

Boulder County Parks & Open Space Weed Management – Policies & Procedures

Mission Statement

Boulder County weed management will minimize the occurrence of weeds and associated negative impacts on native plant communities, agricultural lands, and public corridors within Boulder County.

Utilizing an integrated weed management approach, we strive to prevent the introduction of new invasive plant species, eradicate isolated or limited populations, and contain and manage weed species that are well established within the county. In doing so we will:

- Implement the Boulder County Noxious Weed Management Plan on County-owned properties and Rights-of-Way.
- Cooperate with the Land Use Department's Zoning Inspector for notification and enforcement of the Noxious Weed Management Plan on private lands in unincorporated Boulder County.
- Coordinate with County Resource Specialists for weed management needs relating to restoration projects and agricultural production.
- Identify the extent of various invasive weed species in the county and monitor the spread or decline of infestations over time.
- Stay current with weed management research and innovative management techniques that may increase effectiveness of weed control and/or decrease environmental impacts.
- Assist Boulder County Agricultural Extension Agents in disseminating information pertaining to identification, impact and management of weeds on agricultural and urban lands.
- Promote education and awareness of new and potential invasive weed species in Boulder County.
- Assist in development of weed management plans with government agencies within the county such as U.S. Forest Service, Colorado Dept. of Transportation, and incorporated municipalities.

Introduction

The Boulder County weed management program is responsible for weed control efforts on approximately 25,000 acres of Parks & Open Space (POS) land designated as natural areas; 7,000 acres of POS agricultural leased land that also serves as wildlife habitat, and 685 miles of county maintained road right-of-way. The weed crew utilizes an integrated management approach consisting of herbicide application, mowing, hand pulling, insect bio-control, and cultural control. It must be recognized that not every tool can be successfully used in every situation and there will be site-specific needs that will require flexibility to achieve the best weed management.

Management is a challenge, as weed problems in Boulder County are as varied as the county's topography. Newly introduced weed species are a constant concern, with an influx of people from all parts of the country transporting weed seed by way of livestock and/or vehicles. It is important that property owners on the upper ends of Boulder County's watersheds are aware of noxious weed issues and actively control weeds as necessary. Weed management methods are described below, with detailed applications given on specific weeds under the management section.

Weed Management Methods

Mowing – Mowing is the primary method of managing vegetation along roadways. Mowing roadsides encourages perennial grasses over broadleaf vegetation (typically weedy species), reduces potential for roadside fire ignition, and maintains sight distance requirements. Two operators are mowing most every day from May through September along county roads conducive to mowing (paved roads, as gravel can be hazardous when projected from mower blades towards cars, bicyclists, or pedestrians), and rotating through those stretches of roads three times within a season. Mowing is used for weed suppression on open space areas when feasible, utilizing large tractor-mounted mowers as well as hand held weed whackers.

Herbicide Application – Specific herbicides, timing, and target species are listed in detail under the “Management of Weed Species” section in this text. Additional herbicide choices are an option as new products become available that are often less toxic and effective at lower use rates. Public concern of herbicide usage is always a major consideration. The County uses herbicides with the lowest rates recommended for effective weed control, that have the lowest toxicity and volatility, and are spot sprayed whenever possible, instead of broadcast on weed infestations. Almost all herbicides used are selective for control of broadleaf weed species. Grasses are unaffected. Notification of herbicide applications in areas with public access are posted daily at 303-441-3940.

All employees in the weed group, full-time and seasonal, are certified with the Colorado Department of Agriculture under Pesticide Application. Application equipment is regularly calibrated to insure accurate delivery. Herbicide label information provides precautionary information relating to proximity to water, sensitive vegetation, re-entry intervals, etc. Product labels are referenced and present with applicators in the field. Right-of-way herbicide applications made by Boulder County west of Highways 36 and 93, or within 200 feet of a County-owned trail are approved by the Board of County Commissioners prior to application. In 2004, concern over the threat of herbicide contamination to Left Hand Creek from spray operations along Left Hand Canyon Road led to sampling of creek water. Samples were collected before, during, and after roadside spraying and submitted to the Colorado Department of Agriculture for laboratory analysis. The analysis, with a detection level capability of parts per trillion, showed no presence of herbicides.

Broadcast spraying will only be used when an infestation is too large to be treated effectively through spot spraying, typically more than an acre in size. Restoration to a

native plant community will always be the focus following a broadcast application. This is accomplished either through seeding an area, or eliminating the weed competition from the site and relying on the native species seed bank to facilitate the conversion. Condition of the native component is monitored in subsequent years to assure the restoration has been effectively accomplished.

