

Cirsium arvense
Canada Thistle

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History

Canada thistle, a noxious weed native to Europe, has plagued North America for at least four centuries. While the specific year in which Canada thistle was first observed in North America is unknown, Lyster Dewey asserted in his 1901 US Department of Agriculture report that by the early 17th century the weed was found growing around the French settlements in Canada. Its spread throughout Canada thereafter was likely rapid. With the Revolutionary War Dewey argued that the extensive movement of each army, along with the army's heavy reliance on hay, served to introduce Canada thistle farther south. Indeed, by 1795, Vermont enacted a law stipulating that Canada thistle must be controlled. Despite this measure the weed spread, and by 1844 Ohio passed a law prohibiting the sale of any seed contaminated by Canada thistle. A 1913 report described the weed's further spread across the nation, specifically noting its emergence in the states surrounding the Rocky Mountains. Soon after, a 1928 report for the Colorado Agricultural College observed the increasing presence of Canada thistle throughout the state. These sources proposed a variety of strategies for the management of Canada thistle, most often recommending the constant removal of the thistle's top shoots. Yet the authors asserted that this method was only effective if vigorously adhered to. Many also noted the availability and effectiveness of chemical treatment methods; however, with chemicals such as nitric acid, sulphuric acid, and gasoline, among others, the surrounding landscape almost certainly suffered.¹



Figure 1. Canada thistle flower head. Source: Ellen Blankers.

By 1960, Rocky Mountain National Park (ROMO) intermittently engaged in efforts to chemically control the weed, changing both the chemicals utilized as well as the consistency of treatment efforts. Treatment strategies were initiated and implemented over short periods of time, resulting in gaps over several years in the treatment of Canada thistle. In the past 20 years alone, the presence of Canada thistle at ROMO has undoubtedly increased exponentially. In response to Dr. Terry McLendon's 1991 report-- which asserted that Canada thistle would not spread in the absence of continued disturbance-- ROMO chose to control the weed only within half a mile of the park boundary. As a result of this ill-conceived management strategy, the acreage of Canada thistle observed by McLendon in 1987-- 12.8 acres-- had increased substantially by 2003 to 69.8 acres. In 2013, the ROMO Exotics Crew treated 1,894 acres of Canada thistle in the park.²

Biological Concerns

Canada thistle is registered as a List B noxious weed in Colorado, in large part due to its ability to rapidly spread and easily crowd out native plants. The weed also reproduces by seed, which disperses and spreads easily due to the pappus on the seed itself; furthermore, the seeds are able to survive and remain viable for up to 22 years. The weed's extensive root systems are a major inhibitor to eradication due to their horizontal, rhizomatous and nutrient-rich characteristics, allowing the weed to quickly respond to control attempts and quickly establish into thick stands. The natural areas most susceptible to Canada thistle invasion in Colorado are riparian habitats, although the weed also establishes itself in grasslands and disturbed areas. Consequently, Canada thistle is a major concern throughout North America. While it does not appear to be allelopathic, studies have found that once Canada thistle is established in an area other exotic species more readily establish themselves. Additionally, Canada thistle greatly reduces and limits crop production. This has major economic

repercussions, not only due to its role in reducing crop yield but also due to the high costs associated with efforts to control and eradicate the weed.³

Management Strategies

Numerous strategies have been adopted to control Canada thistle, though no single method allows for total elimination of the weed. Resource managers repeatedly recommend implementing multiple treatment strategies to assure successful eradication of Canada thistle, as it is most effective. In his 1958 study Jesse Hodgson found that combining cultivation, cropping, and chemical treatment was most effective, as opposed to implementing each strategy separately. The Future Farmers of America (FFA) in Flagler, Colorado also implemented multiple strategies to eradicate the Canada thistle present in the Flagler State Wildlife Area (FSWA) between 1989 and 1992. Before applying chemicals to the area, cattle grazed in the FSWA, serving to trample the weed and disperse other organic material around the site; after this, the FFA applied herbicides to the Canada thistle. In three years, 90% of the Canada thistle was successfully eradicated, and the native vegetation increased by 50%. In another study, K. George Beck and James R. Sebastian determined that mowing Canada thistle before herbicide treatment was more effective than solely applying herbicide at sites with a high water table.⁴

