

ATTACHMENT C

Biennial Thistle Management by Rod Cook

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April 2006

Background of Biennial Thistle Invasion:

Bull, Musk, Plumeless and Scotch, (biennial thistles) are indicator plants. They indicate that recent or historic disturbances have occurred in an area. Common disturbances that promote biennial thistle invasion are: land that was tilled or farmed and perennial grasses were not established once the farming discontinued, heavy equipment construction, prairie dog colonies, pocket gophers, continuous grazing practices, soil compaction from animals, vehicles or heavy equipment, intense fire, drought, insufficient irrigation and soil nutrients to support the requirements of a healthy perennial grass community.

Biennial thistles live only two years. The first year they form a rosette germinating from seed. Plants over-winter in this rosette stage and the second year bolt in early May, to become a flowering adult. In the second year after flowering and going to seed, they die. These are shallow, tap-rooted plants that spread only by seed and not by underground root systems. Seed longevity in the soil can be several years. Preventing flowering and seed formation will stop seeds from being deposited, and is one of the initial steps in reclaiming an area.

Biennial thistles get established and are allowed to spread due to lack of a healthy vegetative cover. They grow where there are spaces in the vegetative cover. Where grass plants are dense and healthy, you will not find robust thistle infestations. Consequently, past, present and future land and vegetation uses need to be scrutinized and modified to promote optimum grass plant health. References: CSU Fact Sheets, Grass Growth and Response to Grazing:

<http://www.ext.colostate.edu/PUBS/NATRES/06108.html> and:

Managing Small Acreage Pastures During and After Drought:

<http://www.ext.colostate.edu/PUBS/NATRES/06112.html>

Once biennial thistles have been managed and the causes that allowed them to invade have been addressed, then rehabilitation with perennial grass plants appropriate for the area is imperative to prevent re-invasion. If desirable perennial grasses are competing with thistles in a common area, grasses can be released from competition by the use of a selective, broad-leaved herbicide appropriate for the site. Be sure to check the herbicide label for this information. Herbicide labels can be found on-line at: <http://www.cdms.net>

Management Options:

Cultural control. Maintaining pastures and rangeland in good condition is a primary factor for biennial thistle management. To favor pasture and rangeland grass growth, do not overgraze. Fertilize when necessary and according to soil testing recommendations. To successfully manage biennial thistles, prevent flowering and seed formation. Cultural methods that favor desirable plant growth can be combined with chemical or biological control by superimposing proper grazing management and seeding.

Mechanical control. Biennial thistles will not tolerate tillage. The site needs to be evaluated for the density and condition of existing grasses in the infestation, if any. Tillage can be used however, it is expensive and it will take grasses a minimum of 5 years to attain sufficient density on non-irrigated ground. Biennial thistle can be removed easily by severing its root one or two inches below ground with a shovel or hoe. It is not necessary to dig up the entire root or flip the

sod plug over. The least amount of disturbance you create, the better. Mowing can reduce seed output if plants are cut when the terminal head is in the late-flowering stage, however mowing can be fatal to biological control insects present in flower heads. Mowing will not kill the plants and will not stop basal flowering and all seed production.

Burning alone will not control thistles long term. Burning off old skeletons from previous years, followed by an appropriate herbicide can be effective since burning can help germinate seeds in the area. Always consider the risk to your property and your neighbors when considering a planned burn. Before burning always contact your local fire department for burn restriction information and enlist their assistance. Keep in mind that burning can negatively impact biological controls that already may be established on site.

Harvesting and disposing of individual flower heads can be time intensive and is generally not worth the effort. One needs to survey for the presence of the seed head weevil and consider that you will be disposing of beneficial insects in a landfill.

Chemical control. Always use the 3 R method, right growth stage treatment timing, right product and right rate per acre. From the tables below, note that lower rates work on spring and fall rosette stages of growth, which saves you money. Many herbicides are registered in pasture, rangeland and non-crop areas to control biennial thistle. Be sure to read and follow all label restrictions. Avoid the purchase and use of diluted garden shop variety herbicides. Non-ionic surfactants designed for use with herbicides should always be in the tank mix at .25% (one fourth of one percent) of the entire tank volume. Surfactants help herbicides get past waxy or hairy plant defenses. Once the plant absorbs the herbicide, it cannot be washed off by rain after a couple of hours post application.

Spring Rosette Growth Stage (before bolting): This is one of the best management practices.

