biennial Forbs	0	
Introduced Annual/Biennial Forbs	0	
Subshrubs/Shrubs	64	
Trees	0	
Total	**82**	
Bare ground	**16**	

The reference transect is located in a mixed mountain shrubland plant community composed primarily of mountain snowberry, mountain and Wyoming sagebrush species, yellow rabbitbrush with an understory of native perennial grass species. A summary of plant species recorded along the transect and their percent foliar cover along is displayed in Table 3.

Table 3. Plant species recorded along reference transect.

Common Name	***Scientific Name***	**Percent Foliar Cover**
Aspen fleabane	*Erigeron speciosus*	2
Gambel oak	*Quercus gambelii*	50
Geyer's sedge	*Carex geyeri*	8
Green needlegrass	*Nassella viridula*	2
Kentucky bluegrass	*Poa pratensis*	6
Roundleaf snowberry	*Symphoricarpos rotundifolius*	10
Yellow rabbitbrush	*Chrysothamnus viscidiflorus*	4
	Total	**82**

REFERENCES

Ackerfield, J. 2015. Flora of Colorado. Colorado State University Herbarium, Brit Press.

Herrick, J.E., J.W. Van Zee, S.E. McCord, E.M. Courtright, J.W. Karl, and L.M. Burkett. 2015. Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems, Second Edition, Volume 1: Core Methods. USDA-ARS Jornada Experimental Range, Las Cruces, NM.

USDI, National Park Service. 2003. Fire Monitoring Handbook. Boise (ID): Fire Management Program Center, National Interagency Fire Center. 274p.

Weber, W. A., and R. C. Wittman. 2012. Colorado Flora, Western Slope. Fourth Edition. University Press of Colorado, Boulder.

Whitson, T. D. (editor), L. C. Burrill, S. A. Dewey, D. W. Cudney, B. E. Nelson, R. D. Lee, and Robert Parker. 2006. Weeds of the West, Ninth Edition. Western Society of Weed Science in cooperation with Cooperative Extension Services, University of Wyoming. Laramie.

Appendix H

BLM Seed Mixes by Habitat Type

BLM MENU-BASED NATIVE RECLAMATION SEED MIXES BY HABITAT TYPE
(October 2021)

- All seed placed on public land shall be approved by the BLM and meet BLM standards for species and seeding rate for the specific habitat type within the project area.
- Seed mix labels and test results shall be provided to the BLM for approval before application.
- All seed shall be tested by a registered seed analyst for viability/germination and noxious weeds at an official state seed analysis lab, within one year of acceptance date.
- Certification shall include a minimum germination rate of 80%, a minimum purity of 90%, source-identification, no noxious weed seeds and no more than 0.5% weight of other weed seeds. Mulch shall be certified weed free. (IM 2006-073)
- For drill-seeding, small seeds (>500,000 per pound) must be packaged separately to allow for separate application and planted no deeper than 0.25 inch.
- The seeding rates in the following tables are based on **60 pure live seeds (PLS) per square foot** for drill-seeding. This is doubled to **120 PLS per square foot** for broadcast-seeding or hydroseeding. For hydroseeding/hydromulching, application of seeds and mulch shall be two separate steps.

Low Elevation Salt-Desert Shrub/Basin Big Sagebrush (8 to 12 inches precipitation)

Common Name	*Species Name*	*Variety*	*Seeds per Pound*	*PLS lbs/acre*
Plant All of the Following Grasses (15% of Mix Each, 45% Total)				
Indian Ricegrass	*Achnatherum hymenoides*	Native Colorado/Utah source or Nezpar, Paloma, Rimrock	141,000	2.8
Alkali Sacaton	*Sporobolus airoides*	Native Colorado/Utah source preferred	5,000,000	0.08
Sand Dropseed	*Sporobolus cryptandrus*	UP* Dolores or native Colorado/Utah source preferred	1,750,000	0.2
And Three of the Following Grasses (10% of Mix Each, 30% Total)				
Bottlebrush squirreltail	*Elymus elymoides*	Fish Creek, Toe Jam Creek, Wapiti	192,000	1.4
Salina Wildrye	*Leymus salinus*	UP* Dolores or native Colorado/Utah source preferred	125,000 (estimate)	2.1
Western Wheatgrass	*Pascopyrum smithii*	UP* variety or Arriba, Recovery, Rodan, Rosana	110,000	2.4
Purple Three-awn	*Aristida purpurea*	Native Colorado/Utah source preferred	275,000	1.0
And Two of the Following Shrubs (5% of Mix Each, 10% Total)				
Fourwing Saltbush	*Atriplex canescens*	Native Colorado/Utah source preferred	50,000	3.9
Shadscale Saltbush	*Atriplex confertifolia*	Native Colorado/Utah source, or Rincon, Snake River, Wytana	60,000	3.3
Gardner's Saltbush	*Atriplex gardneri*	Native Colorado/Utah source preferred	111,500	1.8

And Three of the Following Forbs/Subshrubs (5% of Mix Each, 10% Total) *					
Common Name	***Scientific Name***	***PLS lbs/acre***	***Common Name***	***Scientific Name***	***PLS lbs/acre***
Broom Snakeweed	*Gutierrezia sarothrae*	0.08	Scarlet Globemallow	*Sphaeralcea coccinea*	0.26
Lewis Blue Flax	*Linum lewisii*	0.8	Western Yarrow	*Achillea millefolium*	0.04
Scarlet Gilia	*Ipomopsis aggregata*	0.36	Winterfat	*Krascheninnikovia lanata*	1.06

*Preferred source = Uncompahgre Project (UP), Kathy See, nativeplant@upartnership.org, 970-240-9498, 970-901-8247 if available; otherwise another native Colorado/Utah source is preferred.

Pinyon-Juniper Woodland or Wyoming Sagebrush Shrubland
(12 to 16 inches precipitation)

Common Name	*Species Name*	*Variety*	*Seeds per Pound*	*PLS lbs/acre*
Plant <u>All</u> of the Following Grasses (15% of Mix Each, 45% Total)				
Indian Ricegrass	*Achnatherum hymenoides*	Native Colorado/Utah source, or Nezpar, Paloma, Rimrock	141,000	2.8
Thickspike Wheatgrass	*Elymus lanceolatus*	Critana, Schwendimar	154,000	2.5
Western Wheatgrass	*Pascopyrum smithii*	UP* or native Colorado/Utah source or Arriba, Recovery, Rodan, Rosana	110,000	3.6
And <u>Three</u> of the Following Grasses (10% of Mix Each, 30% Total)				
Bottlebrush Squirreltail	*Elymus elymoides*	Native Colorado/Utah source, or Fish Creek, Toe Jam Creek, Wapiti	192,000	1.4
Slender Wheatgrass	*Elymus trachycaulus*	San Luis	159,000	1.6
Sandberg Bluegrass	*Poa secunda "sandbergii"*	UP* Colorado-Sims Mesa or High Mesa	882,000	0.3
Bluebunch Wheatgrass	*Pseudoroegneria spicata*	Native Colorado/Utah source, or Anatone, Goldar	140,000	2.8
Needle-and-Thread	*Achnatherum nelsonii Hesperostipa comata*	Native sources within 500 miles preferred	150,000/ 225,000/ 115,000	0.9/ 0.6/ 1.1
Sand Dropseed	*Sporobolus cryptandrus*	UP* Dolores or native Colorado/Utah source preferred	1,750,000	0.1
And <u>Two</u> of the Following Shrubs/Subshrubs (5% of Mix Each, 10% Total)				
Fourwing Saltbush	*Atriplex canescens*	Native Colorado/Utah source preferred	50,000	2.6
Broom Snakeweed	*Gutierrezia sarothrae*	Native Colorado/Utah source preferred	1,600,000	0.1
Winterfat	*Krascheninnikovia lanata*	Native Colorado/Utah source preferred	123,000	1.1

And <u>Five</u> of the Following Forbs (3% of Mix Each, 15% Total) *

Common Name	*Scientific Name*	*PLS lbs/acre*	*Common Name*	*Scientific Name*	*PLS lbs/acre*
American Vetch	*Vicia americana*	2.4	Prairie Coneflower	*Ratibida columnifera*	0.11
Arrowleaf Balsamroot	*Balsamorhiza sagittata*	1.2	Scarlet Gilia	Ipomopsis aggregata	0.18
Blanketflower	*Gaillardia aristata*	0.5	Scarlet Globemallow	*Sphaeralcea coccinea*	0.13
Fernleaf Biscuitroot	*Lomatium dissectum*	1.5	Silvery Lupine	*Lupinus argenteus*	3.6
Great Basin Penstemon	*Penstemon subglaber*	0.19	Sulphur Buckwheat	*Eriogonum umbellatum*	0.3
Hairy Goldenaster	*Heterotheca villosa*	0.1	Thickleaf Penstemon	*Penstemon pachyphyllus*	0.3
Hoary Tansy-aster	*Machaeranthera canescens*	0.15	Utah Sweetvetch	*Hedysarum boreale*	1.4
Lewis Blue Flax	*Linum lewisii*	0.4	Western Yarrow	*Achillea millefolium*	0.02

*Preferred source = Uncompahgre Project (UP), Kathy See, nativeplant@upartnership.org, 970-240-9498, 970-901-8247 if available; otherwise another native Colorado/Utah source is preferred.

Mixed Mountain Shrubland – Xeric (Mountain-Mahogany/Bitterbrush)
(14 to 18 inches precipitation)

Common Name	*Species Name*	*Variety*	*Seeds per Pound*	*PLS lbs/acre*
Plant Three of the Following Grasses (15% of Mix Each, 45% Total)				
Indian Ricegrass	*Achnatherum hymenoides*	UP* White River preferred, or Nezpar, Paloma, Rimrock	141,000	2.8
Arizona Fescue	*Festuca arizonica*	Colorado/Utah source; Redondo	550,000	0.7
Slender Wheatgrass	*Elymus trachycaulus*	San Luis	159,000	1.6
Bluebunch Wheatgrass	*Pseudoroegneria spicata*	Native Colorado/Utah source, or Anatone, Goldar	140,000	2.8
And Two of the Following Grasses (10% of Mix Each, 20% Total)				
Bottlebrush Squirreltail	*Elymus elymoides*	Native Colorado/Utah source, or Fish Creek, Toe Jam Creek, Wapiti	192,000	1.4
Prairie Junegrass	*Koeleria macrantha*	Native Colorado/Utah source preferred	2,315,000	0.1
Mutton Bluegrass	*Poa fendleriana*	Native Colorado/Utah source preferred	890,000	0.3
And One of the Following Grasses (10% of Mix Each, 10% Total)				
Western Wheatgrass	*Pascopyrum smithii*	UP* variety native Colorado/Utah source, or Arriba, Recovery, Rodan, Rosana	110,000	2.4
Thickspike Wheatgrass	*Elymus lanceolatus*	Bannock, Critana, Schwendimar	154,000	1.7
And the Following Grass (10% of Mix Each, 10% Total)				
Needle-and-Thread	*Hesperostipa comata*	Native sources within 500 miles preferred	115,000	2.3

And Five of the Following Forbs (3% of Mix Each, 15% Total) *					
Common Name	***Scientific Name***	***PLS lbs/acre***	***Common Name***	***Scientific Name***	***PLS lbs/acre***
American Vetch	*Vicia americana*	2.4	Rocky Mountain Penstemon	*Penstemon strictus*	0.1
Arrowleaf Balsamroot	*Balsamorhiza sagittata*	1.4	Scarlet Gilia	*Ipomopsis aggregata*	0.2
Bigelow's Tansy-aster	*Machaeranthera bigelovii*	0.05	Scarlet Globemallow	*Sphaeralcea coccinea*	0.16
Blanket-flower	*Gaillardia aristata*	0.6	Showy Goldeneye	*Heliomeris multiflora*	0.07
Great Basin Penstemon	*Penstemon subglaber*	0.19	Sulphur Buckwheat	*Eriogonum umbellatum*	0.4
Hairy Goldenaster	*Heterotheca villosa*	0.1	Tailcup Lupine	*Lupinus caudatus*	4.4
Lewis Blue Flax	*Linum lewisii*	0.5	Utah Sweetvetch	*Hedysarum boreale*	1.7
Little Sunflower	*Helianthella uniflora*	1.9	Western Yarrow	*Achillea millefolium*	0.03

*Preferred source = Uncompahgre Project (UP), Kathy See, nativeplant@upartnership.org, 970-240-9498, 970-901-8247 if available; otherwise another native Colorado/Utah source is preferred.

Mixed Mountain Shrubland – Mesic (Gambel's Oak/Mountain Sagebrush)
(16 to 22 inches precipitation)

Common Name	*Species Name*	*Variety*	*Seeds per Pound*	*PLS lbs/acre*
Plant Three of the Following Grasses (15% of Mix Each, 45% Total)				
Mountain Brome	*Bromus marginatus*	UP* Cold Springs preferred, or Bromar, Garnet	64,000	6.1
Slender Wheatgrass	*Elymus trachycaulus*	San Luis	159,000	1.6
Bluebunch Wheatgrass	*Pseudoroegneria spicata*	Native Colorado/Utah source, or Anatone, Goldar	140,000	2.8
Rocky Mountain Fescue	*Festuca saximontana*	Colorado/Utah source preferred	1,200,000	0.3
And One of the Following Grasses (10% of Mix Each, 20% Total)				
Prairie Junegrass	*Koeleria macrantha*	Native Colorado/Utah source preferred	2,315,000	0.1
Mutton Bluegrass	*Poa fendleriana*	Native Colorado/Utah source preferred	890,000	0.3
And One of the Following Grasses (10% of Mix Each, 10% Total)				
Western Wheatgrass	*Pascopyrum smithii*	UP* variety native Colorado/Utah source, or Arriba, Recovery, Rodan, Rosana	110,000	2.4
Thickspike Wheatgrass	*Elymus lanceolatus*	Bannock, Critana, Schwendimar	154,000	1.7
And One of the Following Grasses (10% of Mix Each, 10% Total)				
Columbia Needlegrass	*Achnatherum nelsonii*	Native sources within 500 miles preferred	150,000	1.7
Lettermann Needlegrass	*A. lettermanii*	Native sources within 500 miles preferred	225,000	1.2

And Five of the Following Forbs (3% of Mix Each, 15% Total) *					
Common Name	***Scientific Name***	***PLS lbs/acre***	***Common Name***	***Scientific Name***	***PLS lbs/acre***
American Vetch	*Vicia americana*	2.4	Rocky Mountain Penstemon	*Penstemon strictus*	0.1
Bigelow's Tansy-aster	*Machaeranthera bigelovii*	0.05	Scarlet Gilia	*Ipomopsis aggregata*	0.2
Blanketflower	*Gaillardia aristata*	0.6	Showy Daisy	*Erigeron speciosus*	0.05
Great Basin Penstemon	*Penstemon subglaber*	0.19	Sticky Geranium	*Geranium viscosissimum*	1.6
Hairy Goldenaster	*Heterotheca villosa*	0.1	Sulphur Buckwheat	*Eriogonum umbellatum*	0.4
Lewis Blue Flax	*Linum lewisii*	0.5	Tailcup Lupine	*Lupinus caudatus*	4.4
Little Sunflower	*Helianthella uniflora*	1.9	Utah Sweetvetch	*Hedysarum boreale*	1.7
Mule's-ears	*Wyethia amplexicaulis*	2.8	Western Yarrow	*Achillea millefolium*	0.03

*Preferred source = Uncompahgre Project (UP), Kathy See, nativeplant@upartnership.org, 970-240-9498, 970-901-8247 if available; otherwise another native Colorado/Utah source is preferred.

Montane or Subalpine Conifers and/or Quaking Aspen (18 to 24+ inches precipitation)

Common Name	Species Name	Variety	Seeds per Pound	PLS lbs/acre
Plant <u>One</u> of the Following Grasses (15% of Mix Each, 15% Total)				
Arizona Fescue	*Festuca arizonica*	Colorado/Utah source; Redondo	550,000	0.7
Idaho Fescue (higher elevations)	*Festuca idahoensis*	Colorado/Utah source, or Joseph, Nezpurs, Winchester	450,000	0.9
Rocky Mountain Fescue	*Festuca saximontana*	Colorado/Utah source preferred	1,200,000	0.3
And <u>Two</u> of the Following Grasses (15% of Mix Each, 30% Total)				
Letterman's Needlegrass	*Achnatherum lettermanii*	Colorado/Utah source preferred	225,000	1.2
Mountain Brome	*Bromus marginatus*	UP* Cold Springs preferred, or Bromar, Garnet	64,000	6.1
Slender Wheatgrass	*Elymus trachycaulus*	San Luis	159,000	2.5
Wheeler Bluegrass	*Poa wheeleri (nervosa)*	Colorado/Utah source preferred	950,000	0.4
And <u>Three</u> of the Following Grasses (10% of Mix Each, 30% Total)				
Big Bluegrass	*Poa secunda "ampla"*	Colorado/Utah source, or Ampla	882,000	0.3
Blue Wildrye	*Elymus glaucus*	Colorado/Utah source, or Arlington, Elkton	134,500	1.9
Mountain Muhly	*Muhlenbergia montana*	Colorado/Utah source preferred	1,500,000	0.17
Rough Bentgrass	*Agrostis scabra*	Colorado/Utah source preferred	5,000,000	0.05
And <u>Both</u> of the Following of Shrubs (5% of Mix Each, 10% Total)				
Mountain Snowberry	*Symphoricarpos rotundifolius (oreophilus)*	Colorado/Utah source preferred	54,700	2.4
Wax Currant	*Ribes cereum*	Colorado/Utah source preferred	350,000	0.4

And <u>Five</u> of the Following Forbs (3% of Mix Each, 15% Total) *					
Common Name	***Scientific Name***	***PLS lbs/acre***	***Common Name***	***Scientific Name***	***PLS lbs/acre***
American Vetch	*Vicia americana*	2.4	Rydberg's Penstemon	*Penstemon rydbergii*	0.09
Bigelow's Tansy-aster	*Machaeranthera bigelovii*	0.05	Showy Daisy	*Erigeron speciosus**	0.05
Blanketflower	*Gaillardia aristata*	0.6	Showy Goldeneye	*Heliomeris multiflora*	0.07
Hairy Goldenaster	*Heterotheca villosa*	0.1	Sticky Geranium	*Geranium viscosissimum*	1.6
Lewis Blue Flax	*Linum lewisii*	0.5	Sulphur Buckwheat	*Eriogonum umbellatum**	0.3
Little Sunflower	*Helianthella uniflora*	1.9	Tailcup Lupine	*Lupinus caudatus*	4.4
Mountain Goldenbanner	*Thermopsis montana*	5.2	Western Yarrow	*Achillea millefolium*	0.02
Rocky Mountain Penstemon	*Penstemon strictus*	0.1	Wild Bergamot	*Monarda fistulosa*	0.06

*Preferred source = Uncompahgre Project (UP), Kathy See, <u>nativeplant@upartnership.org</u>, 970-240-9498, 970-901-8247 if available; otherwise another native Colorado/Utah source is preferred.

Appendix I

Garfield County Noxious Weed Management Plan

GARFIELD COUNTY
NOXIOUS WEED MANAGEMENT PLAN

Adopted by Board of County Commissioners
February 16, 2016

Prepared by Garfield County Vegetation Management
and the Garfield County Weed Advisory Board

GARFIELD COUNTY
NOXIOUS WEED MANAGEMENT PLAN

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SECTION I
INTRODUCTION

1.01 Executive Summary

A. The health of our environment is a high priority for residents of Garfield County. The health and productivity of natural plant communities and agricultural lands is threatened by the introduction of numerous invasive alien plants. Without an effective integrated weed management plan these aggressive plants will continue to infest and degrade the lands we value so highly.

B. Rapid expansion of noxious weeds is an obstacle to maintaining healthy ecosystems and restoring disturbed native plant communities and habitats. Because noxious weeds tend to be highly invasive and harmful to native vegetation, they can quickly dominate many sites and often cause permanent damage to plant communities. Estimates indicate that 100 million acres of private, state, and federal land are infested with noxious weeds in just 11 western states. This is occurring in both disturbed and relatively undisturbed areas.

C. The intent of the Colorado Noxious Weed Act and the goal of the Garfield County Weed Advisory Board is to curb the degradation of our valued environment by implementing an Integrated Weed Management Plan designed to stop the spread of noxious weeds.

D. Management of weeds may seem overwhelming, but through developing partnerships at all levels – local, regional and national – we hope to achieve our weed management goals. The challenge for all involved is to develop management systems, support and direction for the prevention of the spread of weeds before the situation becomes even more serious and economically unfeasible.

1.02 Purpose of the Plan

A. The purpose of the Plan is to provide guidelines for managing designated noxious weeds which represent a threat to the continued economic, environmental and agricultural value of lands in Garfield County. This plan provides for the implementation of the Colorado Noxious Weed Act by detailing integrated management options for designated noxious weeds. Options include education, preventive measures, good stewardship, and control techniques.

B. The intent is to incorporate those options that are the least environmentally damaging and are practical, timely and economically feasible. It is the responsibility of all landowners to use integrated methods to manage noxious weeds, and the responsibility of local governing bodies to ensure that these plants are managed on public and private lands.

1.03 Enactment Authority

A. The Colorado Weed Management Act (C.R.S. 35-5.5-101) was signed into state law in 1990 and last amended in 2014. Now known as the Colorado Noxious Weed Act, it states that noxious weeds pose a threat to the natural resources of Colorado.

B. This plan is designed in accordance with the statutory provisions of the Colorado Noxious Weed Act. The Act directs the Board of County Commissioners (BOCC) of each county to adopt a Noxious Weed Management Plan for all unincorporated land within its jurisdiction.

C. Municipalities shall adopt a weed management plan for all lands within their boundaries. The county and municipalities may cooperate, through an intergovernmental agreement, for the powers and authorities of the act.

D. The Act directs the Board of County Commissioners to appoint a Weed Advisory Board, whose power and duties are:

1. Develop a noxious weed list.
2. Develop a Weed Management Plan for managing designated noxious weeds.
3. Declare noxious weeds and any state noxious weeds designated by rule to be subject to integrated management.
4. Recommend to the Board of County Commissioners that identified landowners be required to submit an integrated weed management plan for managing designated noxious weeds on their properties.

1.04 Colorado and Garfield County Noxious Weed Lists

The Colorado Department of Agriculture's Noxious Weed Program has three noxious weed lists: A, B and C, plus a Watch List.

A. Species are assigned to one of three State weed lists through the rule-making authority of the Department of Agriculture. The Commissioner of the Department of Agriculture uses a mandatory administrative process to create the lists, subject to the public notice and publication requirements of the State Administrative Procedure Act.

B. The Colorado Noxious Weed Act requires the Commissioner to review and revise the lists at least once every 3 years, using this public process. Updated State weed lists and notices of departmental rule-making are available electronically through the State of Colorado's websites: www.state.co.us; www.ag.state.co.us and www.sos.state.co.us and through the Office of the Garfield County Vegetation Manager.

C. State A, B and C Lists. The Colorado Department of Agriculture has determined that "an organized and coordinated effort must be made to stop the spread of noxious weeds." (C.R.S. 35-5.5-102). The rules designate and classify noxious weeds into four categories:

1. The State's A list is made up of rare noxious weed species that are subject to eradication, as a matter of law, wherever they are detected in the State, including Garfield County.
2. The B list includes species that have differing distributions throughout the State. Specified populations of B list species are subject to eradication, containment, or suppression in identified areas of the state, including portions of Garfield County.
3. The State's C list includes weed species that are widespread and well-established, for which the State recommends but does not require control, although Garfield County's Weed Management Plan may require control.
4. The Watch List was established in 2011 and is non-regulatory and advisory only. It is designed to increase awareness of new invasive species to the State.

D. Garfield County follows the dictates of the State's rules as to which species on the A and B lists must be eradicated, contained or suppressed and manages those species and the species on its own locally-designated list in accordance with the Weed Management Plan contained in the following Sections II-V and the State Department of Agriculture's administrative rules.
   1. The County's management plan for species on the State's lists is subject to review every 3 years.
   2. The Board of County Commissioners may also adopt a revised Weed Management Plan that includes designated noxious weeds not previously included on any list.

E. In addition to the weeds designated on the State's A, B and C lists, the BOCC has the authority to declare plants as noxious weeds if the plant meets one or more statutorily defined criteria (C.R.S. 35-5.5-104 (16), 35-5.5-107, and 35-5.5-108 (3)).
   1. The BOCC can also declare those weed species and the weeds on the State's weed lists to be subject to integrated management within unincorporated Garfield County.
   2. The County list is subject to change as the State amends the A, B and C lists and as the BOCC declares species not included on the State's list as noxious.

F. Garfield County Noxious Weed List as recommended by the Garfield County Weed Advisory Board on February 24, 2014, with Colorado designations listed as A, B or C or NL (Not Listed by the State). The list is current as of adoption of this regulation by the BOCC.

Common Name	**Scientific Name**	**Colorado Weed List**
Absinth wormwood	*Artemisia absinthium*	B
Black henbane	*Hyoscyamus niger*	B
Bouncing Bet	*Saponaria officinalis*	B
Bull thistle	*Cirsium vulgare*	B
Canada thistle	*Cirsium arvense*	B

Chicory	*Cichorium intybus*	C
Chinese clematis	*Clematis orientalis*	B
Common burdock	*Arctium minus*	C
Common tansy	*Tanacetum vulgare*	B
Common teasel	*Dipsacus fullonum*	B
Corn chamomile	*Anthemis arvensis*	B
Curly dock	*Rumex crispus*	NL
Cutleaf teasel	*Dipsacus laciniatus*	B
Cypress spurge	*Euphorbia cyparissias*	A
Dalmatian toadflax	*Linaria dalmatica*	B
Dame's rocket	*Hesperis matronalis*	B
Diffuse knapweed	*Centaurea diffusa*	B
Hoary cress	*Cardaria draba*	B
Houndstongue	*Cynoglossum officinale*	B
Jointed goatgrass	*Aegilops cylindrica*	B
Leafy spurge	*Euphorbia esula*	B
Mayweed chamomile	*Anthemis cotula*	B
Meadow knapweed	*Centaurea nigrescens*	A
Mediterranean sage	*Salvia aethiopsis*	A
Musk thistle	*Carduus nutans*	B
Myrtle spurge	*Euphorbia myrsinites*	A
Oxeye daisy	*Leucanthemum vulgare*	B
Perennial pepperweed	*Lepidium latifolium*	B
Plumeless thistle	*Carduus acanthoides*	B
Poison hemlock	*Conium maculatum*	C
Purple loosestrife	*Lythrum salicaria*	A
Russian knapweed	*Acroptilon repens*	B
Russian olive	*Elaeagnus angustifolia*	B
Salt cedar	*Tamarix parviflora*	B
Salt cedar	*Tamarix ramosissima*	B
Scentless chamomile	*Tripleurospernum perforata*	B
Scotch thistle	*Onopordum acanthium*	B
Spotted knapweed	*Centaurea stoebe*	B
Sulfur cinquefoil	*Potentilla recta*	B
Yellow starthistle	*Centaurea solstitialis*	A
Yellow toadflax	*Linaria vulgaris*	B

G. The BOCC has the statutory authority to adopt standards that are more stringent than those set by the State Commissioner of Agriculture.