Hand Pulling – Hand pulling is utilized for control of annual and biennial species, particularly along trails and roadsides. Volunteer groups often participate in hand pull events, the largest being Mediterranean sage removal in 2004 & 2005. Volunteers for Outdoor Colorado sponsored the two events with 400 volunteers participating each year. Hand pulling or other manual methods on deep-rooted perennials is minimally effective and should only be utilized sensitive areas. Where manual efforts are employed, it's important to commit to a continued regimen of repeated hand-pulling at least twice a year for a minimum of three to five years.

Grazing - Grazing, especially with goats, has been utilized in some scenarios in the Rocky Mountain West. While often good as a PR piece, goats are expensive and their impact will not eradicate most noxious weeds. Grazing mimics mowing and should be considered only where community sentiment and funding warrant this intensive weed control practice. Consideration must be given to the expense, environmental impact from intensive livestock use, possible danger of spreading disease to certain wildlife, and the potential liability for events relating to escaped animals may prove prohibitive.

Insect Bio-Control – Biological weed control through insect/plant interactions (insect bio-control) is an important component of the County's weed management program. The use of insects and other bio-control agents is employed in cases where eradication is impractical due to the vastness of the infestation, and where eradication with more timely methods is infeasible. Insect agents released over the past 10 years in Boulder County have been for control of musk thistle, diffuse knapweed, leafy spurge, field bindweed, and dalmatian toadflax. Most field releases take 3-5 years for establishment of an insect population to become numerous enough to impact a weed infestation. Eradication of a weed species cannot be attained through insect bio-control. The most effective scenario is a weed infestation reduced to a 'tolerable level', a level where the insect agents are significantly limiting distribution and abundance of the target weed species and the weed density is no longer considered detrimental to the desired plant community.

The oldest and most successful example of insect bio-control is suppression of St. Johnswort by *Chrysolina quadrigemina*, introduced into this area around 1960. The leaf-feeding beetle has such an impact on St. Johnswort populations that it is no longer considered a major rangeland weed along the front range of Colorado.

A seedhead-feeding weevil, *Rhinocyllus conicus*, was first introduced into this region in 1969 to control musk thistle. The release was controversial due to off-target impacts of the weevil on native thistle species. The effect of the weevil on musk thistle populations

was favorable, significantly reducing infestations in Colorado and other western states. Ironically, the worst weed problem in Boulder County in 2005 was musk thistle – demonstrating the cyclic nature of insect/plant interactions.

The most numerous insect agent released on Boulder County Open Space properties in 2005 was *Mecinus janthinus*, a stem-boring weevil that feeds on dalmatian toadflax. Releases of *Mecinus* beetles have had a significant impact on dalmatian toadflax infestations in the NW United States. Though the impact of this insect has yet been observed in this region, it potentially could be one of the more useful tools in curbing the spread of dalmatian toadflax, a rapidly expanding weed along steep and remote areas of the front range of the Rocky Mountains. Releases of *Larinus minutus* and *Cyphocleonus achates* on diffuse knapweed, *Aceria malherbae* on bindweed, and *Apthona* species on leafy spurge, are intended to enhance existing populations, as these biocontrols are already well dispersed in Boulder County. The impact of bio-controls on the latter three species have been site specific and ranges from poor to good.

Cultural Control – The primary method of cultural control utilized by the county is the establishment of desirable and competitive vegetation. Along county right-of-ways perennial grasses serve this purpose. In natural areas, establishment of a diversity of native vegetation is the goal. The weed crew works very closely with plant ecologists and agricultural specialists on restoration projects.

Public Outreach – Education is a critical component of County weed management. CSU Cooperative Extension and Boulder County Weed Management conduct small acreage weed management workshops.

Mapping /Monitoring – The weed crew now uses GPS for more effective mapping. Weed infestations and management efforts are surveyed and monitored through GPS mapping. The 8 largest County POS properties are extensively surveyed for weed infestations and mapped every 5 years. Management efforts such as insect releases, herbicide applications, and mowing operations are mapped as part of our routine protocol. Additionally, insect bio-control research on the SE buffer POS properties has been monitored by ESCO Associates from 1997 to present.

Mapping infestations over time, as well as documentation of management efforts will serve as a useful tool for future management decisions.

Research - The County Weed Management staff attends and participates in conferences of the Western Society of Weed Science, Society for Range Management, Colorado Weed Management Association, Great Plains Grassland Conference, High Altitude Revegetation Workshops, and regional meetings of the Colorado Weed Network. We collaborate with numerous researchers conducting field studies on Boulder County POS properties. Such studies focus on restoration, weed management through organic weed control, insect bio-control and/or herbicide application, mapping and monitoring riparian corridors, and prescribed fires for cheatgrass suppression. Tours of the field sites in Boulder County and on sites in other counties in NE Colorado take place each season. Such tours serve to disseminate recent vegetation management techniques to area

managers, and facilitate interaction among managers, and between managers and university scientists.

