

# Field Guide for Managing Camelthorn in the Southwest



## Cover Photos

*Upper left: John M. Randall, The Nature Conservancy, Bugwood.org*

*Right: NRCS*

*Bottom: John M. Randall, The Nature Conservancy, Bugwood.org*

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# Camelthorn (*Alhagi pesudalhagi* Bieb., synonym: *A. maurorum* Medik)

Pea family (Fabaceae)

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Camelthorn 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 camelthorn in rangelands and deserts 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

Camelthorn (synonyms: camels thorn, Caspian manna, Persian manna) is a deep rooted, perennial shrub native to southeast Russia and the Mediterranean region. It was introduced into California as a contaminant in alfalfa seed in the early 1900s and is now widely scattered on dry, open rangeland areas across the western United States.

## Growth Characteristics

- Perennial, long-lived shrub with rhizomatous roots that can reach up to 25 feet laterally.
- Grows 1.5 to 4 feet tall with spiny, intricate branches.
- Leaves are simple, entire, and alternately arranged on the branches. They are oval to wedge shaped with yellowish coloration above and bluish-green underneath.
- Pea-like flowers bloom mostly from May to July and are pinkish to maroon in color. Flowers are borne on short, spine-tipped branches arising from the leaf axils.
- Seedpods are jointed and reddish-brown to tan with a beak-like tip.
- Seeds are kidney shaped with a hard, thick coat that requires scarification for germination.
- Reproduction is primarily vegetative through rhizomes or resprouting root fragments. Seedlings are rare, and their growth rate is slow.

## Ecology

### *Impacts/threats*

Camelthorn is a hardy shrub that can thrive on both dry and wet sites. It aggressively invades disturbed areas and is very difficult to manage once established. Roots of camelthorn can send shoots upward through asphalt, and the plant's sharp spines can puncture vehicle tires making it a hazard along roadsides. The spines also cause injury or discomfort to livestock and humans.

### *Location*

Camelthorn is widely distributed along roadways, agricultural areas, river terraces, ditchbanks, saline meadows, and disturbed pasture and rangeland. It prefers deep, loamy soils where the water table is near the surface; but it can grow in many soil types ranging from sand to clay. It is usually found from 100 to 5,000 feet in elevation and is not tolerant of flooding or cold temperatures.

### *Spread*

Although its seedpods may be transported by wind or water, camelthorn spreads mostly by underground rhizomes and sprouting from fragmented root crowns. New plants may form every 3 to 5 feet along lateral roots, and shoots have been noted to grow up to 25 feet away from the parent plant. Seed scarified in the rumen of cattle have been noted to successfully germinate in passed manure.

### *Invasive Features*

Camelthorn stores large amounts of energy reserves in its extensive root system. This makes it resistant to many management methods and very difficult to eradicate.

## Management

Preventing establishment is critical to managing camelthorn, and it is very important to eliminate new plants or small infestations soon after they are discovered. Strategies to control larger infestations of camelthorn require long-term planning and integrated management. The following

actions should be considered when planning a management approach:

- Maintain healthy plant communities to prevent or limit camelthorn infestations. Try to minimize soil disturbance when controlling the shrub and/or promptly revegetate disturbed areas with desirable perennial native species, especially grasses.
- Detect, report, and eradicate new populations of camelthorn as early as possible. Map known infestations and keep annual records of reported infestations.
- Anticipate that control methods may need to be combined together and repeated over several years for increased effectiveness.
- Implement monitoring and a followup treatment plan to control root sprouts and seedlings.

Table 1 summarizes management options for controlling camelthorn under various situations. Choice of individual control method(s) for camelthorn depends on many local factors including degree of infestation, current land use, and site conditions (terrain, accessibility for treatment, microclimate, nontarget flora and fauna present, etc.). Other important considerations include treatment effectiveness, overall cost, and the number of years needed to achieve control. Typically, more than one control method may be needed for a particular site.

### Physical Control

Physical methods for camelthorn control that do not completely remove the root system are not likely to be successful and may contribute to further spread when improperly applied. Followup monitoring and re-treatment of root sprouts or regrowth should always be anticipated after using a physical control approach.