1. The Weed Advisory Board will request such action of the BOCC if and when a species presents a local threat which requires such action.
2. The BOCC also has the authority to apply to the State Commissioner of Agriculture for a Waiver of Compliance if and when the State Department of Agriculture's mandate that a species be eradicated in a portion of or all of Garfield County is deemed unfeasible.
3. If the Commissioner of Agriculture, in consultation with the BOCC, determines that the most cost-effective manner to eradicate designated noxious weeds is for the state to implement an eradication program, the Commissioner may implement such a program through the Department of Agriculture (C.R.S. 35-5.5-108.5(3)(d)).

SECTION II
GENERAL INFORMATION

2.01 Definitions

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

Adjacent: Having a common boundary that meets or touches at some point.

Aggressive: Fast growing, tending to spread quickly.

Agriculture: Uses involving the cultivation of land, production of crops, and/or the keeping of livestock and the preparation of these products for man's use and disposal.

Alien Plant: A plant species that is not indigenous to the State of Colorado.

Annual: A plant that lasts one growing season, completing its life cycle from seed to seed in one year.

Biennial: A plant that lives in 2 calendar years. The first year is usually a vegetative form, such as a rosette of leaves. The second year the plant grows a flowering shoot, sets seeds and dies.

Biological Control: The deliberate introduction of living agents such as insects, vertebrate predators, grazing animals and plant diseases to reduce a noxious weed population.

Biological Management: The use of organisms to disrupt the growth of noxious weeds.

Bolt: To flower or produce seeds prematurely or develop a flowering stem from a rosette.

Bract: A reduced or modified leaf often surrounding the base of a flower.

Browse: Tender shoots, twigs and leaves of trees and shrubs fit for food for wildlife.

Chemical Management: The use of agents or plant growth regulators to disrupt or inhibit the growth of noxious weeds.

Commissioners: The Garfield County Board of Commissioners.

Containment: "…maintaining an intensively managed buffer zone that separates infested regions, where suppression activities prevail, from largely uninfested regions, where eradication activities prevail." (C.R.S. 35-5.5-103(11.7)(b)).

County: The unincorporated areas of Garfield County.

Cultural Management: Methods or management practices which favor the growth of desirable plants over noxious weeds, including maintaining 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 a particular area.

Designated Noxious Weed: A non-native, invasive plant or plant parts that are identified as a threat to native plant communities and included on the Garfield County Noxious Weed List.

Desirable Plants: Plants considered to be advantageous and beneficial to the environmental viability of the County.

Elimination: Removing and destroying live plants of List A or List B species designated for eradication and preventing seed production until the seed source is depleted; considered the first step in the eradication process.

Eradication: "…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 seed bank is exhausted." (C.R.S. 35-5.5-103(11.7)(a)).

Escaped Ornamental: A plant originally intended for horticultural or landscape planting that has escaped its intended boundaries.

Exotic Plant: A plant that is not a regular member of the native or natural community in which it is found.

Forb: A broad-leafed, non-woody plant other than grass that dies back to the ground after each growing season.

Forage: Food for animals, especially when taken by browsing or grazing.

Garfield County Weed Advisory Board: A group of individuals appointed by the BOCC to advise on matters of management of noxious weeds.

Herbaceous: Applies to plants of soft texture whose stems die back to the ground after each growing season; green and leaf-like, not woody.

Infestation: Growth of an undesirable plant which has become harmful or bothersome. There are 3 types of infestation:

1. Heavy: Dense; 25-100% canopy cover.
2. Moderate: Widely scattered plants; 5-25% canopy cover.
3. Light: Occasional plant per acre; less than 5% canopy cover.

Insectary: The Colorado Department of Agriculture Biological Pest Control Division operates the Palisade Insectary, which imports, rears, establishes and colonizes new beneficial organisms for control of specific plant and insect pests.

Integrated Management: The planning and implementation of a coordinated program utilizing a variety of methods for managing noxious weeds, in order to achieve desirable plant communities. Such methods may include but are not limited to education, preventive measures, good stewardship and biological, cultural, herbicide and mechanical management.

Invasive: Aggressive, capable of invading a plant community and creating a monoculture.

Invasive Ornamental: A plant originally intended for horticultural or landscape planting that has escaped its intended boundaries and is capable of invading a plant community and creating a monoculture.

Landowner: Any owner of record of state, municipal or private property including an owner of any easement, right-of-way, or estate within the county.

List A Species: "…rare noxious weed species with discrete statewide distributions that are subject to eradication wherever detected statewide in order to protect neighboring lands and the state as a whole." (C.R.S. 35-5.5-108(2)(a)(I)).

List B Species: "…noxious weed species with discrete statewide distribution 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." (C.R.S. 35-5.5-108(2)(a)(II)).

List C Species: "…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." (C.R.S. 35-5.5-108(2)(a)(III)).

Lobe: A division or segment of a leaf or other plant part, especially a rounded one.

Local Noxious Weed: Any plant of local importance which has been declared an invasive or undesirable plant by the Garfield County Board of County Commissioners.

Management: Any activity that presents a plant from establishing, reproducing or dispersing itself.

Management Plan: A plan developed by the Garfield County Weed Advisory Board and implemented by the BOCC in order to control the spread of noxious weeds.

Mechanical Management: Methods or management practices that physically disrupt plant growth, including tilling, mowing, burning, flooding, mulching, hand-pulling, shoveling, hoeing and chopping.

Monoculture: A single homogeneous crop without diversity.

Native Plant: A plant species that is indigenous to a particular locale.

Noxious Weed: An alien plant or parts of an alien plant that has been designated as being invasive and undesirable and has been declared a noxious weed by the Garfield County Weed Advisory Board and meets one or more of the following criteria:

1. Aggressively invades or is physically destructive to economic crops or native plant communities.
2. Detrimental directly or indirectly to the environmentally sound management of natural or agricultural ecosystems.
3. Poisonous to livestock.
4. Carrier of detrimental insects, diseases or parasites.

Noxious Weed Management: The planning and implementation of an integrated program to manage undesirable or problematic plant species.

Ornamental: A decorative, aggressive, non-native plant often sold through nurseries, seed catalogues, or spread through seed collection. A threat to native plant species because it has no natural predators and thus competes against the plants of the natural ecosystem.

Perennial: A plant that grows for 3 years or more; usually flowers and produces fruit each year. The above-ground part of the plant may die, but new growth comes from the roots or crown each spring.

Petiole: A slender stem that supports the blade of a foliage leaf.

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

Rosette: A cluster of closely-crowded leaves in a compact circle, usually at ground level.

State Noxious Weed: Any weed identified by the Colorado Commissioner of Agriculture by rule after notifying and consulting with the State Noxious Weed Advisory Committee.

Subject Lands: All public and private lands within unincorporated Garfield County with the exception of:

1. Any municipal property owned or leased to an incorporated municipality.
2. Any land managed or administered by a federal agency.

Suppression: "…reducing the vigor of noxious weed populations within an infested region, decreasing the propensity of noxious weeds species to spread to surrounding lands, and mitigating the negative effects of noxious weed populations on infested lands." (C.R.S. 35-5.5-103(11.7)(c)).

Surfactant: A compound that improves the emulsifying, dispersing, spreading, wetting or other surface modifying properties of liquids.

Watch List: The State Watch List, which is advisory and for educational purposes, includes plant species that have been determined to pose a potential threat to the agricultural productivity and environmental values of the lands of the state.

Weed Inspector: The agent or employee appointed to conduct the duties and functions as defined under this Plan.

Weed Office: The office of the Weed Inspector, or Vegetation Manager, out of which all noxious weed administration and enforcement activities are conducted.

Wildflower: The flower of a wild or uncultivated plant or the plant bearing it.

Xeriscape: Landscaping with water conservation as a major objective.

2.02 Importation and Cultivation of County and State Listed Noxious Weeds.
Persons are prohibited from importing seeds, propagating plant parts or live plants and cultivating Garfield County and State of Colorado listed weed species within Garfield County except as provided for in C.R.S. 35-5.5-104.5(a). All listed species are non-native and problematic in Garfield County and the State of Colorado.

A. Threat of Escaped Ornamentals. Most plants used for landscaping purposes cannot proliferate outside the cultivated environment of the home garden. Certain exotic plants and seeds were imported to the United States for their aggressive growth habits, xeriscape potential or re-seeding capabilities.
    1. The escaped ornamentals include bouncing bet, chicory, cypress spurge, the chamomiles, Dalmatian toadflax, dame's rocket, myrtle spurge, oxeye daisy, purple loosestrife, Russian olive, yellow toadflax. The very traits that make these plants desirable for a garden or landscape may also enable them to thrive outside cultivated areas and become fierce competitors with native vegetation.
    2. Because they exist here without the presence of any natural predators, these plants have the ability to spread extensively and pose a severe threat to the delicate balance of our native ecosystems.
B. Since various invasive ornamental plants are attractive and establish themselves quickly, they are popular with landscapers and gardeners and may be purchased through certain nurseries in Colorado, in seed catalogues and on the Internet.
    1. It is imperative to educate landscape architects, gardeners and nursery growers about the need to eliminate such plants from their landscape plans. Otherwise these plants will inevitably escape from the cultivated garden and jeopardize natural wildflower and plant communities.
    2. Native grasses and forbs, as well as agricultural plantings, cannot compete with invasive ornamental plants for nutrients, sunlight and water. As a result, biologically diverse mountain meadows, grasslands, wetlands and agricultural lands are in danger of being overrun by non-native invasive ornamental plants.

2.03 Integrated Weed Management – Treatment Methods

An integrated approach to noxious weed management is important because no single technique will be effective.

A. Prevention should always be practiced and is effective on all species of weeds. It is accomplished through good land stewardship, planting weed-free seed, avoiding planting invasive weed species, using weed-free seed mulch and erosion control, using clean equipment and taking legal measures such as quarantines and weed laws.

1. Cultural management includes methods or management practices which favor the growth of desirable plants over noxious weeds, including maintaining 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 a particular area. Techniques include dense seeding, fertilization, mulching, careful irrigation practices, sensible grazing regimes and improved land management practices.
2. Mechanical management methods or practices that physically disrupt plant growth and include tilling, mowing, burning, flooding, mulching, hand-pulling, shoveling, hoeing and chopping. Mechanical methods are most effective for annual and biennial weeds and less effective for perennials. Equipment should be cleaned thoroughly before moving to uninfested areas to prevent the spread of weeds.
3. Biological management involves the use of organisms such as insects and animals to disrupt the growth of noxious weeds. It rarely provides 100% control and must be incorporated with other methods for successful management. Insect species developed to mitigate specific noxious plants are available to the public free of charge from the Colorado Department of Agriculture Conservation Services Division**,** Biological Control Program, 750 37.8 Rd., Palisade, CO 81526; 866-324-2963 or 970-464-7916.
4. Herbicide application. It is extremely important to treat small infestation of certain weeds (List A and B species to be eradicated) as soon as possible. Herbicides are most effective when sprayed at specific stages during the life cycle of the weed. To ensure that small infestations of noxious weeds are controlled or eradicated effectively, it is extremely important to take immediate action on certain weed patches.

B. The optimum method or methods for weed management will vary depending on a number of site-specific variables:
   1. Factors to be considered should include soil type and stability, grade, associated vegetation, existing and proposed land use, proximity to water, availability of irrigation water, weed type and stage of growth and severity of infestation.
   2. The management method selected should be the least environmentally damaging, yet practical and reasonable in achieving the desired results.
   3. When considering weed management on a property, work on the areas that may transport weed seeds. These areas include ditches, streams, roadsides, driveways, trails, livestock-concentrated areas and equipment storage sites.

C. The Colorado Department of Agriculture has prepared fact sheets for most State-listed noxious weeds. They feature detailed descriptions and photographs of the plants, as well as integrated management for each species. (See Appendix A).

D. Herbicide application. It is the County's philosophy to minimize the use of herbicides and impacts to desirable vegetation. However, for some species of noxious weeds

herbicide application is the only effective method of control. It is extremely important to treat small infestation of certain weeds (List A and B species to be eradicated) as soon as possible. To ensure that small infestations of noxious weeds are controlled or eradicated effectively, it is extremely important to take immediate action on certain weed patches. The County uses hand gun, hand-held or backpack sprayers, utility task vehicles or truck-mounted equipment for selective spot spraying.

1. No Spray Areas. Anyone living adjacent to a County right-of-way who does not want spraying in front of their property can call the Garfield County Vegetation Department and request it be listed as a no-spray property. However, the property owner is responsible for elimination of noxious weeds. Only noxious weeds on the A and B State and County Lists need to be controlled. Land owners must dig up or mow any noxious weeds before they go to seed. If weeds are not properly managed, the County must resume spraying in order to comply with the Colorado Noxious Weed Act (C.R.S 35-5.5-101). Owners of organic farms or who have pesticide-sensitive crops can also call the County to request no-spray listing. Landowners may place "No Spray" signs on their property adjacent to County rights-of-way. Signs should be readable from the roadside and not impact county road maintenance operations.
2. Registry of Pesticide-Sensitive Persons. The registry is maintained by the State of Colorado under the regulatory requirements of the Pesticide Applications Act. Notification to registered individuals must be given in accordance with C.R.S 35-10-112, and Part 12 of the PAA rules. Pesticide applicators are required to notify registered individuals prior to application of pesticides on adjacent properties. For information about the registry, call the Colorado Department of Agriculture, 303-239-4146.
3. Source Water Protection. A Source Water Protection Plan was developed in 2013 for community drinking water systems in Garfield County. A current list of systems covered under the Source Water Protection Plan is available through the Garfield County Public Health Department. The plan prioritizes source water protection concerns and identifies local source water management approaches that can be implemented to protect the source of drinking water for these communities. It delineates areas around these communities as source water protection areas. Pesticide application was identified a potential source of water contamination. Garfield County Vegetation Management is committed to using best management practices when applying herbicides to control noxious weeds. These practices include following label directions and selective spot spraying to ensure direct treatment of noxious weeds and protection of native vegetation and water resources.
4. Changes in herbicide registrations occur constantly. The herbicide label is the legal document on herbicide use. ***Read and follow all directions carefully.*** The

use of an herbicide in a manner not consistent with the label can lead to injury of crops, humans, animals and the environment.

5. Specific chemical recommendations are available from the Garfield County Vegetation Management Department and/or licensed applicators and are not listed in the Plan. Before using any chemical, thoroughly read the label. Any use of an herbicide inconsistent with the label is neither legal nor recommended.

E. The optimum method or methods for weed management will vary depending on a number of site-specific variables. Factors to be considered should include soil type and stability, grade, associated vegetation, existing and proposed land use, proximity to water, availability of irrigation water, weed type and stage of growth and severity of infestation.

F. The management method selected should be the least environmentally damaging, yet practical and reasonable in achieving the desired results. When considering weed management on a property, work on the areas that may transport weed seeds, including ditches, streams, roadsides, driveways, trails, livestock-concentrated areas and equipment storage sites.

2.04 Cost Share Program

Garfield County offers two cost-share programs – the noxious weed cost-share program and the tamarisk/Russian olive program.

A. The noxious weed program is a partnership between the three local Conservation Districts based in Glenwood Springs and Garfield County.

1. Applications are reviewed and approved by a review committee of representatives of the Conservation Districts and the Weed Advisory Board.

2. The program provides partial reimbursement to private landowners for noxious weed treatments on lands within Garfield County. For current program information, go to www.mountsopriscd.org, phone 970-945-5495, ext. 105; www.garfield-county.com, phone 970-945-1377, ext. 4305.

B. The tamarisk/Russian olive program is administered through the Garfield County Vegetation Management office and is designed to partially assist landowners with management of tamarisk and Russian olive through the coordination of cutting crews and treatment methods. For more information, contact Garfield County Vegetation Management, 970-945-1377, ext. 4305.

2.05 Description of Designated Noxious Weeds

GARFIELD COUNTY NOXIOUS WEED LIST

The Garfield County Weed Advisory Board encourages all county residents to be knowledgeable about noxious weeds. Below are general descriptions of the County's listed noxious weeds. Locations of some weeds are provided in general terms under their descriptions. Not all locations are listed.

ABSINTH WORMWOOD *(Artemesia absinthium)*

Description: A member of the Sunflower family native to Eurasia, the Middle East and Africa. A long-lived perennial. Reproduces from seed. Grows to roughly 3 feet tall and 2 feet across, with silver-grey leaves and yellow flowers. Smells strongly of sage.

Comments: It is commonly found in disturbed sites with moist soils. Considered poor forage for all but sheep and will taint milk of cows.

Location: Common between Glenwood Springs and Carbondale. Infested sites include the Missouri Heights and Crystal Springs areas. Also spread to South Canyon, Peach Valley and Rulison.

Cultural Control: Cultural controls are possible but time-consuming and expensive. Complete removal of any seedling or newly established plants by continual hand-pulling is possible.

Chemical Control: Treat when plant is 12 inches tall through flowering growth stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Absinth wormwood* (Appendix A).

BLACK HENBANE *(Hyoscyamus niger)*

Description: A member of the Nightshade family originally introduced from Europe as an ornamental and medicinal herb. Annual or biennial; reproduces from seed. Recognized by its rosettes, shallowly-lobed leaves with sticky hairs and brownish-yellow flowers with purple veins and a distinctly unpleasant smell. Grows up to 3 feet.

Comments: Poisonous due to alkaloids in all parts of the plant. It is important to protect threatened areas from over-grazing.

Location: Relatively rare. Found in Gibson Gulch west of Divide Creek; reported just west of the West Fork of Stewart Gulch on the Roan Plateau near the Rio Blanco County line.

Mechanical Control: Complete removal of any seedling or newly established plants by continual hand-pulling.

Chemical Control: Treat plants in spring to early summer prior to seed production, in rosette stage. Follow up treatments are recommended to pick up missed or late bolting plants. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Black henbane* (Appendix A).

BOUNCING BET *(Saponaria officinalis)*

Description: Member of the Pink family originally introduced from Europe as a garden plant. Perennial. Reproduces from seed and rhizomatous swollen nodes. Stout oppositely branching and leaved stems. Leaves smooth and narrow. Flowers have 5 light pink to white petals with notches at the end.

Comments: Grows most commonly in wet areas which may restrict the use of certain herbicides. Poisonous.

Location: No Name, Glenwood Springs and New Castle.

Cultural Control: Eliminate seed production while depleting nutrient reserves in the roots. Prevent the establishment of new infestations by minimizing disturbance and seed dispersal, while keeping native community healthy. Maintain healthy pastures and avoid over-grazing.

Chemical Control: Treat at bolting to bud-growth stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Bouncing Bet* (Appendix A).

BULL THISTLE *(Cirsium vulgare)*

Description: Member of the Sunflower family introduced from Eurasia as a seed contaminant. Biennial. Reproduces from seed. Only thistle species with leaves that are prickly hair above and cottony below. Heads hairy with composite purple flowers.

Comments: Commonly found in dry to moist environments in full sun. Thrives in highly disturbed, nitrogen-rich, gravelly to clay-textured soils.

Cultural Control: Prevention is the most effective control. Maintain healthy plant communities and monitor for new infestations. Limit seed production. Plants with buds or flowers should be immediately disposed of or destroyed.

Biological Control: *Urophora stylata*, a fly predator lays its eggs in the seed head, then larvae consume the seeds. Crown weevils, *Trichosirocalus horridus*, lay eggs in rosettes and consume the seeds.

Chemical Control: Treat rosettes in spring or fall. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Bull thistle* (Appendix A).

CANADA THISTLE *(Cirsium arvense)*

Description: A member of the Aster family introduced from Europe. Creeping perennial. Reproduces from seeds and fleshy horizontal roots. Grows 1-4 feet tall. Flowers pink to purple. Leaves lance-shaped, spine-topped lobes. The root is extensive and creeping, forming colonies.

Comments: One of the most widespread and economically damaging noxious weeds in Colorado. Infestations are found in cultivated fields, riparian areas, pastures, rangeland, forests, lawns and gardens, roadsides and in waste areas. Because of its seeding habits, vigorous growth and extensive underground root system, control and eradication are difficult.

Location: Common in Garfield County.

Cultural Control: Best managed through integrated management system that emphasizes competitive, desirable plants. Maintain soil fertility and moisture at optimum levels to favor grass growth.

Biological Control: It is best to release a complex of insects that will stress different parts of the plant: *Ceutorhyncus litura* weevil that stresses the crown of the plant; *Urophora carduii*, a stem and shoot gall fly; *Cassidia rubiginosa*, leaf beetle.

Mechanical Control: Mowing may be effective when repeated at 2 week intervals over a period of several years. Pulling and digging up is ineffective as the plant has an extensive root system.

Chemical Control: Treat in spring during bud to bloom stage or during fall regrowth after the first light frost. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Canada thistle* (Appendix A).

CHICORY *(Chicorium intybus)*

Description: Member of the Sunflower family. Perennial; reproduces from seed. Deep fleshy root and tufted basal leaves that resemble those of a dandelion. Stem multi-branched and can reach over 5 feet tall. Flowers bright blue, purple or occasionally white.

Location: Well established in western Garfield County (Parachute) and is spreading rapidly in other parts of the County.

Cultural Control: Reseed disturbed areas adjacent to chicory infestations with appropriate perennial grasses.

Biological Control: Close grazing by sheep will control chicory in pastures.

Chemical Control: Treat at early growth stage in early spring. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Chicory* (Appendix A).

CHINESE CLEMATIS *(Clematis orientalis)*

Description: Member of the Buttercup family introduced from Asia as a garden ornamental. Herbaceous to wood-vined perennial; reproduces by seed. Native clematis, *C. ligusticifolia*, distinguished from the noxious weed species by groups of small white flowers. Chinese clematis has single yellow flowers.

Comments: Found in well-drained, sunny areas with basic soils. Prefers roadsides, riparian corridors and rocky slopes. Known to cause death in young trees. Entire plant is poisonous, causing internal bleeding when ingested in large amounts.

Location: Glenwood Canyon on both sides of the Colorado River; along the Roaring Fork River south of Glenwood Springs.

Cultural Control: Eradication requires intensive and persistent control efforts to effectively eliminate weed infestations and soil seed reserves. Site must be monitored for 10 years after last flowering plant is destroyed. Prevent the establishment of new infestations by minimizing disturbance and seed dispersal, while keeping native community healthy. Maintain healthy pastures and avoid over-grazing.

Chemical Control: Treat at flower stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Chinese clematis* (Appendix A).

COMMON BURDOCK *(Arctium minus)*

Description: A member of the Aster family. Biennial. Prolific seed producer. Grows to 6 feet tall with very large leaves and a prickly bur. Flowers are purple and white.

Comments: Grows along roadsides, ditch banks and neglected areas. A very serious threat to sheep as the burs can significantly damage the quality of their wool. May cause severe infections in cattle.

Location: Found throughout Garfield County.

Cultural Control: Minimize soil disturbances, encourage desirable plant growth.

Mechanical Control: Top growth removal through mowing or cutting is effective as is pulling or digging out the plant at flowering or early seed formation.

Chemical Control: Treat rosettes in late spring or early fall. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Common burdock* (Appendix A).

COMMON TANSY *(Tanacetum vulgare)*

Description: A member of the Sunflower family introduced from Europe as a medicinal herb. Perennial. Reproduces from seed and creeping rootstalks. Button-shaped flower heads that lack petals. Foliage has a strong smell when crushed.

Comments: Poisonous. Found most commonly in full sun on fertile, well-drained soils along roadsides, streams, irrigation ditch banks and pastures. Undesirable forage for livestock.

Location: Roaring Fork Valley along irrigation ditch banks. Isolated patches have been found along Elk Creek west of New Castle, and along the Colorado River south of Silt.

Cultural Control: Preventing establishment and seed production, and minimizing disturbance and seed dispersal are the most effective. Keep native community healthy. Maintain healthy pastures and avoid over-grazing.

Chemical Control: Treat when bolting to bud growth stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Common tansy* (Appendix A).

COMMON TEASEL *(Dipsacus fullonum)*

Description: A member of the Teasel family introduced from Europe. Biennial or sometime perennial forb; reproduces from seeds. Egg-shaped purple or white flowers at the top of each stem. Can grow to over 6 feet in height.

Comments: Commonly found in open, sunny areas. Prefers moist habitats such as ditches and rivers, however it appears to be moving to drier areas. Each plant can produce 2,000 seeds that remain viable for 2 years.

Location: Found in one location in Garfield County in Battlement Mesa at the golf course.

Cultural Control: The key to controlling is to eliminate seed production and exhaust the seed bank. Prevent the establishment of new infestation by minimizing disturbance and seed dispersal, while keeping native community healthy. Maintain healthy pastures and avoid over-grazing.

Chemical Control: Treat spring or fall rosettes. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Common teasel* (Appendix A).

CORN CHAMOMILE *(Anthemis arvensis)*

Description: A member of the Sunflower family. Annual. Reproduces from seed. Small daisy-like flowers. Bushy branched plant that grows 10 to 30 inches.

Comments: Most commonly found in moist, poorly-drained soils. Tends to increase in abundance in years of above-average precipitation.

Location: While rare, it is found in Beaver Creek and throughout the County in small numbers.

Cultural Control: Prevent the establishment of new infestations by minimizing disturbance and eliminating seed dispersal. Continue to deplete seed bank from 4 to 6 years. Reseed infested areas to reduce infestation.

Chemical Control: Treat when plant is in rosette or bolting growth stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Corn chamomile* (Appendix A).

CURLY DOCK ***(Rumex crispus)***

Description: A member of the Buckwheat family native to Eurasia. Robust, tap-rooted perennial. Grows 2 to 5 feet tall. Stems are erect; leaves basal with curly or wavy margins. Flowers small and in dense green, spike-like clusters.

Comments: Common in wet meadows and along ditch banks.

Location: Scattered throughout the County, in particular the Roaring Fork and Colorado River valleys.

Cultural Control: Treating before the plant seeds is the key to control. Maintain range and pasture in good condition. Promote healthy grass growth through proper irrigation and fertilization. Do not over-graze.

Chemical Control: Apply when plant is in rosette stage, in spring or fall, prior to bolting to eliminate seed production. For specific treatments for rangeland and pasture sites, contact Garfield County Vegetation Management.

CUTLEAF TEASEL ***(Dipsacus laciniatus)***

Description: A member of the Teasel family introduced from Europe. Biennial, Reproduces from seed. Egg-shaped purple or white flowers at the top of each stem. Can grow to over 10 feet in height.

Comments: Commonly found in open, sunny habitats. Prefers moist areas such as ditches and rivers, however it appears to be moving to drier areas. Each plant can produce 2,000 seeds that remain viable for 2 years. More aggressive than common teasel.

