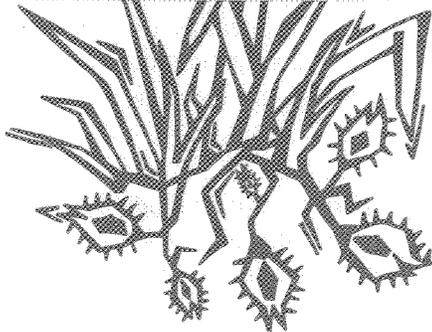


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## Quick Facts...

Weed management means developing a control plan to implement over time.

Prevention, eradication and control are three general management strategies.

Prevention is the first line of defense to keep weeds from occurring or increasing.

Eradication is the removal of weeds from an area so they will not reoccur unless reintroduced.

Control reduces a weed population to a level where you can make a living off of or enjoy using the land.

A weed management system integrates two or more methods into a plan of operation.

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## Weed Management for Small Rural Acreages no. 3.106

by K.G. Beck<sup>1</sup>

### Prevention

Prevention keeps weeds from occurring or increasing in an area. Preventive techniques include planting high quality, weed-free crops or grass seed. Legislative items, such as clean-seed acts and weed-management laws, also can help stop weed problems before they occur and deter weed spread.

An important preventive measure related to control is to keep weeds from going to seed. This is important for annuals and biennials, because that is the only way they reproduce. Perennials reproduce from seed, as well as vegetatively from their root systems. Annual weeds live for one growing season, biennials for two and perennials more than two. However, preventing seed set is extremely important to keep perennials from starting new infestations some distance from existing ones.

### Eradication

Eradication is the removal of weeds from an area so they will not recur unless reintroduced. If eradication creates an open area, one weed problem may be cured simply to create another one. If eradication is necessary, revegetate the ground to prevent another weed infestation. Eradication is desirable for small patches, 10 to 100 feet in diameter, but not always for larger ones.

### Control

Control, the most common management strategy, reduces a weed population to a level where you can make a living off of or enjoy using the land. Adequate control also may prevent future infestations. There are four control methods: cultural, mechanical, biological and chemical.

**Cultural control methods** promote growth of desirable plants. Fertilization, irrigation and planting at optimum densities let crops compete with weeds and not with each other. While nitrogen fertilization increases yields in grass hay meadows, it also fosters weed establishment and growth. Fertilize cautiously, especially with nitrogen, and only when necessary as determined by soil testing.

**Mechanical control methods** physically disrupt weed growth. This is the oldest control method and is used most often worldwide. Tillage, hoeing, hand-pulling, mowing and burning are examples. To mulch or smother weeds often is considered mechanical, even though it simply excludes light rather than physically disrupting weed growth.

**Biological control methods** use an organism to disrupt weed growth. Often the organism is an insect or disease and a natural enemy of the weed. This is called classical biological control. Classical is not the only form of biological control. Livestock can be effective weed-management tools if used correctly. Generally biological control is environmentally sound, particularly classical

biological control. However, improper livestock management (overgrazing) can be extremely damaging to the environment and exacerbate weed problems.

**Chemical control methods** use herbicides to disrupt weed growth. The first rule of any pesticide use is to read the label **before** using the product and follow all directions and precautions. (NOTE: Avoid using soil-active herbicides, such as Tordon, Vanquish/Clarity or Telar, near windbreak plantings and other desirable woody vegetation. Plant injury or death can occur. Do not allow any herbicide to drift onto woody or other desirable vegetation for the same reason.)

## Weed-Management Systems

A weed-management system uses two or more control methods. The key is to encourage desirable plant growth with optimum fertilization, when necessary, and/or irrigation (cultural control). Plant competition is an often overlooked tool and should be used first, but not exclusively.

Till, hoe, hand-pull, mow or mulch (mechanical control) where possible. Herbicides (chemical control) are powerful tools that should be used judiciously, not exclusively. Unfortunately, too often herbicides are used to make up for poor cultural or mechanical management decisions. Herbicides may be a component of the weed-management system. Biological controls can be part of a system. Several natural enemies currently are available from the Colorado Department of Agriculture. Livestock grazing can be effective, depending on the weed species, and integrate with other methods.