State Weed Law

The Colorado Noxious Weed Act states that noxious weed management is the responsibility of each local governing agency - incorporated municipalities, counties, and lands owned by state and federal agencies. The Act states that the board of county commissioners of each county in the state shall adopt a noxious weed management plan for all of the unincorporated lands within the county. The Boulder County Noxious Weed Management Plan was adopted in January of 1992. Enforcement of the weed management plan is the responsibility of the Zoning Administrator under the County Land Use Department. The County Weed Manager coordinates with the Zoning Administrator for notification and enforcement of the management plan. Boulder County, in cooperation with the Natural Resource Conservation Service, Cooperative Extension, and other agencies, actively recruits landowners to control all listed weed species, particularly List A species. The County will enforce on noncompliant landowners.

- The Boulder County Noxious Weed Management Plan was revised July 20, 2004 to conform to the revised Colorado State Noxious Weed Law, which went into effect May 3, 2004.
- The basic change that occurred in the state weed law was categorizing noxious weed species into 3 lists: A, B, and C.
 - List A species require mandatory eradication by local governing agencies.
 - List B species are common enough in parts of the state that eradication is not feasible, though the species are still recommended for eradication, suppression, or containment depending on distribution and densities around the state.
 - List C species are widespread and well established.
- Control of List B and C species is recommended but not required by the state, although local governing bodies may require management.
- The Boulder County Noxious Weed Management Plan requires eradication of all List A species, as mandated by the state, and containment and suppression measures for 13 of the List B species identified as significantly troublesome in Boulder County.
- Enforcement of the County Weed Plan on private or public property cannot be conducted by the County Land Use Department without first applying the same measures to any land or rights-of-way owned or administered by the County that are adjacent to such properties.
- The County Weed Plan can be accessed at http://www.co.boulder.co.us/lu/pdf/weed_pln_04.pdf

List A Species in Boulder County

Of the 18 List A species, only 9 are currently known to exist in Colorado, and 7 of those 9 are known to exist in Boulder County. Those species are:

Cypress spurge (*Euphorbia cyparissias*)
Dyer's woad (*Isatis tinctoria*)
Mediterranean sage (*Salvia aethiopsis*)
Myrtle spurge (*Euphorbia myrsinites*)
Orange hawkweed (*Hieracium aurantiacum*)
Purple loosestrife (*Lythrum salicaria*)
Yellow starthistle (*Centaurea solstitialis*)

The required management objective for List A species is eradication, defined as prevention of production of seed or other reproductive propagules. Techniques prescribed by the State of Colorado for management of List A species are hand-pulling, digging, or herbicide application. Suppression techniques such as mowing, grazing, or insect bio-control releases are not acceptable forms of management.

Status of List A species in Boulder County:

Cypress spurge – is a perennial, escaped ornamental plant. Cypress spurge is not known to exist on any County-owned land. Some small infestations occur on private land.

Dyer's woad – is a biennial, originally brought to this country for extracting red dye. Dyer's woad is found on one small location within the city limits of Boulder. City weed managers there are monitoring and working towards eradication of this species.

Mediterranean sage – is a biennial that is problematic on rangeland. Mediterranean sage is found primarily in the east central portions of Boulder County, has been on the County weed list for over ten years, but still persists as a troublesome weed on public and private lands. Large volunteer hand-pull events in 2004 and 2005 have taken place on the Boulder County's Platt, Centennial, and Wolf Run Open Space properties, as well as on City of Boulder Open Space property and federal land on Table Mountain. In addition to hand pulling or digging, spot spray applications are conducted on dense populations located on these properties as well as Colp and Pierce.

Myrtle spurge – is a tap-rooted perennial that can reproduce by seed or plant fragments. Myrtle spurge is an escaped ornamental, found in small patches on Hall Ranch and Walker Ranch County Open Space properties. Both patches were hand pulled in 2005 and will be monitored in the future. Myrtle spurge is commonly found within most municipalities in Boulder County.

Orange hawkweed – is a perennial species which can reproduce by seed or runners. Two infestations are known to exist in Boulder County: a small patch of less than one acre in Roosevelt National Forest, north of Jamestown; and a two acres of pasture land on

the border between Gilpin and Boulder Counties, five miles east of Nederland. Both sites are being treated and monitored.

Purple loosestrife – is a perennial, escaped ornamental that invades wetlands. Found in past years on the County’s Broomfield North and Rock Creek Open Space properties, no purple loosestrife was found on either property in 2005. Management consists of clipping and bagging the flowering head, then spot spraying the remainder of the plant with an appropriate herbicide. A few infestations were located and clipped within municipalities in the county 2005.

