

Field Guide for Managing Canada Thistle in the Southwest



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

Sunflower family (Asteraceae)

Canada thistle is an invasive plant that has been 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 includes four 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 that includes lateral and vertical roots extending up to 15 feet wide and 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.
- Weak rosette base; may have few, if any leaves.
- Alternate, lance-shaped leaves with spiny-toothed margins; upper surface waxy; sparsely wooly lower surface.
- Erect, branched, slightly hairy stem with ridges, 18 to 48 inches tall. Stems not winged.
- Pink or purple disk flowers in umbrella-shaped clusters; male and female flowers are on separate plants (species is dioecious).

- Urn-shaped flower heads; spineless, scale-like bracts.
- Extensive root system includes taproot and rhizomes.
- Reproduces via root buds, rhizomes, and seed. Seed may remain viable in soil up to 20 years.
- Allelopathic chemicals may inhibit growth of 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.

Location

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

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

A high priority in Canada thistle management is to focus on early detection and taking immediate measures to prevent establishment. Since Canada thistle allocates most of its reproductive energy into vegetative reproduction, this feature can be manipulated to the land manager's advantage. Small localized infestations occurring in otherwise healthy sites should be given first priority for control treatment(s). Initial treatment(s) should attempt to eliminate live plants and disrupt seed production as much as possible. Treated areas must be monitored, and followup treatment measures should be anticipated. Consider the following actions 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 back-country 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.
- Map known infestations. Keep annual records of reported infestations.
- Combine mechanical, cultural, biological, and chemical methods for most effective control.
- Implement monitoring and a followup treatment plan for missed plants and seedlings.

Table 1 summarizes management options for controlling Canada thistle under various situations. Choice of individual control method(s) for Canada thistle depends on the degree 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 native thistles are noninvasive and are important constituents of their ecological communities. Since native thistles can be confused with nonnative thistles, accurate identification of thistle species should be an important first step in managing invasive, nonnative thistles.

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 treatment of thistle in these types of habitats 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, resprouting 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

Table 1. Management options*

Site	Physical Methods	Cultural Methods	Biological Methods	Chemical Methods
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.	Train road crews to identify and report infestations along roads; implement requirements for vehicle operations.	Use biological control agents (beetle, weevil, or gall-forming fly) if release does not threaten rare or endangered native thistles. Biological control 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 certified weed-free hay and seed. After passing through infested areas, inspect and remove any seed from animals, clothing, and vehicles before entering treated or uninfested 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. Use biological control agents (beetle, weevil, or gall-forming fly) if release does not threaten rare or endangered native thistles. Biological control 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 land resource.

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.

Mechanical Methods

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 in a combined herbicide control strategy. See the “Control Strategies” section for more information.

Mowing will reduce plant height but will not usually eliminate flower or seed production completely. Mow when plants begin to bolt and repeat as necessary to prevent seed production. Mowing is more effective when used as part of a combined strategy with herbicide treatments (see the “Control Strategies” section for more information). Many vegetation management experts do not recommend mowing

as a single treatment method as plants often produce side branches with more flowers, even with repeated mowing and proper timing.

Prescribed Fire

Burning will not destroy the root system of Canada thistle and is likely to increase thistle presence 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 preventing Canada thistle establishment. Land managers, the local public, and road crews should be educated on identification of nonnative noxious species so they can help report all suspected infestations. 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 increases effectiveness of these control methods. See the “Control Strategies” section for more information about combined approaches.

Classical Biological Control

Numerous classical biological control agents have been introduced throughout the United States to control Canada thistle, including those listed in table 2. Biological control

methods for Canada thistle primarily involve using insect larvae to impact the shoot, stem, or leaf. Control with biological agents may be most suitable for remote, otherwise inaccessible pastures and rangeland sites where mowing, cultivating, or herbicide treatment is not practical. Some agents have been found to be less effective when their life cycle is disturbed, either by the presence of livestock or by management actions involving the thistle. For further information on biological control of Canada thistle, see Winston et al. (2008) in the “References and Further Information” section of this field guide.

An important consideration for release of a biological control agent is whether the agent will impact native thistles, especially rare or endangered species. For example, recent expansion of seed head weevil (*Rhinocyllus conicus*) from early release sites has enabled the weevil to attack the endangered Sacramento Mountains thistle in southern New Mexico. The rosette weevil (*Trichosiocalus horridus*) has also recently arrived in the Sacramento Mountains, and its presence could impact the Sacramento Mountains thistle along with local populations of the Wright’s marsh thistle which is a New Mexico listed endangered species and a Federal candidate for listing. To help prevent such impacts, these particular weevil species should not be released as biological control agents. 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 biological control agents within the Sacramento Mountains or Eddy, Chaves, Guadalupe, and Socorro Counties in New Mexico that can impact these endangered thistles.