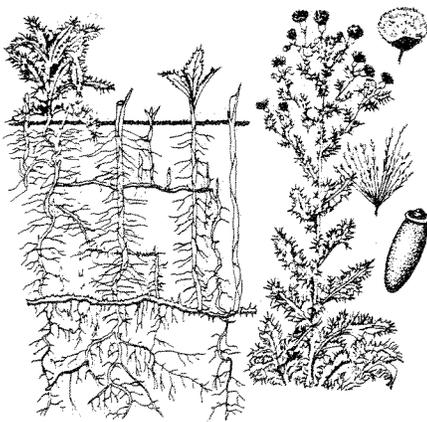


Figure 1: Canada thistle.

### Canada Thistle

Mow Canada thistle (Figure 1) to 2 to 4 inches during the growing season to stress plants and prevent seed formation. Mow monthly, starting at bolt to early bud-growth stage. Alternatively, till at three-week intervals. Tillage or mowing during the growing season sets up the weed for fall herbicide treatments. Tillage or mowing stresses Canada thistle and forces it to draw upon stored root nutrients. The key to controlling Canada thistle and other perennials is to exhaust root nutrient stores, regardless of the control procedure used.

Allow Canada thistle to recover (cease mowing or tillage) in mid-August so ample foliage is present in fall to intercept herbicides. Some plants may recover to flower in the fall, so apply an herbicide before this occurs. Treat the infestation with Tordon at 1 quart per acre (A), Vanquish/Clarity at 2 quarts/A, or Telar at 1 ounce/A. Add an agricultural surfactant at 0.25 percent v/v to Telar treatments or control will be inadequate.<sup>3</sup>

Colorado State University research shows that under habitat conditions where the root growth of Canada thistle may be restricted, such as high water tables, mowing is advantageous. Mow Canada thistle two to three times at monthly intervals (beginning at bolt to early bud-growth stage). Follow with fall applications of Curtail at 2 to 3 quarts/A or Vanquish/Clarity at 2 quarts/A.

Tordon is a restricted-use herbicide labeled for use in permanent grass pastures and noncrop areas. Telar is labeled for noncrop use only. Any of these herbicides kill legumes, such as alfalfa or clover. Don't use Tordon near water, particularly irrigation water. The herbicide can end up in a field other than a grass pasture and injure susceptible crop species or desirable woody vegetation. Consult the Tordon label for precautions or contact your Colorado State University Cooperative Extension county office.

Sometimes Canada thistle invades grass pastures that are in good condition. In situations where the grass population is adequate, a single management method may be sufficient because plant competition from perennial grasses (cultural control) is already in place.

In this circumstance, a spring application of Curtail at 3 quarts/A, Tordon at 1 quart/A, Telar at 1 ounce/A, or Vanquish/Clarity at 2 quarts/A may prove

<sup>3</sup>Treatment key: /A - per acre; ai/A - active ingredient per acre; v/v - volume per volume.

adequate. Apply Vanquish/Clarity when Canada thistle is in the rosette-growth stage, Curtail after all the Canada thistle has emerged, Telar at the bloom stage, or Tordon any time after the weed has emerged. Alternatively, repeated mowing will, overtime, decrease the Canada thistle population.

Usually reseeding is necessary to fill an open space left by killed thistle and provide competition to thistle that recovers. Perennial grasses may be sown the same season any of these herbicides are used. Dormant seeding is recommended (seed in late fall so grass seed will not germinate and emerge until the following spring). Wait at least 30 days after herbicide application. When necessary, improve fertility in the controlled area to favor grass or other desirable plant growth. Take soil samples to determine nutrient needs and fertilize in fall or the following spring. Remember, nitrogen fertilization favors weed growth so fertilize cautiously.

This system combines mechanical, chemical and cultural control. Canada thistle is difficult to control and may recover. Repeat procedures as necessary.

### Leafy Spurge

Mowing leafy spurge (Figure 2) at 14- to 21-day intervals may cause higher susceptibility to fall-applied herbicides, but there is limited data to support this. Alternatively, sheep or goats can graze leafy spurge. This stresses the weed and relieves grasses from competition so pastures can be used effectively by cattle and horses. Sheep or goat grazing may make leafy spurge more susceptible to fall-applied herbicides. Colorado State research shows that leafy spurge was not more susceptible to fall-applied herbicides when preceded by grazing but research by North Dakota State University suggests the opposite. At a minimum, grazing leafy spurge makes use of the weed and infested ground, may help deter its spread, and in some situations, may reduce its population.