While methods of biological control of Canada thistle exist, there has been no known implementation of biological control at ROMO. The weevil *Rhinocyllus conicus*, which is more commonly known for attempting to control musk thistle, is not effective against Canada thistle. A different weevil was introduced to North America in another bio-control attempt- *Larinus planus*. Svata Louda and Charles O'Brien, however, found in their 2002 study that this weevil instead targets a native Colorado thistle known as "Tracy's thistle" (*Cirsium undulatum*), and thus should not be used as a control method. In a 2000 study conducted in Switzerland, two researchers studied the efficacy of a native weevil, *Apion onopordi*, and discovered that it promoted the infection of *Puccinia punctiformis* in Canada thistle- also known as rust fungus. It is currently being considered for biological control of Canada thistle in New Zealand. Rust fungus (*Puccinia punctiformis*) is a very effective method of biological control against Canada thistle and has been a noted "natural enemy" of the weed since at least 1900; however, the effects it may have on the surrounding environment and species has yet to be studied.⁵

ROMO's management and treatment of Canada thistle has varied significantly since 2000. Prior to 2003, mechanical treatment (e.g. mowing) was the preferred management strategy, although only carried out in small areas. Following the implementation of the 2003 Invasive Exotic Plant Management Plan, in which the use of herbicides to control Canada thistle was allowed, chemical treatment of the weed has become the sole method of eradication. Currently, the ROMO Exotics Crew uses the herbicide Milestone (aminopyralid). It is a selective herbicide that may also be applied to Canada thistle near water sources- areas that were previously unreachable with earlier chemicals. Furthermore, monitoring conducted by Christopher Davis and Cynthia Brown has revealed that aminopyralid does not affect the vegetation surrounding treated Canada thistle.⁶

Recommendations

Due to the fact that Canada thistle is most competitive in riparian areas, variability between treatment strategies based on the location of the weed is imperative. The author recommends that ROMO continue to treat Canada thistle with Milestone (aminopyralid), targeting the weed during the rosette stage of the plant's growth, while also utilizing additional management strategies to ensure eradication. The location of the weed should be taken into consideration before determining a secondary treatment strategy. For example, Canada thistle found in areas with a high water table could also be treated by mowing. Additionally, the author suggests that the Exotics Crew lead develop a template for the Year-End Reports so that reports may be more easily comparable.

Table 1: Canada Thistle Treatment at Rocky Mountain National Park, 2000-2013				
Year	Mechanical Treatment	Manual Treatment	Chemical Treatment	Total Acres Treated
2000	1.5 acres	0 acres	0 acres	1.5 acres
2001	N/A	N/A	N/A	N/A
2002	N/A	N/A	N/A	N/A
2003	D/E	D/E	D/E	23.7 acres
2004	0 acres	0 acres	66.71 acres	66.71 acres
2005	N/A	N/A	N/A	N/A
2006	0 acres	5.2 acres	96.3 acres	101.5 acres
2007	0 acres	9 acres	25.83 acres	34.83 acres
2008	D/E	D/E	D/E	D/E
2009	D/E	D/E	438.42 acres*	438.42 acres*
2010	0 acres	D/E	657.8 acres*†	657.8 acres*†
2011	0 acres	0 acres	1041 acres	1041 acres
2012	0 acres	0 acres	1915.96 acres	1915.96 acres
2013	0 acres	0 acres	1894.2 acres	1894.2 acres

Key

N/A: Report Missing
D/E : Data Excluded from YER

*Includes acreage of Canada Thistle treated in conjunction with oxeye daisy
†Includes acreage of Canada Thistle treated in conjunction with dalmatian toadflax

Endnotes

¹Lyster H. Dewey, *Canada Thistle* (Washington, DC: US Department of Agriculture, 1901), 5; William W. Donald, "Management and Control of Canada Thistle (*Cirsium arvense*)," *Reviews of Weed Science* 5 (1990): 197; H.R. Cox, *Controlling Canada Thistles* (Washington, DC: US Department of Agriculture, 1913), 5; Charles F. Rogers, *Canada Thistle and Russian Knapweed and Their Control* (Fort Collins: Colorado Agricultural College, Colorado Experiment Station, 1928), 12; Dewey, *Canada Thistle*, 11; Cox, *Controlling Canada Thistles*, 13; Albert Hansen, *Canada Thistle and Methods of Eradication* (Washington, DC: US Department of Agriculture, 1918), 9.