Yellow starthistle – is an annual invader, infesting an estimated 20 million acres in California. Yellow starthistle is found on a very restricted site within the Town of Superior. Aggressive control by that municipality should result in eradication within a few years.

Weed species from the State’s B List on the Boulder County Weed Management Plan:

The following 13 species have been identified as troublesome in Boulder County. The Land Use Department requires management of these species where jurisdiction applies.

- Canada thistle (*Cirsium arvense*)
- Musk thistle (*Carduus nutans*)
- Bull thistle (*Cirsium vulgare*)
- Scotch thistle (*Onopordum acanthium*, *Onopordum tauricum*)
- Dalmatian toadflax (*Linaria dalmatica*, *Linaria genistifolia*)
- Yellow toadflax (*Linaria vulgaris*)
- Diffuse knapweed (*Centaurea diffusa*)
- Russian knapweed (*Acroptilon repens*)
- Spotted knapweed (*Centaurea maculosa*)
- Leafy spurge (*Euphorbia esula*)
- Houndstongue (*Cynoglossum officinale*)
- Common teasel (*Dipsacus fullonum*)
- Tamarisk or salt cedar (*Tamarix ramosissima*)

County Weed Management Practices

The following principles are incorporated into weed management decisions:

Prevention of the establishment of new weed infestations through early detection and rapid response saves substantial time and expense. This principle underlines the importance of public outreach efforts in promoting noxious weed awareness, of impacts and of identification. Identification of new infestations and bringing them to the attention of the County Weed working group is critical. Optimal timing for management is when weeds are in the early invasion stage. Small, isolated weed infestations are eradicated whenever possible (as opposed to suppression and/or containment measures) to prevent a

small problem from becoming a large problem. The weed supervisor and crews need the ability to make decisions without significant delays as one year of seed production could result in several years of needed control. Weed management research suggests that focusing weed management on small and isolated occurrences is more efficient than focusing attention on large occurrences.

Weed management along roads and trails needs to be a high priority. Public corridors serve as sights for introduction of weed species from other areas and as vectors for weed dispersal. Weed seed is often transported along roads and trails by livestock, pets, vehicles and hiking shoes. It is important to keep these vectors as weed-free as possible in order to prevent establishment of weed species from other areas, and to prevent movement of weed seed along these corridors onto adjacent sites.

Cultural control, the establishment of desired vegetation, prevents or slows down invasion by weedy species and is a key element of weed management. Weeds are typically opportunistic and readily invade disturbed sites. Large tracts of County Open Space have been in a disturbed state since acquisition and are in need of restoration. Impacts from prairie dogs, intensive livestock grazing in the past, and/or past farming practices have left large tracts of POS land devoid of native vegetation, and infested with noxious weeds. Restoration to a native plant community is the primary objective for POS natural areas, and noxious weed management is an important part of obtaining this objective. Establishment and promotion of perennial grasses along right-of-ways is a primary goal for roadside vegetation management.

Insect bio-control agents are utilized only when proven to be effective for weed suppression. Insect bio-control is an important component of weed management efforts. Many insect species can be obtained for dispersal onto numerous weed species, though not all are effective. It is the County's policy to only release insect agents if effective suppression can be attained, and not to introduce exotic organisms into the environment if only marginal results can be expected.

Management of weed species on the Boulder County Weed Management Plan (List B species):

Canada Thistle (*Cirsium arvense*)

- A deep-rooted perennial that reproduces by seed or underground rootstalks. Seed can remain viable in soil for up to 20 years.
- Canada thistle is the most common weed problem in Boulder County and the western United States, and found on all Parks & Open Space (POS) properties.
- Insect agents are available but ineffective, and are not released. Livestock grazing effectively suppresses Canada thistle through the early summer.
- Herbicide applications are utilized on restoration sites where competition for moisture and light are critical, on roadside infestations, and on sites where encroachment is recent.
- Herbicides used - Curtail, Milestone, Redeem, Telar, Tordon, Transline

- On sites with sparse stands of Canada thistle, weed whackers (hand held motorized trimmers) are most commonly utilized for suppression. On large dense stands, mowing prior to seed set followed by an herbicide application in the fall, has been most effective.
- Shallow tillage (disk, sweep) has shown to be counter-productive, creating a denser, more uniform stand. Deeper tillage such as moldboard plowing can provide 1-2 years control.