Location: Not known in Garfield County at this time.

Cultural Control: The key to removing cutleaf teasel is to eliminate seed production and exhaust seed bank.

Chemical Control: Treat spring or fall rosettes. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Cutleaf teasel* (Appendix A).

CYPRESS SPURGE ***(Euphorbia cyparissias)***

Description: A member of the Spurge family introduced from Eurasia; an invasive ornamental. Low-growing perennial that overwinters as root and crown tissue. Reproduces from seed. Leaves are stalkless, alternate, narrow and linear to lance-shaped. Flowers are yellowish-green usually turning reddish-green towards maturity.

Comments: Leaves and stems emit a milky, toxic sap when broken. Sap is an irritant and may cause dermatitis or rashes. The soil seed reserve is estimated to be at least 8 years.

Location: Found in the Crystal Springs area and in landscaping situations in Carbondale and Glenwood Springs.

Cultural Control: The most important consideration is replacing it in nurseries with alternative native or non-invasive cultivated plants. Remove plants before seed is set, in moist conditions. Be sure to wear gloves due to the toxic milky sap. Prevent establishment of new infestations by minimizing disturbance and seed dispersal, while keeping native community healthy. Maintain healthy pastures and avoid over-grazing.

Chemical Control: Treat at flowering stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Cypress spurge* (Appendix A).

DALMATIAN TOADFLAX ***(Linaria dalmatica)***

Description: A member of the Figwort family introduced as an ornamental from Europe. A creeping, aggressive perennial and escaped ornamental with stems from 2 to 4 feet tall. Flowers are snapdragon-shaped, bright yellow, with orange centers; leaves are waxy and heart-shaped.

Comments: Especially well-adapted to arid sites and can spread rapidly once established. Because of its deep, extensive root system, and heavy seed production, this plant is difficult to manage.

Location: Common in Glenwood Springs, Three Mile Creek, Four Mile Creek and one isolated patch up Slaughter Gulch north of Peach Valley.

Biological Control: The defoliating moth, *Calophasia lunula*, has been released on Dalmatian and yellow toadflax. It may defoliate up to 20% of the leaves of the plant. *Mecinus janthinus*, a stem-boring weevil, is capable of killing a large portion of the above-ground plant by boring into and killing stems where the larvae feed and live.

Cultural Control: Reseed disturbed areas adjacent to toadflax infestation with appropriate perennial grasses.

Mechanical Control: Repeated mowing 2 to 3 times a year will slow spread and reduce seed production.

Chemical Control: Treat at flower stage or in the fall. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Dalmatian toadflax* (Appendix A).

DAME'S ROCKET *(Hesperis matronalis)*

Description: A member of the Mustard family from Eurasia. Biennial or short-lived perennial forb; a prolific seed producer. Flowers have 4 white or purple petals on terminal stalks. Leaves are lance-shaped with toothed margins and are 2 to 4 inches long and slightly hairy.

Comments: Found most commonly in areas that have moist, well-drained soils and full sun to light shade.

Location: No Name and along Midland Avenue in Glenwood Springs.

Cultural Control: Locate and remove plants before seeds are allowed to set. The seed bank must be monitored until it is depleted. Check wildflower seed mix to make sure this plant is not included. Prevent the establishment of new infestations by minimizing disturbance and seed dispersal, while keeping native community healthy. Maintain healthy pastures and avoid over-grazing.

Chemical Control: Treat when plant is in rosette or bolting stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Dame's rocket* (Appendix A).

DIFFUSE KNAPWEED *(Centaurea diffusa)*

Description: A member of the Aster family introduced from Europe. Biennial or short-lived perennial forb; reproduces from seed. Usually produces a single main, multi-branched stem that is 1½ to 2 feet tall. Flower is white or pink with bracts.

Location: The largest infestation in Garfield County is located west of the Riverbend subdivision southeast of New Castle; scattered along Interstate 70 between Rifle and Parachute and south of Glenwood Springs at the Glenwood Airport and old rodeo grounds and Rifle Creek Golf Course.

Cultural Control: Reseeding of disturbed sites with fast growing grasses helps prevent diffuse knapweed establishment.

Mechanical Control: Hand-pulling has been effective, if repeated persistently over time.

Biological Control: A root-boring weevil, *Cyphocleonus achates*, weakens plants by destroying the root system. The weevil larvae of *Larinus minutus* feed within the seedhead and cause defoliation.

Chemical Control: Apply to spring to early rosette or bolt stage of growth, or fall rosettes. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Diffuse knapweed* (Appendix A).

HOARY CRESS *(Cardaria draba)*

Description: Also known as whitetop. A member of the Mustard family probably introduced from Europe in alfalfa seed. A very competitive, deep-rooted perennial that reproduces by root segments and seed. Grows erect from 10 to 18 inches high and has a grey-white colored leaf. Flowers are white and numerous in compact, flat-topped clusters which give the plant its name.

Comments: One of the earliest perennial weeds to emerge in the spring, producing flowers in May or June. Grows in waste places, cultivated fields and pastures, and is capable of vigorous growth.

Location: Common in Garfield County.

Cultural Control: Mowing or cultivation effectiveness will be increased if other plants like perennial native grasses or alfalfa are seeded in the hoary cress stand as competitors. Maintain range and pasture in good condition. Promote healthy grass growth through proper irrigation and fertilization. Do not over-graze.

Mechanical Control: Removal of top growth is somewhat effective. Repeated treatments may reduce seed production and spread.

Chemical Control: Treat at the early bud stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Hoary cress* (Appendix A).

HOUNDSTONGUE *(Cynoglossum officinale)*

Description: A member of the Borage family introduced from Europe. Biennial. Prolific seed producer. Grows 1½ to 3 feet high with reddish-purple flowers. Basal leaves resemble a dog's tongue in shape.

Comments: Its small nutlets attach to and are rapidly spread by people, domestic animals, wildlife and vehicles. Grows on ranges, pastures, trails and roadsides and is toxic to horses and cattle, as it contains alkaloids that may cause liver cells to stop reproducing.

Location: Widespread throughout Garfield County.

Cultural Control: Reseed disturbed sites with fast-growing native grasses. Maintain range and pasture in good condition. Promote healthy grass growth through proper irrigation and fertilization. Do not over-graze.

Mechanical Control: Physical removal of the plant at flowering or in early seed formation, by pulling or digging, will break the cycle of the plant.

Chemical Control: Treat in spring or fall rosettes. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Houndstongue* (Appendix A).

JOINTED GOATGRASS *(Aegilops cylindrica)*

Description: A member of the Grass family, Barley tribe. A non-native grass introduced from Turkey. Winter annual, reproduces from seed. Grows 15 to 30 inches tall in erect stems which branch at the base to give the plant a tufted appearance.

Comments: Established in many winter wheat-growing areas of North America. The seeds are very similar in size and shape to wheat seed and therefore are difficult to screen out. Found along roadsides, in waste areas, fields and pastures.

Location: Found in the Harvey Gap area, in West Mamm Creek, in fields adjacent to Parachute Creek, in scattered locations along county roadsides in the Silt and New Castle areas, and in Wallace and Spring Creeks.

Cultural Control: The key to control is to prevent the grass from becoming established in fields by cleaning equipment. Plant competitive native grasses.

Mechanical Control: Tillage can be effective when plants are in the seeding stage. The main goal is to prevent seed production and spread.

Chemical Control: Treat in early spring, late summer, or early fall when the plant is germinating, to prevent seed production. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Jointed goatgrass* (Appendix A).

LEAFY SPURGE *(Euphorbia esula)*

Description: A member of the Spurge family, introduced from Europe. A creeping perennial that grows up to 3 feet tall and reproduces by vigorous root stalks and seed. Roots can extend as deep as 30 feet from a plant that grows 1 to 3 feet tall, with pale green shoots and small yellow-green flowers.

Comments: The plant, including the root, has milky latex that is damaging to eyes and sensitive skin. Extremely difficult to control because of its extensive sprouting root. Adapted to a wide variety of Colorado habitats and very competitive with other plants species. If it becomes established in rangeland, pasture and riparian sites, it may exclude all other vegetation due to its competitive nature.

Location: Primarily found in Wallace and Spring Creeks in western Garfield County. Individual plants have been located throughout Garfield County.

Biological Control: Sheep or goats will graze leafy spurge. If livestock graze it after seed formation, hold animals in a corral for at least 7 days before moving them to an uninfested area to avoid seed spread.

Several flea beetles, *Apthona spp.,* produce larvae that bore into roots and the adults feed on the leaves. *Oberea erythrocephala,* a stem and root crown-mining, long-horned beetle, and *Spurgia esulae*, a shoot tip gall midge, are also available. The leafy spurge hawk moth, *Hyles euphorbiae*, deposits its eggs which then consume the leaves and bracts of the plant.

Cultural Control: Any activity that encourages vigorous grass growth is very important. Over-grazing stresses grasses and makes them less competitive to leafy spurge.

Mechanical Control: Mowing leafy spurge at 14 to 21-day intervals may cause higher susceptibility to fall-applied herbicides.

Chemical Control: Treat after full bloom or in the fall. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Leafy spurge* (Appendix A).

MAYWEED CHAMOMILE *(Anthemis cotula)*

Description: A member of the Sunflower family introduced from Europe. A bushy annual that reproduces prolifically from seed. Mature plants are one-half to 2 feet tall with finely dissected alternate leaf structures. White ray flowers.

Comments: Each plant is capable of producing 960,000 seeds that are viable for up to 6 years. The most distinguishing feature is the unpleasant odor it emits. Most commonly found in a wide range of soils but prefers moist poorly-drained soils. Increases in abundance in years of above-average precipitation. Can cause skin rashes, blistering of livestock muzzles, and irritation to the mucous membranes of grazing livestock. Can impart a strong flavor to the milk of dairy animals.

Location: While rare, may be found in Beaver Creek and throughout the County in small numbers.

Cultural Control: Prevent establishment of new infestations by minimizing disturbance and seed dispersal, while keeping native community healthy. Maintain healthy pastures and avoid over-grazing. Mowing is an effective method before the seed is set. Perennial grasses should be reseeded for several years. Seed bank must be monitored for 4 to 6 years.

Chemical Control: Treat from rosette to bolting stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Mayweed chamomile* (Appendix A).

MEADOW KNAPWEED *(Centaurea nigrescens)*

Description: A member of the Sunflower family introduced from Europe as a forage species. Perennial. Reproduces from seed. Pink to purple flower heads that are solitary at the tips of branches. Grows 20 to 40 inches with many branches. Leaves up to 6 inches long and 1 inch wide.

Comments: When disturbed, has the ability to re-sprout from root and crown fragments. Found most commonly in moist sites, irrigated pastures, moist meadows, river banks, streams, irrigation ditches, roadsides and openings in forested area.

Location: Found in the upper Dry Hollow area south of Silt.

Cultural Control: Prevent the establishment of new infestations by minimizing disturbance and seed dispersal, while keeping native community healthy. Maintain healthy pastures and avoid over-grazing. Since meadow knapweed has only been found in small quantities in Colorado, preventing populations from spreading is the most important consideration. Eradication requires intensive work to eliminate seed dispersal and deplete the seed bank. An integrated management plan utilizing hand-pulling, herbicides and cultural remediation is the most effective method.

Chemical Control: Treat in spring to early summer during bolting to bud growth stages or in fall. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Meadow knapweed* (Appendix A).

MEDITERRANEAN SAGE *(Salvia aethiopsis)*

Description: A member of the Mint family introduced from northern Africa. Biennial or shot-lived perennial. Reproduces from seed. Very hairy rosette of leaves during both the first and second years. During the second year the plant bolts and sends up stems that end in white to yellowish-white flower clusters. Flowers will eventually form 4 nutlets with dark veins.

Comments: When crushed, the leaves have a pungent odor. Most commonly found on rangeland but will invade riparian areas, forests, roadsides and dry pastures. Prefers south-facing slopes in loose, gravelly, well-drained soils. Once established, has the capability to adapt to numerous conditions and form dense monocultures. In the fall of the second year, the stem breaks off and forms a tumbleweed, dispersing 100,000 seeds. Unpalatable to livestock.

Location: The only known County location is on the south-facing slope surrounding the No Name Tunnel on Interstate 70 and along the Colorado River bikepath.

Cultural Control: Prevent establishment of new infestations by minimizing disturbance and seed dispersal while keeping native community healthy. Maintain healthy pastures and avoid over-grazing. Hand pull or shovel when soil is moist, before flowering, and turn over

to dry out. If flowering, collect specimens and bag them carefully to collect all seeds. Seed bank must be monitored for years. Sites must be monitored for 10 years after plant is eradicated.

Chemical Control: Apply in spring during rosette to bolting growth stages. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Mediterranean sage* (Appendix A).

MUSK THISTLE *(Carduus nutans)*

Description: A member of the Aster family introduced from Eurasia. A winter annual or biennial; reproduces from seed. First year growth is a large, compact rosette from a large, fleshy, corky taproot. Second year stem is erect, spiny, 2 to 6 feet tall and branched at the top. Waxy leaves dark green with light green midrib and mostly white margins; flowers purple or occasionally white.

Comments: Commonly found in pastures, roadsides and waste places. Prefers moist bottomland soil, but can also be found on drier uplands.

Location: Scattered throughout the County; heaviest in the Crystal River Valley.

Cultural Control: Musk thistle, like other biennial thistles, thrives on disturbance. The best management is to minimize disturbance. If it does occur, be certain to revegetate with competitive grasses.

Biological Control: A weevil, *Trichosirocalus horridus*, attacks the crown area of the rosettes and weakens the plant before it bolts. This weevil has reduced stand density in areas where it has become well established.

Chemical Control: Treat rosettes in spring or fall. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Musk thistle* (Appendix A).

MYRTLE SPURGE ***(Euphorbia myrsinites)***

Description: A member of the Spurge family introduced from Eurasia as an ornamental. Perennial. Reproduces from seed. Capable of projecting seeds up to 15 feet. Blue-green waxy leaves. Plants emit a toxic milky latex when stems are broken. Flowers yellow-green petal-like bracts that appear from March to May.

Comments: A popular plant in xeriscapes and rock gardens. Prefers sunny to partly sunny areas in well-drained soils. Poisonous if ingested; milky sap causes blisters upon contact. Most important consideration is replacing it in nurseries with alternative native or non-invasive cultivated plants. Remove plants before seed is set, in moist conditions.

Location: Fairly common in Glenwood Springs and Battlement Mesa. Isolated patches have been found in Westbank, Peach Valley and New Castle.

Cultural Control: Area must be monitored for 9 years after last flowering plant is eradicated. Prevent the establishment of new infestation by minimizing disturbance and seed dispersal, while keeping native community healthy. Maintain healthy pastures and avoid over-grazing.

Mechanical Control: Hand pull or dig when soil is moist. Make certain to pull all the roots and wear rubber gloves and eye protection to protect yourself from the toxic milky sap. Treatment follow-up is important to check root fragment re-sprouts that will occur when the taproot is not completely removed.

Chemical Control: Treat at flowering stage in spring or fall regrowth. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Myrtle spurge* (Appendix A).

OXEYE DAISY ***(Chrysanthemum leucanthemum)***

Description: A member of the Aster family; a native of Eurasia. Rhizomatous perennial, escaped ornamental. White ray and yellow disk flowers, which bloom from June through August.

Comments: Commonly sold in wildflower seed mixes or transplanted as an ornamental despite its tendency to crowd out more desirable vegetation.

Location: A rapidly spreading weed in Garfield County on the increase along Main Elk Creek, East Elk Creek, Canyon Creek, Crystal Springs, Missouri Heights and Four Mile Creek.

Mechanical Control: Hand pull or dig when soil is moist.

Chemical Control: Treat at flowering stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Oxeye daisy* (Appendix A).

Education: The key to oxeye daisy management is to create an awareness among homeowners, nurseries, landscapers and landscape architects that oxeye is a noxious weed and therefore should not be specified in plantings, sold in nurseries or planted in home gardens or large-scale landscape projects.

PERENNIAL PEPPERWEED *(Lepidium latifolium)*

Description: A member of the Mustard family introduced from southern Europe and western Asia as a contaminant in sugar beet seed. Perennial. Reproduces from seed, roots and shoots. One to over 3 feet in height and has waxy leaves with a white midrib. White flowers in dense round clusters at branch tips.

Comments: Can grow in a variety of habitats but frequently found in moist soils such as riparian areas, wetlands, marshes, irrigation ditches, canals and floodplains. Alters ecosystems by acting as a "salt pump," pulling salts from deep in the soil and excreting them on the surface. Change in soil pH alters biodiversity drastically and deceases agriculture and pasture production. Extremely invasive. The best method is prevention. In order to control this plant intensive use of herbicides and revegetation must be utilized.

Location: Scattered throughout central to western Garfield County, with the largest infestation found along Parachute Creek.

Cultural Control: Prolonged spring flooding of new growth will kill pepperweed. Reestablishment of native and desired plants can take years. Re-plantings must be repeated.

Chemical Control: Apply when plant is in bolting to early flower growth stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Perennial pepperweed* (Appendix A).

PLUMELESS THISTLE *(Carduus acanthoides)*

Description: A member of the Aster family introduced from Eurasia. Winter annual or biennial; prolific seed producer. Distinguished from musk thistle by smaller flowers from ½ to 1 inch in diameter. Leaves lack prominent white margin present on musk thistle leaves. May grow to 5 feet or more. Flowers reddish-purple, either solitary or clustered.

Comments: Found in pastures, river valleys and along roadsides.

Location: Common in southern Garfield County; rapidly spreading south of Battlement Mesa.

Biological Control: A weevil, *Trichosirocalus horridus*, attacks the crown area of rosettes and weakens the plant before it bolts. This weevil has reduced stand density in areas where it has become well established.

Cultural Control: Like other biennial thistles, it thrives on disturbance. The best management is to minimize disturbance and revegetate with competitive species.

Mechanical Control: Mowing is generally not effective due to the plant's capacity for rapid regrowth. Hand cutting is not effective unless there are repeated follow-up treatments and should only be conducted if there is a commitment to follow-up efforts. Plumeless tends to branch out where it is cut and then re-flowers. Pulling can be very effective, especially after a light rain. Hand-pulling with a good set

of gloves is preferable to shoveling which disturbs the ground creating a potential seedbed for future infestations.

Chemical Control: Treat rosettes in spring or fall. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Plumeless thistle* (Appendix A).

POISON HEMLOCK *(Conium maculatum)*

Description: A member of the Parsley family. A biennial forb native to Europe. Grows 4 to 10 feet tall. Has white flowers in an umbrella-like cluster. Leaves are shiny green and finely divided, with a musty odor.

Comments: Seeds may remain viable in soil for about 3 years. All parts of the plants are highly poisonous. Found along streams, ditch banks and pasture borders. Highly poisonous.

Location: Garfield and Baldy Creeks.

Cultural Control: The key to control is containment and prevention. Pulling the taproot when the soil is moist can be effective. When the plants are present, the use of herbicides is critical.

Biological Control: Larvae of the hemlock moth, *Agonopterix alstroemericana*, feed on the leaves, stem, flowers and seeds causing severe defoliation and death of the plant.

Mechanical Control: Deplete root reserves and reduce seed production with repeated mowing.

Chemical Control: Treat in early spring. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Poison hemlock* (Appendix A).

PURPLE LOOSESTRIFE *(Lythrum salicaria)*

Description: A member of the Loosestrife family introduced from Europe; an escaped ornamental. Prolific seed producer, able to produce over

10,000 seeds per square yard. Erect, square stem; can reach 1½ to 8 feet tall. Magenta-colored flowers.

Comments: Highly aggressive invader species found in most wetland sites throughout the state. If left unchecked, a wetland will eventually become a monoculture of loosestrife, posing a severe threat to waterfowl habitat and impeding water flow in irrigation ditches.

Location: Tara Park in Silt and the Westbank subdivision in Glenwood Springs.

Mechanical Control: Include hand-pulling, mowing and flooding. Hand-pulling is effective only on small plants, when infestations are detected early. The root system must be completely removed, since the root sections can sprout and form new plants.

Chemical Control: Cut and properly dispose of flower heads before chemical treatment. Treat in summer. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Purple loosestrife* (Appendix A).

RUSSIAN KNAPWEED (*Acroptilon repens)*

Description: A member of the Aster family introduced from Europe. Perennial that reproduces from seed with an extensive underground root system. Ridged stems are stiff and 1 to 3 feet high, with thistle-like flowers that are lavender to white.

Comments: Very difficult to control or eradicate once it becomes established. Grows in cultivated fields, along ditch banks, fence rows, roadsides and in waste places. Toxic to horses, and will cause death if consumed over a period of time.

Location: Very common in Garfield County; most common in Dry Hollow, Silt Mesa and Missouri Heights.

Cultural Control: A single control strategy such as mowing or an herbicide usually is not sufficient. Tends to form monocultures by eliminating other plants. Sowing desirable plant species is necessary after the weed is controlled. Research indicates that the native grasses,

streambank wheatgrass and thick-spike wheatgrass will establish in an area after Russian knapweed is suppressed with herbicides. If the 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 it under continual stress.

Mechanical Control: Repeated mowing combined with herbicide applications will gradually stress the plant.

Chemical Control: Treat in spring to bud stage or to dormant plants in fall after the first freeze. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Russian knapweed* (Appendix A).

RUSSIAN OLIVE *(Elaeagnus angustifolia)*

Description: Member of the Oleaster family. A hardy, fast-growing tree from Europe, Russian olive has been promoted for windrow and ornamental plantings. Many reach heights from 10 to 25 feet. Trunks and branches armed with 1 to 2 inch woody thorns. Leaves covered with small scales which give the foliage a distinctive silvery appearance. Fruit berry-like and silvery when first formed but turns brown at maturity.

Comments: Once imported as a wind-break, it has spread to riparian areas throughout the County where it is becoming the dominant plant. It has invaded cottonwood areas along streams, and impacted wildlife and bird habitat.

Location: Very common along the Colorado River and other drainages especially between Silt and Rifle in western Garfield County.

Cultural Control: Plant native trees or less aggressive introduced trees. In riparian areas, establish native riparian vegetation.

Mechanical Control: Small trees may be controlled mechanically by using an appropriate tool or shovel.

Chemical Control: Treatments include cut-stump, foliar or basal bark. Timing varies; avoid late spring and early summer during heavy sap flow. For

specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Russian olive* (Appendix A).

SALT CEDAR *(Tamarix ramosissima, Tamarix parviflora)*

Description: A member of the Tamarisk family. Deciduous or evergreen shrub or small tree, 5 to 25 feet tall.

Comments: May live 50 to 100 years. Tolerance to saline and alkaline soil and water. Copes with high concentrations of dissolved solids by absorbing them through its roots and excreting salts through glands in its stem and leaves which eventually form a saline crust on the soil. A single plant of salt cedar will use about 200 gallons of water a day while it is actively growing. Leaves small and scale-like, on highly branched slender stems. *Ramosissima* flowers are 5-petaled and pink to white; *Parviflora* flowers are 4-petaled.

Location: Widespread throughout Garfield County in riparian areas.

Biological Control: Tamarisk leaf beetle, *Diorhabda carinulata*, has been released along the mainstem of the Colorado River in western Garfield County and some tributaries, and is now established. Adult and larvae cause defoliation.

Cultural Control: Establish native riparian vegetation.

Mechanical Control: Historically, salt cedar management projects have included root plowing and raking, dozing, mowing and prescribed burning. These methods provide only short-term benefits and are labor intensive.

Chemical Control: Treatments include cut-stump, foliar or basal bark. Timing varies; avoid late spring and early summer during heavy sap flow. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Salt cedar* (Appendix A).

SCENTLESS CHAMOMILE *(Tripleurospernum perforata)*

Description: A member of the Sunflower family introduced from Europe. Annual, biennial or short-lived perennial forb; reproduces by seed. Flowers are daisy-like with 1 yellow centered flower with white petals for every stem. Leaves are alternate, finely divided, fernlike, odorless when crushed. Stems can grow 3 to 6 feet tall.

Location: While rare, may be found throughout the County in small numbers.

Comments: Scentless chamomile is most commonly found in moist areas such as hayfields, pastures, roadsides, stream banks, fence lines and drainages. A single plant can produce 300,000 seeds. Has the potential to be devastating in agricultural settings because it causes blistering on livestock muzzles and irritation to mucous membranes.

Cultural Control: Any practice that aids in the establishment of forage into a firm moist seedbed will help reduce growth. Integrated management is the most effective method for controlling scentless chamomile. A combination of tillage, herbicide and competitive cropping can be very effective in preventing seed production and crowding out infestations.

Chemical Control: Treat in rosette or bolting stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Scentless chamomile* (Appendix A).

SCOTCH THISTLE *(Onopordum acanthium)*

Description: A member of the Aster family introduced from Europe or eastern Asia. A biennial that can reach a height of 8 feet. Rosette forms the first year and can have leaves up to 2 feet long and 1 foot wide. The second year the plant produces flowers that are reddish-purple to violet.

Comments: Found primarily along roadsides and railroads, but can become an impassable obstacle to livestock on rangeland and pastures.

Location: Common in the County. The worst infestations are located between Glenwood Springs and New Castle.

Cultural Control: Reseed disturbed sites with appropriate perennial grasses.

Mechanical Control: Digging the plant at the rosette stage is effective.

Chemical Control: Treat rosettes in spring or fall. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Scotch thistle* (Appendix A).

SPOTTED KNAPWEED *(Centaurea stoebe)*

Description: A member of the Aster family, native to central Europe. Short-lived, non-creeping perennial that reproduces from seed and forms a new shoot each year from a taproot. One or more shoots up to 4 feet tall. Flowers lavender to purple.

Comments: Occupies dry meadows, pastures, stony hills, roadsides and the sandy or gravel flood plains of streams and rivers, where soils are light textured, well-drained and receive summer precipitation. Tolerates dry conditions similar to diffuse knapweed, but will survive in higher moisture areas as well. One of the most invasive, aggressive weeds to plague the western United States.

Location: Scattered, isolated patches are increasing in the County. A large infestation is located just west of the Riverbend subdivision southeast of New Castle. Also North Dry Fork northwest of DeBeque, the East Divide area, Cardiff area south of Glenwood Springs, and Battlement Creek.

Biological Control: A root-boring weevil, *Cyphocleonus achates*, weakens plants by destroying the root system. The weevil larvae of *Larianus minutus* feed within the seedhead and cause defoliation.

Cultural Control: If desirable grass competition is evident in spotted knapweed stands, judicious herbicide application that does not injure grasses may release them to compete effectively with the weeds. Irrigation may help stimulate grass competition in these cases. Seeding suitable perennial grasses is necessary to prevent weed reinvasion.

Chemical Control: Treat spring or fall rosettes. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Spotted knapweed* (Appendix A).

