Rubus armeniacus Focke

Himalaya blackberry

Family: Rosaceae
Range: Common throughout the western United States, except in Wyoming, North and South Dakota.
Habitat: Disturbed, open, moist sites such as canals, ditch banks, fencerows, roadsides, open fields, and riparian zones, in a variety of plant communities. It can also tolerate periodic flooding with brackish water.
Origin: A cultivar introduced from Eurasia, originating from Armenia, quickly spread throughout Europe and the rest of the world.
Impact: Himalaya blackberry is a highly competitive plant with a growth form that allows it to quickly crowd out native species. Its thickets have dense canopies allowing little light penetration and reducing the growth of understory plants. In riparian areas it can prevent access to water sources for livestock and wildlife.
Western states listed as Noxious Weed: California, Oregon
California Invasive Plant Council (Cal-IPC) Inventory: High Invasiveness

Himalaya blackberry is an evergreen erect shrub that grows up to 10 ft tall and is climbing, mounded, or trailing. The aboveground canes are usually biennial while the roots are perennial. The roots are found in the top 20 inches of the soil but may grow down to a depth of 7 ft in loose soil. The roots can sprout new shoots from root buds, and in good conditions root fragments may sprout a new plant. The stems are green to purplish-red, woody, strongly angled, and are protected against predation by straight or curved pickles with a thick base. The leaves are pinnately compound with 3 to 5 leaflets that are dark green with a white underside covered with dense short hairs. The leaflets are broadest above the middle, toothed and sometimes shallowly lobed.

The flowers of Himalaya blackberry are white to pinkish and numerous in non-glandular panicles. They are self-fertile with 5 petals, and numerous stamens and pistils. The fruit are edible and an aggregate of drupelets that adhere to a fleshy receptacle. The mature berries are ovoid to oblong, black, 0.75 inch long, glossy, and glabrous or slightly pubescent. They typically ripen later in the season than the native berries. Seeds are dispersed primarily by birds. In addition to seeds, plants reproduce by root sprouts and stem tip rooting. Seeds likely only survive a few years in the soil.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Hand pulling can be an effective control method for small populations. To successfully control populations with mechanical removal, it is important to remove the canes, roots and the root crowns to prevent resprouting. A Pulaski, mattock or similar device can be used to remove plants. Bulldozing may cause resprouting and can spread the weed by fragmenting roots and stems. Cutting and removing only the aboveground biomass will result in the stimulated growth of root sprouts. The root sprouts must be controlled and repeated cutting of the above-ground biomass during flowering time will exhaust the root stores. Tillage can be effective if the canes are raked and removed from the site. However, this will cause significant soil disturbance and is unsuitable in riparian areas.
Cultural	Goats will readily consume Himalaya blackberry and could help to control new populations. It is a common

	method of management in Australia and New Zealand. Their consumption is indiscriminate and could result in the loss of other desirable species. This is particularly true in riparian areas. Burning is only effective if the root sprouts are controlled by other methods, such as chemicals, when they resprout after the burn.
Biological	Blackberry leaf rust fungus (*Phragmidium violaceum*) was discovered in 2005 on the coast of Oregon and has since spread through most of the counties. It appears to have been accidentally introduced. It partially to fully defoliates Himalaya blackberry and evergreen blackberry (*Rubus laciniatus*) and also reduces tip rooting. The fungus is native to Europe, the Middle East and Africa and has been used for years to control native blackberry plants in Australia and New Zealand. It is not an approved biocontrol agent yet and has not shown sustained control of Himalaya blackberry over a wide region.

CHEMICAL CONTROL

The following specific use information is based on 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. Excellent control information, both chemical and non-chemical, can be obtained at http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7434.html#MANAGEMENT and http://extension.oregonstate.edu/catalog/pdf/em/em8894.pdf.