Biennial Thistles

Bull Thistle (*Cirsium vulgare*) Musk Thistle (*Carduus nutans*)

Scotch Thistle (*Onopordum acanthium*)

- Biennial species are defined as requiring two growing seasons to complete the life cycle, and reproduction is by seed only. Plants typically germinate in late summer or early fall, over-winter as a rosette, bolt and flower in the spring or early summer, disperse seed in mid-summer. Seed longevity of these thistle species is variable but can last up to 10 years.
- These 3 thistle species are common throughout Boulder County, and are found on all Parks & Open Space properties.
- A seedhead weevil targeting musk thistle, *Rhinocyllus conicus*, is well dispersed throughout Colorado, and the western US. The impact from this weevil has been cyclic, some years very effective, other years not. Other insect predators are available, but have only been marginally effective and are not released.
- Herbicide applications are utilized on roadside infestations, on sites where encroachment is recent, and on large dense stands at the rosette to bolt stage.
- Herbicides used - Curtail, Milestone, Redeem, Escort, Tordon, Transline.
- Mowing and grazing can suppress populations, but plants will still flower and set seed from a reduced height. Hand pulling and digging, when practical, is effective if prior to seed set.

Dalmatian Toadflax (*Linaria dalmatica and genistifolia*), Yellow Toadflax (*Linaria vulgaris*)

- Perennial species that originated as ornamentals, have escaped and become problems in rangeland and natural areas. Plants reproduce from seed and vegetative root buds. Seeds can remain viable in the soil for at least 10 years.
- Dalmatian toadflax is generally found on foothill sites, and has become a major weed problem on Heil Valley Ranch, Hall Ranch, and Rabbit Mountain Open Space areas.
- Yellow toadflax is generally more abundant on wetter, cooler sites at higher elevations, though many exceptions exist. Yellow toadflax is a problem on the County's Ann U. White Trail, and becoming well dispersed through western Boulder County.
- A stem-boring weevil, *Mecinus janthinus*, has been released since 2003 on the highest and most inaccessible POS sites. We are anticipating significant suppression from this insect agent, though research shows five years are needed for establishment and impact. It appears *Mecinus* does not significantly impact yellow toadflax, but potentially could significantly suppress dalmatian toadflax.

Other toadflax feeding insects are available, but only marginally effective and are not released.

- Infestations of these weed species often occur among desirable shrubs and trees, limiting herbicide applications to spot spray only. Herbicide applications have been along trails and the perimeters of infestations to prevent spread, and our hope is the *Mecinus* will have a major impact on toadflax in the core areas.
- Herbicides used - Plateau (fall applied) Tordon, Telar, Tordon/Telar tank mix .
- Mowing, hand pulling, or digging can reduce seed production and stress plants, but these perennials will readily grow back.

Diffuse Knapweed (*Centaurea diffusa*)

- Generally a biennial, sometimes an annual, sometimes perennial, reproduces by seed only. Diffuse knapweed is a major weed problem throughout Boulder County, and is often the cause of public complaints due to the plant's tumbleweed nature and prolific seed production.
- Found throughout the eastern half of Boulder County, diffuse knapweed is a major problem around Lyons, and north of the Jefferson County line from Boulder to Superior. Diffuse knapweed is a problem on POS's Walker Ranch, SE Buffer, and Hall Ranch properties.
- Numerous insect bio-control agents have been released since the mid-1990's that feed on the seed head and roots of this weed. *Larinus minutus*, a seedhead-feeding weevil, is established throughout the eastern half of Boulder County. The less mobile root feeder, *Cyphocleonus achates*, is still released onto sites of dense knapweed infestations and poor accessibility. Bio-control efficacy has been best when other stress factors are present such as droughty conditions and/or competitive vegetation.
- Herbicide broadcast applications have taken place on extensive infestations found on the County's SE Buffer Open Space properties. Spot spray applications are used on new and encroaching infestations on other Open Space properties.
- Herbicides used - Curtail, Milestone, Redeem, Tordon, Transline, and Telar (for seed reduction).
- Mowing and grazing can suppress populations, but plants will still flower and set seed from a reduced height. Hand pulling and digging is very effective and often conducted, where practical, on roadsides and along trails.

Spotted Knapweed (*Centaurea maculosa*)

- Typically a perennial, reproduces by seed only. Spotted knapweed is generally found at higher elevations with cooler, wetter conditions than where diffuse knapweed is prevalent, though exceptions exist. This plant has allelopathic properties (disperses a chemical toxic to other plants), giving it a competitive edge.
- Spotted knapweed is a major invasive weed problem in the Rocky Mountain Region infesting many millions of acres, 5 million acres in Montana alone. Less than 100 acres are known to exist in Boulder County, primarily in the western half along east-west roads connecting Highways 36 and 72. The potential for spotted

knapweed to proliferate in Boulder County and other areas in the Colorado Rockies is a great concern.

- Because of the limited range of this species, we do not release insect bio-control agents on infestations, but rather eradicate small patches where found. If practical, we hand pull the plants, and spot spray larger infestations.
- Spot spray applications are used on new and encroaching infestations along roadsides.
- Herbicides used - Curtail, Milestone, Redeem, Tordon, Transline.
- Mowing and grazing can suppress populations, but plants will still flower and set seed from a reduced height. Hand pulling and digging is very effective and often conducted, where practical, on roadsides and along trails.