SULFUR CINQUEFOIL *(Potentilla recta)*

Description: A member of the Rose family introduced from Eurasia. Perennial, reproduces from seed. Leaves are palmately compound with 5 to 7 toothed leaflets. Flowers light yellow with 5 petals, seeds are coated with a net-like pattern.

Comments: Most commonly found in disturbed areas such as roadsides and pastures. Prefers dry, sandy, gravelly and rocky soils that receive 13 to 50 inches of annual precipitation. Unpalatable to livestock due to a high concentration of phenolic tannins. Can live for 20 years.

Location: Found in South Canyon.

Cultural Control: Small infestations can be controlled by hand pulling while larger infestations are commonly controlled with herbicides. Re-vegetation should focus on improving the competitiveness of native communities. Increasing the competitiveness of native communities can prevent the establishment of sulfur cinquefoil. As with all weeds, disturbance and bare ground should be avoided.

Chemical Control: Treat anytime during the growing season. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Sulfur cinquefoil* (Appendix A).

YELLOW STARTHISTLE *(Centaurea solstitialis)*

Description: A member of the Aster family introduced from Europe. Annual; prolific seed producer. Grows two to 3 feet tall. Flowers are yellow, located singly on ends of branches, armed with sharp straw-colored thorns up to ¾ inches long.

Comments; In California alone, this plant has infested more than 20 million acres. “Chewing disease” results when horses are forced to eat yellow starthistle.

Location: No known infestations in the County, however there have been reports in the past of single plant infestations.

Biological Control: A seed-feeding beetle, *Bangasterus orientalis*, has been released in California and Idaho. Seed weevils and seed flies have also been released.

Cultural Control: Vigorous competitive grass is essential to maintain a plant community's resistance to starthistle invasion.

Mechanical Control: Mowing or cutting is rarely effective.

Chemical Control: Treat during rosette growth stage. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Yellow starthistle* (Appendix A).

YELLOW TOADFLAX *(Linaria vulgaris)*

Description: A member of the Figwort family sometimes called common toadflax or "Butter and Eggs." Introduced from Europe. Escaped ornamental perennial reproducing by seed and rootstalk. Flowers bright yellow with deep orange centers that resemble the snapdragon.

Comment: Has now become a serious problem to rangelands and mountain meadows. Does well in all types of soils. Its displacement of desirable grasses not only reduces ecological diversity, but also reduces rangeland value and can lead to erosion problems. Because of its early vigorous growth, extensive underground root system and effective seed dispersal methods, yellow toadflax is difficult to control.

Location: Infests thousands of acres in the Flat Tops Wilderness. Increasing in the Lookout Mountain area above Glenwood Springs.

Biological Control: The defoliating moth, *Calophasia lunula*, has been released on Dalmatian and yellow toadflax. It may defoliate up to 20% of the leaves of the plant. *Mecinus janthinus*, a stem-boring weevil, is

capable of killing a large portion of the above-ground plant by boring into and killing stems where the larvae feed and live.

Cultural Control: Attempt to maintain competitive communities of desirable species. Reseed any open ground with perennial grasses to prevent invasion by other weed species.

Education: The key to management of escaped ornamentals is to create awareness among homeowners, nurseries, landscapers and landscape architects that yellow toadflax is a noxious weed and therefore should not be specified in plantings, sold in nurseries or planted in home gardens or large-scale landscape projects.

Mechanical Control: Digging and pulling where feasible can provide effective control if conducted annually for 10 to 15 years.

Chemical Control: Treat at flowering through fall. For specific treatments for rangeland and pasture sites, refer to the Colorado Department of Agriculture Fact Sheets – *Yellow toadflax* (Appendix A).

2.06 Identification of Native and Noxious Thistles

A. Colorado has several species of thistle which are native and do not cause the problems of the noxious species. Some of them are very rare. An excellent reference guide is "Thistles of Colorado," published by the Larimer County Weed District. Native thistles share these characteristics:
   1. They have mostly white, sometimes very pale lavender flowers and are more succulent than the noxious species. The flowers may have a hairy or fuzzy appearance and stems of some species are reddish.
   2. They are valuable to pollinators and wildlife and contribute to biodiversity.
   3. They are sometimes inadvertently sprayed, pulled, clipped or dug up because they are confused with noxious, non-native thistles.
   4. Among the native thistles in Garfield County are Barneby's thistle (*Cirsium barneybi)*, fringed thistle (*Cirsium centaureae)*, Fish Lake thistle (*Cirsium clavatum* var. *americanum)*, Rocky Mountain thistle (*Cirsium perplexans)*, and adobe thistle (*Cirsium perplexanis)*.

B. Five introduced thistle species include Canada, musk, plumeless, bull and Scotch.
   1. Canada thistle is a perennial and has an extensive root system.
   2. Plumeless, Scotch and musk thistles are biennials. They are relatively shallow-rooted and reproduce by seed only.

3. Canada and plumeless are often mistaken for each other. It is very simple to tell them apart:
    a) Canada has a smooth stem; plumeless has a spiny stem and leaves.
    b) The bracts under the flower of Canada are spineless; bracts under the leaves of plumeless appear as sharp spines.
    c) The flowers of musk thistle are about 3 times larger than those of Canada or plumeless.
4. Musk thistle seedlings have a very prominent white midrib.
5. Scotch thistle leaves are larger than those of the other thistles. They grow up to 2 feet in length and 1 foot wide. The leaves are covered with dense hairs which give them a grey appearance.
6. The leaves of bull thistle are deeply lobed and spiny with prickly hair above and cottony hair below. Canada leaves are smooth above and smooth or hairy below.
7. All of the biennial thistles may grow to heights of greater than 6 feet. Canada thistle may grow from 1 to 4 feet tall.

SECTION III
JURISDICTIONAL OVERVIEW OF AREAS OF INFESTATION

3.01 Overview

It is the goal of Garfield County to develop and implement a comprehensive noxious weed management program on all County-owned property and to be available as a resource for private landowners and public land managers. The County has adopted an "early detection, early treatment" policy for the purpose of establishing priorities. Early detection involves identification and documentation of recently introduced weed species into an area. Early treatment is the follow-up that could possible eradicate new infestations.

3.02 County Land: Roads, Airport, Landfill

A. Roads: Garfield County has over 900 miles of county roads. Roadsides shall be managed for weeds on the County's noxious weed list and Colorado listed weeds designated for eradication.
   1. A Priority List of roads will be established each growing season based upon input from the Road and Bridge Department, the public and past observations by staff. Roadsides will be selectively spot-treated for noxious weeds.
   2. There will be no general herbicide applications to non-listed weeds unless specifically requested by the Road and Bridge Department or the County Commissioners to treat a roadside for safety and sight reasons or to protect new paving.
   3. Roadside treatment will start in the warmer, western end of the County in mid-April and move east and south as the growing season progresses. Each road on the Priority List will be treated at least twice. If time and workload allows some of the heavily infested roadsides will be treated a third time.

B. Airport: The Airport will be treated on an as-needed basis for noxious weeds.
   1. There are scattered infestations of Russian knapweed, musk thistle, whitetop, tamarisk and Russian olive on Airport property.
   2. In 2006, ten acres of tamarisk were treated using the cut-stump method with the Rifle Correctional Crew on property along lower Mamm Creek. Annual follow-up is necessary.

C. Landfill. The West Garfield County Landfill will be treated on an as-needed basis for noxious weeds. There are isolated patches of musk thistle, Scotch thistle and tamarisk at the Landfill.

3.03 State Land

A. Colorado Department of Transportation's state highways in Garfield County are Highways 13, 82, 133, 139, 325 and U.S. Highway 6&24. These highways are

managed for noxious weeds by CDOT through their offices in Glenwood Springs, Grand Junction and Craig.

1. Goals:
    a. Manage all noxious weeds in accordance with the Garfield County Weed Management Plan and the latest version of State Rules and Regulations Pertaining to the Noxious Weed Act, (8CCR 1206-2).
    b. Establish an intergovernmental agreement with CDOT that enables the County to perform weed management on a very limited basis. The major responsibility for weed management would still lie with CDOT.
2. Key Species:
    a. Interstate 70: Diffuse knapweed, spotted knapweed, Russian knapweed, Scotch thistle, Russian olive, tamarisk.
    b. Glenwood Canyon Bike Path: Chinese clematis, Russian knapweed, hoary cress, tamarisk, common tansy, plumeless thistle, Canada thistle.
    c. Highway 13: Musk thistle, yellow toadflax, Russian knapweed, Scotch thistle.
    d. Highway 82: Plumeless thistle, Canada thistle, Russian knapweed.
    e. Highway 133: Oxeye daisy, yellow toadflax, plumeless thistle, Canada thistle.
    f. Highway 139: Whitetop, Russian knapweed, spotted knapweed, Canada thistle.
    g. Highway 325: Diffuse knapweed, Canada thistle, Russian knapweed.
    h. Highway 6&24: Diffuse knapweed, Russian knapweed, Scotch thistle, Canada thistle, whitetop.

B. Colorado Division of Parks and Wildlife
    1. The Colorado Division of Parks and Wildlife has a weed management program in place for the Garfield Creek State Wildlife Area. Garfield County partnered with the DPW to map the area for noxious weeds in 2009.
    2. The Division has two ponds adjacent to Cottonwood Park in Parachute. Key species are tamarisk and Russian olive.
    3. Rifle Gap, Rifle Falls and Harvey Gap have weed management programs for those properties.
C. Garfield County is available to provide technical assistance and weed identification upon request.

3.04 Federal Land

A. Bureau of Land Management

The BLM within Garfield County manages its noxious weeds through the Field Offices in Silt (Colorado River Valley) and Grand Junction. Garfield County has an intergovernmental agreement with the Colorado River Valley Field Office to treat noxious weeds on BLM land as a supplement to the BLM's own program. This agreement is reviewed and modified on an annual basis. Resources are limited and may provide for approximately 10 sites per year to be treated by County crews.

B. White River National Forest

The WRNF within Garfield County manages its noxious weeds through its Ranger Districts in Rifle, Carbondale, Eagle and through the Supervisor's Office in Glenwood Springs. The WRNF has an intergovernmental agreement with Garfield County that supplements the Forest's program.

3.05 Municipalities

The towns and cities within the County include Carbondale, Glenwood Springs, New Castle, Parachute, Rifle and Silt. Municipalities have specific responsibilities as described in the Colorado Noxious Weed Act (See Section 1.03 of this plan). As of December 2015, all municipalities have a representative on the County Weed Advisory Board which serves in an advisory capacity. This cooperation does not preempt the above-stated responsibilities. Listed below are general descriptions of the weed issues in each municipality. The list is meant to provide institutional memory as to where key species are known to occur. The list is not all-inclusive.

The suggested goal for each municipality is to manage all noxious weeds in accordance with the latest version of State Rules and Regulations Pertaining to the Noxious Weed Act (8CCR 1206-2).

A. Carbondale:
   1. Key Species: Absinth wormwood, diffuse knapweed, yellow toadflax, whitetop, Canada thistle, plumeless thistle, oxeye daisy.
   2. Locations:
      a. North Face Park/Roaring Fork High School: Canada thistle, oxeye daisy, plumeless thistle.
      b. Nature Park: Canada thistle, oxeye daisy, yellow toadflax.
      c. Bull Pasture Park: Canada thistle, absinth wormwood.
      d. Carbondale Ditch: Canada thistle, absinth wormwood.
      e. Weaver Ditch: Absinth wormwood.
      f. Bowls and Holland Ditch: Absinth wormwood.
      g. Snowmass and White Hill Trails: Canada thistle.
      h. River Valley Ranch Golf Course: Absinth wormwood.
      i. County Road 108: Whitetop.

B. Glenwood Springs
   1. Key Species: Myrtle spurge (List A), Dalmatian toadflax, diffuse knapweed, tamarisk, Scotch thistle, plumeless thistle, sulfur cinquefoil, oxeye daisy.
   2. Locations:
      a. South Canyon Landfill: Scotch thistle.
      b. South Canyon Parklands: Scotch thistle, tamarisk, Dalmatian toadflax, sulfur cinquefoil, oxeye daisy.
      c. Glenwood Springs Airport and rodeo grounds: Dalmatian toadflax, diffuse knapweed.

d. Two Rivers Park: Tamarisk, Russian olive.
e. Midland Avenue: Dalmatian toadflax.

C. New Castle
1. Key Species: Scotch thistle, Russian knapweed, myrtle spurge (List A), tamarisk, oxeye daisy, whitetop.
2. Locations:
a. Castle Valley Boulevard: Scotch thistle, whitetop, Russian knapweed.
b. 7th Street: Myrtle spurge, absinth wormwood.
c. Riverside Park: Oxeye daisy, Russian knapweed.
d. Colorow Trail: Russian knapweed, Scotch thistle, whitetop.
e. Lakota Canyon subdivision: Scotch thistle.

D. Parachute
1. Key Species: Russian knapweed, whitetop, Russian olive, tamarisk, Scotch thistle, diffuse knapweed.
2. Locations:
Cottonwood Park: Whitetop, tamarisk.

E. Rifle
1. Key Species: Tamarisk, Russian olive, plumeless thistle, Canada thistle, yellow toadflax, Scotch thistle, Russian knapweed.
2. Locations:
a. Rifle Mountain Park: Yellow toadflax, plumeless thistle, Canada thistle.
b. Centennial Park: Tamarisk, Russian olive, Russian knapweed.

F. Silt
1. Key Species: Tamarisk, Russian olive, Russian knapweed, musk thistle, Scotch thistle, hoary cress.
2. Locations:
a. River Park: Russian knapweed, hoary cress, tamarisk, Russian olive.
b. Stoney Ridge: Tamarisk.
c. Tara Park: Russian olive, tamarisk, purple loosestrife.

3.06 Unincorporated Battlement Mesa

Battlement Mesa is a community of 4,500 residents in unincorporated Garfield County. Garfield County Vegetation Management has collaborated with the Battlement Mesa Company and the Battlement Mesa Service Association on noxious weed management projects.

A. Key Species: Russian olive, Russian knapweed, hoary cress, common teasel, musk thistle, myrtle spurge, chicory, common burdock, tamarisk, Canada thistle, perennial pepperweed, plumeless thistle, houndstongue.

B. Locations:

1. Battlement Mesa Golf Course: Common teasel, Russian knapweed, common burdock, tamarisk, Canada thistle, perennial pepperweed, plumeless thistle, houndstongue, Russian olive, hoary cress.
2. Monument Gulch: Musk thistle, Russian knapweed, tamarisk, houndstongue, plumeless thistle, cheatgrass.
3. Metro District Water/Sewer Plant and areas along the Colorado River: Russian knapweed, hoary cress, Russian olive, musk thistle.
4. Battlement Mesa neighborhoods and subdivisions:
    a. Eagle's Point: Russian knapweed.
    b. Battlement Reserve: Myrtle spurge.
    c. Willow Creek: Russian knapweed in vacant lots.
    d. Spencer Parkway: Russian knapweed on medians and roadsides.
    e. Stone Corral and areas around County Road 302: Russian knapweed.

3.07 Railroad

The Union Pacific Railroad owns the rail line that generally runs parallel to Interstate 70 from Glenwood Canyon to the Mesa County line. Garfield County worked with other Western Slope counties to develop a weed management plan for UP in 2010. Portions of the rail line between Glenwood Springs and Rifle were mapped by the County in 2009 with the cooperation of UP.

A. Suggested Goal: Manage all noxious weeds in accordance with the Garfield County Weed Management Plan and the latest version of State Rules and Regulations Pertaining to the Noxious Weed Act (8CCR-1206-2).
B. Key Species: Scotch thistle, tamarisk, Russian knapweed, whitetop, Russian olive, common tansy, Chinese clematis.

SECTION IV
IMPLEMENTATION OF WEED MANAGEMENT PLAN

4.01 Objectives and Goals

A. Management Goals for Weed Species. Management goals will vary from species to species, by location and over time.
   1. For some species, such as Colorado List A species, complete eradication of existing infestations and total suppression of newly identified infestations is mandated by State law.
   2. Containment of existing intentional plantings, exclusion of seed from new wildland or open space mixes and elimination of targeted escaped infestations are goals for certain ornamentals such as oxeye daisy.
   3. Russian knapweed, tamarisk and Russian olive infestation are so widespread that they must be managed, in many cases, merely for containment and reduction in the rate of spread. Eradication of these stands may only be viewed as unlikely in some instances or as a long range objective.

B. Objectives:
   1. Develop and implement a comprehensive noxious weed management program on all County-owned property.
   2. Educate the public concerning weed management issues.
   3. Foster a spirit of cooperation among federal, state and local government agencies and private landowners.
   4. Work with other government agencies and departments to institute Best Management Practices and policies that stress prevention as a weed management tool.
   5. Promote and use integrated management techniques.
   6. Establish and maintain healthy plant communities with native or beneficial vegetation.
   7. Restore and maintain desirable plant communities, healthy ecosystems and productive agricultural lands in Garfield County.
   8. Stop the spread of noxious weeds to non-infested lands.
   9. Contain heavily weed-infested areas.
   10. Implement Title 35, Article 5.5, of the Colorado Weed Management Act (8CCR 1206-2).

C. In all cases, revegetation either from the existing seed bank or through supplemental planting must be included as a management goal. Without revegetation, disturbed or denuded soils invite weed infestation.

4.02 Prevention and Detection

Prevention is the highest priority weed management technique on non-infested lands. Among government officials, land managers, farmers, ranchers and the general public there is a growing recognition that protecting weed-free plant communities is the most economical and efficient land management practice.

A. Weed-free plant communities:
   1. Provide essential wildlife habitat and forage.
   2. Save ranchers and farmers many billions of dollars in labor costs and lost production.
   3. Ensure aesthetic and recreational qualities of an area.
   4. Prevent soil erosion and improve water quality. The spread of noxious weeds is most likely to occur where soil has been disturbed either by human activities such as road and trail cuts, construction sites, the spread of gravel, road fill and topsoil contaminated with noxious weed seed, or over-grazing.

B. Exotic plants and seeds such as oxeye daisy, purple loosestrife, chicory, toadflax and Russian olive escape from our yards and gardens. Since they are attractive and establish themselves quickly, they are popular with landscapers and gardeners for ornamental planting and may be purchased through nurseries. They have the same ability to dominate and spread, however, as other better known noxious weeds.

C. Other methods of weed introduction include:
   1. Contaminated seed, feed grain, hay, straw and mulch.
   2. Movement of contaminated equipment, cars, bikes, etc. across uncontaminated lands.
   3. Animal fur, fleece, human clothing.
   4. Dried flower arrangements.

D. Prevention is best accomplished by ensuring that new weed species seed or vegetative reproductive plant parts are not introduced into new areas, and by early detection of any new weed species before they become widespread.

E. Strategies to prevent the introduction or establishment of noxious weeds in areas not already infested include:
   1. Identification and eradication of small, new infestations.
   2. Continuous monitoring and evaluation to prevent recurrence.
   3. Identification of existing conditions, disturbances and activities that represent a potential threat to native habitat.
   4. Identification of recently introduced weed species that represent a future threat.
   5. Timely revegetation and reclamation of disturbed sites using appropriate native plant species.
   6. The use of weed-free seeds and mulch.
   7. County-wide promotion of the Colorado Weed Free Hay and Forage program.
   8. Prioritization of weed management along areas of entry and dispersal.

9. Discouraging the sale of weedy ornamental plants and seed packets that contain weeds.

4.03 Garfield County Gravel Purchase Guidelines

A. The County shall require the following before agreeing to purchase any gravel for County projects:
   1. The gravel pit shall be inventoried and mapped by the pit operator for all plant species on Garfield County's noxious weed list on an annual basis.
   2. The gravel pit operator shall provide the County with a weed management plan. Noxious weeds shall be treated prior to seed formation.
   3. The gravel pit operator must supply the County with a detailed treatment record.
   4. The County will inspect the pit, the inventory and the application records 2 weeks prior to the purchase of gravel or other aggregates.

4.04 Education and Awareness

A. Education must play a major role in implementing the weed management plan. Groups targeted for public education include farmers and ranchers, golf course managers, homeowner associations, private citizens, housing developers, gardeners, landscapers, nurseries, public and private land management agencies, recreational users, youth groups, schools, oil and gas companies, pipeline companies and other utilities.

B. A partnership of the public and private sectors, along with awareness of noxious weeds and the problems they cause, is essential to maintain or create plant communities that are free of noxious weeds.

C. Knowledge about how to identify weeds, how and where weeds are spread and what it takes to manage weeds is needed.

D. Continuation and expansion of current educational programs as well as the development of new programs is a priority of the Garfield County Noxious Weed Management Plan.

E. Garfield County Vegetation Management and other governmental agencies will provide this instruction. Workshops will be held throughout the year to enhance public awareness.

F. Opportunities for education include:
   1. Updates on County Website.
   2. Widespread distribution of informative printed material.
   3. Offering weed tours and talks to the public.
   4. Private applicator certification, applicator safety and laws and regulations.
   5. Proper calibration of spraying equipment.
   6. Contacting area nurseries, landscapers and landscape architects to emphasize the problems created by escaped ornamentals.

7. Cooperation with local media to disseminate weed information.
8. Custom weed management recommendations for individual landowners.

4.05 Land Stewardship

The Colorado Noxious Weed Act requires that all property owners use integrated methods to manage noxious weeds. Weed management must be ongoing, requiring an integrated approach in which proper land stewardship practices are utilized. Most weed species, if detected early, can be managed.

A. Strategies for implementing a noxious weed management plan:
   1. Identify your plants.
   2. Understand the target weed. Does it reproduce by seed or roots or both?
   3. Maintain inventory maps.
   4. Develop a noxious weed database.
   5. Develop site-specific weed management plans in cooperation with other individual landowners and public agencies.
   6. Develop a decision-making process that uses site-specific information to make decisions about treatment choices.
   7. Develop a long-term strategy including regular monitoring of treatment areas.
   8. Correct the situation or practices that allowed the weeds to spread.
   9. Take necessary action.

B. Maintaining land that is free of weeds is good stewardship. Landowners who do not manage their weeds place their neighbors' land at risk.

4.06 Revegetation

A crucial part of any weed management plan is the reintroduction of site-appropriate vegetation.

A. Establishing a desirable plant community after noxious weeds have been removed from a highly infested area requires timely cultivation and reseeding.
B. Since the seeds from noxious weeds may lay dormant for many years, removing all visible signs of the noxious weeds does not ensure against their return.
C. Revegetation can help prevent the germination of weed seeds. It is important to inspect the land regularly to identify and treat small, new infestations.
D. For proper revegetation, managed irrigation of dry areas and reseeding are essential to establish desirable communities.
E. Native plants are most appropriate when the goal is restoration of native habitat.
F. Weed-free seeds of native Colorado grasses, wildflowers or plant species appropriate to the site may be purchased, but the best source for seeds is from native species that grow in the immediate vicinity of the infestation. They will be best adapted to local conditions and will help maintain local integrity and genetic viability.

G. Using native plants or seeds to revegetate disturbed land reduces degradation of native ecosystems, reduces the need for herbicides and conserves water resources.
H. Native plants provide broad biological diversity and help keep the Colorado landscape from being irrevocably altered by non-native species.
I. When the goal is reclamation – reseeding for quick ground cover establishment or erosion control – it may be appropriate to use introduced, non-aggressive grasses and forbs.
J. Contact the Natural Resources Conservation Service or Colorado State University Extension for specific seeding recommendations. General seeding recommendations:
    a) Study all vegetation in the area and surrounding areas.
    b) Preserve plant species native to Colorado.
    c) Test the soil for pH balance.
    d) Retain and utilize as much on-site topsoil as possible.
    e) Select a predominant species that is appropriate to the site. Then choose a few complementary species to provide a balanced plant community.
    f) Choose plants that are healthy, vigorous and pest-free.
    g) Use weed-free, non-hybrid seeds.
    h) Avoid commercial seed packets containing exotic plant species.
    i) Confirm viability and purity of seed through seed testing from an accredited seed testing lab.
    j) When choosing seeding rates, consider the guidelines provided by the Natural Resource Conservation Service. Fact sheets are available for individual species at the USDA-NRCS Plants Database website: http://plants.usda.gov/java/factSheet.

4.07 Requirements – Reclamation/Revegetation Plan, Soil Management Plan and Security

Various land use change permits processed through the Community Development Departments (e.g. grading, pipeline, and Land Use Change permits) may require a Reclamation/Revegetation and Soil Management Plan which includes a Weed Management Plan.

A. Soil Plan to include:
    1. Provisions for salvaging on-site topsoil.
    2. Timetable for eliminating topsoil and aggregate piles.
    3. Provision for soil cover if any disturbances or stockpiles that sit exposed for a period of 90 days or more.
B. Reclamation/Revegetation Plan to include:
    1. Plant material list and seed mix. Specifically, scientific names and common names and the application rate in terms of Pure Live Seed per acre.

2. Planting schedule which includes timing, methods, mulching and provisions for watering, if applicable.
3. A map of the impacted area with a calculation of the surface area of disturbance in acres of the disturbed area, at preliminary plan.
4. A Weed Management Plan for all listed Garfield County noxious weeds and State of Colorado listed noxious weeds that are targeted for statewide eradication. The Plan will include a site specific map and weed inventory. A Weed Management Plan is required if an area 1 acre or greater is disturbed for the purposes of site construction, development or grading but not including areas serving the long-term function of the site such as building footprint, road surface or permanent parking areas.
5. A revegetation security in cash, bond or letter of credit.
6. Agricultural practices are exempt from revegetation requirements unless they are in association with a subdivision or land use proposal.

C. A financial security may be required for revegetation if, in the determination of the BOCC, the proposed project has:
1. A potential to facilitate the spread of noxious weeds.
2. A potential to impact watershed areas.
3. A potential for visual impacts from public viewing corridors.
4. Steep slopes of 15% or greater or unstable areas.
5. Disturbs large areas of 1 acre or greater where topsoil is exposed for the purposes of site construction, development or grading but does not comprise the long term functioning of the site (i.e. building footprint, road surface or permanent parking areas).

D. The revegetation security will be in an amount to be recommended by the Vegetation Manager to the BOCC that will be site-specific and based on the amount of disturbance.
1. The security shall be held by Garfield County until vegetation has been successfully reestablished, or for a period of time approved by the BOCC, in any specific land use action, according to the Reclamation Standards.
2. The BOCC will designate a member of its staff to evaluate the reclamation prior to the release of the security.

E. If a property owner fails to comply with his/her approved Reclamation/Revegetation and Soil Management Plan, the provisions of the County's adopted land use and development code in regard to enforcement may be in effect.

4.08 Reclamation Standards

Areas disturbed during development shall be restored as natural-appearing landforms that blend in with adjacent undisturbed topography within 90 days of completion of construction unless an alternative timeframe is approved by the Vegetation Manager.