GROWTH REGULATORS	
Dicamba *Banvel*, *Clarity*	**Rate:** 1 to 2 pt product/acre (0.5 to 1 lb a.e./acre) **Timing:** Postemergence, to weed regrowth in the late summer or fall following a mowing or tillage treatment. **Remarks:** Dicamba provides only suppression of growth. It is a broadleaf-selective herbicide often combined with other active ingredients, particularly 2,4-D. Tank mix combinations with glyphosate are also more effective. It may injure grasses at higher rates. Do not apply when outside temperatures exceed 80°F. Do not exceed 64 oz product/acre per year.
Fluroxypyr *Vista XRT*	**Rate:** 22 oz product/acre (7.7 oz a.e./acre) **Timing:** Postemergence when target plants are growing rapidly. **Remarks:** Reduced control occurs if plants are under stressed growth conditions.
Triclopyr *Garlon 3A*, *Garlon 4 Ultra*, *Pathfinder II* Aminopyralid + triclopyr (*Capstone*)	**Rate:** Broadcast foliar treatment: 4 pt product (*Garlon 4 Ultra*)/acre (2 lb a.e./acre). Spot treatment: 0.75 to 1% *Garlon 4 Ultra* or 1% *Garlon 3A*; thoroughly cover the foliage. Basal bark treatment: 20% *Garlon 4 Ultra* mixed with basal oil or seed oil; *Pathfinder II* is a ready-to-use triclopyr/oil mix. Dormant stem and leaf treatment: 1% v/v solution of *Garlon 4 Ultra* with 2 to 3% v/v crop oil concentrate or seed oil. For *Capstone* use 8 to 9 pt product/acre. **Timing:** Postemergence in mid-summer or early fall after flowering and start of fruit set. Basal bark applications can be made almost any time of the year, even after leaves have senesced (aged, dried, and fallen from plant). In areas where people frequently harvest the fruit of wild blackberries, a mid-fall basal bark treatment might be desirable to avoid human contact with the chemical. For dormant stem and leaf treatment apply to dormant leaves and stems in late fall and winter in a 3% crop oil concentrate mixture. Spray the plant until it is thoroughly wet but not to the point of runoff. Like basal bark treatments, the timing of this technique prevents human contact with the herbicide during berry-picking season. **Remarks:** Foliage or stems (dormant stem application) must be thoroughly wet. Triclopyr is broadleaf-selective and safe on most grasses. It is most effective on smaller plants and has little or no residual activity. For basal bark treatment, thoroughly cover a 12 to 15-in basal section of the stem with spray but not to the point of runoff. *Garlon 3A* and other amine formulations are registered for aquatic use. Ester formulations (e.g., *Garlon 4 Ultra*) may volatilize if applied in warm temperatures. Application in some counties and grape-growing areas may be restricted. Sometimes aminopyralid + triclopyr (*Capstone*) or glyphosate and triclopyr (1% solution each) are used to achieve better control.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Roundup*, *Accord XRT II*, and others	**Rate:** Broadcast foliar treatment: 2 to 3 qt product (*Roundup ProMax*)/acre (2.25 to 3.4 lb a.e./acre). Spot treatment: 0.5 to 1.5% v/v solution. **Timing:** Postemergence in late summer to early fall when canes are growing rapidly, have reached full

	leaf maturity, and after berries are formed. Fall treatments must be made before a killing frost. **Remarks:** Fall treatment symptoms may not show before frost. Retreatment may be necessary for complete control. Trailing blackberry is more difficult to control. Glyphosate controls grasses in the treated area as well as other vegetation. To obtain good control complete foliage coverage (spray-to-wet) is essential. Burning or mowing 40 to 60 days after spraying with glyphosate increases the level of control and also contributes to pasture establishment by removing stem debris. Shoots recovering from sublethal glyphosate treatment tend to die more quickly when subjected to heavy grazing. Sometimes glyphosate and triclopyr (1% each in solution) are used in combination to achieve better control.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Metsulfuron *Escort*	**Rate:** 0.5 to 1 oz product/acre (0.3 to 0.6 oz a.i./acre) **Timing:** Postemergence, to fully leafed-out vegetation before fall leaf coloration. **Remarks:** Metsulfuron is primarily active on broadleaf species. Apply only to pasture, rangeland, and non-crop sites. Do not apply when plants are under stressed growing conditions. Metsulfuron can be used in a premix with aminopyralid (*Opensight*) or a tank mix with triclopyr for better control. Metsulfuron and its formulations are not registered for use in California.
Sulfometuron *Oust* and others	**Rate:** 3 to 4 oz product/acre (2.25 to 3 oz a.i./acre) **Timing:** Early postemergence when target plants are germinating or actively growing. Will only be effective on very small plants and not on fully mature plants. **Remarks:** Add a surfactant at 0.25% v/v for improved control.
PHOTOSYNTHETIC INHIBITORS	
Hexazinone *Velpar L*	**Rate:** 3 to 4 gal product/acre (6 to 8 lb a.i./acre) **Timing:** Preemergence or postemergence when plants are germinating or actively growing. **Remarks:** Hexazinone is used as a nonselective herbicide in non-cropland areas and as a selective herbicide in reforestation practices. It only suppresses the growth of Himalaya blackberry. Use higher rates on fine textured soils and soils with high organic matter. Do not apply to frozen ground. Non-target plants may be adversely affected from drift and run-off. Apply when there is adequate moisture for activation. Hexazinone can be mixed with triclopyr for better control. High rates of hexazinone can create bare ground, so only use high rates in spot treatments.
Tebuthiuron *Spike*	**Rate:** 20 lb product (*Spike 20P*)/acre (4 lb a.i./acre) **Timing:** Preemergence before the start of spring growth or before expected seasonal rainfall. **Remarks:** Do not apply tebuthiuron at more than 20 lb/acre. Do not apply more than 10 lb/acre in areas that receive 20 inches or less of annual rainfall. May injure non-target species. Follow restrictions on the label for use around desirable plants.