**Table 1. Management options\***

Site	Physical Methods	Cultural Methods	Biological Methods	Chemical Methods
Roadsides, fence lines, or nonvegetated areas	Hand pull or dig to remove as much of the root as possible. Anticipate regrowth.	Work closely with road crews and others to help identify and report infestations.  Establish alternative ground cover by reseeding.	NA	Use an individual plant treatment (IPT) method to apply either a foliar or soil active herbicide on sparse populations.  Apply herbicide using a broadcast method for extensive, dense infestations.
Rangeland, pasture, or riparian corridors	Mechanical methods are generally not recommended as disturbing the extensive root system may lead to an increase in population density.	Clean vehicles or equipment prior to leaving an infested area.  Establish alternative ground cover by reseeding.	Encourage alternative ground cover through prescribed grazing.	Use an individual plant treatment (IPT) method to apply either a foliar or soil active herbicide on sparse populations.  Apply herbicide using an aerial or ground broadcast method for extensive, dense infestations.
Wilderness, other natural areas, and/or small infestations	Same as above.	Place caution signs near trailheads; educate public to identify and report infestations; coordinate control efforts with other land managers.  Establish alternative ground cover by reseeding.	Same as above.	Same as above.

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

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## **Manual Methods**

**Hand pulling or digging** – Hand pulling or digging repeated on an annual basis can control camelthorn; but this approach is only practical for sparse, isolated populations. Extract plants when the soil is moist and remove as much of the root as possible. For young seedlings, it may be feasible to dig up the entire root.

## **Mechanical Methods**

**Tillage** – As a single approach, tilling infested areas may be counterproductive since a great number of root fragments are left behind; resprouting from these root fragments can be prolific. Persistent and repeated tilling over a number of years can stress the root reserves, but this is costly and greatly disturbs the soil. Chemical control as a followup should be anticipated if tillage is used. To reduce spread, clean tillage equipment onsite following treatment.

**Mowing or shredding** – These management tools are usually not recommended for camelthorn as plants regrow rapidly after cutting.

## **Prescribed Fire**

Prescribed burning is not recommended for camelthorn control.

## **Flooding**

Where feasible, maintaining a water depth of 5 to 10 inches over a camelthorn infested site for a period of several weeks can contribute to successful control. However, the option to use flooding to control camelthorn is usually limited to areas where natural basins are formed and an adequate water supply is available.

## **Cultural Control**

Early detection and plant removal are critical for preventing camelthorn establishment. Land managers, the local public, road crews, etc., should be educated on identification of nonnative invasive species so they can help report suspected infestations. Vehicles, humans, and livestock should be discouraged from traveling through infested areas. A program to check and remove seed or root fragments from

vehicles and equipment after going through infested areas should be encouraged to help stop dispersal. If possible, use weed screens on irrigation water intakes inside infested areas to prevent seed from being transported by water systems.

## **Biological Control**

### **Grazing**

Despite the thorns, camelthorn leaves and pods are palatable to livestock, especially after first frost. Monitor grazed areas to determine if seed germination of camelthorn is taking place.

### **Classical Biological Control**

As of yet, there are no biological control agents approved for use on camelthorn in the United States.

## **Chemical Control**

Herbicide control is effective on camelthorn, but it is important to anticipate that followup treatments may be necessary for up to 3 years. The key to chemical control is to apply the appropriate dosage at a time when carbohydrate reserves in the shrub's extensive root system can be depleted. Herbicides listed in table 2 for camelthorn control include some products that are foliar sprayed and others that are applied to the soil surface. All herbicides listed in table 2 will effectively control camelthorn when properly applied, although some may also impact nontarget species or other resources such as groundwater when not used according to the label. Therefore, caution should be taken if nontarget plants, including woody species, need to be protected. Each herbicide product will have different requirements and restrictions. Thus, it is important to read the label carefully and follow all instructions and guidelines when mixing and applying chemical herbicides.