A. Site Stability. The reclaimed areas shall be stable and exhibit none of the following:

1. Large rills or gullies.
2. Perceptible soil movement or head-cutting in drainages.
3. Slope instability on or adjacent to the reclaimed area.
4. Slopes shall be stabilized using appropriate reshaping and earthwork measures, including proper placement of soils and other materials.

B. Soil management. Topsoil management shall be salvaged from areas to be disturbed and managed for later use in reclamation.

C. Erosion Prevention. The surface area disturbed at any one time during the development of a project shall be kept to the minimum necessary and the disturbed areas reclaimed within 90 days to prevent unnecessary or undue degradation resulting from erosion.
   1. The soil surface must be stable and have adequate surface roughness to reduce run-off, capture rainfall and snow melt, and allow for revegetation.
   2. Application of certified noxious weed-free mulch or erosion netting may be necessary to reduce soil movement, retain soil moisture and promote revegetation.
   3. Soil conservation measures, including surface manipulation, reduction in slope angle, revegetation and water management techniques shall be used.
   4. Sediment retention structures or devices shall be located as close to the source of the sediment-generating activities as possible to increase their effectiveness and reduce environmental impacts.

D. Contouring and Revegetation. Abrupt transitions and linear placement on visible slopes shall be avoided. Areas disturbed by grading shall be contoured so they can be revegetated and shall be planted and have vegetation established.
   1. When final landform is achieved, the surface shall be stabilized by vegetation or other means to reduce further soil erosion from wind or water, provide forage and cover, prevent fugitive dust as required by State Statute, and reduce visual impacts.
   2. A uniform vegetative cover shall be established with an individual plant density of at least 70% of pre-disturbance levels within 4 growing seasons. State or county-listed noxious weeds, as well as alien annual invasive species, do not count as part of the 70% cover.
   3. Application of topsoil. Topsoil will be stockpiled, placed on disturbed areas and managed for later use in reclamation. Provisions for salvaging on-site topsoil, a timetable for eliminating topsoil and aggregate piles and a plan that provides for soil cover if any disturbances or stockpiles sit exposed for a period of 90 days or more will be reviewed and accepted by the Garfield County Vegetation Manager.
   4. Specific criteria for evaluating revegetation success must be site-specific and included as a part of the reclamation plan.
   5. Vegetation production, species diversity and cover shall support the post-disturbance land use.

6. Areas where post-disturbance land use does not include lawns, gardens and flower beds shall approximate the surrounding undisturbed areas or be revegetated to a desired plant community with a composition of species and plant cover typical to that site.
7. The vegetation shall stabilize the site and support the planned post-disturbance land use, provide natural plant community succession and development, and be capable of renewing itself. This shall be demonstrated by:
    a. Using certified noxious weed-free seed.
    b. Successful on-site establishment of the species included in the planting mixture or other desirable species.
    c. Evidence of vegetation reproduction, either spreading by rhizomatous species or seed reproduction.
    d. Evidence of overall site stability and sustainability.
8. The revegetation plan shall provide for the greatest probability of success in plant establishment and vegetation development by considering environmental factors such as seasonal patterns of precipitation, temperature and wind, soil texture and fertility, slope stability and direction of slope faces.
9. To ensure the establishment of a diverse and long-lasting vegetative cover, the permittee shall employ appropriate techniques of site preparation and protection.
10. Species diversity should be selected for long-term land uses and provide for a reduction in visual contrast.
11. Where vegetation is to be used, a diversity of vegetation species shall be used to establish a resilient, self-perpetuating ecosystem capable of supporting the post-disturbance land use.
12. Species planted should include those that will provide quick soil stabilization, litter and nutrients for soil building and are self-renewing.
13. Integrated weed management methods shall be employed for all noxious weed species on the Garfield County List. Weed management methods shall be used whenever the infestation of the reclaimed area by noxious weeds threaten nearby areas.
14. Where revegetation is impractical or inconsistent with the surrounding undisturbed areas, other forms of surface stabilization shall be used.

4.09 Mapping and Inventory

A. The Vegetation Manager will establish and maintain visual maps of past and present infestations of noxious weeds on County land. This will provide a graphic representation of weed management progress and needs.
B. The primary goal of mapping will be to record the noxious weed species present, areas infested, density of infestations and other site factors pertinent to successfully managing the infestation.

C. Mapping priorities will be List A species, List B species designated for eradication and support for future grant-funded projects.

SECTION V
ENFORCEMENT

The control of noxious weeds is the responsibility of the subject property's owner or occupant. The Garfield County Vegetation Manager is available to provide technical assistance.

Enforcement of the Garfield County Weed Management Plan is authorized by the Colorado Noxious Weed Act (the Act), C.R.S 35-5.5-101.l, *et seq*. The Act directs local governments to take the necessary steps to manage noxious weeds in their jurisdiction, and provides specific authorization for local enforcement of duly adopted Weed Management plans. Garfield County will manage noxious weeds identified in the Garfield County Weed Management Plan and the Act in accordance with the following procedures:

5.01 Compliance: Private Lands

A. Inspection: Garfield County, 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 has occurred:
   1. The landowner had requested an inspection.
   2. A neighboring landowner or occupant has reported a suspected noxious weed infestation and requested an inspection.
   3. An authorized agent of the County has made a visual observation from a public right-of-way or area and has reason to believe that a noxious weed infestation exists.

B. No entry upon any premises, lands or places shall be permitted until the landowner or occupant has been notified by certified mail that such an inspection is pending. Where possible, inspections shall be scheduled and conducted with the concurrence of the landowner or occupant.
   1. If after receiving notice that an inspection is pending, the landowner or occupant denies access to the Garfield County inspector, 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 Garfield County, through its agent or employee, of an affidavit stating:
      a. The information which gives the inspector reasonable cause to believe that any provision of the Act or the Garfield County Weed Management Plan is being or has been violated.
      b. That the occupant or landowner has denied access to the inspector.
      c. A general description of the location of the affected land.
   2. No landowner or occupant shall deny access to such land when presented with an inspection warrant.

C. Management

1. If following inspection pursuant to 5.01(A), land is found to contain designated noxious weeds, Garfield County through its agent or employee, will give the landowner written notice, personally or by certified mail. The notice shall:
   a. Name the noxious weeds.
   b. Identify the location of the noxious weeds.
   c. Advise the landowner to control the noxious weeds.
   d. Specify the best available control methods of integrated management.
   e. The notice shall include an offer to consult with the landowner in the development of a management plan for the control of noxious weeds on the land.
2. The notice shall also state that the landowner has a reasonable period of time not to exceed 10 days, or 5 days for State List A species and populations of State List B species designated for eradication after receipt of notice to do one of the following:
   a. Option I: Comply with the terms of the notification.
   b. Option II: Acknowledge the terms of the notification and submit an acceptable plan and schedule for the completion of the plan for compliance to the Garfield County Vegetation Management Department.
   c. Option III: Request an arbitration panel to determine the final management plan.
3. If the landowner chooses Option I, the Garfield County Vegetation Management Department or its representative will re-inspect the land to confirm compliance within a reasonable period of time not to exceed 10 days, or 5 days for State List A species and populations of State List B species designated for eradication.
4. If the landowner chooses Option II, the Garfield Vegetation Management Department or its representative will review the proposed weed management plan and determine its efficacy. If the plan is acceptable, the Garfield County Vegetation Management Department will monitor the landowner's compliance with the management plan, and after completion, will re-inspect to ensure that the noxious weeds have been effectively managed.
5. If the landowner chooses Option III, an arbitration panel will be selected by the Garfield County Board of County Commissioners in accordance with C.R.S. 35-5.5-109(4)(b).
   a. The arbitration panel shall be comprised of a weed management specialist or weed scientist, a landowner of similar land in the Garfield County, and a third panel member chosen by agreement of the first two panel members.
   b. The landowner or occupant shall be entitled to challenge any one member of the panel, and the Garfield County Board of County Commissioners shall name a new panel member from the same category.

c. The decision of the arbitration panel shall be final.
d. A hearing shall be set for a time and date as soon as practical after the panel is appointed.
e. The Garfield County Vegetation Management Department or its representative shall give written notice, personally or by mail, of the hearing date and time to any complainant. The landowner or occupant is entitled to appear before the panel, individually or by representative, as is any complainant.
f. The arbitration panel will be required to develop the final management plan not more than 2 calendar weeks after the hearing is completed.
g. In the event of non-compliance with any management plan developed and approved by the arbitration panel, in addition to remedies set forth in paragraph 5.01(D), the arbitration panel shall have the ability to award costs of the arbitration to the prevailing party including the arbitration panel fees and expenses.
h. These fees and expenses may include, but are not limited to salary, wages, travel and per diem expenses.

D. Failure to Comply.

In the event the landowner or occupant fails to comply with the notice to manage the identified noxious weeds or fails to implement the plan developed by the arbitration panel, the Garfield County Board of County Commissioners has the authority to:

1. Compel management of the noxious weeds after notice to the landowner and a hearing. The Garfield County Vegetation Department or its representative shall give written notice of the hearing before the Garfield County Board of County Commissioners to the landowner personally or by certified mail which will include:

a. Description of the affected land.

b. Name of the noxious weeds and their location on the land.

c. Date and time the Garfield County Vegetation Management Department or its representative will perform weed control on the land.

d. Method of control to be applied.

e. A statement that the Garfield County Board of County Commissioners may assess the whole cost of compliance, including up to 20% for inspection and other incidental costs in connection therewith, upon the lot or tract of land where the noxious weeds are located. Such assessment shall be a lien against the subject 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 Garfield County Treasurer and collected or 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 Garfield County Weed Fund or any similar fund.

2. Costs of providing for and compelling weed management shall not be assessed until the level of management called for in the notice or as developed by the arbitration panel has been successfully achieved.

3. Public Nuisance. If the landowner fails to comply with the notice to control the designated noxious weeds, fails to submit an acceptable management plan, or fails to comply with a management plan as determined by an arbitration panel, the Garfield County Board of County Commissioners may declare the noxious weeds a public nuisance pursuant to C.R.S. 35-5.5-113. Once declared, such nuisances are subject to all laws and remedies relating to the prevention and abatement of nuisances.

E. Other occupants. Whenever the land is known to the Garfield County Vegetation Management Department or its representative to be occupied by someone other than the record owner, written notices also shall be given to the occupant, and the occupant shall be informed that pursuant to C.R.S. 35-5.5-109 and the Garfield County Weed Management Plan imposes on occupants the same responsibilities for noxious weed control as it imposes on landowners.

F. Notice.
   1. Whenever notice is given by mail, it shall be deemed given when deposited in a regular depository of the United States Postal Service, postage prepaid.
   2. Notice to landowners shall be mailed to the affected lot or tract's physical address and the landowner's last known address as shown in the County Assessor's records, and any other addresses the occupant has provided to the Garfield County Vegetation Management Department.
   3. Notice to occupants shall be mailed to the affected lot or tract's physical address and any other addresses the occupant has providedto the Garfield County Vegetation Management Department.

G. Condition Precedent. No private land management shall be compelled without first applying the same or greater management measures to the County land or rights-of-way that are adjacent to the private property.

5.02 Compliance: Public Lands

A. Municipalities. The governing body of each municipality in Garfield County shall adopt a noxious weed management plan pursuant to C.R.S. 35-5.5-106 for all lands within its jurisdiction.
   1. Municipalities adopt and provide for the enforcement of such ordinances, resolutions, rules and other regulations as necessary to enforce such a plan.
   2. Any municipal agent, delegate, employee, staff or contractor applying or recommending the use of chemical management methods in the administration of the Weed Management Plan shall be certified by the Colorado Department of Agriculture.

3. Municipalities may cooperate with counties and other municipalities to exercise any and all powers and authorities granted by the Act by entering into intergovernmental agreements.

B. State Land. State boards, departments or agencies that administer or supervise state lands must manage noxious weeds pursuant to C.R.S. 35-5.5-110 on any lands under its jurisdiction, using methods prescribed by the local governing body in whose jurisdiction the state lands are located.
   1. The Garfield County Board of County Commissioners, through its employees and agents, may give notice to the state board, department or agency advising of the presence of noxious weeds on public lands. This notice will specify the best available methods of integrated management. Wherever possible Garfield County shall consult with the state entity in development of a plan for the management of noxious weeds on the premises or lands in question.
   2. Within a reasonable time after the receipt of the notification, not to exceed 10 days, the state entity shall do one of the following:
      a. Option I: Comply with the terms of the notification;
      b. Option II: Submit an acceptable management plan and a schedule for its completion to the Garfield County Vegetation Management Department;
      c. Option III: Request an arbitration panel to determine a final management plan.
   3. If the state entity chooses Option I, the Garfield County Vegetation Management Department or its representative will re-inspect the land to confirm compliance within a reasonable period of time not to exceed 10 days, or 5 days for State List A species and populations of State List B species designated for eradication.
   4. If the state entity chooses Option II, the Garfield County Vegetation Management Department or its representative will review the proposed weed management plan and determine its efficacy.
      a. If the plan is acceptable, the Department will monitor the state's compliance with the management plan, and after completion, will re-inspect to ensure the noxious weeds have been effectively managed.
   5. If the state entity chooses Option III, an arbitration panel will be selected by the Garfield County Board of County Commissioners in accordance with C.R.S. 35-5.5-110(2)(b). The arbitration panel shall be comprised of a weed management specialist or weed scientist, a landowner of similar land in Garfield County, and a third panel member chosen by agreement of the first two panel members.
   6. The state entity will be entitled to challenge any one member of the panel, and the Garfield County Board of County Commissioners will name a new panel member from the same category.
   7. The decision of the arbitration panel shall be final.
   8. A hearing shall be set for a time and date as soon as practical after the panel is appointed.

9. The Garfield County Vegetation Management Department or its representative shall give written notice, personally or by mail, of the hearing date and time to any state entity. The state entity is entitled to appear before the panel, individually or by representative.
10. The arbitration panel will be required to develop the final management plan not more than 2 calendar weeks after the hearing is completed.

C. Failure to Comply. In the event the state entity fails to comply with the notice to manage the identified noxious weeds, or implement the plan developed by an arbitration panel, the Garfield County Vegetation Management Department may undertake management of the noxious weeds at the expense of the state entity.
   1. A written agreement for payment of the costs of noxious weed management will be reached within 2 weeks after the date such expenses are submitted to the state entity.
   2. If no agreement for payment is reached, and if the costs of the noxious weed management is not immediately paid, such charge will be submitted to the controller who shall treat such amount as an encumbrance to the budget of the state entity, pursuant to C.R.S. 35-5.5-112.
   3. Any state entity may enter into a contract with Garfield County to authorize management of noxious weeds on state-administered property on terms and conditions satisfactory to both parties.

D. Federal land. Local governing bodies of all counties and municipalities are authorized pursuant to C.R.S. 35-5.5-111 to enter into cooperative agreements with federal and state agencies for the integrated management of noxious weeds within their jurisdictions.
   1. Bureau of Land Management. The BLM within Garfield County manages its noxious weeds through its Field Offices in Silt (Colorado River Valley) and Grand Junction. Garfield County has an intergovernmental agreement with the Colorado River Valley Field Office to treat noxious weeds on BLM land as a supplement to the BLM's own program. This agreement is reviewed and modified on an annual basis. Resources are limited and may provide for approximately 10 sites per year to be treated by County crews.
   2. The White River National Forest has an intergovernmental agreement with the County to supplement the Forest program. Within Garfield County the Forest manages its noxious weeds through its Ranger Districts in Rifle, Carbondale and through the Supervisor's Office in Glenwood Springs.

5.03 County Rights-of-Way

Garfield County and each state entity must confirm that all public roads, highways, rights-of-way, and any easements pertaining to these, under the jurisdiction of these entities, are in compliance with C.R.S. 35-5.5-112, and any violations of the Act shall be the financial responsibility of the Garfield County or state entity.

SECTION VI
PLAN EVALUATION

6.01 Plan Evaluation

A. The goals and plan of work in the Garfield County Noxious Weed Management Plan will be reviewed and evaluated annually at the February Garfield County Weed Advisory Board meeting. Any proposed additions or changes shall be recommended by the Board and approved by ordinance by the BOCC before becoming final.

B. The Garfield County Weed Management Plan shall be reviewed by the Weed Advisory Board at least every 3 years (C.R.S. 35-5.5-107(4)(a)). The management plan and any recommended amendments to the plan shall be transmitted to the BOCC for approval, modification or rejection.

APPENDIX A

Absinth wormwood

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Absinth wormwood Identification and Management

Key ID Points

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

Identification and Impacts

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

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

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

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

Absinth wormwood is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

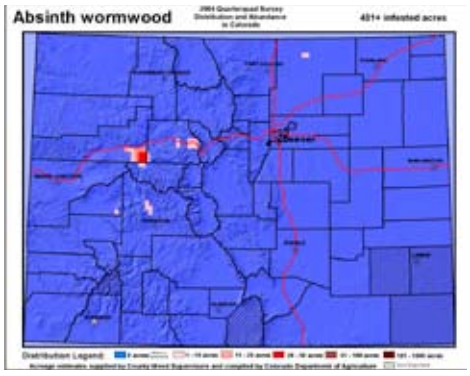


Photo s © Kelly Uhing, Colorado Department of Agriculture; and map above by Crystal Andrews, Colorado Department of Agriculture.

Artemisia absinthium L,

Updated on:
08/08

Management Recommendations

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

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

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

Integrated Weed Management:

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

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

Absinth wormwood

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
Picloram (Tordon 22K- restricted use)	1 pint product/acre	Apply when plant is 12 inches tall through flowering growth stage. Do not use near trees, desirable shrubs or water. (Summer to Early Fall)
Aminopyralid (Milestone - general use)	7 fl oz product/acre	Apply when plant is 12 inches tall though flowering growth stage. (Summer to Early Fall)
Clopyralid +2,4-D (Curtail - general use)	2 quarts product/acre	Apply when plant is 12 inches tall through flowering growth stage. (Summer to Early Fall)
Dicamba (Banvel, Vanquish, Clarity - general use)	1 quart product/acre	Apply when plant is 12 inches tall through flowering growth stage. Do not use near trees, desirable shrubs or water. (Summer to Early Fall)

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

Black henbane

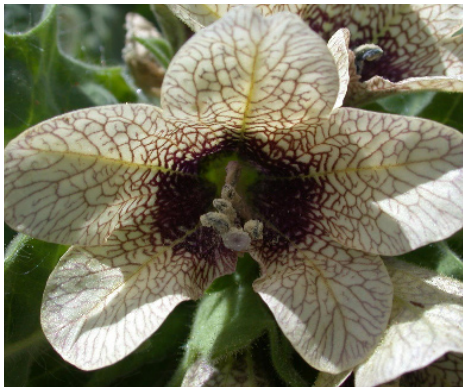
Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

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

Updated on: 08/08

Black henbane Identification and Management



Identification and Impacts

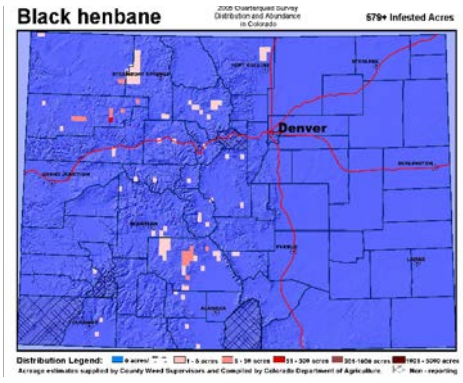
Black henbane *(Hyoscyamus niger)* was introduced from Europe as an ornamental and medicinal herb. In Colorado it is mostly found on the western slope. The plant blooms June through September and may be an annual or biennial. A mature plant reaches 1 to 3 feet in height with foliage that has a fowl odor. 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.

Hyoscyamus niger

Management Recommendations

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

BIOLOGICAL
There is no biological control available for 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.

Black henbane

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)
Picloram (Tordon 22K *this is a Restricted Use Pesticide*)	Apply at 1 qt/acre plus 0.25% v/v non-ionic surfactant	Apply when soil moisture adequate and weeds rapidly growing. (Late Spring 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.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Bouncingbet

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

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

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.

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)

Bull thistle

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Bull thistle Identification and Management

Identification and Impacts

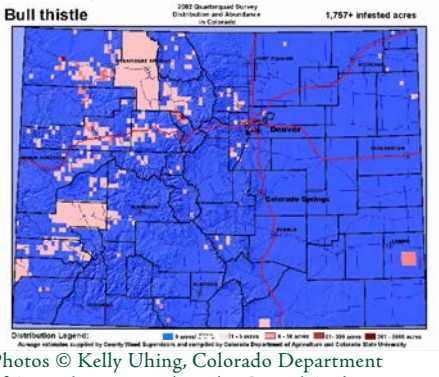
Bull thistle *(Cirsium vulgare (Savi) Tenore)* is a biennial forb that was introduced to North America as a seed contaminant and is now widespread. Gumdrop-shaped flowers are pinkish to dark purple in color and 1 ½ to 2 inches in diameter. The flower bracts are somewhat tapered and covered with spines. Seeds are capped with a circle of plume-like white hairs. Leaves are alternate. In Colorado, Bull thistles are the only species that are prickly hairy on the top and are cottony-hairy on the undersides of the leaves. In mature plants the leaves extend down, clasping the stem and are divided into segments. The plant has a short, fleshy taproot with several primary roots extending from the root crown. Seed leaves are round to spatulate, and smooth. Mature plants can produce up to 4,000 seeds per plant.

Habitats for Bull thistle include dry to moist environments. It thrives on nitrogen-rich soils, and it grows on gravelly to clay-textured soils. Bull thistle cannot withstand deep shade and is commonly seen in areas such as pastures, overgrazed rangeland, roadsides, and logged areas. Within Colorado Bull thistle infestations have been reported to occur in nearly all counties west of the continental divide, this plant has also been observed in the Upper Arkansas Watershed and in pockets on the plains. It is widespread throughout the United States and parts of Canada.

Heavy infestations can reduce livestock forage. Additionally, the presence of bull thistle in hay decreases the forage value and lowers the market price. It is an aggressive weed, but it will not withstand cultivation. Bull thistle is often a transient species, appearing in recent clear cuts or disturbed areas and becoming a dominant species for several years. It has been reported to cause hay fever in some individuals and is often confused with musk thistle.

The key to effective control of Bull thistle is maintaining healthy pastures and rangeland, guarding against disturbance or overuse, and as with most biennial limit seed production. To reduce seed production, plants with buds or flowers should be collected and immediately disposed of or destroyed. Chemical control is most effective when plants are in rosette stage, spring or early fall. Mechanical controls can be used to eliminate small patches or plants in a later growth stages. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Bull 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,

Key ID Points

1. Leaves are prickly-hairy above and cottony below.
2. Heads cobwebby-pubescent (hairy).
3. Flowers are composite and purple in color.

Updated on: 08/08

Cirsium vulgare (Savi) Tenore

Management Recommendations

Bull thistle

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
Urophora stylata, a fly predator, is used to help control this thistle. The female fly lays eggs in the seed head of the thistle. The maggot then consumes the seed in the flower. This species has overwintered in Colorado but the limited numbers will not allow for general redistribution. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Because biennial thistles do not reproduce from their roots, any mechanical or physical method that severs the root below the soil surface will kill the weed. It is necessary to revegetate the site with desirable plants. Tillage, hoeing, or even hand-pulling should be successful (not on rangeland), providing it is done before the reproductive growth stages.

Integrated Weed Management:

Prevention is the most effective control with Bull thistle, maintaining healthy pastures and rangeland and continually monitor your property for new infestations.

As with most biennials, limiting seed production is another key to controlling plant populations. Chemical and mechanical options to control Bull thistle are also effective.

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
Clopyralid (Transline or Stinger)	0.13 to 0.5	Apply to rosettes in spring or fall.
Clopyralid + 2,4-D (Curtail)	0.2 + 1.0 to 0.3 + 1.5	Apply to rosettes in spring or fall.
Dicamba (Banvel, Vanquish, or Clarity)	0.5 + 1.0	Apply to rosettes in spring or fall if good growing conditions exist.
2,4-D or 2,4-D + dicamba (Rangestar)	1.5 to 2.0 1.0 + 0.5	Apply to rosettes in spring.
Picloram (Tordon 22K *restricted use chemical)	0.13 to 0.25	Apply to rosettes in spring or fall.
Chlorsulfuron (Telar)	0.047 (0.75 oz ai)	Spring from bolting to bud stages; add a non-ionic surfactant
Metsulfuron (Escort XP)	0.019 (0.3 oz ai)	Spring from bolting to bud stages; add a non-ionic surfactant.

Canada thistle

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street, Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

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

Updated on: 08/08

Canada thistle Identification and Management

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

Identification and Impacts

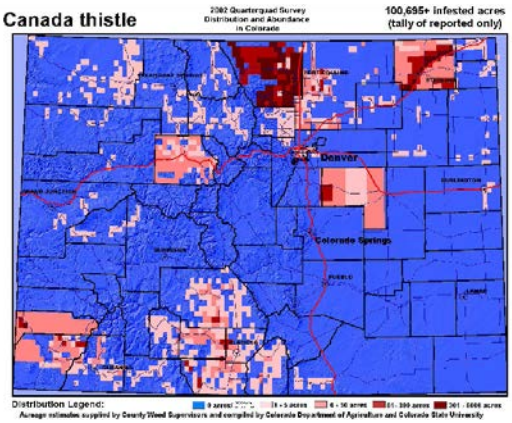
Canada thistle (*Cirsium arvense*) is a non-native deep-rooted perennial that spreads by seeds and aggressive, creeping, horizontal roots (rhizomes). Canada thistle can grow 2 to 4 feet in height. The leaves are oblong, spiny, bright green in color, and are only slightly hairy on the undersurface. Flowers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

Canada thistle emerges from its root system from late April through May. It begins to flower in late spring to early summer with increase in day length. Canada thistle only produces about 1,000 to 1,500 seeds per plant. Typically, it reproduces vegetatively through a creeping root system, and can quickly form dense stands. Every piece of root, from 1/2 to 1 inch in length, is capable of forming new plants. The key to controlling Canada thistle is to eliminate seed production and also to reduce the plant's nutrient reserves in its root system through persistent, long-term management.

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

The key to effective control of Canada thistle is combining control methods. These weeds need 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. 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 on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



All photos © Kelly Uhing, Infestation map above, Crystal Andrews, Colorado Department of Agriculture.

Cirsium arvense

Management Recommendations

Canada thistle

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

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 but have not been effective. Insects can be obtained at no charge from the Colorado Department of Agriculture. Please call 970-464-7916 or visit www.colorado.gov/ag/csd for more information.

