

This WEED REPORT does not constitute a formal recommendation. When using herbicides always read the label, and when in doubt consult your farm advisor or county agent.

This WEED REPORT is an excerpt from the book *Weed Control in Natural Areas in the Western United States* and is available wholesale through the UC Weed Research & Information Center (wric.ucdavis.edu) or retail through the Western Society of Weed Science (wsweedscience.org) or the California Invasive Species Council (cal-ipc.org).

Cardaria chalepensis (L.) Hand.-Maz; lens-podded whitetop (= *Lepidium chalepense* L.)

Cardaria draba (L.) Desv. ; hoary cress (= *Lepidium draba* L.)

Cardaria pubescens (C.A. Mey.) Jarmolenko; hairy whitetop (= *Lepidium appelianum* Al-Shehbaz)



Hoary cress (whitetop), lens-podded and hairy whitetop

Family: Brassicaceae

Range: Nearly all western states and many central and eastern states, except southeastern states

Habitat: Disturbed open sites, ditch banks, roadsides, wetlands and riparian areas, agricultural fields including pastures, alfalfa, grain, orchards and vineyards. Often on moderately moist, alkaline to saline soils, but tolerate a wide range of soil types and moisture conditions, especially wet areas.

Origin: Hoary cress is native to Eurasia, while lens-podded and hairy whitetop are native to Central Asia.

Impacts: Hoary cress is the most common and most aggressive of the three species. However, all three species can completely displace desirable vegetation forming dense monocultures. Once established, they can be very difficult to control. They are generally considered to be unpalatable to livestock.

Western states listed as Noxious Weed: *C. draba*, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Washington, Wyoming; *C. chalepensis*, Arizona, California, Oregon; *C. pubescens*, Arizona, California, Oregon, Washington, Wyoming

California Invasive Plant Council (Cal-IPC) Inventory: *C. draba* and *C. chalepensis*, Moderate Invasiveness; *C. pubescens*, Limited Invasiveness

All three species of *Cardaria* are erect perennials up to 2 ft tall. The stems are generally erect and covered with short hairs. The leaves are alternate, gray-green, and variable in shape, some arrowhead shaped. The upper and especially the lower blade surface are covered with short white hairs. The basal leaves are short-stalked, and the upper leaves clasp the stem at their base. Leaves are 0.5 to 4 inches long by 0.1 to 1.5 inches wide. The basal leaves tend to be narrower but longer than stem leaves.

All three species reproduce by both seeds and through vegetative means. Numerous small, white, fragrant flowers appear in loose inflorescences in spring to summer. Flowers have four petals 2 to 4 mm long. They produce tiny pods that are heart-shaped to ovate. One plant can produce from 1,200 to 4,800 seeds. Seeds germinate in fall after the first rains. Under field conditions, seeds are short-lived. The three species also reproduce vegetatively, developing new shoots from their extensive system of vertical and horizontal roots. This is the primary method of spread. Within 3 weeks of germination the roots of seedlings can start producing buds. Root fragments also can generate new plants, but regeneration is poor in dry soils. The roots can penetrate deep into the soil, and depths well over 10 ft have been documented in some studies. Roots and rhizomes can account for 75% of the total plant biomass and store considerable amounts of carbohydrates. Carbohydrate reserves are minimal in early to mid-spring and accumulate to maximum levels by mid-summer. The foliage dies back during extended periods of freezing temperatures or drought, but the roots survive. Because of these large and deep underground systems, the three species form hard-to-control clonal colonies.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting,	Hand-pulling is fairly impractical with hoary cress due to its extensive root and rhizome system. Their roots can remain alive even when the top-growth has been eliminated for a year. However, hand hoeing at
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disking)	<p>intervals no longer than 4 weeks for 2 years has been effective.</p> <p>Mowing alone will not control the <i>Cardaria</i> species. A combination of mowing and competitive cropping has been used to control other <i>Cardaria</i> species and may work for hoary cress. In pasture, hoary cress has been controlled by ceasing irrigation, removing outlying plants, decreasing grazing, and generally managing for grassland health.</p> <p>Although improper cultivation can spread the <i>Cardaria</i> species by dispersing root fragments, its root systems can be exhausted through repeated cultivation. Repeat passes should be made within 10 days of weed emergence. It is important that no green leaves be allowed to form. This can eliminate colonies in 2 to 4 years. However, it is important to be aware that cultivation machinery can spread the roots of these species and increase infestations. All root fragments should be removed from machinery before it is moved to uninfested fields.</p> <p>Cultivation may be more successful in combination with competitive cropping, e.g., annual disking followed by planting alfalfa or grass forage crops.</p>
Cultural	<p>Sheep and goats will eat hoary cress and the other <i>Cardaria</i> species, especially the seedlings. Cattle tend to avoid eating them and those animals that consume it may have tainted milk. In addition, plants contain glucosinolates, which can form toxic compounds in cattle.</p> <p>Burning is not effective for controlling any of the <i>Cardaria</i> species. Fire will kill aboveground portions of the plant; however, plants will resprout because of their extensive root and rhizome system. Rhizomes have been found as deep as 4 ft and the root system much deeper. In addition, post-fire spread of <i>Cardaria</i>, particularly hoary cress, has been documented. Frequent searing with a weed burner at intervals less than 4 weeks apart has been found to be effective when continued for at least 2 years.</p> <p>Flooding an area with 6 to 10 inches of water for 2 months can be highly effective; however, short-term flooding (1 week) has no lasting impact.</p>
Biological	<p>Due to the taxonomic similarity to other important members of the mustard family, there are no biological control agents available for any of the <i>Cardaria</i> species.</p>

CHEMICAL CONTROL

The following specific use information is based on reports by researchers and land managers. Much of the information is based on trials for the control of hoary cress. It is expected that these options should also provide the same results with the other two *Cardaria* species. Other trade names may be available, and other compounds also are labeled for this weed. Chemical control is often impeded by the presence of annual grass biomass intercepting foliar applications. Timing for low annual grass presence is recommended.