ECOMMENDED 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.

Centaurea solstitialis L.

Yellow starthistle

Family: Asteraceae
Range: Most contiguous states, except a few southern and northeastern states.
Habitat: Open disturbed sites, open hillsides, grassland, rangeland, open woodlands, fields, pastures, roadsides, waste places. May also inhabit cultivated fields. Does not tolerate low light areas or shading.
Origin: Southern Europe. Accidentally introduced as a seed contaminant in alfalfa. It has spread rapidly since its introduction into California in the mid-1800s.
Impacts: Plants are highly competitive and typically develop dense, impenetrable stands that displace desirable vegetation in natural areas, rangelands, roadsides and other places. Yellow starthistle is considered one of the most serious rangeland weeds in the western U.S. Yellow starthistle is sometimes problematic in grain fields, where the seeds can contaminate the grain harvest and lower its quality and value. Yellow starthistle contains an unidentified compound that causes nigropallidal encephalomalacia or chewing disease in horses.
Western states listed as Noxious Weed: Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington
California Invasive Plant Council (Cal-IPC) Inventory: High Invasiveness

Yellow starthistle is a simple to bushy winter annual, occasionally biennial, with spiny yellow-flowered heads and stiff wiry stems to 6 ft tall. Plants form a basal rosette of leaves until mid-spring. Stem leaves are alternate and mature foliage is grayish- to bluish-green, densely covered with fine white cottony hairs. Its leaf bases form wings along the stems. Rosette leaves typically wither by flowering time. The taproot can extend deep into the soil (> 6 ft) allowing plants to utilize deep soil moisture not available to other annual species, particularly grasses.

The flowerheads are solitary on stem tips, and consist of numerous yellow disk flowers. The phyllaries are densely to sparsely covered with cottony hairs or with patches of hairs at the bases of the spines. The central spine of the main phyllaries is 10 to 25 mm long, stiff, yellowish to straw-colored throughout. Yellow starthistle reproduces only by seed and develops two types of achenes. The outer ring of achenes is a dull dark brown, often speckled with tan, lacking pappus bristles, and often remaining in heads. The inner achenes are glossy, gray or tan to mottled cream-colored and tan, with slender white pappus bristles 2 to 5 mm long. Most seeds fall near the parent plant. Some seed is viable 8 days after flower initiation. Large flushes of seeds typically germinate after the first fall rains, but smaller germination flushes can occur during winter and early spring. Seeds can survive for up to about 10 years in the field under certain environmental conditions, but it appears that few seeds survive beyond 4 years.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Hand removal, mowing, or cultivation, when used to prevent seed production over 2 to 3 years or more (the soil life of the seeds), can reduce or eliminate an infestation. Manual removal of yellow starthistle is most effective with small patches or in maintenance programs where plants are sporadically located in the grassland system. This usually occurs with a new infestation or in the third year or later in a long-term management program. These methods can also be important in steep or uneven terrain where other mechanical tools (e.g., mowing) are impossible to use. To ensure that