Agents used for biological control in southwestern states should be adaptable to arid environments and local conditions. Public, tribal, and private land managers may obtain biological control agents for release directly from local offices of the USDA Animal and Plant Health Inspection Service (APHIS) when the agents are available. Other sources for biocontrol agents include private companies or locally developed insectaries. A permit must be obtained from APHIS before biological control agents

Table 2. Classical biological control agents

Species	Type of Agent	Site of Attack	Impact	Use/Considerations for Release
<i>Cassida rubiginosa</i>	beetle	foliage	Adults lay 800 eggs. Adults and larvae feed on foliage throughout the growing season.	
<i>Rhinocyllus conicus</i>	beetle/ weevil	seed head and upper stems	Larvae impact seed production of Canada thistle (and other thistles) by feeding within developing buds and preventing seed formation.	Since Canada thistle reproduces primarily by vegetative means, using this weevil to limit seed production will not control or limit the spread of Canada thistle. This particular weevil species should not be released as a biological control agent since it can feed on native thistles including the endangered Sacramento Mountains thistle.
<i>Trichosirocalus horridus</i>	beetle/ weevil	rosette shoot tip	Larvae burrow down petiole into the growth point. Heavy feeding by mature larvae results in death of rosette. As larval infestation increases, stressed thistle becomes more susceptible to competition from perennial grasses.	Released in Oklahoma and Texas; establishment not confirmed. This particular weevil species should not be released as a biological control agent since it can feed on native thistles including the endangered Sacramento Mountains thistle.
<i>Urophora cardui</i>	gall-forming fly	stem	Lays eggs on apical meristem of shoots; prevents flowering, reduces seed set, and may stress shoots to the point of death.	

can be transported across state boundaries. Regulations and permit applications (PPQ 526 permit forms) pertaining to interstate shipment of biological control agents can be found at <http://www.aphis.usda.gov/ppq/permits/>. Although biological control agents may be collected and released within a given state without a permit from APHIS, the state's Department of Agriculture or Agricultural Extension Service should be consulted for any regulations relating to movement of these agents inside the state.

Chemical Control

Canada thistle is best controlled with a selective postemergent broadleaf herbicide. 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 variables and the plant's growth stage so special care should be taken to closely follow label directions for spraying.

Each herbicide product will have different and unique requirements and restrictions according to the herbicide label. Read and understand the label prior to any application. Consult the registrant if you have questions or need further detail.

Effective herbicides for Canada thistle include aminopyralid, aminocyclopyrachlor, clopyralid, and picloram mixed alone or in combination with 2,4-D or another herbicide. Herbicides listed in table 3 will impact other desirable broadleaf and woody species; therefore, caution should be taken if nontarget species need protection. Use a label recommended surfactant (0.25 to 0.5 percent v/v; equivalent to 1 to 2 quarts of surfactant per 100 gallons of spray solution) in the spray mixture. Read label instructions carefully and follow guidelines for mixing. Always follow application requirements and grazing restrictions after treatment.

Table 3. Herbicide recommendations

Common Chemical Name (active ingredient)	Product Example ¹	Product Example Rate per Acre (broadcast)	Backpack Sprayer Treatment Using Product Example 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 prebud 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 ozs 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 noncrop 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 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; prebud to early bud stage.	Less expensive but also less effective alone.

¹Trade 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.

²Herbicide/water ratio - As an example, a gallon of spray water with a 3 percent mixture is made by adding a sufficient volume of water to 4 ounces of liquid herbicide until a volume of 1 gallon is reached (4 oz ÷ 128 oz/gal = 0.03 or 3 percent). For dry formulations, particulates should be added to sufficient water as specified by the label until the required concentration or volume of spray water is reached.

³2,4-D is a restricted use pesticide in New Mexico only. A certified applicator's license is required for purchase and use.

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

Spraying in fall before Canada thistle enters dormancy (before soil freezes up) usually gives the most consistent results. Spraying in spring in prebud to early bud growth stages is also effective, especially with herbicides that are mixed in combination with 2,4-D. Herbicides may be applied by backpack sprayer, ATV or UTV sprayers, or conventional boom sprayers that are pulled or attached to a tractor or truck. For individual plant treatment (IPT), wet foliage and stems thoroughly using a hand-held or backpack sprayer fitted with a cone-shaped adjustable nozzle.

Control Strategies

Strategies to contain and reduce Canada thistle populations require long-term planning and integrated management. Large infestations are difficult to eradicate; therefore, do not anticipate that Canada thistle will be effectively controlled within a single year or by using only one method. Complete control will likely require 2 to 4 years of repeated management methods. Consider the following strategies for Canada thistle control:

- **Herbicide–regrow–herbicide strategy** – This strategy 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 prebud 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 strategy** – Mow early in spring and then repeat 2 to 4 times during growing season. In fall, allow shoots to regrow to >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 reseeding with a variety of desirable perennial forage species following treatment. Periodically monitor for new seedlings and spot treat or hand remove regrowth.

- **Grazing–herbicide strategy** – Use a controlled, intensive 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 for return of Canada thistle and for desirable perennial native species, especially grasses. Consider reseeding if native grasses do not naturally recover following control efforts.

Regardless of the strategy used, the key to successful Canada thistle control is to stress and eliminate root reserves. A follow-up treatment plan should be anticipated and managed within a complete restoration program. Failure to perform follow-up monitoring and adapt control methods as needed could result in recolonization by Canada thistle and a return to pretreatment levels of invasion.

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Suggested Web Sites

2,4-D Safe Handling Guide:

<http://www.cdms.net/LDat/ld02B005.pdf>

Dow AgroSciences labels:

Curtail: <http://www.cdms.net/LDat/ld02B005.pdf>

Milestone: <http://www.cdms.net/LDat/ld77N006.pdf>

Redeem: <http://www.cdms.net/LDat/ld4KE004.pdf>

Rodeo: <http://www.cdms.net/LDat/ld4TN001.pdf>

RoundUp Pro: <http://www.cdms.net/ldat/ld07A008.pdf>

Stinger: <http://www.cdms.net/LDat/ld02P012.pdf>

Tordon22K: <http://www.cdms.net/LDat/ld0AJ013.pdf>

Encycloweedea Datasheets by California Department of Food and Agriculture at:

<http://www.cdfa.ca.gov/phpps/IPC/weedinfo/cirsium.htm>

USDA Plants Database:

<http://plants.usda.gov/index.html>

**For more information
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