2,4-D Amine: 1.5 to 2 qts per acre

Redeem R&P: 1 pt per acre

Milestone: 3 to 5 oz per acre

Curtil: 2 qts per acre

2,4-D Amine: 1 qt + Tordon ½ to ¾ pt per acre (not to be used in flood/sub irrigated, seasonal flood plain, in or up slope of tree root zones)

Escort: ¼ to ½ oz per acre

Telar: ½ to 1 oz per acre (non-crop areas only)

Bolted growth stage (bolting occurs generally first week of May in La Plata County):

2,4-D (not effective or recommended at this growth stage)

Redeem R&P: 1.5 pts per acre

Milestone: 3 to 5 oz per acre

Curtil: 3 qts per acre

2,4-D Amine: 1 qt + Tordon ¾ to 1 pt per acre (not to be used in flood/sub irrigated, seasonal flood plain, in or up slope of tree root zones)

Escort: ½ oz per acre

Telar: ½ to 1 oz per acre (non-crop areas only)

Prebud growth stage:

2,4-D: (not effective or recommended at this growth stage)

Redeem R & P: 2 pts per acre

Milestone: 3 to 5 oz per acre

Curtil: 4 qts per acre

Escort: ½ to 1 oz per acre

Telar: ½ to 1 oz per acre (non-crop areas only)

Full Flowering Stage of growth is the worst time to apply herbicides.

Fall after Frost Rosette Growth Stage: Apply generally when cottonwood tree leaves are turning yellow in the river valleys or mid September to mid October. This is one of the best management practices.

2,4-D LV 4: 1 to 2 qts per acre

Redeem R&P: 1 pt per acre

Milestone: 3 to 5 oz per acre

Curtail: 2 qts per acre

Tordon: ½ to ¾ pt per acre (not to be used in flood/sub irrigated, seasonal flood plain, in or up slope of tree root zones)

Escort: ¼ to ½ oz per acre

Telar: ½ to 1 oz per acre (non-crop areas only)

Cool temperatures (below 50 degrees F), particularly in fall, may adversely affect 2,4-D control of biennial thistle; therefore, favor the use of 2,4-D in spring. Apply 2,4-D Amine before musk thistle bolts in spring or seed production will still occur.

Tordon, Redeem, Milestone, Escort and Telar are largely unaffected by cool temperatures. Use Telar in non-crop areas only and Escort in pastures, rangeland or non-crop areas. Research from Colorado State University and the University of Nebraska shows that Telar or Escort 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. The same is true of Redeem, Milestone and Curtail.

Biological control. The Musk and Plumeless thistle seed head weevil, *Rhinocyllus conicus*, can be found throughout Colorado. The female deposits her eggs on the back of developing flowers and covers them with chewed leaf tissue. After eggs hatch, larvae bore into the flower and destroy developing seeds. The seed head weevil reduces seed production by 50 percent on the average. If used alone, however, it is not an effective management tool. The use of herbicides in spring or fall rosette stage does not interfere with the seed head weevil's life cycle. This allows the weevils to complete their life cycle and ensures their presence in subsequent growing seasons. The use of herbicides during summer full flowering stage is discouraged. Diluted herbicide solutions are not toxic to these insects, however surfactants in the tank mix can suffocate them if they get sprayed. The Colorado Department of Agriculture has established another weevil, *Trichosirocalus horridus*. This weevil attacks the crown area of Musk and Plumeless thistle rosettes and kills or weakens the plant before it bolts. This weevil is being distributed throughout Colorado by the Department of Agriculture. It tends to be more effective than the seed head weevil.

The thistle-defoliating beetle *Cassida rubiginosa*, causes some damage to foliage. Many biologicals are available on the market today, but before buying you should inquire for unbiased research or references as to their effectiveness. Biological controls generally do not eradicate weed populations due to the fact that insects will not eat themselves out of house and home. Sometimes it takes decades for biologicals to get established and see visible results. If they do get established, then most times reduction in vigor and seed production may be realized.

Integrating Control Methods

A good management system integrates at least two or more methods of control into a plan of operation. To combine chemical and biological control methods, apply herbicides when they won't interfere with insect development and allow the control insects to complete their life cycle. One step that is easily overlooked is follow-up and monitoring. This may be the most important part of a weed management plan, because if you do not keep records of what you did and when

you did it, you will not know what has worked or failed and why. Record keeping is required by the EPA for restricted use herbicides and is recommended in the industry for all herbicides.

Weed management is developing a working plan to implement over time and integrate into your total land management plan. It is different from simple weed control, which reacts to weeds after they occur. Start with making a weed management file, keep accurate records and take beginning and occasional photos as you work your plan. Establish photo points and take pictures from the same angle over time. A chronology of a project captured with photographs can be rewarding in a few years.