	plants do not recover it is important to detach all above-ground stem material. Leaving even a 2-inch piece of the stem can result in recovery if leaves and buds are still attached to the base of the plant. The best timing for manual removal is after plants have bolted but before they produce viable seed (i.e. early flowering). At this time, plants are easy to recognize, and some or most of the lower leaves have senesced. If hand removal is conducted after plants begin to produce seeds, it may be necessary to put pulled plants in bags and remove them from the site. Hand removal is particularly easy in areas with competing vegetation. Under this condition, yellow starthistle will develop a more erect slender stem with few basal leaves. These plants are relatively brittle and easy to remove. In addition, they usually lack leaves at the base and, consequently, rarely recover even when a portion of the stem is left intact. Hand removal options for yellow starthistle typically include hand pulling, hoeing, or string trimming. Systematic surveys and repeated removal should be conducted every 2 to 4 weeks throughout the growing season. Mowing is most effective when 2 to 5% of the total population of seedheads is in bloom. Mowing too early can result in higher seed production. Plants should be cut below the height of the lowest branches. It will require multiple years of continuous mowing to successfully manage yellow starthistle. Mowing is best used in an integrated approach. Since it is a late season management tool, it is best employed in the later years of a long-term management program or in a lightly infested area. Mowing is not feasible in many locations due to rocks and steep terrain. Mowing is not always successful and can decrease the reproductive efforts of insect biocontrol agents, injure late growing native forb species, and reduce fall and winter forage for wildlife and livestock. The success of mowing depends on proper timing and the growth form of the plant. Mowing too early (before seedheads reach spiny stage) or too late (after seed set) will usually increase the yellow starthistle problem. Mowing too early in the season can remove competitive grass cover and promote vigorous yellow starthistle regrowth. If done too late, mowing scatters yellow starthistle seed. Best results were obtained by mowing once at the early flowering stage, and again 4 to 6 weeks later to cut regrowth during the floral bud stage. A dense spring canopy of desirable vegetation optimizes yellow starthistle control. Yellow starthistle plants with an erect, high-branching growth form are effectively controlled by a single mowing at the early flowering stage, while sprawling low-branching plants cannot be controlled even with repeated mowing. Despite its limitations, mowing conducted at the early flowering stage, before viable seed production, can be very effective for yellow starthistle control. Anecdotal information also indicates that mowing the standing skeletons in fall, before the first rains, can form a mulch that blocks light and suppresses subsequent germination of yellow starthistle. A flail mower is considered best. The yellow starthistle litter layer may be less suppressive to grass germination, as it is not as light dependent as yellow starthistle. Tillage is effective, and is occasionally used on roadsides. It is also often used in agricultural lands, which is probably why yellow starthistle is not a significant cropland weed. In wildlands and rangelands, tillage is usually not appropriate because it can damage important desirable species, increase erosion, alter soil structure, and expose the soil for rapid reinfestation if subsequent rainfall occurs. Any tillage operation that severs the roots below the soil surface can effectively control yellow starthistle. Early summer tillage, before viable seeds are set, and repeated tillage following rainfall/germination events will rapidly deplete the yellow starthistle seed bank, but may also have the same effect on the seed bank of desirable species.
Cultural	High-intensity short-duration grazing by sheep, goats, or cattle should be implemented during the period when yellow starthistle plants have bolted to just before they produce spiny heads. Cattle and sheep avoid yellow starthistle once the buds produce spines, whereas goats continue to browse plants even in the flowering stage. For this reason, goats have become a more popular method for controlling yellow starthistle in relatively small infestations. Grazing the weed during the bolting stage can provide palatable high protein forage (8 to 14%). This can be particularly useful in late spring and early summer when other annual species have senesced. Grazing alone will not provide long-term management or eradication of yellow starthistle, but can be a valuable tool in an integrated management program. This prescription must be continued for at least 3 years in a severe infestation to reduce the yellow starthistle seed bank. Prescribed burns can provide control if conducted at the proper timing. Burning should be timed to coincide with the very early yellow starthistle flowering stage. At this time yellow starthistle has yet to produce viable seed, whereas seeds of most desirable species have dispersed and grasses have dried to provide adequate fuel. Fire has little if any impact on seeds in the soil. Burning at other times may enhance yellow starthistle survival by removing the thatch and encouraging seed germination in fall. The ability to use repeated burning depends on climatic and environmental conditions. In areas where