### **Foliar Application**

Herbicides commonly available for foliar application to camelthorn include picloram, aminocyclopyrachlor, dicamba, imazapyr, metsulfuron, and clopyralid. These herbicides may be used as single formulations or in tank mixes with 2,4-D. Active ingredients may also be combined as a product for foliar spot spraying such as Viewpoint®

**Table 2. Herbicide recommendations**

Common Chemical Name (active ingredient)	Product Example <sup>1</sup>	Product Example Rate per Acre (broadcast)	Treatment by Backpack Sprayer or by Hand Method Using Product Example <sup>2</sup>	Time of Application	Remarks
Aminocyclopyrachlor + imazapyr + metsulfuron methyl	Viewpoint	13–20 ounces	Consult label for spot spray applications.	Apply as high volume or broadcast foliar spray on actively growing plants.	Nonselective herbicide used on noncrop sites; may cause temporary injury to some grass species.
Aminocyclopyrachlor + metsulfuron	Streamline	7.5–11.5 ounces	Same as above.	Same as above.	Selective foliar application. Use a quality adjuvant.
Clopyralid	Reclaim	1-1/3 pints	3 quarts per 100 gallons water <sup>2</sup>	On regrowth, after full leaf when buds begin to form.	Foliar application; mainly for individual plant treatment (IPT) and followup treatment of resprouts.
Dicamba + 2,4-D <sup>3</sup>	Weedmaster Veteran720	1–4 quarts	1–3%	Late summer or fall before senescence but during active growth.	Foliar application; selective for broadleaf species. Used for IPT or broadcast spraying. Follow mixing instructions on label.
Metsulfuron	Escort XP	1–3 fluid ounces	High-volume: 1–3 fluid ounce per 100 gallons. Consult label directions.	Same as above.	Same as above.
Picloram <sup>4</sup>	Tordon 22K	2 quarts	1–3%	Same as above.	Same as above.
Imazapyr	Arsenal	0.75–1.5 quarts	0.5–2%	Same as above.	Foliar application; nonselective; apply only to foliage and stems you want to control. Higher rate is for heavier, denser infestations.  In addition to overspray, death or injury for nontarget plants may occur from root transfer of imazapyr between intertwined root systems.
Tebuthiuron	Spike 80 DF	1–1.25 pounds	Low volume: 1 pound per 1 gallon water  High volume: 1 pound per 10 gallons water.	Anytime; most effective if applied before rainfall season or in the fall.	Tebuthiuron is a nonselective, soil active herbicide applied to the ground surface. Use as an IPT or broadcast treatment. Leave treated plants in place for 2 years following application.  For Spike 80 DF, agitate continuously; will be slurry-like.
Tebuthiuron	Spike 20P	¼ oz pellets per 3-foot canopy height	Hand scatter pellets near canopy drip line.	Same as above.	Tebuthiuron is a nonselective, soil active herbicide applied to the ground surface. Use as an IPT or broadcast treatment. Leave treated plants in place for 2 years following application.

**Table 2. Herbicide recommendations (continued)**

Common Chemical Name (active ingredient)	Product Example <sup>1</sup>	Product Example Rate per Acre (broadcast)	Treatment by Backpack Sprayer or by Hand Method Using Product Example <sup>2</sup>	Time of Application	Remarks
Hexazinone	Velpar L	3 ml/3 foot canopy height	Velpar L can be mixed with equal parts water (50:50) and applied by backpack sprayer.	Same as above.	Hexazinone is a nonselective, soil active herbicide applied to the soil surface. Apply as an IPT.
Hexazinone	Pronone Power Pellets	1 pellet/2 foot canopy height	Hand scatter near canopy drip line	Same as above.	Same as above.
Fosamine	Krenite S	1.5–6 gallons	Low volume: at least 1.5%; high volume: less than 30%.	Same as above.	Same as above.

<sup>1</sup> 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 camelthorn.

