Onopordum acanthium L.

Scotch thistle

Family: Asteraceae
Range: All western states.
Habitat: Disturbed areas such as river and stream corridors, roadsides, right-of-ways, trails, rangeland, pasture, forest clearings, and abandoned cropland. Best suited to areas with high soil moisture during germination periods. Often associated with degraded annual plant communities and areas with high rodent activity. Not common on annually cultivated lands.
Origin: Native to Eurasia.
Impacts: Scotch thistle populations spread rapidly and can form dense stands over large acreage. Seeds contain a water-soluble germination inhibitor causing a high percentage of seeds to remain dormant in the soil. This makes control difficult and a long-term commitment. Populations often expand rapidly on infested land during wet years due to the large amount of seed that break dormancy. Sharp spines on leaves, stems, and seedheads deter livestock and wildlife from grazing. Dense stands create a natural barrier that prevents movement by livestock, wildlife, and humans.
Western states listed as Noxious Weed: Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming
California Invasive Plant Council (Cal-IPC) Inventory: High Invasiveness

Scotch thistle is a biennial with large, green, spiny leaves that are covered with fine, cottony hairs. Rosettes can often grow up to 1 to 2 ft in diameter and mature plants are generally 4 to 6 ft tall. Scotch thistle's tall, spiny stature made it useful as a natural fence in Europe centuries ago.

Flower heads are large (1 to 3 inches diameter), spherical to hemispherical, and either solitary of in clusters of 2 to 7. The heads consist of numerous spine-tipped phyllaries in many overlapping rows. The numerous disk flowers are purple (sometimes white) and showy. The pappus is composed of bristles (7 to 9 mm long) that form a detachable ring at the base. Scotch thistle reproduces only by seeds. It produces large numbers of achenes that remain viable in the soil for 7 to 39 years. Seeds contain a water-soluble germination inhibitor, and greater than 80% of the seeds display innate dormancy at maturity. Germination often occurs in spring and fall during saturated soil conditions. Seed dispersal is primarily by wind, but can also occur with water, rodents, livestock, or vehicles.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Small infestations can be removed by manual methods. Digging is effective and the preferred manual removal method. When digging, sever the root below the soil surface. Mowing in the late bolting or bud stage can reduce seed production. Mow before flowering to prevent seeds from developing in severed flowerheads. On sites with high soil moisture, plants may need to be removed to prevent flowering on regrowth. When mowing is conducted too early, it only delays flowering. Similarly, when plants are cut too late in the flowering process, viable seed may still develop in the seedhead. Because there can be wide variation in plant maturity, a single mowing is unlikely to provide satisfactory control, but repeated mowing throughout the entire growing season can be successful. For

	total kill, plants must be cut off below the soil surface with no leaves remaining. Tillage will control emerged plants but often stimulates germination. Land managers using tillage for seedbed preparation for reseeding efforts should prepare for a flush of seedlings when soils become saturated.
Cultural	Sheep, goats and horses, but not cattle, have a significant effect on thistles in the early stages of infestation when they eat young thistle plants. Sheep may graze small rosettes. Goats ignored the leaves of Scotch thistle, but they ate all the flower heads and prevented seed production and dispersal. Cattle avoid grazing Scotch thistle. Overgrazing promotes Scotch thistle. Fire is not an effective control. Promoting competitive vegetation can slow spread and help prevent establishment. Perennial grass plantings have been shown to inhibit Scotch thistle seedling establishment and can reduce Scotch thistle populations. Perennial grass stand density and vigor should be managed to minimized bare ground exposure.
Biological	No biological controls are currently available in the United States. Australia has released biocontrol insects, but some of them have failed host specificity tests in the U.S. Insects are being evaluated by USDA for release in the U.S.

CHEMICAL CONTROL

The following specific use information is based on published papers and reports by researchers and land managers. Other trade names may be available, and other compounds also are labeled for this weed. Directions for use may vary between brands; see label before use. Herbicides are listed by mode of action and then alphabetically. The order of herbicide listing is not reflective of the order of efficacy or preference.

GROWTH REGULATORS	
2,4-D Several names	**Rate:** 1 to 2 qt product/acre (0.95 to 1.9 lb a.e./acre) **Timing:** Postemergence from rosette to beginning of bolting, or fall rosette. Most effective on small rosettes. **Remarks:** Often tank-mixed with chlorsulfuron or dicamba for quicker burndown. Does not control large bolting plants. Broadleaf-selective and safe on most grasses. 2,4-D has minimal soil activity. Do not apply ester formulation when outside temperatures exceed 80°F. Amine forms are as effective as ester forms for small rosettes, and amine forms reduce the chance of off-target movement.
Aminocyclopyrachlor + chlorsulfuron *Perspective*	**Rate:** 4.75 to 8 oz product (*Perspective*)/acre **Timing:** Postemergence and preemergence. Postemergence applications are most effective when applied to plants from the seedling to the bolting stage. **Remarks:** Aminocyclopyrachlor provides excellent control of Scotch thistle at most growth stages. One of the few herbicides that provides soil residual control 1 year after application. *Perspective* provides broad-spectrum control of many broadleaf species. Although generally safe to grasses, it may suppress or injure certain annual and perennial grass species. Do not treat in the root zone of desirable trees and shrubs. Do not apply more than 11 oz product/acre per year. At this high rate, cool-season grasses will be damaged, including bluebunch wheatgrass. Not yet labeled for grazing lands. Add an adjuvant to the spray solution. This product is not approved for use in California and some counties of Colorado (San Luis Valley).
Aminopyralid *Milestone*	**Rate:** 5 to 7 ounces product/acre (1.25 to 1.75 oz a.e./acre) **Timing:** Postemergence from the rosette to young bolting stage. **Remarks:** Longer soil residual than clopyralid. Safe on most grasses, although preemergence application at high rates can greatly suppress some annual grasses, such as medusahead. Applications can decrease seed production in some annual and perennial grass species. Provides over 90% control when applied to rosettes. For postemergence applications, adding a non-ionic surfactant (0.25 to 0.5% v/v spray solution) enhances control under adverse environmental conditions; however, this is not normally necessary. Other premix formulations of aminopyralid can also be used for Scotch thistle control. These include *Opensight* (aminopyralid + metsulfuron; 1.5 to 2.5 oz product/acre) and *Forefront HL* (aminopyralid + 2,4-D; 1.5 to 2.1 pt product/acre); apply at the rosette to bolting stage.
Clopyralid *Transline*	**Rate:** 0.67 to 1.33 pt product/acre (4 to 8 oz a.e./acre). Use higher rate for older plants or dense stands.