Russian Knapweed (*Acroptilon repens*)

- A perennial that reproduces from seed and vegetative root buds. Russian knapweed emerges in the spring, bolts in early summer, and flowers mid-summer. This weed is allelopathic (inhibits the growth of other plants), and toxic to horses. Seeds remain viable for 2-3 years.
- Only small patches are known to exist in Boulder County, totaling less than 100 acres. Most infestations occur on private land.
- There are currently no effective bio-control insects available for release on Russian knapweed.
- Landowners are encouraged to apply an herbicide for control, followed by establishment of competitive grass species.
- Herbicides used - Curtail, Milestone, Plateau, Redeem, Telar, Tordon, Transline.
- Mowing reduces seed production and stresses the plant. Hand pulling and digging are marginally effective.

Leafy Spurge (*Euphorbia esula*)

- A deep-rooted perennial that reproduces by rootstalks and seed. Leafy spurge emerges in early spring, flowers in April/May. The entire plant contains a milky latex that can be toxic to horses and cattle and irritating to humans. Seeds can remain viable for 8 years.
- Leafy spurge is found mainly along riparian habitats. Leafy spurge is a major weed problem in the western US, and in several counties adjoining Boulder County. An estimated 300 acres exist in this county, half west of Highways 93 and 36, half east of the highways. Plants are found on POS agricultural properties in eastern Boulder County, and are a big problem on private and USFS lands around Gold Hill. This is a weed species we would like to significantly reduce or eventually eradicate from Boulder County before it becomes a major problem as in other areas along Colorado's Front Range.
- Sheep and goats can be trained to browse leafy spurge. Flea beetles have been released for leafy spurge control since the early 1990's, and we continue to release them on infestations as we find them. Insect bio-control is fairly effective, but used alone will not control this weed. The insects are fairly effective in the eastern half of the county, but substantially less effective at higher elevations.

This observation has been reported in Rocky Mountain National Park (estimated 5 acres), Gilpin County, and sites in Boulder County. To rely strictly on insects for management of this noxious weed in western Boulder County could lead to significant expansion of infestations, severely impacting native flora and fauna.

- Herbicides applied for leafy spurge control are not toxic to the insects. Applications are made either in the spring, prior to emergence of adult beetles, or in the fall after larvae have moved to the roots (root feeding is the primary impact from these bioagents). One year's herbicide application will not completely control leafy spurge, so insects continue to weaken the plants the season following an application.
- Herbicides used - Plateau (fall applied), Tordon.
- Grazing can be effective in depleting root reserves but should be followed with a herbicide application in the fall. Hand pulling or digging can reduce seed production and stress plants, but this perennial will readily grow back.

Houndstongue (*Cynoglossum officinale*)

- Houndstongue was added to the County weed list in 2004.
- A tap-rooted biennial that reproduces only by seed. Plants typically germinate in late summer or early fall, over-winter as a rosette, bolt and flower in the spring or early summer, then disperse seed in mid-summer. Seeds are velcro-like, attaching to clothing and animals. There is no data available on seed longevity in the soil.
- Houndstongue is widely distributed around the county, though more prevalent west of Highways 93 and 36. There are no known large infestations of this weed in the county, but the species has potential to greatly expand its range.
- Houndstongue is toxic to livestock.
- No insect agents are currently available.
- We do not target this weed specifically for spray applications, but spot spray when out applying herbicides for other noxious weeds.
- Herbicides used - dicamba, Escort, 2,4-D, Plateau, Telar, Tordon.
- Hand pulling or digging is very effective.

Common Teasel (*Dipsacus fullonum*)

- Common teasel was added to the County weed list in 2004.
- A tap-rooted biennial that reproduces only by seed. Plants typically germinate in late summer or early fall, over-winter as a rosette, bolt and flower in the spring or early summer, and disperse seed in late summer. No data is available on seed longevity in the soil.
- Found in moist sites, teasel is a threat to wetlands.
- There are no effective insect bio-control agents available for teasel.
- Teasel is fairly common along riparian corridors throughout eastern Boulder County, and found on several POS agricultural properties. We have only targeted teasel for spot spray applications at Monarch Park, along Dry Creek. In the future we will manage this weed on more acres and work with private landowners as well.

- Herbicides used - Curtail, dicamba, Escort, Milestone, Plateau, Redeem, Telar, Tordon, Transline, 2,4-D.
- Hand pulling or digging is very effective. Mowing can reduce seed production but plants generally re-flower and set seed from a reduced height.