<sup>2</sup> Herbicide/water ratio - As an example, a 3 percent mixture for a gallon of spray water is made by adding a sufficient volume of water to 4 ounces of liquid herbicide until a volume of 1 gallon is reached ( $4 \text{ oz} \div 128 \text{ oz/gal} = 0.03$  or 3 percent).

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

<sup>4</sup> Restricted use pesticide - A certified applicator’s license is required for purchase and use.

which has a combination of aminocyclopyrachlor, imazapyr, and metsulfuron. Consult the label for mixing and application directions. Add a quality nonionic surfactant (0.25 to 0.5 percent v/v) to the spray mixture to ensure even coverage and maximum leaf uptake.

To foliar spray camelthorn properly, all green leaves and shoots should be uniformly wet within the shrub’s canopy. Camelthorn occurring in large continuous areas can be broadcast sprayed using a fixed-width boom or boomless spray system, such as those attached to or towed by a truck, ATV, or tractor. Individual plant treatment (IPT) or spot spraying should be used wherever the camelthorn population is sparse or scattered. There are two basic techniques available for spraying camelthorn using the IPT method:

- The **low-volume technique** may be used for areas with sparse to moderate camelthorn densities. The technique involves applying a low quantity of concentrated herbicide, usually with a backpack or hand-held sprayer. The low volume approach is very flexible and can target specific plants. For success, the operator must be able to spray the entire canopy in a light, uniform manner.
- The **high-volume technique** may be used for areas with moderate to high camelthorn densities. A high powered pressurized sprayer is used with this technique to apply herbicide until the foliage is visibly wet. The technique delivers a greater quantity of a less concentrated herbicide solution under high pressure, thereby allowing remote foliage to be sprayed at a greater distance.

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## Soil Application

Tebuthiuron and hexazinone are the primary herbicides used in a soil-applied approach for camelthorn control. Tebuthiuron is formulated either as a dry flowable powder for liquid spraying or as a dry pellet. Either formulation can be used for IPT or broadcast treatment. Hexazinone is formulated as a liquid but is best suited only for application as an IPT. Although these soil active herbicides can be applied during any time of the year, the optimal time is just before the rainy season or in the fall. Both herbicides are slow acting, and it may take 1 or more years before root reserves are depleted and the shrub is completely dead. These soil applied herbicides may be inappropriate for some specific sites such as areas where the chemical can move through the soil profile into a shallow water table.

## Control Strategy

Camelthorn is very persistent and difficult to eradicate. Any effort to contain and reduce camelthorn must involve careful planning and a long-term commitment to control actions. Anticipate that successful control will likely involve repeating treatments for several years.

## References and Further Information

California Department of Food and Agriculture.

Encycloweedia Datasheet: Camelthorn. Available at <http://www.cdffa.ca.gov/phpps/ipc/weedinfo/alhagi.htm> (accessed May 2010)

Donaldson, S. and D. Rafferty. 2003. Identification and Management of Camelthorn (*Alhagi pseudalhagi*). University of Nevada Cooperative Extension Fact Sheet 02-41. Available at <http://www.unce.unr.edu/publications/files/nr/2002/FS0241.pdf> (accessed May 2010)