	resources are ample and total plant biomass is abundant, 2 or 3 consecutive years of burning may be practical. However, in other situations, fuel loads may not be sufficient to allow multiple year burns. Consequently, prescribed burning may be more appropriate as part of an integrated approach. Air quality issues can be significant when burns are conducted adjacent to urban areas. A major risk of prescribed burning is the potential of fire escapes. This risk is greatest when burns are conducted during the summer months. In some areas, burning can lead to rapid invasion by other undesirable species with wind-dispersed seeds, particularly members of the sunflower family. In addition to summer burning, yellow starthistle seedlings have been controlled using winter or early spring flaming. This technique is somewhat nonselective, and control of yellow starthistle is inconsistent. When spring drought follows a flaming treatment, control of yellow starthistle can be excellent. In contrast, a wet spring can lead to complete failure and increased yellow starthistle infestation, particularly since competing species may be dramatically suppressed.
Biological	Six insects have become established for the control of yellow starthistle in the western United States. These include three species of weevils (seed-head weevil [*Bangasternus orientalis*], flower weevil [*Larinus curtus*], and the hairy weevil [*Eustenopus villosus*]), and three species of flies (seed-head fly [*Urophora sirunaseva*], peacock fly [*Chaetorellia australis*], and the false peacock fly [*Chaetorellia succinea*]). All six insects attack the flower heads of yellow starthistle and produce larvae that develop and feed within the seedhead. Of these, only four have become well established. Of these, only two, *Eustenopus villosus* and *Chaetorellia succinea*, have any significant impact on reproduction. The combination of these two insects reduces seed production by 43 to 76%. Although this level of suppression is not sufficient to provide long-term yellow starthistle management, the use of biological control agents can be an important component of an integrated management approach. A more successful biological control program will likely require the introduction of plant pathogens or other insects which attack roots, stems, or foliage. A new potential biological control agent is a root-feeding weevil, *Ceratapion basicorne*, that has shown promise under greenhouse conditions. It has yet to be approved, but is expected to be released in the next couple of years. The most widely studied pathogen for yellow starthistle control is the Mediterranean rust fungus *Puccinia jaceae*. It can attack the leaves and stem of yellow starthistle, causing enough stress to reduce flowerhead and seed production. Although it has been released it does not seem to have much impact on yellow starthistle populations.

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 1.5 pt product/acre (0.48 to 0.72 lb a.e./acre) for small rosettes, 2 to 4 pt product/acre (0.95 to 1.9 lb a.e./acre) for larger plants up to bolting **Timing:** Postemergence from rosette to beginning of bolting, but before flowering. **Remarks:** 2,4-D controls larger plants well, but is not considered as effective as other growth regulator herbicides for season-long control. It is broadleaf-selective and may injure other non-target species, particularly crop plants. 2,4-D has no 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 from volatility.
Aminocyclopyrachlor + chlorsulfuron *Perspective*	**Rate:** 3 to 5 oz product (*Perspective*)/acre **Timing:** Postemergence and preemergence. Postemergence applications are most effective when applied to plants from the seedling to the mid-rosette stage. **Remarks:** Aminocyclopyrachlor gives control of yellow starthistle similar to aminopyralid. *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:** 3 to 5 oz product/acre (0.75 to 1.25 oz a.e./acre). Use higher rates when weeds are larger. **Timing:** Postemergence and preemergence. Postemergence applications are most effective when applied to plants from the seedling to the mid-rosette stage. Earlier applications (i.e., in fall) may not provide full-season control, and later applications (bolting to early spiny stage) will require higher rates. **Remarks:** Aminopyralid is one of the most effective herbicides for the control of yellow starthistle. It is safe on grasses, although preemergence application at high rates can greatly suppress invasive annual grasses, such as medusahead. Aminopyralid has a longer residual and higher activity than clopyralid. Other members of the Asteraceae and Fabaceae are very sensitive to aminopyralid. 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. Other premix formulations of aminopyralid can also be used for yellow starthistle control. These include *Opensight* (aminopyralid + metsulfuron; 1.5 to 2 oz product/acre) and *Forefront HL* (aminopyralid + 2,4-D; 2 to 2.6 pt product/acre), both applied at the rosette to bolting stages.
Clopyralid *Transline*	**Rate:** 0.25 to 0.67 pt product/acre (1.5 to 4 oz a.e./acre). Seedlings and rosettes can be treated at the lower rate, but bolted plants should be treated at higher rates. **Timing:** Postemergence and preemergence. For postemergence application, apply to plants from seedling to mid-bolting stage. However, since clopyralid has a shorter soil residual compared to aminopyralid, optimal timing is at the later rosette stages, but before bolting. Earlier applications (i.e., in fall) may not provide full-season control, and later applications (bolting to early spiny stage) will require higher rates and may not give sufficient control. **Remarks:** Clopyralid gives excellent control of yellow starthistle. While it is very safe on grasses, it will injure many members of the Asteraceae, particularly thistles, and can also injure legumes, including clovers. Most other broadleaf species and all grasses are not injured. When clopyralid is used to control seedlings a surfactant is not necessary. However, when treating older plants or plants exposed to moderate levels of drought stress, surfactants can enhance the activity of the herbicide.
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 pt product/acre (0.25 lb a.e./acre) for seedlings, 1 to 1.5 pt product/acre (0.5 to 0.75 lb a.e./acre) for larger plants up to bolting. **Timing:** Postemergence to plants from rosette to beginning of bolting. **Remarks:** Dicamba is a broadleaf-selective herbicide often combined with other active ingredients. It is not typically used alone to control yellow starthistle. Dicamba is available mixed with diflufenzopyr in a formulation called *Overdrive*. This has been reported to be effective on yellow starthistle. Diflufenzopyr is an auxin transport inhibitor which causes dicamba to accumulate in shoot and root meristems, increasing its activity. *Overdrive* is applied postemergence at 4 to 8 oz product/acre to rapidly growing plants. Higher rates should be used on large annuals. Add a non-ionic surfactant to the treatment solution at 0.25% v/v or a methylated seed oil at 1% v/v solution.
Picloram *Tordon 22K*	**Rate:** 1 to 1.5 pt product/acre (4 to 6 oz a.e./acre) **Timing:** Postemergence and preemergence. Postemergence applications should be made to plants from rosette to bud formation stage. Apply when there is adequate soil moisture and weeds are growing rapidly. **Remarks:** Picloram acts much like aminopyralid, aminocyclopyrachlor, and clopyralid, but gives a broader spectrum of control and has much longer soil residual activity. It can provide about 2 to 3 years of control. Most broadleaf plants are susceptible. 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. Do not apply near trees. *Tordon 22K* is a federally restricted use pesticide. Picloram is not registered for use in California.