Tamarisk/Saltcedar (*Tamarix ramosissima*)

- Tamarisk was added to the County weed list in 2004.
- A deciduous shrub or small tree introduced into this country for erosion control, windbreaks and as an ornamental.
- Also referred to as saltcedar, this plant exudes salts through its leaves, which over time, can create saline soil conditions intolerable to most other vegetation. Tamarisk reproduces by seed, is a prolific seed producer, but seed longevity is just a few months.
- Tamarisk is a major problem along riparian corridors of the Arkansas and Colorado River drainages. On lands under Boulder County jurisdiction, few tamarisk trees exist, and we can strive for eradication in the near future. Some tamarisk is found within municipal boundaries.
- A new insect bio-control agent *Diorhabda elongata* will be available in 2007. The agent is a defoliating beetle which will be released in areas of the state where extensive stands of tamarisk occur.
- Tamarisk removal occurred in 2004 on Lagerman reservoir, Alexander Dawson, and Kenosha open space properties. The technique used for removal was the cut-stump treatment, which consists of cutting the tree down near the base and applying a herbicide on the stump to prevent re-growth.
- Herbicides used – Garlon 4 and Arsenal.
- Mechanical treatments such as cutting, bulldozing, and fire are temporarily effective, though a herbicide application is necessary to prevent subsequent sprouting.

Troublesome Weeds Not On the Boulder County Weed List

The following weed species are found in Boulder County but are not on the County weed list due to the high frequency of occurrence and subsequent difficulty of enforcement.

Cheatgrass - downy Brome (*Bromus tectorum*), Japanese Brome (*Bromus japonicus*)

- State C List.
- ‘Cheatgrass’ is generally considered a collective term in this region for the above-mentioned winter annual brome species. These grasses typically germinate in late summer, are semi-dormant through winter, resume growth in early spring, and set seed by June/July.
- At maturity this grass becomes a nuisance to pets and livestock and is a fire hazard. Because of the ubiquitous distribution of cheatgrass, we seldom target the weed for control.
- No insect biocontrol agents are available.

- Colorado State University conducted a field trial investigating cheatgrass control on POS's Hillside property in 2002 and 2003. The study demonstrated which rates and timing of the herbicide Plateau were most effective for controlling cheatgrass. Herbicide tolerance of mature grasses and seeded grasses was also established.
- In 2003 we applied a herbicide over 250 acres on the east side of Rabbit Mountain to control cheatgrass and increase production of perennial grasses that serve as forage for a grazing allotment. The outcome of this large scale operation was difficult to assess due to extreme drought and prairie dog colonization of the area.
- We intend to spray for cheatgrass control on open space trailheads and parking lots, where prevalent, to reduce spread and public complaints.
- Herbicide used – Plateau.
- In 2004, the Forestry group conducted prescribed burns on Rabbit Mountain for cheatgrass management with favorable results. This promises to become a practical management tool in certain years on locations where feasible.

Russian olive (*Elaeagnus angustifolia*)

- State B List.
- A deciduous tree prevalent on most riparian corridors within Boulder County.
- Russian olive trees are considered weedy due to their invasive tendencies in crowding out native cottonwoods and willows. Russian olives spread primarily by seed transport of exotic bird species. This tree does not serve as good nesting habitat or food source for native birds.
- No insect biocontrol agents are available.
- The Boulder County POS Weed Group and Plant Ecologists actively work to remove Russian olives as part of riparian restoration. The most common management practice is a cut-stump treatment, which consists of cutting the tree down near the base and applying a herbicide on the stump to prevent re-growth. The cut portion of the tree is typically put through a mechanical chipper. Smaller trees are pulled out of the ground with a weed wrench.
- Herbicides used – Garlon 4 and Arsenal.

Kochia (*Kochia scoparia*)

- Not on State weed list.
- Kochia is an annual weed of the goosefoot family, and the most common weed of the eastern plains. Kochia is a major weed in agriculture, but considered more of a nuisance in natural areas.
- Kochia is a pioneer species that is the first to appear on disturbed sites or abandoned farm or ranchland.
- Dense infestations of kochia are highly competitive and are often a problem on POS restoration sites limiting light, moisture and nutrient availability to emerging desirable vegetation.
- There are no insect bioagents for kochia, and mowing is not effective management as the plant will set seed from 2-3 inches in height.

- Herbicide treatments are used only when infestations are so severe that emergence of desired vegetation is impeded.
- Herbicides used – Vanquish or Vista.

Field bindweed (*Convolvulus arvensis*)

- State C List.
- Bindweed is a common perennial, generally not considered a problem outside of agricultural sites.
- A gall mite *Aceria malherbae*, is looking very promising for suppression of bindweed. We have released bindweed mites since 2003 on roadside and trailside sites in hopes of suppressing bindweed and making more soil moisture available for desirable vegetation.
- Bindweed is not often targeted for herbicide control on natural areas, except in cases where infestations are dense enough to significantly impact soil moisture on re-vegetation sites.
- Herbicides used – Vanquish or Tordon.

