



United States Department of Agriculture

Field Guide for Managing Canada Thistle in the Southwest



Forest
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Region

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Cover Photos

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Canada thistle (*Cirsium arvense* (L.) Scop., synonym: *Carduus arvensis* L.)

Sunflower family (Asteraceae)

Canada thistle is an invasive plant that is listed as a noxious weed in both Arizona and New Mexico. This field guide serves as the U.S. Forest Service's recommendations for management of Canada thistle in forests, woodlands, and rangelands associated with its Southwestern Region. The Southwestern Region covers Arizona and New Mexico, which together have 11 national forests. The Region also administers 4 national grasslands located in northeastern New Mexico, western Oklahoma, and the Texas panhandle.

Description

Canada thistle (synonyms: creeping thistle, Californian thistle, corn thistle) is a patch-forming, creeping perennial with prickly, alternate, green leaves that are lance shaped and deeply lobed. Male and female flowers occur on separate plants (dioecious) but are quite similar in appearance. Canada thistle has an extensive, fast growing, fibrous root system of lateral and vertical roots that extend out 15 feet wide and 15 feet deep. New shoots emerge from the root system in spring, but other flushes may also occur in fall or during the growing season with favorable soil moisture. Canada thistle reproduces from seed and by vegetative cloning via adventitious root buds. Seedlings grow slowly and are sensitive to competition, particularly if shaded.

Growth Characteristics

- Patch-forming, creeping perennial; erect, branched, slightly hairy stem with ridges, 18 to 48 inches tall. Stems not winged.
- Extensive root system includes taproot and rhizomes.
- Weak rosette base; may have few, if any leaves.
- Alternate, lance-shaped leaves with spiny-toothed margins; upper surface waxy; sparsely wooly lower surface.
- Urn-shaped flower heads; spineless, scale-like bracts.

- Pink or purple disk flowers in umbrella-shaped clusters; male and female flowers are on separate plants (species is dioecious).
- Reproduces via root buds, rhizomes, and seed. Seed may remain viable in soil up to 20 years.
- Allelopathic chemicals may inhibit other plants.

Ecology

Impacts/Threats

Canada thistle is a highly competitive, persistent plant that grows in dense, impenetrable colonies. A high density of spiny-leaved Canada thistle reduces the availability of quality forage and the diversity of flora and fauna species.

Site/Distribution

As compared to other thistles, Canada thistle has a more limited range and more specific requirements for soil and precipitation. It prefers areas with 16 to 30 inches of precipitation that have moist, but not waterlogged soils such as meadows and hay fields. Found on rangeland and disturbed or neglected sites; especially along roadsides, railways, ditch banks, and waste areas.

Spread

New shoots and roots emerge from almost anywhere along the root system, and new plants can develop from small broken pieces after disturbance by tillage. Canada thistle develops seed sparingly; however, the seeds are winged and are easily dispersed by wind, water, birds, and other animals. Seed can be spread over wide distances when it adheres to the surfaces and undercarriages of road vehicles and farm equipment or when introduced into new areas in hay that is not certified to be weed free.

Invasive Features

Canada thistle produces new shoots from roots each spring, but shoots can also develop throughout summer and fall. This is a particular problem when plants are stimulated or disturbed by mowing, tillage, or fire.

Management

Canada thistle is quite difficult to control once established. Prevention, early detection, and eradication are the best management tools for controlling this noxious weed. Since Canada thistle allocates most of its reproductive energy into vegetative reproduction, this attribute can be manipulated to the land manager's advantage through the use of various control methods.

The following actions should be considered when planning a management approach:

- Maintain healthy plant communities to prevent or limit Canada thistle infestations.
- Check hay and straw for presence of weed seed before using them in thistle-free areas. Certified weed-free hay or pellets should be fed to horses used in backcountry areas.
- Limit disturbance and/or promptly revegetate disturbed areas with desirable perennial forage species, especially perennial grasses.
- Detect, report, and eradicate new populations of thistle as early as possible.
- Combine mechanical, cultural, biological, and chemical methods for most effective control.
- Implement monitoring and a follow-up treatment plan for missed plants and seedlings.
- Map known infestations. Keep annual records of reported infestations.

Table 1 summarizes some management options for controlling Canada thistle under various situations. Further details on these management options are explained below. Choice of individual control method(s) for Canada thistle depends on the extent and density of the infestation, current land use, and site conditions (accessibility, terrain, microclimate, other flora and fauna present, etc.). Other important considerations include treatment effectiveness, overall cost, and the number of years needed to achieve control. More than one control method may be needed for a particular site.