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

Integrated Weed Management:

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

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

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
Aminopyralid (Milestone)	5-7 ounces/acre or 1 teaspoon/gal water	Apply in spring at the pre-bud growth stage and/or to fall regrowth. Add non-ionic surfactant 0.32oz/gal water or 1 qt/100 gal water.
Chlorsulfuron (Telar DF)	1-3 ounces/acre or 0.50 grams/1 gal water	Apply in spring during bud to bloom stage and/or to fall regrowth. Add non-ionic surfactant 0.32oz/gal water or 1 qt/100 gal water.
Clopyralid + 2,4-D (Redeem R&P)	3 pints/acre or 1.25 oz/gal water	Apply from rosette to bud stage when all plants have emerged. Add non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water. (Spring or Fall)
Picloram (Tordon 22K *This is a Restricted Use Pesticide*)	1 qt/acre or 1.0 oz/gal water	Spring - early bud stage and/or fall regrowth. DO NOT apply near or under trees or where soils have rapid permeability or where water level is high. Add a non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Chicory

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

Updated on:
08/09

Identification and Management

Identification and Impacts

Chicory (Chichorium intybus) a perennial forb native to Eurasia. Plants initially appear as a basal rosette with leaves similar to a common dandelion. The leaves are lanceolate shaped and have rough hairs on the upper and lower surfaces. They are slightly lobed or dissected with toothed margins and can be 3 inches to 10 inches in length. The lobes and dissections are not opposite, like dandelions. The leaves that appear on the flowering stem are similar in shape but smaller in size. Stems can reach up to 3 to 5 feet in height and are sticky to glabrous to the touch. The plants flowering stems appear later in the growing season, producing purple to blue to white flowers. The flowers are in clusters of 1 to 3, and individual flowers are about 1 inch in diameter with toothed petals. The root system consists of a large brown taproot, which will produce a milky sap if broken. Chicory generally reproduces by seeds, that can survive up to 4 years.

Habitats for Chicory include, pastures, turfgrass, hayfields, roadsides, waste ground, and any disturbed site. Plants can survive in infertile and dry conditions. Plants can even be present after a drought period. It is found throughout Colorado from elevations of 4,000 to 7,000 feet. The milky sap released from all parts of the plant can cause dermatitis if it contacts the skin. Animals will consume Chicory. If consumed by dairy cattle, it can leave a bitter taste to the milk.

The key to effective control of Chicory is preventing the establishment of the plant on disturbed sites. The plants can not resist persistent cultivation. Mechanical and chemical treatments are effective as well. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

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

Photos © All Photos from Kelly Uhing, Department of Agriculture; Except middle left Colorado State University Extension, East Adams County

Chichorium intybus

Management Recommendations

Chicory

CULTURAL
Planting desirable grasses and forbs to outcompete chicory is an effective management tool. Reestablishing a healthy plant community where disturbed or bareground is present helps with management. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes.

BIOLOGICAL
Currently there is not any biocontrol available for Chicory. Biocontrol takes many years of research and development. For more information contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916 for more information.

MECHANICAL
Hand pull or dig when soil is moist, but make sure to wear gloves. Bag specimens carefully so as not to scatter seeds. The key to effective control is to prevent seed production and/or spread. Mowing can also be an effective management option. Chicory plants don't respond well if mechanical treatments are persistent.

Integrated Weed Management:

Identifying and preventing the establishment of Chicory on disturbed sites proves to be the most effective control. Plants can also be controlled using a combination of chemical and mechanical treatments.

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)	4-6 oz./acre or 1 teaspoon/gal water	Spring at actively growing stage. Add non-ionic surfactant @ 0.32 oz/gal water or 1 qt/100 gal water.
2,4-D Amine	2-4 qt./acre	Apply to early growth of flower bud stage in spring. DO NOT apply when outside temperature exceed 85 degrees. Add non-ionic surfactant @ 0.32 oz/gal water or 1 qt/100 gal water.
2,4-D+Dicamba	3 pints/acre	Apply to early growth stage to early bolting stage in spring.
Picloram (Tordon 22K *This is a Restricted Use Pesticide*)	1-2 pts/acre or 0.75 oz/gal water	Apply in spring seedling to early growth stages. DO NOT apply near trees/shrubs/high water table.

Photos © Top to Bottom; (Unklnown) Viginia Tech Weed Guide; Whitney Cranshaw, colorado State University, Bugwood.org; Kelly Uhing, Colorado Department of Agriculture

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Chinese clematis

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Chinese clematis
Identification and Management

Identification and Impacts

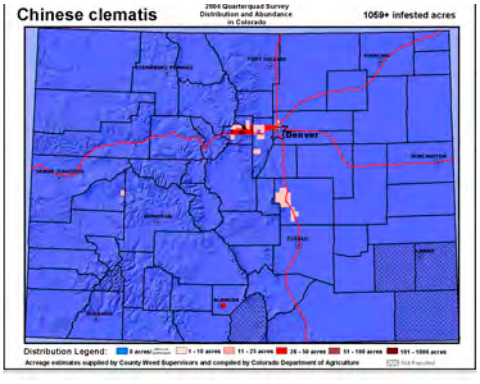
Chinese clematis *(Clematis orientalis)* is a herbaceous to woody vined perennial that is native to Eurasia. It is an escaped ornamental species that is a deciduous climber growing up to 12 feet. Solitary flowers have four yellow sepals (petal-like structures) that are often nodding. Each flower produces numerous feathery, long-tailed fruits which are conspicuous all winter. The plant flowers from August to September.

Habitats for Chinese clematis include roadsides, riparian corridors and rocky slopes. It is sometimes found in open woods. Plants prefer sunny areas but have shown to be somewhat shade tolerant. Chinese clematis prefers well-drained soils.

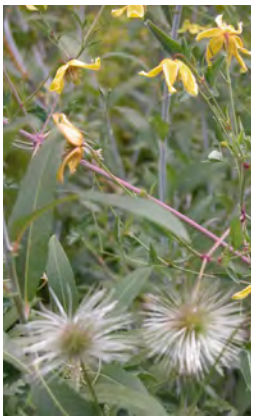
Chinese clematis can cause death to young trees and brush. It outcompetes native shrubs and herbaceous species. Plants will completely cover; rock walls, trees, bushes and fences. The juice of freshly crushed leaves and stems have blister causing agents.

The key to effective control of Chinese clematis is preventing the plants from going to seed. Pulling the woody stem prior to flowering can be an effective control. Chemical treatments are also effective when dealing with Chinese clematis. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Chinese clematis 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 and Map © Colorado Department of Agriculture.



Key ID Points

1. Solitary flowers with four yellow sepals.
2. A herbaceous to woody vine climbing perennial.

Updated on: 08/08

Clematis orientalis

Management Recommendations

Chinese clematis

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

MECHANICAL
Hand pull or dig when soil is moist. Make certain to pull all the roots and bag specimens carefully so as to not scatter seeds if flowering.

Integrated Weed Management:

The most effective control method for dealing with Chinese clematis is preventing the plant from going to seed. Pulling the plant from the ground, by the woody stem, prior to the plant flowering is the most effective control. Chinese clematis also responds well to chemical treatments.

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	Apply at flowering growth stage. (equivalent to 1 qt. over 100 gal. of total spray solution) (Fall)
Imazapic (Plateau)	12 fl oz product/ acre plus 1 qt/acre methylated seed oil	Apply at flowering growth stage. (Fall)
2, 4-D amine	2,4-D amine that is 4.0 lb active ingredient/ gallon of product	Apply at flowering to early post flowering growth stages, will damage neighboring brush species, if present (2 qts.product/acre) (Fall)
Picloram (Tordon 22K *this is a Restricted Use Pesticide*)	1 qt product/acre	Apply at flowering growth stages, will damage neighboring brush species, if present, do NOT apply near trees or water. (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.

Common burdock

Arctium minus

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Key ID Points

Updated on:
08/09

Identification and Management

Identification and Impacts

Common burdock (Arctium minus) is a biennial forb that is native to Europe. The first year of growth is a basal rosette, producing large cordate, thickly hairy leaves. The second year of growth, is a coarse, multi-branched, erect stem that will grow to heights of 3 to 10 feet tall. The large, dark green leaves are alternate and appear to have toothed or wavy margins. They are broadest and the base of the leaf and diminish as they approach the tip of the leaf, and have a hairy underside. The flowers appear at the end of the branches, numerous, clustered and are pink to purple in color. At the base of the flower there are many spines that often have a hook on the end. The flower and the spines dry and becomes an easily dispersible bur. Flowering and seed production occur from July to October. The plant grows from a sturdy taproot that is brown and fleshy in color.

Habitats for Common burdock include roadsides, ditch banks, waste places, pastures, and fencerows. Animals will avoid eating the plant in both years of growth, the first year due to the hairy leaves and the second year due to the spines and burs. The burs can easily get entangled into livestock fur, make distribution easy over large areas.

The key to effective control of minimizing soil disturbance and preventing the establishment of plants. Using an integrated weed management approach combining chemical, cultural, and mechanical methods to control these plants is effective. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

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

Photos © All Photos from Kelly Uhing, Department of Agriculture

Management Recommendations

Common burdock

CULTURAL
Minimizing soil disturbance and encouraging the establishment of desirable grasses and forbs, can assist in controlling Common burdock. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes.

BIOLOGICAL
Currently there is not any biocontrol available for Common burdock. Biocontrol takes many years of research and development. For more information, 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. Mowing is also effective, cutting the top growth of the plant. The key to effective control is to prevent seed production and/or spread.

Integrated Weed Management:

Preventing the establishment and minimizing soil disturbance is an effective way to control Common burdock. Combining treatment methods of cultural, mechanical and chemical assist with controlling these 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
Aminopyralid (Milestone)	4-7 oz/acre or 1 teaspoon/gal water	Apply in rosette stage in spring or fall. Add non-ionic surfactact @ 0.32 oz/gal water or 1 qt/100 gal water.
Clopyralid (Stinger)	1/2-1 1/3 pts/acre	Apply to young to actively growing plants in the spring. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.
2,4-D Amine	2 pts/acre	Apply to young to actively growing plants in the spring. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.
2,4-D Dicamba	1 pt/acre	Apply to young to actively growing plants pre-flower stages in spring. Add non-ionic surfactant @ 0.32 oz/gal water or 1 pt/100 gal water.

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

Common tansy

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

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)

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Common teasel

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

1. Grows over 6 feet tall.
2. Leaves at the base are dark green and appear rippled.
3. Flowers are purple or white.

Updated on: 08/08

Common teasel Identification and Management

Identification and Impacts

Common teasel *(Dipsacus spp.)* is a biennial or sometimes monocarpic perennial forb. The fruits are a four-angled achene, each containing a single seed. Common teasel can produce more than 2,000 seeds per plant. The flowers are purple or white with spiny, awned bracts at the base. The flower head is generally egg-shaped, with a square base. The floral bracts at the base of the head are generally longer than the head. Rosette leaves are conspicuously veined, with stiff prickles on the lower midrib and appear to be wrinkled. Stem leaves are simple, opposite, net-veined, stalkless, and clasp the stem. Mature plants can grow up to or over six feet tall. The taprooted stem is rigid with several rows of downward turned prickles. Plants die after production of seed has occurred.

Habitats for Common teasel include open, sunny habitats that range from wet to dry levels. It is generally found along irrigation ditches, rivers, abandoned fields, pastures, waste places, and forests. Common teasel is spreading rapidly in America, particularly in the Pacific Northwest. In Colorado, teasel is usually found in relatively moist, disturbed situations but is moving into drier areas. Seeds can stay viable for at least 2 years. Seeds don't generally disperse far form the parent plant. Plants can regenerate fairly easily, due to the bare ground where the basal leaves were. Common teasel is native to Europe where it historically had many uses.

The key to effective control of Common teasel is prevention. Eliminate seed production to decrease the spread of this forb, and continue to deplete the seed bank for four to six years. Reseeding areas with perennial grasses for several years will reduce an infestation. Mechanical and chemical control methods are effective when dealing with Common teasel. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Common teasel 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.

Dipsacus spp.

Management Recommendations

Common teasel

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 teasel. 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
Treatments such as digging and cutting can be effective in certain situations. Digging at the rosette and bolting stage, making sure that the majority of the root comes up, can be effective. Cutting plants when near the flowering stage is also effective. When using either of these methods, revisiting the site frequently is recommended to ensure regrowth does not occur.

Integrated Weed Management:

The key to controlling Common teasel is to eliminate seed production and exhaust the seed bank in the soil. Common teasel does not reproduce vegetatively and dies after seed production.

Mechanical and chemical control methods can be effective.

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
Metsulfuron (Escort XP)	1 oz. of product/ac. + 0.25% v/v non-ionic surfactant	Apply when in rosette or bolting growth stage. (Spring or Fall rosettes or Early summer bolting)
Aminopyralid (Milestone)	4 to 7 fl. oz./ac. (start with 7 fl. oz.) + 0.25% v/v non-ionice surfactant	Apply when in rosette or bolting growth stage. Best choice of herbicide to use in riparian areas. (Spring or Fall rosettes or Early summer bolting)
Imazapic (Plateau)	8 to 12 fl. oz./ac. + 2 pt/ac. methylated seed oil	Apply when in rosette or bolting growth stage. Good choice of herbicide to use in riparian areas. (Spring or Fall rosettes or Early summer bolting)

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Corn chamomile

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Corn chamomile Identification and Management

Identification and Impacts

Corn chamomile (*Anthemis arvensis L.*) is an annual forb. The flowers are 0.75 inches in diameter and are borne at the ends of branched stems. Flowers resemble daisies with white ray flowers and yellow disk centers. The seeds are 10 ribbed with out glandular bumps. Leaves are alternate and finely dissected and mature plants are 10 to 30 inches tall. There is no odor when leaves are crushed, unlike Mayweed chamomile. Stems are erect, smooth, and highly branched above. Corn chamomile germinates readily in the spring and fall. It has a dense, fibrous root system, which spreads rapidly during wet periods.

Late summer and fall-germinated seedlings may overwinter as rosettes. In the spring, bolting commences with the elongation of the central stem. Overwintering plants flower in mid-May and spring germinated seedlings flower in June. Flowering stops after a killing frost, usually in October. The plant reproduces primarily by seeds.

Habitats for Corn chamomile include: roadsides, ditches, in urban areas, waste places, cultivated fields, and pastures. It can grow in a wide range of soils but seems to prefer moist, poorly drained soils. Corn chamomile prefers moist areas and increases in abundance during years of above average precipitation.

The key to effective control of Corn chamomile is prevention. Eliminate seed production to decrease the spread of this annual forb. Mowing is effective if done before the seed sets. Reseeding areas with perennial grasses for several years will reduce an infestation. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Corn chamomile is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Photos © Clockwise from lower left: 1995 Dean Wm. Taylor, Jepson Herbarium;

Key ID Points

1. Has no odor.
2. Small daisy-like flowers.
3. Small, bushy forb that is 10 to 30 inches in height.

Anthemis arvensis L,

Updated on:
08/08

Corn chamomile

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

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

Integrated Weed Management:

Prevent the establishment of new infestations by minimizing disturbance and seed dispersal. Eliminate seed production to decrease the spread of this annual forb, and continue to deplete the seed bank for four to six years. Reseeding areas with perennial grasses for several years will reduce an infestation.

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)	0.33 oz product/ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette to bolting growth stage. (Early Spring to Early Summer, sometimes Fall rosettes)
Chlorsulfuron (Telar)	0.33 oz product/ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette or bolting growth stage. (Early Spring to Early Summer, sometimes Fall rosettes)
Aminopyralid (Milestone)	7 fl oz/ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette growth stage. (Early Spring to Early Summer, sometimes Fall rosettes)

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Cutleaf teasel

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

1. Grows over 6 feet tall.
2. Leaves are dark green and appear rippled.
3. Flowers are purple or white.

Updated on:
08/08

Cutleaf teasel
Identification and Management

Identification and Impacts

Cutleaf teasel *(Dipsacus spp.)* is a biennial or sometimes monocarpic perennial forb. The plant grows as a basal rosette for a minimum of one year then sends up a tall flowering stalk and dies after flowering. The period of time in the rosette stage varies depending on the amount of time needed to acquire enough resources for flowering to occur. The flowers are almost white (taninsh) or white with spiny, awned bracts at the base. The floral bracts at the base of the head are generally longer than the head and wider than Common teasel. Flowering plants have large, oblong, opposite leaves that form cups and are prickly. The fruits are a four-angled achene, each contains a single seed. A single teasel plant can produce over 2,000 seeds. Rosette leaves are conspicuously veined, vary from somewhat ovoid in young plants to large and oblong leaves that are quite hairy in older plants. Stem leaves are simple, opposite, broad and feathering lobed. Mature plants can grow up to or over six feet tall. Cutleaf teasel blooms from July through September.

Habitats for Cutleaf teasel include open, sunny habitats that range from wet to dry levels. It is generally found along irrigation ditches, rivers, abandoned fields, pastures, waste places, and forests. Teasels are an aggressive exotic species that have the capacity to take over prairies and savannas if allowed to become established.

Seeds typically don't disperse far; most seedlings will be located around the parent plant. Parent plants often provide an optimal nursery site for new teasel plants after the adult dies. Dead adult plants leave a relatively large area of bare ground, formerly occupied by their own basal leaves, that new plants readily occupy. Seeds may have the capacity to be water-dispersed, which may allow seeds to be dispersed over longer distances. Immature seed heads of Cutleaf teasel are capable of producing viable seed. Lack of natural enemies allows teasel to proliferate. If left unchecked, teasel can quickly form large monocultures excluding all native vegetation. Cutleaf teasel is more aggressive than Common teasel.

The key to effective control of Cutleaf teasel is prevention. Eliminate seed production to decrease the spread of this forb, and continue to deplete the seed bank for four to six years. Reseeding areas with perennial grasses for several years will reduce an infestation. Mechanical and chemical control methods are effective when dealing with Cutleaf teasel. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Cutleaf teasel 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.

Dipsacus spp.

Cutleaf teasel

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 Cutleaf teasel. 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
Treatments such as digging and cutting can be effective in certain situations. Digging at the rosette and bolting stage making sure that the majority of the root comes up can be effective. Cutting plants when plants near the flowering stage is also effective. When using either of these methods, revisiting the site frequently is recommended to ensure regrowth does not occur.

Integrated Weed Management:

The key to controlling Cutleaf teasel is to eliminate seed production and exhaust the seed bank in the soil. Cutleaf teasel does not reproduce vegetatively and dies after seed production.

Mechanical and chemical control methods can be effective.

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
Metsulfuron (Escort XP)	1 oz. of product/ac. + 0.25% v/v non-ionic surfactant	Apply when in rosette or bolting growth stage. (Spring or Fall rosettes or Early summer bolting)
Aminopyralid (Milestone)	4 to 7 fl. oz./ac. (start with 7 fl. oz.) + 0.25% v/v non-ionice surfactant	Apply when in rosette or bolting growth stage. Best choice of herbicide to use in riparian areas. (Spring or Fall rosettes or Early summer bolting)
Imazapic (Plateau)	8 to 12 fl. oz./ac. + 2 pt/ac. methylated seed oil	Apply when in rosette or bolting growth stage. Good choice of herbicide to use in riparian areas. (Spring or Fall rosettes or Early summer bolting)

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Cypress Spurge

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

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

Updated on:
01/09

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.

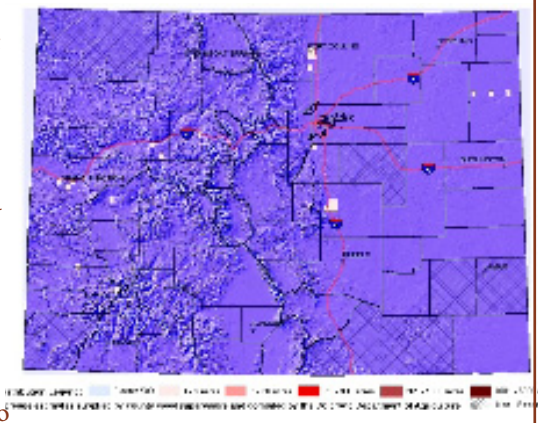
The plants milky sap is an irritant and may cause dermatitis or rashes. Although sheep may eat it, the plant is toxic to horses and cattle. Animals should not be pastured where spurges grow. Humans should be careful and avoid contacting the plant with bare skin as it can cause skin irritation for some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



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.

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)
Picloram (Tordon 22K-restricted use)	2-4 pints product/acre + 0.25% v/v non-ionic surfactant	Apply in spring at full bloom, or in the fall during regrowth.

Top photo, © Kelly Uhing, Colorado Department of Agriculture; Bottom photo Todd Pfieffer Klamath County.

Dalmatian toadflax

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

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

Updated on: 08/08

Dalmatian toadflax Identification and Management

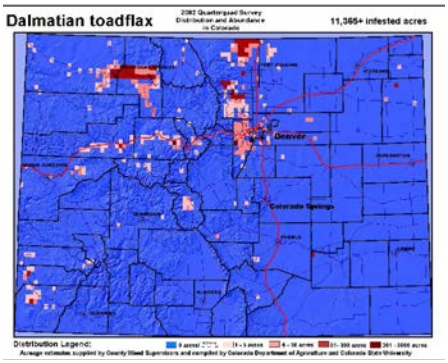
Identification and Impacts

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

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

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

Dalmatian toadflax is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



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

Linaria dalmatica

Management Recommendations

Dalmatian toadflax

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

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

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

Integrated Weed Management:

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

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

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
Picloram (Tordon 22K) *Avoid spraying near trees and/or water	2-4 pints/acre	Apply when flowering in spring and/or in the fall. Add non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.
Chlorsulfuron (Telar)	2-3 oz./acre	Apply at flower stage in spring and/or in the fall. Add non-ionic surfactant @ 0.32 oz/gal. water or 1 qt./100 gal. water.
2,4-D + Dicamba (Rangestar)	2 qt. + 2 qt/ acre	Apply during pre-bloom to flower stage in spring. Add non-ionic surfactant @ 0.32 oz/ gal. water or 1 qt/100gal water. Retreatment is required for several years.

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

Dame's rocket

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Dame's rocket Identification and Management

Identification and Impacts

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

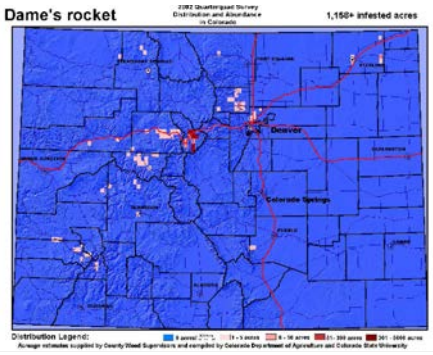
Habitats for Dame's rocket include: gardens, partly shaded woodlands, ditches, roadsides, pastures, rangelands, thickets, open woods, disturbed sites, and other areas that have moist well drained soils and full sun to light shade. Many people think that it is a native wildflower and is planted as a garden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

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

Dame's rocket is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Key ID Points

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



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

Updated on:
08/08

Hesperis matronalis

Management Recommendations

Dame's rocket

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

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

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

Integrated Weed Management:

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

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
NO INFORMATION AVAILABLE: Colorado State University is conducting experiments to provide data and recommendations. Recommedations should control, but waiting official data.		
Metsulfuron (Escort XP)	1 oz product/ac. + 0.25% non-ionic surfactant	Apply when plant is in rosette or bolting growth stage. (Early Spring)
Chlorsulfuron (Telar)	1 oz product/ac. + 0.25% non-ionic surfactant	Apply when plant is in rosette or bolting growth stage. (Early Spring)
Imazypic (Plateau)	9 to 10 fl oz/ac. + 2 pt/ac. methylated seed oil	Apply when plant is in late flower growth stages. (Late Spring to Fall)

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Diffuse knapweed

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

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

Updated on: 08/08

Diffuse knapweed Identification and Management

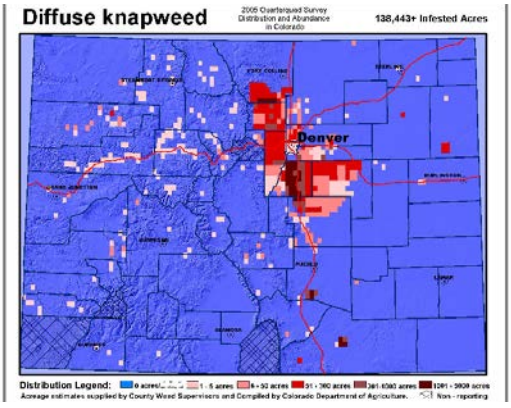
Identification and Impacts

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

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

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

Diffuse knapweed is designated as a "List B" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information, visit www.colorado.gov/ag/csd and click on the Noxious Weed Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division at 303-239-4100.



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

Centaurea diffusa

Management Recomendations

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

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

MECHANICAL
Any mechanical or physical method that severs the root below the soil surface will kill diffuse knapweed. Mowing or chopping is most effective when diffuse knapweed plants are at full-bloom. Be sure to properly dispose of the flowering cut plants, since seeds can mature and become viable after the plant has been cut down.

Integrated Weed Management:

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

Diffuse knapweed

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

HERBICIDE	RATE	APPLICATION TIMING
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 non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.
2,4-D Amine	1 qt./acre or 1 oz/gal water	Apply to spring/fall rosettes - before flowering stalk lengthens. DO NOT apply when outside temperatures will exceed 85 degrees. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.
Clopyralid + Triclopyr (Redeem R&P)	1.5-2 pints/acre or 0.75 oz/gal water	Apply from rosette to early bolt stage of growth and/or in the fall to rosettes. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.
Picloram (Tordon 22K *this is a Restricted Use Pesticide*)	1-2 pts/acre or 0.75 oz/gal water	Apply to spring rosettes through mid-bolt and in fall to rosettes. DO NOT apply near trees/ shrubs/high water table.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Hoary cress

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

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.

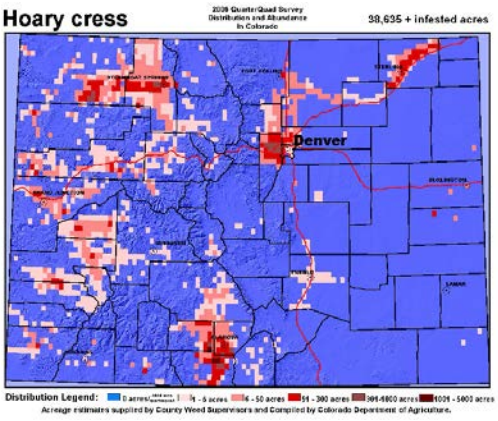
Identification and Impacts

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/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; 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!**

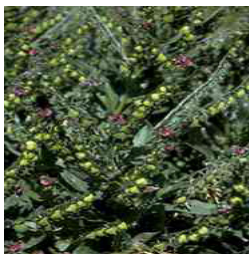
HERBICIDE	RATE	APPLICATION TIMING
Metsulfuron (Escort XP)	1 oz. product/acre 0.25 v/v non-ionic surfactant	Apply at the early bud growth stage; i.e. "broccoli" growth stage. (Early Spring to Early Summer)
Chlorsulfuron (Telar)	1 oz. product/acre 0.25 v/v non-ionic surfactant	Apply at the early bud growth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

COLORADO DEPARTMENT OF AGRICULTURE

Houndstongue

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100



Key ID Points

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

Updated on: 08/08

Houndstongue Identification and Management

Identification and Impacts

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

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

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

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

Houndstongue is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

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

Cynoglossum officianale

Management Recommendations

Houndstongue

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

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

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

Integrated Weed Management:

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

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
Metsulfuron Methyl + Chlorsulfuron (Cimarron X-tra)	2.0 oz. product/acre + 0.25% v/v non-ionic surfactant	Apply in spring rosette to early bud growth stages.
Picloram + 2,4-D (Grazon P+D)	4 pints/acre + 0.25% v/v non-ionic surfactant	Apply in spring rosette stage.