Regardless of the top-growth control method, allow leafy spurge to regrow in mid-August so a good stand is present to receive fall-applied herbicides. Apply Tordon at 1 quart/A, Tordon + 2,4-D at 0.5 to 0.75 + 1 quart or Vanquish/Clarity at 2 quarts/A in fall. Fertilization, as determined by soil sampling, can help grasses compete with stressed leafy spurge.

Leafy spurge is a persistent, hard-to-control weed that often recovers from control attempts. If necessary, repeat the management system after three to four years. Reduced herbicide rates often can be used at that time.

Biological control agents are available from Colorado Department of Agriculture. Four flea beetles (*Apthona nigriscutis*, black-dot spurge flea beetle; *A. flava*, copper spurge flea beetle; *A. Cyparissiae*, brown-dot spurge flea beetle; and *A. Czwalinae*, black spurge flea beetle) are being reared and redistributed by the Colorado Department of Agriculture. Their habitat requirements vary. The black-dot spurge flea beetle prefers open (no shade), dry sites with coarse soils low in organic matter. The brown-dot spurge flea beetle prefers soils higher in moisture than the black-dot spurge flea beetle but still prefers open sites with moderately coarse textured soils such as sandy loams. The copper spurge flea beetle does well in coarse soils with high-water tables in open and shaded condition. The black spurge flea beetle prefers moist clay soils. Adults feed on leaves but larvae bore into leafy spurge roots, causing the majority of plant damage.

### Musk Thistle

Musk thistle (Figure 3) is a biennial. The key to successful management is to prevent seed formation. Musk thistle occurs in pastures in direct proportion to moisture and sunlight. The weed grows more in pastures in poor condition than those in good condition. Reseeding may be a necessary final management step to prevent reinfestation by musk thistle.

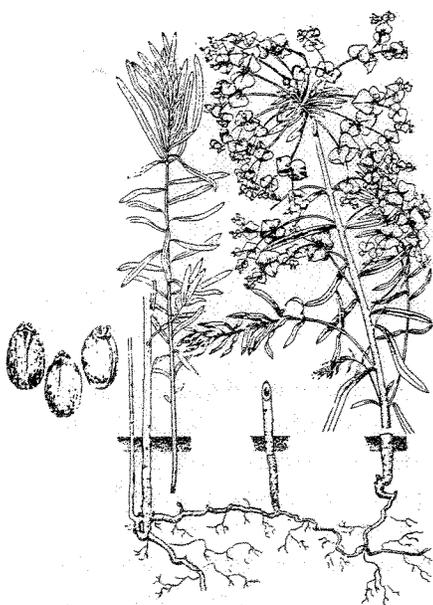


Figure 2: Leafy spurge.

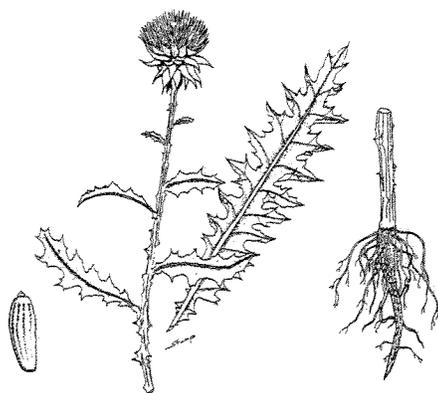


Figure 3: Musk thistle.

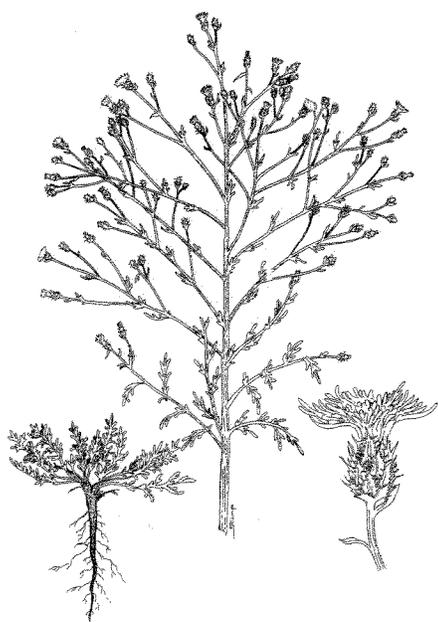


Figure 4: Diffuse knapweed.