Triclopyr *Garlon 3A, Garlon 4 Ultra*	**Rate:** 1 pt *Garlon 4 Ultra* or 1.33 pt *Garlon 3A*/acre (0.5 lb a.e./acre) for seedlings, up to 3 pt *Garlon 4 Ultra* or 4 pt *Garlon 3A*/acre (1.5 lb a.e./acre) for larger plants. **Timing:** Postemergence from seedling to bolting stage. **Remarks:** Triclopyr has little to no residual activity. It is broadleaf-selective and typically does not harm grasses. *Garlon 4 Ultra* is formulated as a low volatile ester. However, in warm temperatures, spraying onto hard surfaces such as rocks or pavement can increase the risk of volatilization and off-target damage.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Roundup*, *Accord XRT II*, and others	**Rate:** Broadcast foliar treatment: 1.33 to 2.67 qt product (*Roundup ProMax*)/acre (1.5 to 3 lb a.e./acre). Spot treatment: 1% to 2% v/v solution **Timing:** Postemergence to plants from bolting to beginning of flowering. **Remarks:** Glyphosate is the most effective herbicide for late season control. Good coverage, clean water, and rapidly growing yellow starthistle plants are all essential for adequate control. It has no soil activity and is nonselective. To achieve selectivity, it can be applied using a wiper or spot treatment to control current year's plants.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Chlorsulfuron *Telar*	**Rate:** 1.33 to 2.6 oz product/acre (1 to 1.95 oz a.i./acre) **Timing:** Preemergence activity only. Chlorsulfuron does not have postemergence activity on yellow starthistle and must be used in combination with 2,4-D, dicamba, or triclopyr to provide effective control. **Remarks:** Chlorsulfuron has mixed selectivity on both broadleaf and grass species but is generally safe on grasses. It has fairly long soil residual activity. Herbicide solution requires constant agitation during application.
Imazapyr *Arsenal*, *Habitat*, *Stalker*, *Chopper*, *Polaris*	Not often used for yellow starthistle control but has been shown to be somewhat effective at 3 to 4 pt product/acre. It has preemergence and some postemergence activity, and a long soil residual.
Sulfometuron *Oust* and others	Not often used for yellow starthistle control but has been shown to be somewhat effective at 1 to 2 oz product/acre. It has preemergence activity only, and a long soil residual.
PHOTOSYNTHETIC INHIBITORS	
Hexazinone *Velpar L*	Not often used for yellow starthistle control but has been shown to be somewhat effective at 1 to 2.5 gal product/acre. It has preemergence activity only, and a long soil residual. High rates of hexazinone can create bare ground, so only use high rates in spot treatments.