²Rocky Mountain National Park, "27 Years of Exotic Plant Control in Rocky Mountain National Park: Summary and Recommendations," 1987; Julie Knudson, Matt Ounsworth, Michael Prowatzke, Jamie Dahlkemper, Jim Bromberg, and Brian Kolokowsky, "Rocky Mountain National Park Exotics Year-End Reports," Rocky Mountain National Park: Division of Resource Stewardship, 2000-2013.

³Victoria Nuzzo, "Element Stewardship Abstract for *Cirsium arvense*." (Richford: The Nature Conservancy, 1998), 2-6; K.G. Beck, "Canada Thistle," last modified February 27, 2014, <http://www.ext.colostate.edu/pubs/natres/03108.html>; Nuzzo, "Element Stewardship Abstract for *Cirsium arvense*," 2; W.J. Stachon and R.L. Zimdahl, "Allelopathic Activity of Canada Thistle (*Cirsium arvense*) in Colorado," *Weed Science* 28, no. 1 (1980): 86; Cynthia Pritekel, Amanda Whitemore-Olson, Neil Snow, and John C. Moore, "Impacts from Invasive Plant Species and their Control on the Plant Community and Belowground Ecosystem at Rocky Mountain National Park, USA," *Applied Soil Ecology* 32 (2006): 132; Jesse M. Hodgson, "Canada Thistle (*Cirsium arvense* Scop.) Control with Cultivation, Cropping, and Chemical Sprays," *Weeds* 6, no. 1 (1958): 2.

⁴Hodgson, "Canada Thistle (*Cirsium arvense* Scop.)," 1; Jason Nichols, "The Integrated Use of Biological and Chemical Control on the Noxious Weed Canada Thistle," *Rangelands* 15, no. 6 (1993): 256-257; K. George Beck and James R. Sebastian, "Combining Mowing and Fall-Applied Herbicides to Control Canada Thistle (*Cirsium arvense*)," *Weed Technology* 14, no. 2 (2000): 351.

⁵Nadeer N. Youssef and Edward W. Evans, "Exploitation of Canada Thistle by the Weevil *Rhinocyllus conicus* (Coleoptera: Curculionidae) in Northern Utah," *Environmental Entomology* 23, no. 4 (1994): 1013; Svata M. Louda and Charles W. O'Brien, "Unexpected Ecological Effects of Distributing the Exotic Weevil, *Larinus planus* (F.), for the Biological Control of Canada Thistle," *Conservation Biology* 16, no. 3 (2002): 717; Jürg Friedli and Sven Bacher, "Direct and Indirect Effects of a Shoot-Base Boring Weevil and Plant Competition on the Performance of Creeping Thistle, *Cirsium arvense*," *Biological Control* 22 (2001): 219-226; Environmental Protection Authority, New Zealand, <http://www.epa.govt.nz/search-databases/Pages/applications-details.aspx?appID=NOC02004>; Rosemary F. Thomas, Thomas J. Tworcoski, Richard C. French, and Gerald R. Leather, "*Puccinia punctiformis* Affects Growth and Reproduction of Canada Thistle (*Cirsium arvense*)," *Weed Technology* 8, no. 3 (1994): 488-493; Dana Berner, Emily Smallwood, Craig Cavin, Anastasia Lagopodi, Javid Kashefi, Tamara Kolomiets, Lyubov Pankratova, Zhanna Mukhina, Michael Cripps, and Graeme Bourdôt, "Successful Establishment of Epiphytotics of *Puccinia punctiformis* for Biological Control of *Cirsium arvense*," *Biological Control* 67 (2013): 350-360; Dewey, *Canada Thistle*. 13.

⁶Knudson et al, "Rocky Mountain National Park Exotics Year-End Reports," 2000-2013; Christopher Davis and Cynthia Brown, "Rocky Mountain National Park Vegetation Monitoring Report," Rocky Mountain National Park: Division of Resource Stewardship, 2011-2013.