Special Considerations

There are at least 20 species of native thistles in the genus *Cirsium* in Arizona and New Mexico. These non-invasive native thistles are important components of their ecological communities and should not be treated. Since native thistles can be confused with invasive thistles, accurate identification of thistle species is an important first step in thistle management.

The Sacramento Mountain range in southern New Mexico serves as habitat for the endangered Sacramento Mountains thistle (*Cirsium vinaceum*) which is protected under the Endangered Species Act of 1973. Portions of the mountain range within Otero County are also inhabited by local populations of Wright's marsh thistle (*C. wrightii*) which is a New Mexico listed endangered species and a Federal candidate for listing. Wright's marsh thistle is also found in Eddy, Chaves, Guadalupe, and Socorro Counties in New Mexico. Both thistle species occur in wetland habitats such as springs, seeps, and marshy edges of streams and ponds. To avoid harm to these species, information should be obtained from the U.S. Fish and Wildlife Service at (505) 346-2525 before implementing thistle treatment in potential habitat for the two species within the Sacramento Mountains and the aforementioned counties.

Physical Control

Physical methods to control Canada thistle should focus on reducing seed production and destroying the root system. These methods usually have to be repeated and must be timed properly to be most effective.

Manual Methods

Hand-pulling, digging, and hoeing can be done any time of year; however, re-sprouting and the need to repeat these treatments should be anticipated. Given the perennial nature of this weed, hand removal is difficult and typically not very effective. Proper disposal of debris is essential in preventing spread. If flowers or seed are not present, plants may be pulled and left onsite. If flowers or seed are present, debris should be bagged and removed from the site or else burned since seed will continue to mature within flower heads left onsite.

Table 1. Management options*

Site	Physical Control	Cultural Control	Biological Control	Chemical Control
Roadsides	Use repeat cultivation or mowing (every 7 to 21 days) to deplete stored energy in roots; repeated hand pulling or hoeing of small infestations in loose soils will also stress root energy reserves.	Use seed, mulch, and fill materials certified to be weed-free. Train road crews to identify and report infestations along roads; implement requirements for vehicle operations.	Consider using biocontrol agents (weevil or gall-forming fly) if release does not threaten rare or endangered native thistles. Biocontrol agents can only be used when thistle infestations are large enough to sustain control agent populations. Effectiveness of agents may be limited due to potential disturbance of the agent's life cycle from road operations.	Apply in spring or fall. Use truck spraying equipment. Wash under vehicle after application to prevent spread.
Rangelands and hay meadows	Mow at early bolt stage and then again every 21 days during growth season. Consider combining with herbicide treatment. Use repeated tillage at 20-day intervals starting as soon as plants emerge in late winter.	Use seed and forage hay certified to be weed-free; use pellets for horses in backcountry areas. After passing through infested areas, inspect and remove any seed from animals, clothing, and vehicles before entering treated or un-infested areas. Reseed, fertilize, and irrigate (if possible) to make desirable plants more competitive.	Use grazing animals on young thistles as part of short-term, intensive grazing approach in the spring. Closely manage grazing to prevent overuse. Consider using biocontrol agents (weevil or gall-forming fly) if release does not threaten rare or endangered native thistles. Biocontrol agents can only be used when thistle infestations are large enough to sustain control agent populations.	For extensive and dense infestations in disturbed areas with few desirable plant species present, use ground or aerial broadcast spraying. Consider using individual plant treatment (IPT) with a backpack sprayer for sparse infestations, areas interspersed with desirable native plants, or areas difficult to access.
Wilderness and other natural areas	Use repeated hand cutting or hoeing prior to seed set.	Same as above. Post signs warning visitors to inspect for seeds and remove them from animals, clothing, and vehicles when leaving an infested area.	Same as above.	Use backpack or hand-held sprayers. Broadcast spraying by aerial or ground methods may be used on thicker stands if allowed.

* Choice of a particular management option must be in compliance with existing regulations for the land resource.

Mechanical Methods

If using machinery to manage Canada thistle, the equipment should be cleaned after use to prevent movement of seeds into un-infested areas.

Tillage – Properly timed and repeated tillage with a plow or disc can provide limited control. However, ill-timed or nonrecurring tillage may favor further spread and invasion. Plants should be cultivated after plants have emerged in late winter but before they reach a height of 3 inches. Cultivation should be repeated at 20-day intervals until first frost or when plants are dormant. Shallow cultivation during hot, dry weather

greatly stresses plants. Tillage will exhaust carbohydrate reserves stored in roots but will not eradicate seeds. Therefore, tillage may be more effective when combined with herbicide application.