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.

Genista monspessulana (L.) L.A.S. Johnson

French broom

Family: Fabaceae
Range: Along the Pacific coast from southern British Columbia to southern California.
Habitat: Grasslands, shrublands, oak woodlands, forest margins, coastal habitats, riparian corridors and disturbed sites such as roadsides, pasture, burned areas, or cleared forests. Grows under varied soil moisture conditions but seems to prefer siliceous soils. Unlike other brooms in California, it grows reasonably well on alkaline soils.
Origin: Native to the Mediterranean region and Azores. Introduced to the U.S. in the 1850s as an ornamental.
Impacts: Grows rapidly and forms dense stands that most wildlife find impenetrable and unpalatable. Dense stems inhibit regeneration of most other plant species, and the accumulation of woody biomass creates a fire hazard. Broom can fix nitrogen, enabling the plant to colonize and dominate areas with poor soil. Increased soil fertility gives a competitive advantage to other non-native weeds that thrive on high nitrogen levels.
Western states listed as Noxious Weed: California, Oregon, Washington (proposed)
California Invasive Plant Council (Cal-IPC) Inventory: High Invasiveness

French broom is an upright, evergreen shrub, commonly less than 10 ft tall. Stems are green, erect, dense, and covered with silky, silvery hairs. French broom is typically leafy as compared with Scotch or Spanish broom, which have few leaves. The leaves are composed of three leaflets 0.4 to 0.8 inch long, oblong to obovate, with length about twice the width, and upper and lower surfaces sparsely to densely covered with silky, silvery hairs.

French broom produces yellow, pea-shaped flowers in dense clusters of 4 to 10 flowers on short axillary shoots. Reproduction is by seed and plants begin flowering from 18 months to 3 years of age. The seeds are produced in small, flattened pods 0.5 to 1 inch long. Pods are dark brown when mature, contain 5 to 8 seeds, and are densely covered with appressed, long silky hairs. When mature, pods eject the seeds several feet from the plant. Seeds can remain viable in the soil for up to 30 years. Large soil seedbanks often accumulate, making long term control difficult. Shrubs may live for up to 30 years.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Hand pulling can remove seedlings and small shrubs, but this technique is generally not effective on established shrubs. For larger established shrubs, a weed wrench or other woody weed extractor can be used. Care must be taken to extract the entire root or stump sprouting will occur. Best results are achieved when soil is moist. Disturbing the soil can stimulate the seedbank. Cutting broom to the ground in spring before it flowers will reduce the number of seeds and will deplete the plant's energy reserves. Resprouts are common after treatment, but can be reduced by cutting broom at the end of the dry season. Cutting should be combined with an herbicide treatment or with multiple cuttings over a period of years. Cut shrubs at ground level with power or manual saws. Heavy equipment can be effectively used to control broom in areas where soil disturbance and nonselective species removal are not important considerations. Stumps remaining following such treatment will require herbicide application to prevent regrowth.
Cultural	Flowers and seeds of brooms contain quinolizidine alkaloids and can be toxic to humans and livestock when ingested. Foliage may be mildly toxic and is unpalatable to most livestock, except goats. Goats confined to a small area can help control resprouting stands after a cutting or burn treatment. Goats can be trained to be quite selective at least within the vegetation structure, for example they can effectively strip flowers.

	Burning alone is not an effective method for controlling broom. Although burning can remove debris, in many cases it can increase the population as it removes competitive vegetation, releases nutrients into the soil, and stimulates the germination of broom seeds in the soil. Burning is more effective when followed by herbicide application, subsequent burnings, and/or revegetation with desirable species. It is important to employ a control strategy following a burn; otherwise the broom population in subsequent years may become worse than before.
Biological	There are no USDA-approved biocontrol agents for French broom. The native pyralid moth, *Uresiphita reversalis*, defoliates some French broom, but plants grow new leaves after the larvae metamorphose. An insect introduced for control of Scotch broom, the Scotch broom bruchid (*Bruchidius villosus*), also attacks French broom.