Perennial pepperweed (*Lepidium latifolium*)

- State B List.
- Commonly referred to as tall whitetop, Perennial pepperweed is a member of the mustard family, often found on moist sites.
- High densities of perennial pepperweed can be found on POS agricultural properties of Doniphan, Alexander Dawson, and Keyes.
- There are no insect bio-control agents available for this weed.
- Pepperweed is not specifically targeted for herbicide control, but is treated when found in areas with other noxious weeds such as Canada thistle.
- Herbicides used – Escort or Telar.

Hoary cress (*Cardaria draba*)

- State B List.
- A perennial of the mustard family, also referred to as whitetop.
- There are no insect bio-control agents for hoary cress.
- The greatest problems occur on POS properties along the St. Vrain River east of Longmont. These infestations have been treated with herbicide and significantly reduced in the past few years, and will hopefully be eliminated when desirable vegetation is restored along the riparian corridor.
- Herbicides used – Escort or Telar.

Common Mullein (*Verbascum thapsus*)

- State C List.
- A biennial commonly found in Boulder County east of the Peak-to-Peak Highway. Mullein seldom appears to have invasive characteristics except on disturbed sites such as heavily grazed pastures or prairie dog colonies.
- There are no insect bio-control agents available.

- Common mullein is not specifically targeted for herbicide control, but is treated when found in areas with other noxious weeds such as Canada thistle.
- Herbicides used – Escort or Telar.

Sulfur cinquefoil (*Potentilla recta*)

- State B List.
- A perennial of the rose family. Scattered infestations of sulfur cinquefoil are becoming more common in Boulder County, particularly west of Highways 36 and 93.
- There are no insect bio-control agents available.
- Sulfur cinquefoil is not specifically targeted for herbicide control, but is treated when found in areas with other noxious weeds.
- Herbicides used – Escort or Telar.

Ornamental Weeds Not On the Boulder County Weed List

Listed below are ornamental species formerly available for purchase at nurseries, now on the state's prohibited sales list. These species have escaped to natural areas throughout Colorado and have demonstrated noxious weed characteristics. Other escaped ornamental species already listed in this text under the A List or B List species on the County Management Plan are: cypress spurge, dalmatian toadflax, dyer's woad, Mediterranean sage, myrtle spurge, purple loosestrife, tamarisk, teasel, and yellow toadflax.

Chicory (*Cichorium intybus*)

- State C List.
- A perennial found along roadsides and riparian areas. Chicory is particularly a problem along Left Hand Canyon and some meadows at Heil Valley Ranch, otherwise not considered invasive.
- There are no insect bio-control agents available.
- Chicory is not specifically targeted for herbicide control, but is treated when found in areas with other noxious weeds such as Canada thistle.
- Herbicides used – Escort or Telar.

Oxeye daisy (*Chrysanthemum leucanthemum*)

- State B List.
- A perennial plant becoming more prevalent every year.
- There are no insect bio-control agents available.
- Oxeye daisy is considered a problem at Caribou Open Space, and around Nederland and Gold Hill.
- The weed crew has spot sprayed for control at Caribou and kept this species from spreading and becoming a large problem as seen around Nederland and Rollinsville in Gilpin County.
- Herbicides used – Escort or Telar.

Scentsless chamomile (*Matricaria perforate*)

- State B List.
- An annual with a flower similar to oxeye daisy, though the leaf structure is very distinguishable.
- Like oxeye daisy, chamomile is found around Gold Hill and Nederland, though not a significant problem on any County Open Space areas.
- There are no insect bio-control agents available, and this plant has not been targeted for any herbicide applications.
- Herbicides used – Escort or Telar.

Bouncingbet (*Saponaria officinalis*)

- State B List.
- A rapidly spreading perennial with greatest infestations along Boulder Canyon and Left Hand Canyon. Bouncingbet is found in eastern Boulder County as well, though much more prevalent west of Hwy's 36 & 93.
- There are no insect bio-control agents available.
- Bouncingbet roadside infestations have been sprayed along Left Hand Canyon and spot sprayed by weed crews when targeting other weed species on POS properties.
- Herbicides used – Escort or Telar.

Dames rocket (*Hesperis matronalis*)

- State B List.
- A biennial of the mustard family, dames rocket is found primarily in the western half of Boulder County. This plant has become a major problem in the Poudre Canyon in Larimer County, and has potential to become a problem here.
- There are no insect bio-control agents available.
- The County is closely monitoring this species.
- No herbicide applications have been made to control dames rocket.