

## Agriculture



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# Identification and Management of Scotch Thistle (*Onopordum acanthium* L.) in Pastures, Rangelands, and Non-Crop Settings

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### Quick Facts

- Plants can produce 40,000 seeds (Young & Evans, 1969).
- Seeds remain viable in the soil for many years (Burnside et al., 1996).
- Removing rosettes requires far less effort than mature plants.

### Identification

This species can be distinguished from other thistles by examining the leaves, stems, and flowers. Mature plant leaves are up to 3 feet long, 1 foot wide, and slightly lobed. Fine wooly hairs on the leaves lend a blue-gray color to the plant (Figure 1). This is a key identifying feature of Scotch thistle.

### Introduction

Scotch thistle (*Onopordum acanthium*) is an invasive species native to Eurasia. It was likely introduced into North America during the late 19th century (Young & Evans, 1969). Due to the plant's size and prickles, a stand can damage pasture productivity, ruin campsites, or make trails nearly impassable. The thistle also outcompetes desirable plants and greatly reduces forage use by large animals.

Not all thistles are related or alike. It is essential to correctly identify Scotch thistle before making management decisions. Additionally, many species of native thistles exist, and some are listed as a threatened or endangered species.



**Figure 1.** Leaves from Scotch thistle (left), native bull thistle (center), and musk thistle (right). Scotch thistle leaves are identified by their wide width, short lobes, and lighter color compared to other thistles.



**Figure 2.** Scotch thistle plants growing upwards of 10 feet tall.

Scotch thistle stems can grow up to 12 feet tall (Whitson et al., 2000) with >100 flower heads (Figure 2). Another key identifier of Scotch thistle is the wing-like growth structures that grow in the internodes of the stem. These structures grow from the bottom of the plant to the base of the flower head. Flower heads are often more than an inch in diameter, characterized by hairy spiny bracts and purple-pinkish flowers. Additionally, flower heads remain upright rather than nodding as musk thistles (*Carduus nutans*) often do (Figures 3.1 and 3.2).



**Figure 3.1** The flower head on the Scotch thistle (left) is identifiable by the spiny wing-like structure that runs all the way up the stem.



**Figure 3.2.** In full bloom, note that the spiny bracts at the base of the flower stay green on Scotch thistle, whereas on the musk thistle (left), they are the same color as the flower. Additionally, both photos show the slight nod in the stem that the musk thistle flower has just below the bloom.



Rosettes are woolly with a grayish-blue leaf color. Mature rosettes can be up to 5 feet in diameter; however, much smaller rosettes are also common (Figure 4).



**Figure 4.** *The arrows indicate Scotch thistle rosettes. This is a plant in its first year. Ideally, management occurs on rosettes before they go to seed the next year.*

## Lifecycle and Distribution

Scotch thistle is a biennial, producing a large rosette of prickly leaves during the first year of growth. Second-year growth begins in spring.

During this time, the plant increases in size before shifting to reproductive growth in early summer, i.e., growth of tall stems and flower heads. Seeds mature and disperse by wind shortly after flower senescence. By mid to late summer, the plant dies, leaving upright dry remains that can persist for a year or two.

Infestations of Scotch thistle often start in disturbed areas such as gravel pits, new developments, roadsides, campsites, burned areas, and ditch banks. The weed is well adapted to many habitats, but severe infestations are found mostly on vacant land where they become a major source

of seed production and spread. These infestations can pose a serious problem in adjacent pastures, rangeland, and non-crop areas.

## Non-Chemical Management

Prevention is always the preferred method to control noxious weeds. See Table 1 for a summary of preventative, cultural, and mechanical control methods.

Scotch thistle management starts with monitoring. Pay attention to disturbed areas where the plants can become established. Eradicate small infestations before they spread. Make every effort to prevent plants from going to seed.

Timing of control is important to seed prevention. Complete mechanical and chemical treatments in spring before flowers open or in fall after seedlings emerge (unless preemergence control is desired). Eradicating existing infestations requires several years of controlling all germinating seedlings. Additionally, good cultural practices when grazing or landscaping will help with management. Planting competitive species or maintaining healthy plant cover in pastures and rangelands will limit thistle establishment and impacts. In new residential developments, landscape early with plants that are well adapted to the area. Weed barriers and mulches are also useful.

Mechanical removal is accomplished by pulling, hoeing, cultivation, or tillage. Mowing can be used as a tool if applied early enough in the year. However, Scotch thistle will continue to make flower heads on shorter stems even after mowing, and follow-up cuttings may be necessary to prevent seed dispersal. Pulling the plant up or ground cultivation are much more effective tools at removing Scotch thistle from smaller areas. Mature plants are extremely difficult to mechanically remove by pulling; a shovel may be needed. The best strategy for using mechanical tools against Scotch thistle is to till, pull, or dig out plants while they are young.