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 REGULATOR	
Picloram *Tordon 22K*	**Rate:** Broadcast foliar treatment: 2 qt product/acre (non-cropland) or 1 qt product per acre (rangeland) plus 0.25 to 0.5% v/v surfactant to thoroughly wet all leaves. **Timing:** Postemergence foliar treatments are best when plants are growing rapidly at or beyond early to full bloom stage. **Remarks:** High levels of picloram can give long-term soil activity for broadleaves. Picloram is a restricted use herbicide. It is not registered for use in California.
Triclopyr *Garlon 3A*, *Garlon 4 Ultra*, *Pathfinder II* Aminopyralid + triclopyr *Capstone*	**Rate:** Foliar treatment: 0.75 to 1.5% v/v solution of *Garlon 4 Ultra*, or 1 to 1.5% *Garlon 3A* and water plus 0.25 to 0.5% surfactant v/v to thoroughly wet all leaves. Low volume/thinline treatment: 10% v/v solution of *Garlon 4 Ultra* plus a 20% v/v seed oil in water. Basal cut stump treatment: 20% *Garlon 4 Ultra* v/v in water. Cut stump treatment: undiluted *Garlon 3A* or 50% *Garlon 3A* in water. Basal bark treatment: 20% v/v *Garlon 4 Ultra* in 20% v/v ethylated crop oil and water, or *Pathfinder II* as a ready-to-use formulation. Use *Capstone* at 8 to 9 pints per acre. **Timing:** Postemergence when plants are growing rapidly. Cut stump and basal bark treatments can be applied anytime although they are optimal if not applied when sap is rising in the early spring. **Remarks:** Triclopyr is a selective herbicide for broadleaf species and will not damage desirable grasses growing nearby. For cut stump treatments, cut stems horizontally at or near ground level and immediately apply *Garlon 3A* solution. Suckering from the roots typically occurs after cutting, but the treatment should control most resprouts. For basal bark treatment, spray the lower trunk, including the root collar, to a height of 12-15 inches from the ground; the spray should wet the lower stem but not to the point of runoff. Plants should not be cut for at least one month after basal bark treatments.
Triclopyr + 2,4-D *Crossbow*	**Rate:** For foliar treatment: 0.5 to 1.5% v/v solution of *Crossbow* and water to thoroughly wet all leaves. **Timing:** Apply when plants are growing rapidly. **Remarks:** *Crossbow* in water forms an emulsion (not a solution).
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Roundup*, *Accord XRT II*, and others	**Rate:** Spot treatment: 1.5 to 2% v/v solution of *Roundup ProMax* (or other trade name with similar concentration of glyphosate) in water to thoroughly wet all leaves. Low volume/thinline treatment: 10% v/v solution of *Roundup* (or other trade name) in water. Cut stump treatment: 25% v/v *Roundup* (or other trade name) in water; 50% can reduce resprouting but may exceed label rate if stands are dense. **Timing:** Postemergence when plants are growing rapidly. Foliar treatments should be made in late summer or early fall. For cut stump treatment, application in late summer, early fall or dormant season provides best control. Stumps should be treated immediately after cutting. **Remarks:** Glyphosate is a nonselective systemic herbicide. It gives good control with some resprouts. Plants should not be cut for at least 4 months after foliar treatments. Cut stump applications are made as described for triclopyr.

BRANCHED-CHAIN AMINO ACID INHIBITORS	
Imazapyr *Arsenal*, *Habitat*, *Stalker*, *Chopper*, *Polaris*	**Rate:** Cut stump treatment: 20% v/v solution of *Stalker* plus a 20% v/v ethylated crop oil in water or 20% *Habitat* v/v in 80% water carrier. Basal bark treatment: 20% v/v solution of *Stalker* plus a 20% v/v ethylated crop oil in water. **Timing:** Best when applied in late summer to early fall, but before leaf drop. **Remarks:** Imazapyr is a soil residual herbicide and may result in bare ground around trees for some time after treatment. Cut stump and basal bark applications are made as described for triclopyr. Plants should not be cut for at least 4 months after basal bark treatment. Other ALS inhibitors, including metsulfuron, have been used effectively to control French broom in Australia.

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.