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to moisture and sunlight. The weed grows more in pastures in poor condition than those in good condition. Reseeding may be a necessary final management step to prevent reinfestation by musk thistle.

Cut off the weed below the soil line before the bud stage or treat the weed in spring or fall with herbicides. Apply Tordon at 0.25 to 0.5 quart or Vanquish/Clarity + 2,4-D at 0.5 + 1.0 quart/A to musk thistle rosettes. In spring, treat before musk thistle bolts or it may recover and develop seed. Apply Telar or Escort at 1 ounce or 0.5 ounce/A, respectively. Telar is labeled for noncrop use only, but Escort is registered for pasture and rangeland use. Add a good agricultural surfactant at 0.25 percent v/v. Apply in spring when musk thistle is in the rosette- to early-flower growth stages. If treating in early flower, do not allow the pink portion of the developing flower to exceed the size of a dime. Research at Colorado State University indicates little to no seed is formed when Telar or Escort are applied during these growth stages.

The musk thistle seedhead weevil (*Rhinocyllus conicus*) is widespread in Colorado. Larvae of this insect destroy developing seeds but are not 100 percent effective by themselves. Musk thistle has flowers in various growth stages at once and the weevil's life cycle usually is finished before all flowers develop. Apparently, the weevil typically decreases seed production by about 50 percent. Herbicides can be combined with weevils if the insects are allowed to complete their life cycles. Telar or Escort, applied at early flower in spring or Tordon or Vanquish/Clarity + 2,4-D in fall, should allow this. The musk thistle rosette weevil (*Trichosirocalus horridus*) also is available from the Colorado Department of Agriculture. Larvae feed on the meristems of rosettes and developing shoots, causing plants to be less vigorous and produce fewer seeds.

#### Diffuse Knapweed

Diffuse knapweed (Figure 4) is a biennial whose growth is similar to musk thistle. The key to management is to prevent it from going to seed. Diffuse knapweed invades overgrazed pastures, forms dense stands and may be toxic to horses. After an herbicide treatment, reseed a poor-conditioned pasture so grasses can be present to compete with surviving diffuse knapweed.

Spring- or fall-applied herbicides are effective. Research conducted at Colorado State University indicates Tordon at 1 pint or Vanquish/Clarity + 2, 4-D at 0.5 + 1.0 quart/A, applied in spring from rosette to early-bolt growth stages, are effective. Curtail at 2 quarts/A and Transline at 0.5 pints/A also readily control diffuse knapweed when applied at the rosette to early-bolting growth stage. Transline is a noncrop herbicide, while Curtail may be applied in pastures, rangeland and noncrop areas.

The Colorado Department of Agriculture offers several biological control agents. The knapweed gall flies (*Urophora affinis* and *U. quadrifasciata*) are readily available. Females lay eggs in developing flowers. As they feed on heads, the larvae incite gall formation, which reduces seed formation.

The gall fly overwinters inside the seed head as larvae. The normal procedure for redistribution is to cut last year's dead stand that contain larvae and tie the bouquet to a fence post near knapweed stands. Adults will emerge in spring and repeat the life cycle. Using biocontrol that affects the vegetative growth stage may be most effective to decrease diffuse knapweed populations.

The diffuse knapweed root beetle (*Sphenoptera jugoslavica*) has been the most successful insect to date in Colorado. The yellow-winged root moth (*Agapeta zoegana*) and *Cyphocleonus achates* (no common name) also attack vegetative growth and are available from the Colorado Department of Agriculture. Two other seedhead insects, the knapweed seedhead moth (*Metzneria paucipunctella*) and the knapweed seedhead weevil (*Bangasternus fausti*) also are available and should complement control from other insects and possibly other control tools as well.

As with any integrated weed-management system, biocontrol should be combined with seeding of perennial grasses.