Mowing – Mowing will reduce plant height but does not usually eliminate flower or seed production completely. Mow when plants begin to bolt and repeat as necessary to prevent seed production. Many vegetation management experts do not recommend mowing as a single control method as plants often produce side branches with more flowers, even with repeated mowing and proper timing. Mowing is more effective when combined with herbicide treatment.

Prescribed Fire

Burning will not destroy the root system of Canada thistle, and thistle presence is likely to increase in succeeding years after a fire. Therefore, using prescribed fire as a control method is not recommended for managing this weed except to remove dead litter and debris.

Cultural Control

Early detection and plant removal are critical for controlling Canada thistle. Land managers, road crews and the local public should be educated on identification of non-native noxious species so they can help report all suspected infestations. Seed and materials used for mulch, forage, or fill should be certified to be weed-free; pellets may be used for horses in backcountry areas. Vehicles, humans, and livestock should be discouraged from traveling through infested areas; and a program to check and remove seeds from vehicles and livestock should be implemented to help stop dispersal. Treated areas may be reseeded, fertilized, and irrigated (if possible) to make desirable plants more competitive.

Biological Control

Grazing

Livestock generally avoid entering dense stands of mature Canada thistle. However, prescribed grazing can be part of an effective control strategy by using a short-term, intensive grazing approach in spring before the plant begins to bolt. Canada thistle seedlings and rosettes are grazed most effectively by goats, followed by sheep, and then cattle. It is also grazed by horses, donkeys, and llamas to varying degrees. Use of grazing in combination with herbicide can increase effectiveness of both of these control methods.

Classical Biological Control

Although a number of classical biocontrol agents are available for controlling other invasive thistles, only a gall fly (*Urophora cardui*) and a stem-mining weevil (*Hadroplontus litura*) are available to attack Canada thistle (table 2). However, recent studies have not demonstrated that *U. cardui* and *H. litura* have a significant impact on

Canada thistle populations. Land managers should contact the New Mexico Ecological Services Field Office of the U.S. Fish & Wildlife Service at (505) 346-2525 before releasing any thistle biocontrol agents within the Sacramento Mountains or Eddy, Chaves, Guadalupe, and Socorro Counties in New Mexico that can impact rare or endangered thistles.

Control with biocontrol agents is most suitable for sites where mowing, cultivating, or treating with herbicide is impractical. Biocontrol agents for thistles should be used only if infestations are large enough to sustain populations of these species. Some biocontrol agents are less effective when their life cycle is disturbed, either by the presence of livestock or by management actions involving the thistle. Treatments such as cutting or spraying may not allow the biocontrol agent to complete its life cycle. As a result, the needs of the biocontrol agent (if present) should be considered before other weed treatments are implemented. For further information on biocontrol of thistles, see Winston et al. (2008) in the “References and Further Information” section of this field guide.

Organisms (insects, pathogens, etc.) used as biocontrol agents in southwestern States should be adaptable to arid environments and local conditions. Public, tribal, and private land managers may obtain biocontrol agents for release directly from local offices of the USDA Animal and Plant Health Inspection Service (APHIS) when these agents are available. Other sources for biocontrol agents include locally developed insectaries or private companies.

A permit must be obtained from APHIS before biocontrol agents can be transported across State lines. Regulations and permit applications (PPQ 526 permit forms) pertaining to interstate shipment of biocontrol agents can be found at https://www.aphis.usda.gov/aphis/ourfocus/planthealth/import-information/permits/regulated-organism-and-soil-permits/sa_apply/ct_plantpest_howtoapply. Although biocontrol agents may be collected and released internally in a given State without an APHIS permit, the State’s department of agriculture or agricultural extension service should be consulted for any regulations relating to movement of these agents within the State.

Table 2. Biocontrol agents approved for Canada thistle

Species	Type of Agent	Site of Attack	Impact	Use/Considerations for Release
<i>Hadroplontus litura</i> (formerly <i>Ceutorhynchus litura</i>)	Stem weevil	Adults feed on leaves and stems; larvae mine leaf veins, stems, and root crowns.	Larval and adult feeding usually does not significantly impact populations of Canada thistle directly, though some stunting and stand reduction has been observed in eastern Oregon. Feeding does cause secondary damage as pathogens and other organisms enter the stems of Canada thistle via holes made by exiting larvae	This insect species does well in moist, disturbed areas where Canada thistle is dense and not stressed by drought, grazing, or other control methods. <i>H. litura</i> is readily available for collection in many states.
<i>Urophora cardui</i>	Stem gall fly	Larvae mine stems.	Larval feeding forms galls that act as metabolic sinks, diverting resources away from normal plant development. Attacked plants produce fewer seeds, are less competitive, and may be more susceptible to pathogens and other insects.	This fly does well in moist, open and partially shaded areas where Canada thistle is scattered. Areas subject to disturbance or other means of control (grazing, mowing, chemical treatment, etc.) are not suitable for this fly's survival.