	Timing: Postemergence from the rosette to young bolting stage. Results are best if applied to rapidly growing weeds. **Remarks:** Most effective for young plants. Shorter soil residual than aminopyralid or aminocyclopyrachlor. Controls or injures plants in the Asteraceae and Fabaceae but safe on most other broadleaf species and all grasses. For postemergence applications, a non-ionic surfactant (0.25 to 0.5% v/v spray solution) enhances control under adverse environmental conditions; however, this is not normally necessary.
Clopyralid + 2,4-D *Curtail*	**Rate:** 2 to 4 qt *Curtail*/acre **Timing:** Same as for clopyralid. **Remarks:** Add a non-ionic surfactant.
Dicamba *Banvel*, *Clarity*	**Rate:** 0.5 to 2 pt product/acre (0.25 to 1 lb a.e./acre). Use higher rates for large rosettes and bolting plants. **Timing:** Postemergence from rosette to beginning of bolting, or fall rosette. **Remarks:** A broadleaf-selective herbicide often combined with other active ingredients. Not typically used alone to control Scotch thistle. Dicamba can also be mixed with 2,4-D (0.5 to 1 pt dicamba + 2 pt 2,4-D/acre) from rosette to bolting stage.
Picloram *Tordon 22K*	**Rate:** 0.5 to 0.75 pt product/acre (2 to 3 oz a.e./acre). **Timing:** Preemergence and postemergence. With postemergence application, best time is rosette to early bolting stage, when plants are growing rapidly. **Remarks:** Picloram controls a wide range of broadleaf species and has relatively long soil residual activity. Lower rates in rate range may require annual spot treatments. Although well-developed grasses are not usually injured by labeled use rates, some applicators have noted that young grass seedlings with fewer than four leaves may be killed. Picloram is a restricted use herbicide. Picloram is not registered for use in California. Do not apply near trees, or where soil is highly permeable and where water table is high. Control with lower rates may be improved by tank mixing with dicamba or 2,4-D: picloram + dicamba (0.25 to 0.5 pt picloram + 0.125 to 0.25 pt dicamba/acre), or picloram + 2,4-D (0.5 to 1 pt picloram + 1 to 2 pt 2,4-D/acre).
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Roundup*, *Accord XRT II*, and others	**Rate:** 1 to 2 qt product (*Roundup ProMax*)/acre (1.1 to 2.25 lb a.e./acre). Spot treatment: 1.5% v/v solution. **Timing:** Postemergence to rapidly growing plants from the rosette to early bolting stage. **Remarks:** Glyphosate will only provide control in the year of application, and will not kill seeds or inhibit germination the following season. Glyphosate has no soil activity and is nonselective. It can create bare ground conditions that can make an area susceptible to weed recruitment. In areas with desirable vegetation, use spot treatment. Glyphosate is a good control option if reseeding is planned shortly after application, as it will not injure seedlings emerging after application. Add a surfactant when using a formulation where it is not already included (e.g., *Rodeo*, *Aquamaster*).
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Chlorsulfuron *Telar*	**Rate:** 1 to 2.6 oz product/acre (0.75 to 1.95 oz a.i./acre) **Timing:** Postemergence from the rosette to flower bud stage. **Remarks:** One of the more effective treatments for large bolting plants. Always use a surfactant. Can be tank-mixed with 2,4-D for quicker burndown.
Metsulfuron *Escort*	**Rate:** 1 to 2 oz product/acre (0.6 to 1.2 oz a.i./acre) **Timing:** Postemergence from the rosette up until flower-bud stage. **Remarks:** Similar activity compared to chlorsulfuron. Always use a surfactant. Metsulfuron can be tank-mixed with 2,4-D for quicker burndown. Other premix formulations of metsulfuron can be used at similar application timing. These include *Cimarron Max* (metsulfuron + dicamba + 2,4-D), *Opensight* (metsulfuron + aminopyralid), and *Cimarron X-tra* (metsulfuron + chlorsulfuron). Metsulfuron and premixes containing metsulfuron are not labeled or use in California.

RECOMMENDED CITATION: DiTomaso, J.M., G.B. Kyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.