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	
<p>2,4-D</p> <p>Several names</p>	<p>Rate: 2 to 3 qt product/acre (1.9 to 2.85 lb a.e./acre)</p> <p>Timing: Postemergence early in the season before flowering, or to new growth in fall. Control is minimal after the bloom stage.</p> <p>Remarks: 2,4-D is broadleaf-selective and safe on grasses. This herbicide will most likely require repeat applications for several years. 2,4-D has little to no soil activity. It is not the most effective treatment, but widely used because of its low cost. 2,4-D is often combined with other active ingredients, e.g. clopyralid or dicamba. Do not apply the ester formulations when outside temperatures exceed 80°F.</p>
<p>Aminocyclopyrachlor + chlorsulfuron</p> <p><i>Perspective</i></p>	<p>Rate: 3 to 4.5 oz product (<i>Perspective</i>)/acre</p> <p>Timing: Postemergence or preemergence. Postemergence applications are most effective when applied to plants from the seedling to the mid-rossette stage.</p> <p>Remarks: <i>Perspective</i> provides broad-spectrum control of many broadleaf species. Aminocyclopyrachlor has marginal activity on mustards and control, when using <i>Perspective</i>, is largely from the chlorsulfuron component. 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</p>

	of Colorado (San Luis Valley).
Aminopyralid + metsulfuron <i>Opensight</i>	Rate: 3.3 oz product/acre Timing: Optimum timing is when the plants are in the bloom stage. Remarks: Follow label restrictions. Not registered for use in California.
Dicamba + 2,4-D	Rate: 1 pt dicamba product/acre + 3 pt 2,4-D product/acre (0.5 lb a.e. + 1.5 lb a.e./acre) Timing: Postemergence from bolting to early bud stage. Remarks: See 2,4-D.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate <i>Roundup, Accord XRT II,</i> and others	Rate: Broadcast foliar treatment: 4 qt product (<i>Roundup ProMax</i>)/acre (4.5 lb a.e./acre). Spot treatment: 2% v/v solution Timing: Postemergence in the early bud stage. Remarks: Glyphosate is a nonselective herbicide. Spot treatment may be the best approach where feasible. Glyphosate has no soil activity. Repeat applications may be necessary. Drought stress will limit its effectiveness and its effectiveness is increased by the addition of ammonium sulfate.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Chlorsulfuron <i>Telar</i>	Rate: 1 oz product/acre (0.75 oz a.i./acre) Timing: Postemergence from bud to bloom stages, or to rosettes in fall. Remarks: Chlorsulfuron is one of the most effective treatments for treatments for control of the <i>Cardaria</i> species. It has mixed selectivity, but is generally safe on grasses. 2,4-D at 1 to 2 pt product/acre can be tank-mixed with chlorsulfuron for quicker burndown. Use a surfactant. Chlorsulfuron has fairly long soil residual activity. <i>Telar</i> can be used near water, but cannot be applied to water.
Imazapic <i>Plateau</i>	Rate: 8 to 12 oz product/acre (2 to 3 oz a.e./acre) Timing: Postemergence after blossoms open until plants desiccate. Fall rosettes may also be treated. Remarks: Imazapic is safe to apply to most native grasses. Higher rates may suppress seed of some cool-season grasses. Imazapic is not registered for use in California.
Imazapyr <i>Arsenal, Habitat, Stalker,</i> <i>Chopper, Polaris</i>	Rate: 1 to 2 pt product (<i>Habitat</i>)/acre (0.25 to 0.5 lb a.e./acre) Timing: Most effective when applied postemergence in spring when plants are flowering. Remarks: Imazapyr is a nonselective herbicide. It has long soil residual activity and leaves more bare ground than other treatments, even a year after application. Add a spray adjuvant.
Metsulfuron <i>Escort</i>	Rate: 1 oz product/acre (0.6 oz a.i./acre) Timing: Postemergence from pre-bloom to bloom stages or to rosettes in fall. Remarks: The effectiveness of metsulfuron is similar to chlorsulfuron. It has mixed selectivity, but is generally safe on grasses. 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 <i>Cimarron Max</i> (metsulfuron + dicamba + 2,4-D), <i>Opensight</i> (metsulfuron + aminopyralid), and <i>Cimarron X-tra</i> (metsulfuron + chlorsulfuron). Metsulfuron typically controls hoary cress for more than one season, but its soil activity is marginal, and seedlings of <i>Cardaria</i> species may invade shortly after application. Metsulfuron is not registered for use in California.
Sulfometuron <i>Oust</i> and others	Rate: 3 to 5 oz product/acre (2.25 to 3.75 oz a.i./acre) Timing: Preemergence or postemergence during or just before the rainy season when the target plants are germinating and growing rapidly. Remarks: Add a surfactant to improve control. Sulfometuron has a long soil residual and is susceptible to off-site movement in dry light windblown soils. Use with extreme care if near crops.

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.