Chemical Control

Canada thistle is best controlled with a selective post-emergent broadleaf herbicide (see table 3). Typically, the primary herbicide entry into the plant is through the leaves and stems although certain herbicides have excellent root uptake properties. Control results can vary due to weather and the plant's growth stage so special care should be taken to follow label directions closely for spraying.

Effective herbicides for Canada thistle control include aminopyralid, aminocyclopyrachlor, clopyralid, and picloram mixed alone or in combination with 2,4-D or another herbicide. Each herbicide product will have different requirements and restrictions according to the herbicide label. Aquatically approved herbicide formulations and surfactants must be used in or near water. Read and understand the label prior to any application. Consult the registrant if you have questions or need further detail.

Herbicide Application

Spraying in fall before Canada thistle enters dormancy (before soil freezes up) usually gives the most consistent results. Spraying in spring in pre-bud to early bud growth

stages is also effective, especially with herbicides that are mixed in combination with 2,4-D. Use a label-recommended surfactant in the spray mixture (0.25 to 0.5 percent v/v; equivalent to 1 to 2 quarts of surfactant per 100 gals. of spray solution). Follow guidelines in the label for mixing instructions. Always follow application requirements and grazing restrictions after treatment.

Herbicides may be applied by backpack or hand-held sprayers, ATV or UTV sprayers, or conventional boom sprayers that are pulled or attached to a tractor or truck. Any equipment used to spray herbicide should be calibrated. For individual plant treatment (IPT), wet foliage and stems thoroughly using a hand-held or backpack sprayer fitted with a cone-shaped adjustable nozzle. Herbicides listed in table 3 will impact other broadleaf and woody species; therefore, measures should be taken if desirable non-target species need protection.

Integrated Control Methods

Regardless of the control method used, the key to controlling established stands of Canada thistle successfully is to stress and eliminate root reserves. The following combinations of control methods will reduce

root reserves and should be considered for managing Canada thistle:

- **Herbicide–regrow–herbicide** – This sequence of control methods can be initiated in either fall or spring. If started in spring, apply a recommended herbicide when Canada thistle is less than 15 inches tall and is in the pre-bud to early bud growth stages. If started or retreated in the fall, spray during rosette stage with either aminopyralid (5 to 7 ounces per acre), dicamba (2 quarts per acre), clopyralid (0.67 pint per acre), or picloram (1 quart per acre). Treated areas should be closely monitored for 2 years and resprayed if necessary. Herbicide combinations with 2,4-D are more effective in spring than when applied in fall.
- **Mow–regrow–herbicide** – Mow early in spring and then repeat 2 to 4 times during growing season. In fall, allow shoots to regrow to more than 15 inches in height and then spray with herbicide. Clopyralid (0.67 pint per acre) and picloram (1 quart per acre) are particularly effective against Canada thistle during this time since nutrients are being translocated toward the root system. Consider reseedling with a variety of desirable perennial forage species following treatment. Periodically monitor for new seedlings and spot treat or hand remove regrowth.
- **Grazing–herbicide** – Use an intensive, controlled grazing approach on infested areas in spring before Canada thistle bolts. Fencing may be necessary to confine livestock to areas of infestation. After removing livestock, apply herbicide treatment to Canada thistle before flowering stage. Repeat in fall with another herbicide treatment if necessary. Monitor native species, especially grasses. Consider reseedling with desirable perennial grasses if native grasses do not naturally recover following control efforts.

Management Strategies

Strategies to contain and reduce Canada thistle require long-term planning and integrated management. A high priority for Canada thistle management should be early detection and preventing establishment. Small localized

infestations found on otherwise healthy sites should be given first priority for control treatment(s). For large infestations, satellite populations and perimeter edges should be treated first with the denser core of the entire infestation scheduled to be reduced and/or eradicated in a series of steps over a period of several years. Initial treatment(s) should try to eliminate live plants and disrupt seed production as much as possible.