- Gottfried, G.J., J.D. Shaw, and P.L. Ford, compilers. 2008. Ecology, Management, and Restoration of Piñon-Juniper and Ponderosa Pine Ecosystems: Combined Proceedings of the 2005 St. George, Utah, and 2006 Albuquerque, New Mexico, Workshops. Proceedings RMRS-P-51. Fort Collins, CO: USDA Forest Service, RMRS. 218 pp. Available at [http://www.fs.fed.us/rm/pubs/rmrs\\_p051.pdf](http://www.fs.fed.us/rm/pubs/rmrs_p051.pdf) (accessed May 2010)
- Invasive Plant Atlas of the United States. Available at <http://www.invasive.org/weedus/index.html>.
- Kerr, H.D., W.C. Robocker, and T.J. Muzik. 1965. Characteristics and Control of Camelthorn. Weeds, Vol. 13, No. 2 (April 1965), pp. 156–163. Available at <http://www.jstor.org> (accessed May 2010)
- Lee, R.D. 1999. New Mexico's Invasive Weeds. New Mexico State University Cooperative Extension. Las Cruces, NM.
- Northam, E. and W. Meyer et al. 2009. Non-Native Invasive Plants of Arizona. pp. 8–9. Publication AZ1482. Available at <http://cals.arizona.edu/pubs/natresources/az1482.pdf>, (accessed May 2010)
- NPS: Grand Canyon National Park Information Booklet: Invasive Plants. pp. 2. Available at [http://www.usbr.gov/uc/rm/amp/amwg/mtgs/08may22/Attach\\_04c.pdf](http://www.usbr.gov/uc/rm/amp/amwg/mtgs/08may22/Attach_04c.pdf) (accessed May 2010)
- O'Connell, R. and M.C. Hoshovsky. 2000. Camelthorn (*Alhagi pseudalhagi*) in C. C Bossard et al. (eds.) Invasive Plants of California's Wildlands. University of California Press. Berkley, CA. Available at <http://www.cal-ipc.org> (accessed May 2010)
- Parker, K.F. 1972. An Illustrated Guide to Arizona Weeds. University of Arizona Press. Tucson, AZ. Available at <http://www.uapress.arizona.edu/onlinebks/weeds/titlweed.htm> (accessed May 2010)
- Parsons, W.T. and E.G. Cuthbertson. 2001. Noxious Weeds of Australia (2<sup>nd</sup> Edition) CSIRO Publishing. Collingwood, Victoria. Australia. pp. 466. Available at <http://books.google.com> (accessed May 2010)

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Ramsey, S.R. and W. Kaufman. 2007. Invasive Plants: A Guide to Identification and the Impacts and Control of Common North American Species (1<sup>st</sup> ed) Stackpole Books. pp. 131–133. Available at <http://books.google.com> (accessed May 2010)

Rashed Mohassel, M.H., M. Nassiri, and E. Poorkazem. 2003. Effect of Glyphosate and Herbicide Combinations on Pistachio Garden Weeds in Kerman (Iran). Available at <http://ressources.ciheam.org/om/pdf/c56/01600175.pdf> (accessed May 2010)

Renz, M.J., C. Deuser, B. Hamilton, C. Nelson, and M. Ryan. 2008. Management of Camelthorn along the Virgin River (Clark County, NV). Available at [http://www.weedcenter.org/funding/docs/FinalReports\\_8\\_08/2003%20Research%20Grant%20Reports/Renz\\_M\\_Final\\_Report.pdf](http://www.weedcenter.org/funding/docs/FinalReports_8_08/2003%20Research%20Grant%20Reports/Renz_M_Final_Report.pdf) (accessed May 2010)

TexasInvasives.org. 2005. Factsheet: Camelthorn. Available at [http://www.texasinvasives.org/invasives\\_database/detail.php?symbol=ALMA12](http://www.texasinvasives.org/invasives_database/detail.php?symbol=ALMA12) (accessed May 2010)

USDA Plants Database. Available at <http://plants.usda.gov/index.html> (accessed May 2010)

Washington State Noxious Weed Control Board. 2008. Factsheet: Camelthorn (*Alhagi maurorum*). Available at [http://www.nwcb.wa.gov/weed\\_info/Alhagi\\_maurorum.html](http://www.nwcb.wa.gov/weed_info/Alhagi_maurorum.html) (accessed May 2010)

### **Suggested Web Sites**

For information about calibrating spray equipment:

NMSU Cooperative Extension Service Guide A-613 *Sprayer Calibration* at [http://aces.nmsu.edu/pubs/\\_a/A-613.pdf](http://aces.nmsu.edu/pubs/_a/A-613.pdf)

Herbicide labels online:

<http://www.cdms.net/LabelsMsds/LMDefault.aspx>





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

USDA Forest Service  
Southwestern Region  
Forest Health  
333 Broadway Blvd., SE  
Albuquerque, NM 87102

**Or visit:**

*<http://www.fs.usda.gov/main/r3/forest-grasslandhealth/invasivespecies>*

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