<b>Table 1.</b> <i>Summary of Non-Herbicide Options for Managing Scotch Thistle</i>	
<b>Control method</b>	<b>Notes</b>
Prevention	<ul style="list-style-type: none"> <li>● Practice early detection and rapid response. Inspect properties frequently and remove new thistles before they become problematic.</li> <li>● Clean and remove the plant and soil residue from people, pets, livestock, and equipment upon exiting infested areas.</li> <li>● Use filters and screens to prevent seeds from spreading by irrigation.</li> <li>● Feed horses and other livestock weed-free hay for three days prior to moving animals off of your property.</li> <li>● Transport clean fill (manure, mulch, topsoil, gravel, road base, etc.)</li> <li>● Prevent existing thistle from producing seed.</li> <li>● Plant quality weed-free seed.</li> </ul>
Cultural and mechanical (pasture and rangeland)	<ul style="list-style-type: none"> <li>● Plant forages that are well adapted to the location of the pasture and management practices.</li> <li>● Do not overgraze the pasture. The general rule is to not graze below four inches of plant height.</li> <li>● Maintain proper stocking rates to encourage an even utilization of the forage.</li> <li>● Maintain a weed-free pasture; dig or pull weeds as they arise.</li> <li>● Plant in the fall to establish pasture grasses before summer weed pressure.</li> </ul>
Cultural and mechanical (non-crop and right of way)	<ul style="list-style-type: none"> <li>● Cultivate and work the ground where appropriate before weeds mature.</li> <li>● Follow-up cuttings may be required.</li> </ul>
Biocontrol	<ul style="list-style-type: none"> <li>● No effective biocontrol agents of Scotch thistle are known.</li> </ul>

## Chemical Management

Always read and follow the entire label when applying chemical herbicides. Pay special attention to safety requirements, restrictions for use, directions for use, and disposal requirements. Pasture, rangeland, and non-crop chemical management is summarized in Table 2.

## Pasture

Good grazing practices are essential to maintaining a healthy pasture. Herbicides will assist good grazing practices in controlling Scotch thistle and preventing its return (Figure 5). Products labeled for use in pasture with little to no activity on grasses are effective. However, in grass-legume



**Figure 5.** This small but mature plant has already bolted, and the flower head is formed but not yet in bloom. Typically, once Scotch thistle is in full bloom, it is too late to treat with herbicides.

mixed pastures, many herbicides labeled for pasture can injure or kill the legumes. In these situations, preemergence herbicides or postemergence herbicides specifically labelled for grass-legume mixes, spot treatments, or omitting chemical control are the only options available.

### Rangeland

Good stewardship of rangeland is important for ensuring access to the resource for future generations. Before applying herbicides, take

caution. Be aware of your environment, e.g., weather, slopes, aquatic areas, and sensitive plant species.

### Non-Crop

Herbicides with long lasting control and labeled for these areas do a fine job. Because non-crop sites are diverse, it is important to read the label carefully to ensure that nontarget vegetation isn't damaged on or around these sites. Ensure that the site being treated is approved on the label.

<b>Table 2.</b>			
<b>Summary of Herbicides for Managing Scotch Thistle</b>			
<b>Mode of action</b>	<b>Active ingredient</b>	<b>Trade name</b>	<b>Comments</b>
Pasture and Rangeland			Rangeland and pasture application restrictions are site-specific. Refer to the label.
Group 4 Growth regulators	aminopyralid	Milestone	Provides excellent control when applied to seedlings, rosettes, and bolting plants. Provides some residual control the following year. Pay special attention to label directions regarding transportation of hay, manure, compost, and livestock off farm.
Group 2 ALS inhibitors	metsulfuron	Escort, MSM 60, etc.	Provides excellent control when applied to seedlings, rosettes, and bolting plants. No residual control the following year. These products may temporarily suppress grass growth.
Group 2 ALS inhibitors	chlorsulfuron	Telar	Typically applied postemergence with some residual the next year. These products may temporarily suppress grass growth.
Group 4 Growth regulators	clopyralid	Several names	Provides excellent control when applied to seedlings, rosettes and good control when applied to bolting plants. No residual control can be expected the following year.
Group 4 Growth regulators	dicamba	Several names	Usually tank mixed or sold premixed with other herbicides (e.g., 2,4-D) to control scotch thistle before bolting. Read the label for more details.
Group 4 Growth regulators	2,4-D	Several names	Research performed in Nevada has shown that 2,4-D alone does not effectively control rosettes or maturing plants, permitting the plant to set viable seed even showing signs of severe injury (Young and Evans, 1969).
Non-Crop			Many of the products listed under pastures and rangeland can be used for non-crop weed control. See the label for specific uses.
Group 9 Aromatic amino acid inhibitors	glyphosate	Several names	Non-selective herbicide, these products kill desirable plants especially grasses. Good control of seedlings and rosettes. Glyphosate will not prevent seedling from germinating.

## Picture Credits

Authors provided all photos.

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