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

Jointed goatgrass

List B Species

Rangeland, pasture, and riparian site recommendations

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Aegilops cylindrica

Key ID Points

Identification and Management

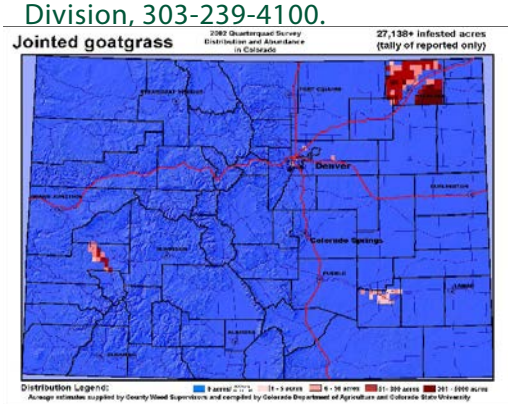
Identification and Impacts

Jointed goatgrass (Aegilops cylindrica) is a winter annual that is native to southern Europe and Russia. The plants can grow as a single or multiple stems or tillers, it will grow 15 to 30 inches tall. Leaves are simple and alternate. The auricles of the leaf are at the base. Leaf blades are hairy and are 1/8 to 1/4 of an inch in width. The cylindrical spikes, contain 2 to 12 spikelets. The spikelets are 1/2 inch long and contain 1 to 3 viable seeds. The spikelets appear to be "jointed," they fit into the contour of the rachis. On top of the spikelets the glumes will appear with long awns. In the seedling stage, Jointed goatgrass looks similar to Winter wheat.

Habits for Jointed goatgrass includes, grasslands, wheat fields, fence rows, waste places, roadsides, alfalfa fields, and pastures. When found in Winter wheat fields, jointed goatgrass can contribute to a significant economic loss. Jointed goatgrass seeds are similar to size and weight of small grain seeds, such as Winter wheat, making separation almost impossible and costly. Once Jointed goatgrass seed has been determined to contaminate Winter wheat fields, fields will not be certified for grain use, again become costly to wheat growers. In some cases when found in the wheat fields, certifications will not be given for several years, until it can be proven that Jointed goatgrass is no longer in the field. Jointed goatgrass and Winter wheat will cross pollinate producing a sterile hybrid, causing more issues.

The key to effective control of Jointed goatgrass is preventing the establishment in fields by cleaning equipment prior to moving into the fields, preventing Jointed goatgrass going to seed, and rotating crops to spring grown plants. Jointed goatgrass can be controlled using a variety of methods. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Jointed goatgrass 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; (first 3) Steve Dewey, Utah State University, Bugwood.org; Kelly Uhing, Colorado Department of Agriculture, Map from Crystal Andrews, Colorado Department of Agriculture

Updated on:
08/09

Jointed goatgrass

Management Recommendations

CULTURAL
Depending on where it is found, there are ways to control infestations using cultural methods. If found in pastures or CRP, plant competitive native grasses or forbs. For specific seed recommendations contact your local Natural Resources Conservation Services for seed mixes. If found in crops, rotate fields to spring grown crops.

BIOLOGICAL
Currently there is not any biocontrol available for Jointed goatgrass. Biocontrol takes many years of research and development. For more information please contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Tillage can be effective, when plants are in the seedling stage, and crops have not been planted. Otherwise, the main goal of preventing the establishment of large infestations is to prevent seed production and/or spread.

Integrated Weed Management:

Preventing the establishment and the spread of existing plant populations. Depending where infestations of Jointed goatgrass are found an integrated management approach can be an effective control option. Combing cultural, chemical and mechanical control methods will provide effective control.

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)	22 oz/acre if weeds are < 6" in height - 1 to 2.7 qt/acre if weeds are > 6" in height	Apply before first spikelets begin to emerge from the boot.
Imazapic + Glyphosate (Journey)	10.7 to 16 oz/Acre	Apply in early stages of growth before spikelets. Add non-ionic surfactant @ 0.32 oz/gal of water or 1 pt/100 gal of water.
Imazapic (Plateau)	4 to 6 oz/Acre	Apply pre-emergance, late summer in this case, and in early stages of growth before spikelets. Add non-ionic surfactant @ 0.32 oz/gal of water or 1 pt/100 gal of water.

Photos © Top to Bottom; (middle) Whitney Cranshaw, Colorado State University, Bugwood.org; (other 2)Kelly Uhing, Colorado Department of Agriculture

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Leafy spurge

Euphorbia esula

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

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.

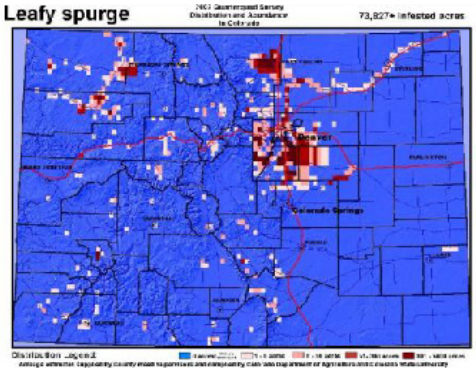
Identification and Impacts

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

Leafy spurge

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.

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.
Picloram (Tordon 22K *this is a Restricted Use Pesticide*)	1 qt./acre or 1 oz/gal water	Spring, just after full-bloom and/or fall. DO NOT apply near or under trees/shrubs or where soils have rapid permeability. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/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
COLORADO DEPARTMENT OF AGRICULTURE

Mayweed chamomile

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Mayweed chamomile Identification and Management

Identification and Impacts

Mayweed chamomile *(Anthemis cotula)* is a bushy annual that can adapt to various conditions and is native to Europe. The seeds are 10 ribbed with small glandular bumps. Mayweed chamomile is a prolific seed producer, producing more than 960,000 seeds per plant. The seeds viability in soil range from 4 to 6 years. The leaves are finely dissected, alternate, and approximately 0.75 to 2.5 inches long and 1 inch wide. Leaves may have some short hairs and emit an unpleasant odor. Flowers are solitary and borne at the ends of branches. They are 0.75 to 1.25 inches in diameter with 12 white ray flowers and yellow disk centers. The white ray flowers are in bloom from June through September. Mature plants grow from 0.5 to 2 feet tall and are highly branched.

Contact with Mayweed chamomile can cause skin rashes, blistering of livestock muzzles and irritated mucus membranes of grazing livestock. The blistering can cause animals to reduce grazing resulting in weight loss and reduced milk production. In addition, it may impart a strong flavor to the milk of dairy animals.

Habitats for Mayweed chamomile include roadsides, ditches, in urban areas, waste places, cultivated fields, and pastures. It can grow in a wide range of soils but seems to prefer moist, poorly drained soils. Mayweed chamomile prefers moist areas and increases in abundance during years of above average precipitation.

The key to effective control of Mayweed chamomile is prevention. Eliminate seed production to decrease the spread of this annual forb. Mowing is effective if done before the seed sets. Reseeding areas with perennial grasses for several years will reduce an infestation. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Mayweed chamomile is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Photos ©

Key ID Points

1. Bushy mature plants are 0.5 to 2 ft. tall.
2. Leaves have foul smell and are divided several times into narrow segments.
3. White ray flowers.

Updated on: 08/08

Anthemis cotula

Management Recommendations

Mayweed chamomile

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

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

Integrated Weed Management:

Prevent new infestations by minimizing disturbance and seed dispersal. The key is to eliminate seed production to decrease the spread and continue to deplete the seed bank for 4 to 6 years. To help reduce an infestation, reseed with perennial grasses for several 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)	0.33 oz product/ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette to bolting growth stage. (Early Spring to Early Summer)
Chlorsulfuron (Telar)	0.33 oz product/ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette or bolting growth stage. (Early Spring to Early Summer)
Aminopyralid (Milestone)	7 fl oz/ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette growth stage. (Spring)

Top to bottom photos, © Michael Shephard, USDA Forest Service, Bugwood.org; Unknown photographer; Charles T. Bryson, USDA Agricultural Research Service, Bugwood.org.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Meadow knapweed

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Meadow knapweed Identification and Management

Identification and Impacts

Meadow knapweed *(Centaurea pratensis)* is a perennial that grows from a woody crown. The upright stems, grow from 20 to 40 inches tall and branch near the middle. Flower heads are solitary at tips of the branches, pink to purple in color, and 3/4 of an inch in size. Bracts are light to dark brown with papery-fringed margins. Lower leaves are lobed and upper leaves are linear. The leaves grow up to 6 inches long and more than 1 inch wide.

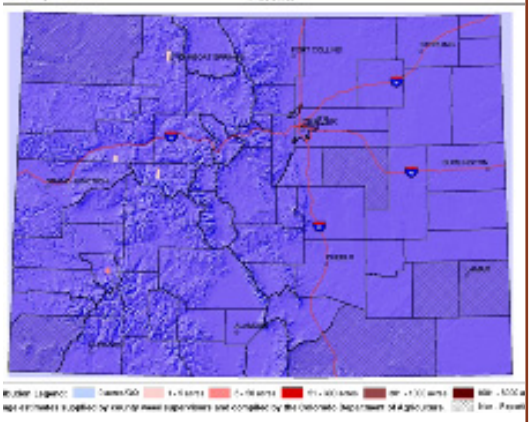
Meadow knapweed primarily reproduces by seed, but root and crown fragments re-sprout when disturbed by heavy equipment or cultivation. Meadow knapweed seeds are carried in rivers, streams, or irrigation water, in hay or by vehicles along roadsides. It is an attractive plant which some people plant as a garden ornamental. The seed viability for meadow knapweed is unknown. The site must be monitored for at least 10 years after the last flowering adult plants have been eliminated and treatments repeated when necessary.

Habitat for meadow knapweed include moist sites, irrigated pastures, moist meadows, river banks, streams, irrigation ditches, roadsides, and openings in forested areas. The plant is native to Europe where originally it was introduced (a cross between black and brown knapweed) as a potential forage species, but it has low palatability to grazing animals. Meadow knapweed outcompetes native plants and pasture species and reduces available forage for wildlife and livestock. It is not palatable or nutritionally sufficient for livestock and disrupts wetland habitat by displacing native plant species.

The key to effective control of meadow knapweed is preventing the establishment of plant communities by maintaining healthy native plant populations. If meadow knapweed is present, using a combination of control methods including; mechanical and herbicides to eradicate populations is effective.

Meadow knapweed 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. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Map of meadow knapweed infestation.



Key ID Points

1. Flowers are pink to purple and are about the size of a nickel.
2. Leaves are up to 6 inches long and 1 inch wide.
3. Bracts have papery-fringed margins.

Photos © Above: Eric Coombs, Oregon Dept. of Agriculture; all others: Kelly Uhing, Colorado Deptartment of Agriculture; map: Crystal Andrews, Colorado Department of Agriculture.

Updated on: 1/09

Centaurea pratensis

Management Recommendations

CULTURAL
Preventing the establishment of the Meadow knapweed is crucial, so maintaining healthy native plant communities is a priority. Contact your local Natural Resources Conservation Service for seed mix recommendations. Bare ground is prime habitat for weed invasion, so prevent bare spots caused by overgrazing.

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. 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 an effective control method when populations are small. Hand pulling should occur when soil is moist and be certain to pull all the roots. It is important to bag specimens carefully so as to not scatter seeds if the plant is flowering.

Integrated Weed Management:

Since Meadow knapweed has been identified in small quantities around Colorado, preventing the populations from spreading is important in management of the weed. Eradication requires intensive and persistent control efforts to effectively eliminate weed infestations and soil seed reserves. If populations occur, utilize hand pulling, cultural, and herbicide control methods for effective eradication.

Meadow knapweed

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 - general use)	7 fl. oz. product/acre plus 0.25% v/v ionic surfactant.	Apply in spring to early summer during bolting to bud growth stages or in fall
Cloypyralid (Transline - general use)	1 pint product/acre plus 0.25% v/v ionic surfactant.	Apply in spring to early summer during bolting to bud growth stages or in fall
Picloram (Tordon or Picloram 22K - restricted use herbicides)	1 qt.product/acre plus 0.25% v/v ionic surfactant.	Apply in spring to early summer during bolting to bud growth stages or in fall

Top to bottom photos, © A. Murray, Univ. of Florida; USDA ARS Archive; and J.Schardt, Florida D.E.P.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Mediterranean sage

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Mediterranean sage Identification and Management

Identification and Impacts

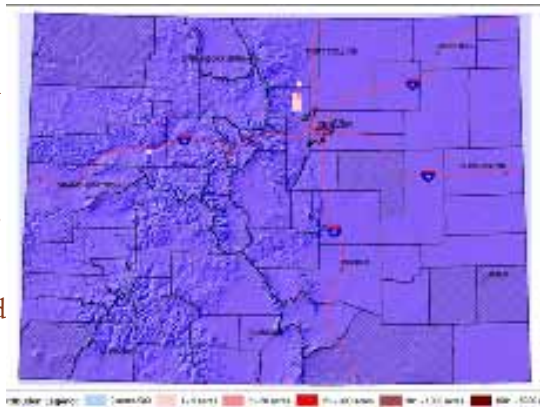
Mediterranean sage *(Salvia aethiopis)* is a biennial that is an erect, coarse biennial or short-lived perennial, with a stout taproot. First year rosettes are blue-green, and are covered with woolly white hairs. Second year plants produce more leaves with a flowering stem. Leaves have a pungent odor when crushed. The flower stem can grow 2 to 3 feet tall and branch 2 to 3 feet wide resembling a candalabra. The stem breaks off in the fall and forms a tumbleweed dispersing thousands of seeds. Mature plants can produce 100,000 seeds each. The flowers are white to yellowish-white and appear in clusters.

Mediterranean sage is native to the Mediterranean region and northern Africa. Mediterranean sage invades primarily rangeland, but will easily invade riparian areas, forests, roadsides, and dry pastures. This invasive ornamental plant prefers south-facing slopes in loose, gravelly, well drained soils. Mediterranean sage initially invades disturbed sites, but quickly spreads to non-disturbed and natural sites. It adapts to a wide variety of environmental conditions and quickly displaces native vegetation. The plant is unpalatable to most grazing animals and is capable of forming dense monocultures. The seed viability for Mediterranean sage is unknown. The site must be monitored for at least 10 years after the last flowering adult plants have been eliminated and treatments repeated when necessary.

The key to effective control of Mediterranean sage is preventing the establishment of plant communities through the use of sound land management practices. Maintain healthy pastures and rangeland and continually monitor your property for new infestations, especially near current known infestations since tumbleweed mobility of this plant can spread the seeds far and wide. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Mediterranean sage 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. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Map of Mediterranean sage infestation.



Key ID Points

1. Leaves have a pungent odor when crushed.
2. Leaves are very hairy.
3. White to yellowish-white flower clusters.

Updated on:
01/09

Salvia aethiopis

Management Recommendations

CULTURAL
Preventing overgrazing and promoting healthy plant communities is crucial. Disturbed, bare ground areas are prime habitat for weed invasions. Contact your local Natural Resource Conservation District for seed mix recommendations for your area.

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. For information on biocontrol in Colorado, please contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Hand pull or shovel when soil is moist. Make certain to pull up all the roots or sever at least 2 to 3 inches of taproot with a shovel. Shake excess soil from specimens and turn over to dry out. Bag specimens carefully so as to not scatter seeds if flowering.

Integrated Weed Management:

Since Mediterranean sage reproduces solely by seed, it is imperative to prevent seeds from producing as well as depleting the soil seed bank. Combining mechanical and herbicide treatments to rosettes or bolting plants can be very effective. If flowering, mechanically remove plants and bag them. Survey properties on the perimeter of known infestations to detect new infestations early.

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
Tordon + Telar (Tordon or Picloram 22K - restricted use herbicides & Telar - general use)	1 quart product/acre (Tordon) + 1 oz product/acre (Telar) + plus 0.25% v/v non-ionic surfactant	Apply in spring during rosette to bolting (early flowring) growth stages
Metsulfuron + 2,4-D (Escort or Cimarron + 2,4-D - general use)	1 oz + 1 qt product/acre plus 0.25% v/v non-ionic surfactant	Apply in spring during rosette to bolting (early flowering) growth stages
Metsulfuron (Escort or Cimarron - general use)	1 oz product/acre plus 0.25% v/v non-ionic surfactant	Apply in spring during rosette to bolting (early flowering) growth stages

Top to bottom photos, © A. Murray, Univ. of Florida; USDA ARS Archives.

Mediterranean sage

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

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

Musk thistle

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

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

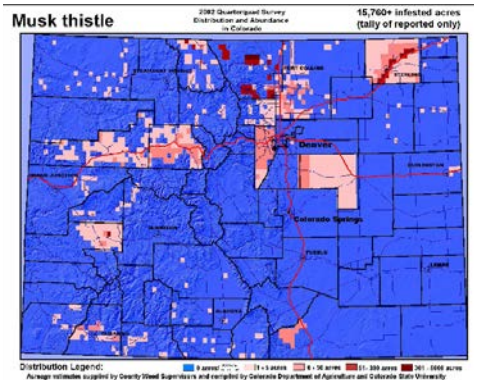
Musk thistle *(Carduus nutans)* is a non-native biennial forb that reproduces solely by seed. A biennial is a plant that completes its lifecycle within two years. During the first year of growth, musk thistle appears as a rosette in spring or fall. During the second year in mid to late spring, the stem 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.

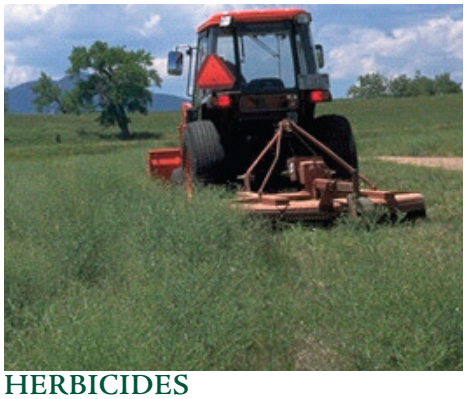
Carduus nutans

Management Recommendations

Musk thistle

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.

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
Picloram (Tordon 22K - *Restricted use chemical*)	1 pint/acre + 0.25% v/v non-ionic surfactant	Apply in spring to rosettes.
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.)

Top to bottom photos, © Norman E. Rees, USDA Agricultural Research Service; Whitney Cranshaw, Colorado State University, Bugwood.org; and Kelly Uhing, Colorado Department of Agriculture.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Myrtle spurge

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

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

Updated on: 01/09

Myrtle spurge Identification and Management

Identification and Impacts

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

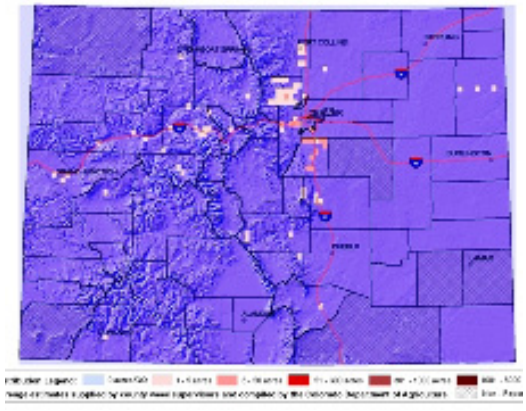
Myrtle spurge contains a toxic, milky sap which can cause severe skin irritations, including blistering. This plant is poisonous if ingested; causing nausea, vomiting and diarrhea. Wearing gloves, long sleeves, shoes, and eye protection is highly recommended when in contact with myrtle spurge, as all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

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

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

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

Map of myrtle spurge infestation.



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

Euphorbia myrsinites

Management Recommendations

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

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

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

Integrated Weed Management:

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

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

Myrtle spurge

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
2,4-D ester (general use)	2 quarts/acre	Use a 2,4-D ester formulation that has a 4.0 lbs. active ingredient/acre. Apply during spring or during fall regrowth.
Dicamba + 2,4-D (general use)	1 pint Dicamba +2 to 3 pints, 2,4-D (amine or ester)	Use a 2,4-D formulation that has a 4.0 lbs. active ingredient/gallon. Apply during spring or during fall regrowth.
Picloram + 2,4-D (Tordon 22K-restricted use + 2,4-D -general use)	20 fl. oz./acre +2 to 3 pints of 2,4-D (amine or ester)	Apply at flowering growth stage during spring or to fall regrowth.
Picloram (Tordon 22K - restricted use)	1 quart product/acre	Apply at flowering growth stage during spring or to fall regrowth.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Oxeye Daisy Identification and Management

List B

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

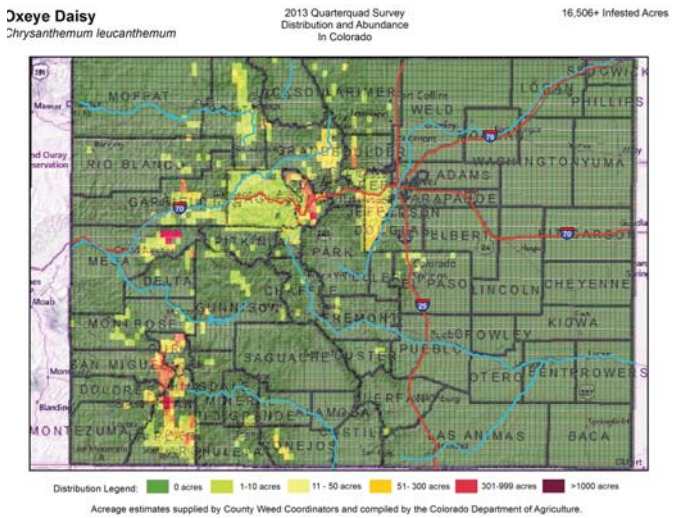
Oxeye daisy is an strong competitor. It forms dense stands that reduce native plant diversity. It degrades pastures and natural areas because cattle and wildlife avoid feeding on oxeye daisy. Heavy infestations may reduce nutrient cycling due to a shallow root system and create areas of bare soil, thus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

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

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

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

2013 Quarter Quad Survey



Key ID Points

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

Oxeye daisy

Leucanthemum vulgare

List B

Integrated Weed Management Recommendations

Oxeye daisy

Leucanthemum vulgare

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

CULTURAL

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

BIOLOGICAL

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

MECHANICAL

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

CHEMICAL

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

HERBICIDE	RATE	APPLICATION TIMING
Aminopyralid (Milestone)	4-6 oz/acre + 0.25% v/v non-ionic surfactant	Optimum control when applied at the pre-flower bud growth stage.
Metsulfuron (Escort XP)	1 oz product/acre + 0.25% v/v non-ionic surfactant	Surfactant is absolutely necessary. Optimum control when applied at flowering growth stage. 1 oz product is the minimum eradication rate based on best treatment observed in several CSU experiments.
Chlorsulfuron (Telar)	1 oz product/acre + 0.25% v/v non-ionic surfactant	Surfactant is absolutely necessary. Optimum control when applied at flowering growth stage.

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

Rev. 10/14

Perennial pepperweed

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

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.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Plumeless thistle

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

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

Updated on: 08/08

Plumeless thistle Identification and Management

Identification and Impacts

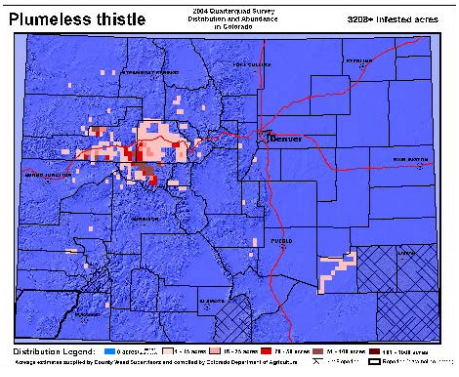
Plumeless thistle *(Carduus acanthoides)* is a winter annual or biennial that is native to Europe and Asia. Plumeless thistle rosettes have wavy leaves with yellow spines along the white-colored leaf margins. The stems are covered with leaf-like, winged spines that extend up to the flowering heads. The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

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

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

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

Plumeless thistle is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Carduus acanthoides

Management Recommendations

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

BIOLOGICAL
Biological control insects, such as the seed head weevil and the crown weevil are effective on large infestations. When used together, these insects provide fair to good control. These insects have been known to threaten native thistle populations. Contact the Insectary of Colorado Department of Agriculture to get complete information at 970-464-7916. Or visit www.colorado.gov/ag/csd.

MECHANICAL
Any mechanical or physical method that severs the root below the soil surface will kill Plumeless thistle. Mowing or chopping is most effective when Plumeless thistle plants are at full bloom. Be sure to properly dispose of the flowering cut plants since seeds can mature and become viable after the plant has been cut down.

Integrated Weed Management:

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

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 product/acre	Apply in spring to early summer rosette to bolting growth stages or in the fall.
Clopyralid (Transline)	0.67 pint product/acre	Apply when plants are in the rosette growth stage. (Spring or Fall rosettes)
Clopyralid +2,4-D (Curtail)	2 quarts product/acre	Apply when plants are in the rosette growth stage. (Spring or Fall rosettes)
Picloram (Tordon - *restricted use herbicide*)	1-2 pints product/acre	Apply when plants are in the rosette growth stage. (Spring or Fall rosettes)
2, 4-D	1 quart/acre	Apply when plants are in the rosette growth stage. (Spring or Fall rosettes)

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

Plumeless thistle

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Poison hemlock

Colorado Department of Agriculture

305 Interlocken Pkwy
Broomfield, CO 80021

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

Poison hemlock Identification and Management

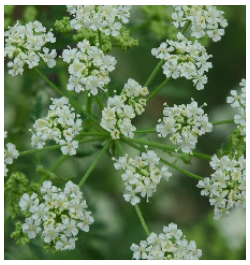
Identification and Impacts

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

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

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

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



Key ID Points

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

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

Conium maculatum

Updated on:
08/09

Poison hemlock

Management Recommendations

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

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

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

Integrated Weed Management:

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

HERBICIDES

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

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

Photos © (Top to bottom): Steve Dewey, Utah State University, Bugwood.org and bottom two by: Jan Samanek, State Phytosanitary Administration, Bugwood.org.

