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## Musk thistle: biology and management

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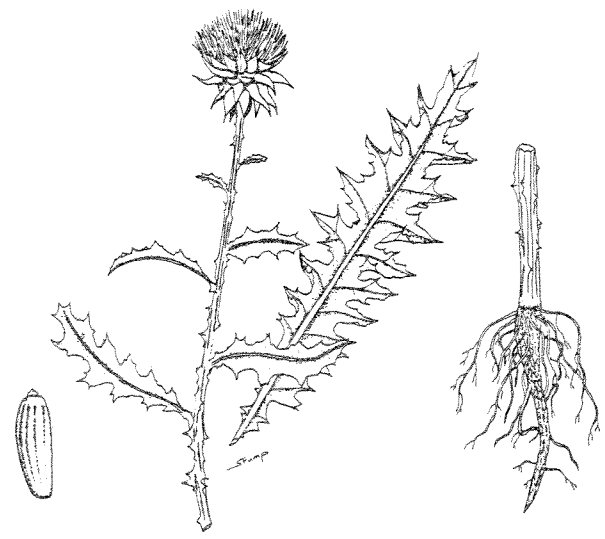
### Quick Facts

Musk thistle is a biennial weed that reproduces only from seed.

The key to successful musk thistle control is to prevent seed production.

Herbicides such as Tordon, Banvel, or 2,4-D should be applied to musk thistle rosettes in spring or fall. Ally or Telar may be applied up to the early flower growth stage.

Combine control methods into a management system for best results.



growth stage. It is important to recognize that musk thistle's tolerance to most herbicides increases after it bolts.

Musk thistle is an aggressive weed of pastures, rangeland, roadsides, and non-crop areas. It is a biennial weed, although occasionally is an annual. Since musk thistle reproduces solely from seed, the key for successful management is to prevent seed production. Germination and seedling establishment are correlated with moisture and light. Thus, more seeds germinate and establish plants in open pastures and other areas. Vigorously growing grass competes with musk thistle and fewer thistles occur in pastures where grazing is deferred. However, musk thistle also can become a problem in pasture or rangeland that is in good condition.

### Reproduction and Spread

Musk thistle is a prolific seed producer. A single plant can set up to 20,000 seeds. However, only one-third of the seeds are viable. Musk thistle produces many heads; the terminal, or tallest, shoot flowers first then lateral shoots develop in leaf axils. A robust plant may produce 100 or more flowering heads. Musk thistle flowers over a seven- to nine-week period and begins to disseminate seed from a head about two weeks after it first blooms. It is quite common to observe musk thistle with heads in several stages of floral development and senescence. Thus, musk thistle sets seed over an extended time period.

### Phenology

Seedlings normally emerge early in spring, develop into rosettes and spend the first season in this growth stage. Seedling emergence also can occur in fall. All seedlings grow into rosettes and overwinter in that stage. Rosettes are usually large and compact with a large, corky taproot that is hollow near the crown. Early in spring of the second year, overwintered rosettes resume growth. Shoots begin to elongate (bolt) in late March through May depending on weather and altitude. Musk thistle flowers and starts to produce seed 45 to 55 days after it bolts. Musk thistle dies after it sets seed. It spends approximately 90 percent of its life cycle in a vegetative

Most seed is disseminated within the immediate vicinity of the parent plant. This leads to a clumped pattern of seedling development and results in intraspecific competition and mortality. Wind and water are good dissemination methods and with these methods seeds attach to animals, farm machinery and other vehicles. However, few seeds (less than 50 percent) stay attached to their pappus when it breaks off the flowering head and floats away on wind currents.

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## Management

**Cultural control.** Combine control methods into a management system. Maintaining pastures and rangeland in good condition is a primary factor for musk thistle management. Favor pasture and rangeland grass growth by not over-grazing and fertilizing according to soil testing recommendations. Prevent seed formation to successfully manage musk thistle.

**Mechanical control.** Musk thistle will not tolerate tillage and can be removed easily by severing its root below ground with a shovel or hoe. Mowing can effectively reduce seed output if plants are cut when the terminal head is in the late-flowering stage. Gather and burn mowed debris to destroy any seed that has developed.

**Chemical control.** Several herbicides are registered in pasture, rangeland and non-crop areas to control musk thistle. Tordon 22K (picloram), Banvel (dicamba), 2,4-D, or Banvel plus 2,4-D are commonly used. Apply these herbicides in spring or fall to musk thistle rosettes. Apply Tordon at 0.125 to 0.25 pound ai/A, Banvel at 0.5 to 2.0 pounds ai/A, 2,4-D at 1.5 to 2.0 pounds ai/A or Banvel plus 2,4-D at 0.5 plus 1.0 pound ai/A. Cool temperatures (less than 40 F), particularly in fall, may adversely affect 2,4-D control of musk thistle; therefore, use 2,4-D in spring. Tordon is largely unaffected by cool temperatures; however, Banvel can be adversely affected but less than 2,4-D. Banvel plus 2,4-D works well in spring or fall. Apply any of these herbicides before musk thistle bolts or seed production still will occur.

Ally-Escort (metsulfuron) or Telar (chlorsulfuron) can be used. Use Telar in non-crop only and Ally-Escort in pastures, rangeland or non-crop. Research from Colorado State University and the University of Nebraska shows Telar or Ally prevents or dramatically reduces viable seed formation when applied in spring, up to early flower growth stages. The latest time to apply these herbicides is when developed terminal flowers have opened up to the size of a dime or quarter. Apply Telar at 0.75 ounce ai/A; use higher rates for dense infestations or when residual control is desired. Apply Ally-Escort at 0.3 ounce ai/A. A good agricultural surfactant at 0.25 percent v/v should be added to Ally-Escort or Telar treatments or control is inadequate. Ally-Escort is available for pastures and rangeland.

**Biological control.** The musk thistle seed head weevil, *Rhinocyllus conicus*, can be found throughout Colorado. The female deposits her eggs on the back of developing flowers and covers them with masticated leaf tissue. After eggs hatch, larvae bore into the flower and destroy developing seed. The seed head weevil reduces seed production by 50 percent on the average, but if used alone, is not an effective management tool. Certain herbicides or mowing can be combined with the seed head weevil if these are applied during late flowering stages. This allows the weevils to complete their life cycles and insures their presence in subsequent growing seasons. The Colorado Department of Agriculture is trying to establish another weevil, *Trichostrocalus horridus*. This weevil attacks the crown area of musk thistle rosettes and kills or weakens the plant before it bolts. This weevil

should soon be ready for re-distribution throughout Colorado by the Department of Agriculture.

## Integrating Control Methods

An example of how to combine chemical and biological control methods would be to apply herbicides at a time that does not interfere with insect development, that is, allow insects to complete their life cycle. Another example is to use herbicides in areas that aren't sensitive to their use and employ biological control in areas where herbicides are impractical or environmentally unsafe. Cultural methods that favor desirable plant growth can be combined with chemical or biological control by superimposing proper grazing management, fertility maintenance and seeding.