Large infestations of Canada thistle are especially difficult to eradicate; therefore, do not anticipate that they will be controlled within a single year or by using only one method. Complete control of Canada thistle will likely require 2 to 4 years of repetitive treatment. Since it is ordinarily useless to treat an area only one time without retreatment, sufficient resources must be allocated for the area where control is attempted. After initial treatment, it is important that resources are also available to respray or retreat the treated area successfully. Previously treated areas should always be continuously monitored to detect recovering Canadian thistle. Follow-up treatment should be anticipated and planned as part of a complete restoration program. Failure to perform follow-up monitoring and adapt control methods as needed could result in recolonization by Canada thistle.

References and Further Information

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Table 3. Herbicide recommendations

Common Chemical Name (active ingredient)	Product Example¹	Broadcast Treatment (rate per acre)	Spot Treatment (spray solution)²	Time of Application	Remarks
Aminopyralid	Milestone	5–7 ounces	3–5%	Use lower rate in fall, right after flowering but before dormancy. Use higher rate in spring for pre-bud to early bud stages.	Labeled for use on wildlife habitat management areas and natural areas. May be applied up to water's edge. No grazing restrictions.
Aminocyclopyrachlor + chlorsulfuron	Perspective	4.75–8 ounces Use a high quality adjuvant	4.75–11 ounces per 100 gal of water. Consult label for spot applications.	Apply to actively growing plants in rosette stage in fall; use higher rate at bolting in spring.	Selective herbicide used on non-crop sites; may cause temporary injury to some grass species.
Aminocyclopyrachlor + metsulfuron methyl	Streamline	4.75–9.5 ounces	Same as above.	Same as above.	Same as above.
Clopyralid	Stinger Reclaim Transline	0.67–1.3 pints	1–3%	Rosette to bud stage.	Will control top growth and inhibit regrowth. Established perennial grasses are tolerant.
Clopyralid + 2,4-D ³	Curtail	6 pints	1–3%	Early bud growth stage or in fall at rosette.	Same as above.
Clopyralid + triclopyr	Redeem	2.5-4 pints	1–3 %	Early bud growth stage or in fall at rosette growth stage.	Same as above.
Picloram ⁴	Tordon 22K	1 quart	1–3%	Any growth stage; however, it is most effective in fall just after bloom.	Persistent, selective herbicide; may pose a risk to groundwater in permeable soils or in areas where the water table is near the surface.
Dicamba	Clarity Banvel [several manufacturers]	2–3 quarts	1–3%	After bloom and before dormancy in fall.	Use higher rate for older or denser stands.
2,4-D ³	[several manufacturers]	2 quarts (based on 1 quart of a 4 pounds per gallon concentration)	5–10%	In spring when thistle is 10 to 15 inches tall; pre-bud to early bud stage.	Less expensive but also less effective when used alone.

¹ Trade names for products are provided for example purposes only, and other products with the same active ingredient(s) may be available. Individual product labels should be examined for specific information and appropriate use with Canada thistle.

² Spray solution is the herbicide/water ratio in a spray mix that may be used for spot treatment with backpack or hand-held sprayers. The amount of product applied during an annual growing season must not exceed the maximum application rate per acre as specified by the product label – refer to the product label for the site type and application.

³ 2,4-D is a restricted use pesticide in New Mexico only. A certified applicator's license is required for purchase and use.

⁴ Restricted-use pesticide – A certified applicator's license is required for purchase and use.

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Winston, R., R. Hansen, M. Schwarzländer, E. Coombs, C.B. Randall, and R. Lym. 2008. Biology and Biological Control of Exotic True Thistles. Forest Health Technology Enterprise Team. FHTET-2007-05. Morgantown, WV. Available at <http://www.fs.fed.us/foresthealth/technology/pdfs/ExoticTrueThistles.pdf> (accessed Feb. 2011).

Suggested Web Sites

Encycloweedias Datasheets by California Department of Food and Agriculture. Available at: <http://www.cdafa.ca.gov/phpps/IPC/weedinfo/cirsium.htm>

For information on invasive species:

<http://www.invasivespeciesinfo.gov/>

<http://www.invasive.org/weedus/index.html>

For information about calibrating spray equipment: NMSU Cooperative Extension Service Guide A-613, Sprayer Calibration. Available at http://aces.nmsu.edu/pubs/_a/A-613.pdf

Herbicide labels online: <http://www.cdms.net/>

**For more information or
other field guides, contact:**

USDA Forest Service
Southwestern Region
Forest Health
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