Purple loosestrife

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street, Suite 4000
Lakewood, CO 80215
303-239-4100

Purple loosestrife Identification and Management

Identification and Impacts

Purple loosestrife *(Lythrum salicaria)* is a non-native, tap-rooted, perennial forb. It is native to Europe and was introduced to North America as an ornamental plant for gardens. It has escaped into natural areas such as streambanks and shallow ponds. Purple loosestrife reproduces primarily by seed. A single, mature plant can produce up to three million seeds per year. The seeds can remain viable in the soil for 5 to 20 years. Pieces of roots or stems also can produce new plants. Purple loosestrife produces multiple four-sided stems that can grow two to eight feet tall. Leaves are two to five inches long, lance-shaped and whorled on the stems. Flowers are tightly grouped in long, vertical heads; they bloom from the bottom up. They are pinkish-purple in color, about one inch long, and have five to seven petals. Flowers appear from late June through September.

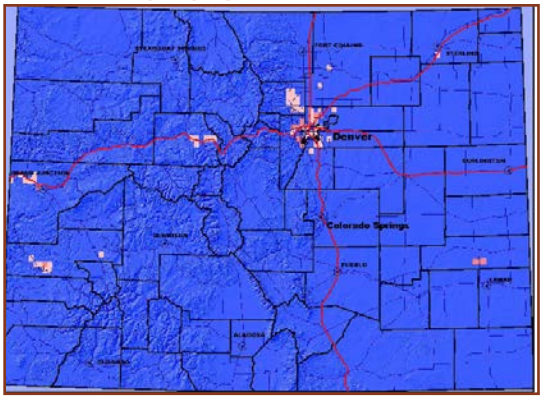
Purple loosestrife can be found along riverbanks, ditches, and wet meadows throughout the state. Infestations rapidly replace native vegetation, can impede water flow in canals and ditches, and have little wildlife habitat value. Infested wetlands eventually become a monoculture of loosestrife.

If purple loosestrife is growing in your garden, remove plants immediately and consider a substitute. There are many planting alternatives that are better suited to Colorado and beneficial to wildlife. Alternatives include spotted gayfeather, Rocky Mountain Penstemon, beebalm, purple coneflower, and Colorado Columbine. For more information refer to Colorado Native Plant Society's website, www.conps.org.

The key to effective control of purple loosestrife is early detection when infestations are small. It is fairly easy to control small numbers of loosestrife plants when the seed bank in the soil is low. Eradicating large populations is much more difficult. Persistent management and monitoring of site is a long-term program to ensure eradication. Small loosestrife infestations should be eradicated by hand-pulling/cutting in combination with herbicide application. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Purple loosestrife is designated as "List A" species on 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 Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Map of purple loosestrife infestation.



Key ID Points

1. Showy pinkish-purple flowers bloom in long vertical racemes.
2. Lance-shaped leaves have smooth edges.
3. Four sided stem.

Updated on: 01/09

Lythrum salicaria

Management Recommendations

CULTURAL
Prevent the establishment of new infestations by minimizing disturbance and seed dispersal.

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. For more information on biocontrol in Colorado, please contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Hand removal of isolated individuals can be effective on small infestations. Hand removal should be performed prior to seed set. It is important to remove the entire rootstalk of the plant to avoid regrowth from root fragments. During the flowering stage, flowerheads must be cut and disposed of properly before a herbicide is applied. This will prevent or reduce seed production.

Integrated Weed Management:

Since purple loosestrife has been identified in Colorado, preventing the populations from spreading is important in management of the weed. Prevent new seeds from being added to the seed bank by managing purple loosestrife before it flowers or by clipping and disposing of the flowerheads prior to seed set and using herbicides to control plants.

Follow up control efforts the same growing season and for several years afterwards. Maintain a healthy cover of perennial plants.

Purple loosestrife

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
Triclopyr (Garlon 3A- general use)	1-2 qts./acre or 1.3-2.5 oz/gal water + non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.	Apply in summer. If plants are flowering, cut and properly dispose of flowerheads before applying Garlon 3A.
Glyphosate* (Rodeo - aquatic safe) -general use *nonselective, will kill all vegetation it contacts	1-2 qts./acre or 1.3-2.5 oz/gal water + non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.	Apply in summer during the flowering stage. Cut and properly dispose of flowerheads before applying Rodeo.

Top to bottom photos, © Kelly Uhing, Colorado Department of Agriculture.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Russian knapweed

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Russian knapweed Identification and Management

Key ID Points

1. **Russian knapweed can be distinguished from other knapweeds by the pointed papery tips of the floral bracts.**
2. **The roots are dark brown and have scale leaves.**

Identification and Impacts

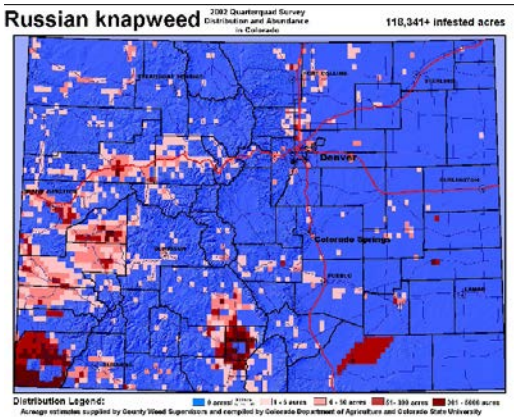
Russian knapweed (*Acroptilon repens*) is a non-native deep-rooted perennial that spreads by aggressive, creeping, horizontal roots (rhizomes) and seeds. The roots are black with a scaly appearance. Russian knapweed can grow up to 3 feet in height. The stems and leaves are covered with short, stiff hairs. The flowers are urn-shaped, pink to purple in color, and are solitary at the tips of the upper branches. Russian knapweed can be distinguished from other knapweeds by the pointed papery tips of the rounded bracts that surround the flowers. Russian knapweed emerges in early spring after soil temperatures remain above freezing. It produces flowers from June to August and sets seed in late summer to early fall. Russian knapweed reproduces primarily from its root system. Buds on the horizontal roots can form adventitious shoots that can grow to be independent 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.

Habitats for Russian knapweed includes many land types, from roadsides, ditch banks, riparian zones, pastures, irrigated cropland, clear cuts, and cropland.

The most effective method of control for Russian knapweed is to prevent its establishment through proper land management. Maintain healthy pastures and rangeland and continually monitor your property for new infestations. If Russian knapweed is already established, using an integrated weed management approach proves to be effective. Russian knapweed can be managed with herbicides or 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.

Russian knapweed is designated as a "List B" species on the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information, visit www.colorado.gov/ag/csd and click on the Noxious Weed Program link or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Bracts photo at left, © Steve Dewey, Invasive.org. Infestation map above, Crystal Andrews, Colorado Department of Agriculture. All other photos © Kelly Uhing.

Acroptilon repens

Updated on: 08/08

Management Recomendations

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

BIOLOGICAL
A gall forming nematode, *Subanguina picridis,* is currently being monitored for effectiveness but is not yet available to the public. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture, 970-464-7916.

MECHANICAL
Mowing several times before the plants bolt stresses Russian knapweed and forces them 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:

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

Russian knapweed

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
Aminopyralid (Milestone)	4-6 ounces/acre	Apply in the spring and summer to plants in the bud and flowering stage and to dormant plants in the fall. Add non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.
Picloram (Tordon 22K *this is a Restricted Use Pesticide*)	1 qt./acre or 1 oz/gal water	Apply in spring to bud/early flower stage and/or fall rosette. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.
Chlorsulfuron (Telar)	1-3 oz/acre or 2 grams/3 gallons of water	Apply in spring from pre-bloom to bloom and to fall rosettes. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Russian olive

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Russian olive Identification and Management

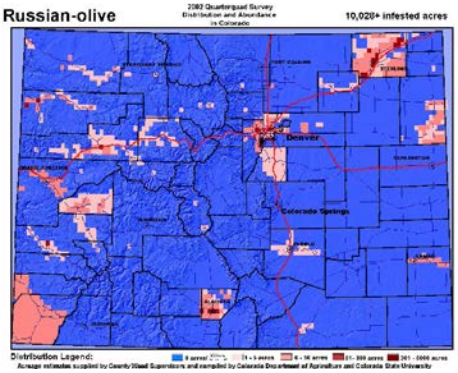
Identification and Impacts

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 can remain viable for up to 3 years and are capable of germinating in a broad range of soil types. Spring moisture and slightly alkaline soil tend to favor seedling growth. The plants extensive root system, sprouts root suckers frequently. The stems can reach up to 30 feet in height with branches and trunks that have 1 to 2 inch thorns. Leaves are 2 to 3 inches long, alternate, narrow, have simple blades, and are untoothed. The lower surface is silvery white with dense scales, while the upper surface of the leaf is light green in color. Flowers are 4 small sepals in light yellow clusters, fragrant, and appear May through June. 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, fields and open areas. Russian-olive can out compete native vegetation, 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 are dependant on size and location of the plant. Details on the back of this sheet can help to 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/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.



Photos © Clockwise from lower left: (1) Richard Old, XID Services, Inc., Bugwood.org; (2) Patrick Breen, Oregon State University, Bugwood.org; (1) Kelly Uhing, Colorado Department of Agriculture and map by Crystal Andrews, Colorado Department of Agriculture.

Key ID Points

1. Leaves are silvery white with dense scales.
2. Flowers have 4 small sepals and are light yellow clusters.
3. Red-yellow fruits on mature plants.

Updated on: 08/08

Elaeagnus angustifolia

Management Recommendations

Russian olive

CULTURAL
Cultural controls are not an option when dealing with Russian olive. Replacing with native trees is important once Russian olive has been removed. Contact your local Natural Resources Conservation Service for recommendations of other possible trees or shrubs.

BIOLOGICAL
Tubercularia canker 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. For more information, contact the Colorado Department of Agriculture's Insectary in Palisade, Colorado at 970-464-7916.

MECHANICAL
Mowing hedges with a brush type mower, followed by removal of cut material may be the most effective method for eradication. Stump sprouting commonly occurs after cutting down the tree, and excavation of the entire stump can trigger root sprouting. Burning is practical when conditions support a long hot fire and most effective in summer or early fall. Saplings are most sensitive.

Integrated Weed Management:

The most effective combination of control efforts has been cutting trees, followed by either spraying or burning the strumps. "Cut-stump" treatments that are applied during the winter months, using an approved herbicide seems effective. Trees are "cut" with a hatchet or chainsaw, then immediately treated with herbicide on the open wound.

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
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.

Above photos © (Top to Bottom): Kelly Uhing, Colorado Department of Agriculture; Whitney Cranshaw, Colorado State University, Bugwood.org; and James H. Miller, USDA Forest Service, Bugwood.org.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Saltcedar

Tamarix spp.

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

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.

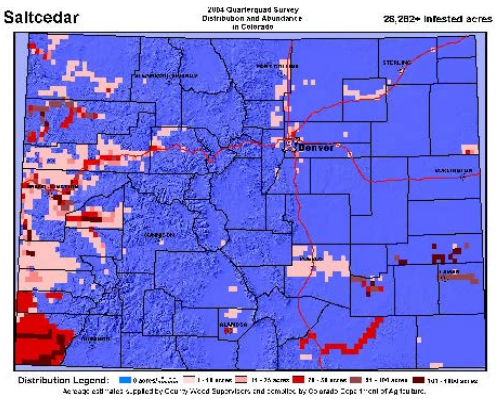
Saltcedar was introduced from central Asia, northern Africa, and southern Europe for ornamental purposes and for stream bank stabilization. It is now widespread in the United States. Saltcedar crowds out native stands of riparian and wetland vegetation. Saltcedar increases salinity of surface soil, rendering 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

Saltcedar

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.

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!**

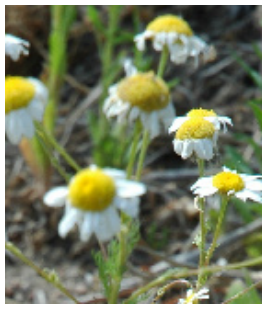
HERBICIDE	RATE	APPLICATION TIMING
Triclopyr (Garlon 4 *approved aquatic label*)	Foliar - 2-4 qts./acre Cut-stump - undiluted 100% Basal bark treatment 1:3 of herbicide:natural oil	Foliar treatments - late spring to early fall Cut-stump - anytime except when snow is present Basal bark - anytime except 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

COLORADO DEPARTMENT OF AGRICULTURE

Scentless chamomile

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100



Key ID Points

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

Updated on: 08/08

Scentless chamomile Identification and Management

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

Identification and Impacts

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

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

Scentless chamomile is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Photos © Kelly Uhing, Colorado Department of Agriculture.

Matricaria perforata

Management Recommendations

Scentless chamomile

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

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

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

Integrated Weed Management:

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

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
Metsulfuron (Escort XP)	0.33 oz product/ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette to bolting growth stage. (Spring to Early Summer)
Chlorsulfuron (Telar)	0.33 oz product/ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette or bolting growth stage. (Spring to Early Summer)
Aminopyralid (Milestone)	7 fl oz/ac + 0.25% v/v non-ionic surfactant	Apply when plant is in rosette growth stage. (Spring to Early Summer)

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

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Scotch thistle

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Key ID Points

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

Updated on: 08/08

Scotch thistle Identification and Management

Identification and Impacts

Scotch thistle *(Onopordum acanthium or O. tauricum)* 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, Scotch thistle appears as a rosette in spring or fall. Rosettes can be 1 to 2 feet in diameter. During the second year in mid to late spring the stem bolts, flowers, sets seed, and the plant dies. A prolific seed producer, Scotch thistle can produce up to 14,000 seeds per plant.

Scotch thistle can grow up to 12 feet tall. Stems are numerous, branched, and have broad, spiny wings. The leaves of species *acanthium* are large, grayish-green, spiny, and covered with fine dense hair giving the leaf a woolly appearance. The leaves of the species *tauricum* are similar in size, but are not hairy, smooth and bright green. On both species, the leaves have a distinct mid-rib. The flowers are violet to reddish in color, numerous (70-100/plant), and are surrounded by spine-tipped bracts. The plants flower from mid-June to September.

Due to the robust, spiny nature of Scotch thistle, this plant can act as a living barbed wire fence, making areas impassible for wildlife, livestock, and people. Scotch thistle invades rangeland, overgrazed pastures, roadsides, and irrigation ditches. It also prefers high-moist soil areas adjacent to creeks and rivers.

The key to effective control of Scotch thistle is maintaining healthy pastures and rangeland, guarding against disturbance or overuse, and as with most biennials limit seed production. To reduce seed production, plants with buds or flowers should be collected and immediately disposed of or destroyed. Chemical control is most effective when plants are in rosette stage, spring or early fall. Mechanical controls can be used to eliminate small patches or plants in a later growth stage. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

Scotch thistle is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

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

Onopordum acanthium or O. tauricum

Management Recommendations

CULTURAL
Establishment of selected grasses can be an effective cultural control of Scotch 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
Urophora stylata, a fly predator, is used to help control this thistle. The female fly lays eggs in the seed head of the thistle. The maggot then consumes the seed in the flower. This species has overwintered in Colorado but the limited numbers will not allow for general redistribution. For more information, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

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

Scotch thistle is best controlled in the rosette stage. For small infestations, Scotch thistle can be controlled by severing its taproot 1-2 inches below the ground. Control can be enhanced by a follow-up application of herbicides to the surviving rosettes. It is imperative to prevent seed production. Do not allow Scotch thistle flowers to appear.

Scotch 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
Picloram (Tordon 22K - *Restricted Use*)	1 pint/acre + 0.25-0.5% v/v non-ionic surfactant	Apply spring or fall in the rosette stage.
Aminopyralid (Milestone)	7 fl. oz./acre + 0.25-0.5% v/v non-ionic surfactant	Apply spring or fall in the rosette stage.
Metsulfuron (Cimarron X-tra)	2 oz. product/acre 0.25-0.5% v/v non-ionic surfactant	Apply rosette to early bolt stages of growth. (Spring)

Spotted knapweed

Centaurea maculosa

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Spotted knapweed Identification and Management

Key ID Points

1. Floral bracts have black tips, with comb-like spines of equal length. Flowers are pink to purple, but rarely white.
2. Leaves are pinnately divided.

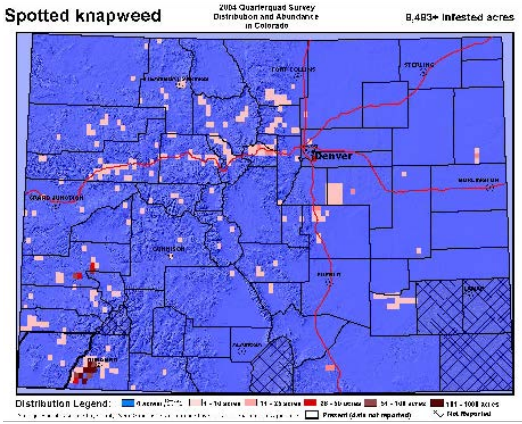
Identification and Impacts

Spotted knapweed *(Centaurea maculosa)* is a non-native short-lived perennial forb that reproduces only by seed. A prolific seed producer, Spotted knapweed can produce up to 40,000 seeds per plant. The key to distinguishing spotted from other knapweeds is the black-tipped involucral bracts (phyllaries) at the base of the flower. Unlike diffuse knapweed, there is no long, distinct terminal spine at the tip of the bracts. Spotted knapweed can grow up to 4 feet tall on erect, ridged stems that are openly branched on the upper half of the plant. Urn-shaped flowers are solitary on the end of each branch tip. Flowers are pink to purple, and rarely white. Leaves are small, oblong in shape and pinnately divided. Multiple rosettes can form on a single spotted knapweed taproot crown. Flowers bloom June to October and seed set usually occurs by mid-August.

Spotted knapweed tends to invade disturbed, overgrazed areas. It also occurs in dry meadows, pastures, stony hills, roadsides, sandy soils and sandy floodplains of streams and rivers. Since it can tolerate both dry conditions and high moisture areas, it is an especially versatile invader. Spotted knapweed and diffuse knapweed infestations often occur together in Colorado. Once established, Spotted knapweed reduces livestock and wildlife forage by out competing native species.

The most effective method of control for Spotted knapweed is to prevent seed production and its establishment through proper land management. Maintain healthy pastures and rangeland and continually monitor your property for new infestations. If Spotted knapweed is already established, using an integrated weed management approach proves to be 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 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, Colorado Department of Agriculture at 303-239-4100.



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

Updated on:
08/08

Management Recommendations

CULTURAL
Establish select grasses as an effective cultural control of spotted knapweed. Contact your local Natural Resources Conservation Service for seed mix recommendations. Bareground is prime habitat for weed invasions, maintaining healthy pastures is crucial.

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, and remove all the taproot as well as all lateral roots. Mowing spotted knapweed at full-bloom will stress the plant, but not kill it. Be sure to bag the flowering cut plants, since the seeds remain viable even after cutting.

Integrated Weed Management:

Spotted knapweed is best controlled in the rosette stage. Enhance control by applying herbicides to the surviving rosettes in spring and fall. It is imperative to prevent seed production. Do not allow spotted knapweed flowers to appear. Management must be intense and persistent in order to deplete the seed bank in the soil.

Spotted Knapweed

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.* **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 teaspsoon/gal water	Spring at rosette to early bolt stage and/or in the fall to rosettes. Add non-ionic surfactant @ 0.32oz/gal water or 1 qt/100 gal water.
Clopyralid (Transline, Stinger)	2/3 to 1 pint/acre	Apply to spring/fall rosettes - before flowering stalk lengthens. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.
Clopyralid + 2,4-D (Curtail)	2-3 qts./acre	Apply in spring and fall to rosettes. Add non-ionic surfactant @ 0.32oz/gal water or 1qt/100 gal water.
Picloram (Tordon 22K - *this is a Restricted Use Pesticide*)	1-2 pts/acre or 0.75 oz/gal water	Apply to spring rosettes through mid-bolt and in fall to rosettes. DO NOT apply near trees/ shrubs/high water table.

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Sulfur cinquefoil

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Sulfur cinquefoil Identification and Management

Identification and Impacts

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

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

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

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

Sulfur cinquefoil is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/csd and click on the Noxious Weed Management Program. Or call the State Weed Coordinator at the Colorado Department of Agriculture, Conservation Services Division, 303-239-4100.

Photos © Kelly Uhing, Colorado Department of Agriculture.

Key ID Points

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

Updated on: 08/08

Potentilla recta

Management Recommendations

Sulfur cinquefoil

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

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

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

Integrated Weed Management:

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

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
Picloram (Tordon 22K - *Restricted Use Chemical*)	1 pint/acre + 0.25-0.5% v/v non-ionic surfactant	Anytime during growing season summer or to fall regrowth.
Aminopyralid (Milestone)	6 fl. oz./acre 0.25-0.5% v/v non-ionic surfac-tant	Spray prebud growth stage, at very early stages of flower growth. (Late Spring to Early Summer)

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Yellow starthistle

Colorado Dept. of Agriculture,
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Yellow starthistle Identification and Management

Identification and Impacts

Yellow starthistle *(Centaurea solstitialis)* originated from Northern Spain. It is a winter annual that is blue-green in color, has a vigorous taproot, and produces bright yellow flowers with sharp, stiff spines surrounding the base of the flower that extend up to ¾ of an inch long. Yellow starthistle grows from 1 inch tall to 4 feet tall. Basal leaves are 1-3 inches long and deeply lobed while upper leaves are smaller and narrower. Stems appear winged and both stem and leaves have a slight whitish nap covering them. Yellow starthistle spreads by seed with a single large plant producing up to 100,000 seeds. Plumed and plumeless seeds disperse at different times.

Yellow starthistle typically germinates in the fall with increased moisture, overwinters as a seedling, and forms its rosette beginning in March through May. It can however, germinate extremely fast with optimal conditions throughout the entire summer (16 hours or less with ~ 70 degrees F and ample moisture). Flowering generally occurs from June to September and often later.

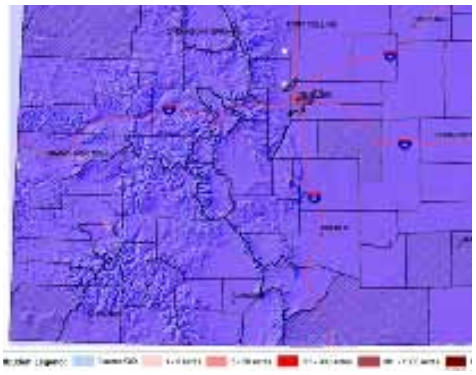
Habitats for yellow starthistle include rangelands, pastures, roadsides, wastelands, and lower elevations. Over utilized grasslands are particularly susceptible to invasion.

Yellow starthistle is fatally poisonous to horses (causing chewing disease) and is considered poor forage for all livestock and wildlife. It also destroys native plant communities. The seed bank of yellow starthistle is not completely understood. The site must be monitored for at least 15 years after the last flowering adult plants have been eliminated and treatments repeated when necessary.

The key to effective control of yellow starthistle is to prevent seed set from occurring in existing populations, monitoring your land for new infestations frequently, treating newly detected invasions rapidly, and preventing new introductions from occurring. Details on the back of this sheet can help to create a management plan compatible with your site ecology.

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

Map of yellow starthistle infestation.



Key ID Points

1. Bright yellow ray and disk flowers.
2. Winged stems.
3. Stiff spines at flower base
4. Plant has a unique blue-green color.

Updated on: 01/09

Photos clockwise from lower left © (3 on left side) Kelly Uhing, Colorado Department of Agriculture, Steve Dewey, Utah State University, Bugwood.org; and map by Crystal Andrews, Colorado Department of Agriculture.

Centaurea solstitialis

Management Recommendations

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

CULTURAL
Following initial control, establishment of selected grasses can be an effective cultural control of yellow starthistle. Contact your local Natural Resource Conservation Service for seed mix recommendations. Maintain healthy pastures and prevent bare spots caused by overgrazing. Bare ground is prime habitat for weed invasions.

BIOLOGICAL
Insect biocontrol agents exist but are not included in the state prescribed management plan. Eradication is the management objective for all List A species. For more information on biocontrol in Colorado, contact the Palisade Insectary of the Colorado Department of Agriculture at 970-464-7916.

MECHANICAL
Hand pull when soil is moist and make certain to pull all the roots. Bag specimens carefully so as to not scatter seeds if flowering. Plants vary greatly in size so be sure to look for plants that are only a few inches tall, as well as plants that are several feet tall. Include dried skeletons as they may still contain seed. Mowing is not advisable and may extend life of the plant and stimulate additional flowering.

Integrated Weed Management:

The sheer number of seeds, high seed viability, and fast growth of yellow starthistle requires a persistent control program. Using herbicides and mechanical techniques to control the invasion followed by establishing a desirable plant community can be effective.

Management must be persistent to deplete the seed bank in the soil.

It is imperative to prevent seed production. Do not allow yellow starthistle plants to go to seed.

Yellow starthistle

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
Picloram (Tordon 22K- restricted use)	1.5 pint product/acre	Apply during rosette growth stage or when adequate moisture is available, and plants are actively growing. (Early spring to late summer depending on conditions.
Aminopyralid (Milestone - general use)	5 fl oz product/acre	Apply during rosette growth and bolting growth stages. (Early spring to early summer)
Clopyralid (Transline - general use)	0.67 pint product/acre	Apply during rosette growth to mid-bolt growth stages. (Early spring to early summer)

Colorado State University

COLORADO DEPARTMENT OF AGRICULTURE

Yellow toadflax

Linaria vulgaris

Colorado Dept. of Agriculture
Conservation Services Division
700 Kipling Street
Suite 4000
Lakewood, CO 80215
303-239-4100

Yellow toadflax Identification and Management

Key ID Points

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

Updated on: 02/08

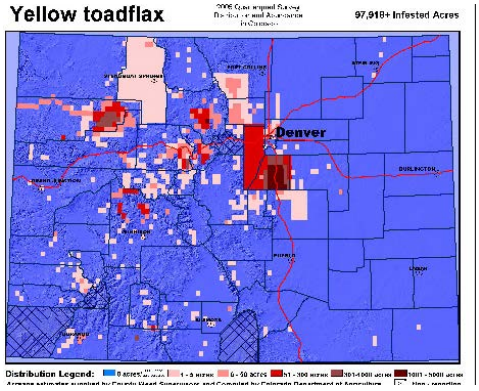
Identification and Impacts

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

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

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

Yellow toadflax is designated as a "List B" species in the Colorado Noxious Weed Act. It is required to be either eradicated, contained, or suppressed depending on the local infestations. For more information visit www.colorado.gov/ag/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.



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

Management Recommendations

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

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

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

Integrated Weed Management:

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

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

Yellow toadflax

HERBICIDES

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

HERBICIDE	RATE	APPLICATION TIMING
Picloram + Chlorsulfurn (Tordon 22K - *restricted use* + Telar - general use)	Apply at 1 qt.+ 1.25 oz product/A plus 0.25% v/v non-ionic surfactant.	Apply at flowering through fall. Typically late August through September application timing has shown best results. Re-treatment may be necessary.
Picloram (Tordon 22K - *restricted use*)	Apply at 1.5 qt./A	Apply in fall (late August through September). Add 0.25% v/v non-ionic surfactant or 1 qt/A crop oil concentrate.