Isatis tinctoria L.

Dyer's woad

Family: Brassicaceae
Range: Throughout western U.S., except Arizona, North and South Dakota.
Habitat: Disturbed and undisturbed sites, roadsides, railroad rights-of-way, fields, pastures, grain and alfalfa fields, forest and rangeland. Often grows on dry, rocky or sandy soils. Most problematic on rangeland, in disturbed non-crop sites, and in undisturbed natural areas in the intermountain west.
Origin: Native to Europe. Was cultivated for centuries in Europe as a medicinal herb and source of blue dye, and was also cultivated by the early settlers of the eastern states.
Impact: Highly competitive and can grow in large, dense colonies that displace desirable rangeland species, crop plants, and native vegetation. It has a deep taproot (3 to 5 ft long), which makes it extremely competitive, especially on gravelly or sandy soil. The foliage contains compounds that appear to have insecticidal and fungicidal properties. The rotting seed pods are believed to be allelopathic.
Western states listed as Noxious Weed: Arizona, California, Colorado, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington, Wyoming
California Invasive Plant Council (Cal-IPC) Inventory: Moderate Invasiveness

Dyer's woad is an erect biennial, sometimes winter annual or short-lived perennial that grows to heights of 1 to 3 ft, occasionally 4 ft under ideal conditions. The leaves are bluish-green, with a pale midvein, and covered with a powdery white film. Rosette leaves are long and narrow, mostly 1.5 to 7 inches long, 0.4 to 1.5 inches wide, with weakly toothed to wavy margins. The stem leaves are broad to narrowly arrowhead-shaped, alternate and clasping the stem. Plants exist as basal rosettes until flower stems develop at maturity.

Dyer's woad reproduces only by seed. It flowers in spring, producing umbrella-shaped panicles with small, bright yellow, four-petaled flowers. These develop into hanging (pendant) blue/blackish fruits 8 to 18 mm long and 2.5 to 7 mm wide. After senescence, dried plants with a few fruits may persist well into winter. Most fruits fall near the parent plants, but some disperse short distances with wind and to greater distances with water, and as a seed and hay contaminant. New seedlings emerge in fall and early spring. Anecdotal evidence suggests the seedbank may persist for several years. Therefore, several consecutive years of control are generally necessary.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Hand pulling may be very effective provided the crown is removed. Hand pulling is easiest after the plants have bolted but should be done before seed set. It is important to visit the site 2 to 3 weeks later to rogue plants that have resprouted or were missed the first time through. It is necessary to follow up for several years to prevent reinfestation. Mowing is not effective due to resprouting from the crown, but mowing multiple times can reduce root reserves and seed production. Dyer's woad populations can be reduced if seed production can be prevented for a few years by cutting off the seed stalks and removing them from the field. Close clipping (2 inches from the soil surface) is more effective. This should be done as soon as possible after flowering to minimize resprouting and prevent seed production. Multiple visits to the field may be necessary to minimize seed production on resprouting plants. Spring cultivation can control infestations in crop fields but is not practical in most range settings.
Cultural	Livestock generally avoid eating dyer's woad. However, significant reductions in dyer's woad have been observed when livestock are forced under heavy grazing pressure to consume dyer's woad. The plant is more palatable before bolting and grazing should be done before flowering to minimize seed production.

	The effect of fire on dyer's woad is not well known, but it is likely that even if fire kills the above-ground part of the plant, it will regenerate from root buds on the crown.
Biological	Insects for biological control of Dyer's woad are not available in the U.S. but are being evaluated. A native rust fungus (*Puccinia thlaspeos*) causes systemic infection in dyer's woad. Infected plants may appear chlorotic, stunted, malformed and have reduced seed production. Even though the disease is systemic, plants derived from the seed of infected plants did not show symptoms of infection. The effectiveness of this fungus is not known at this time.

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:** Broadcast treatment: 2 to 3 qt/acre (1.9 to 2.85 lb a.e./acre). Spot treatment: 1% v/v solution **Timing:** Postemergence from seedling to rosette stages. **Remarks:** 2,4-D is broadleaf-selective and has no soil activity. It may require repeat application. It is an effective treatment for seedlings that may emerge following mechanical treatments. Do not apply ester formulations when outside temperatures exceed 80°F.
Aminocyclopyrachlor + chlorsulfuron *Perspective*	**Rate:** 4.75 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:** *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).
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Chlorsulfuron *Telar*	**Rate:** 1 to 1.33 oz product/acre (0.75 to 1 oz a.i./acre) **Timing:** Preemergence or postemergence to seedlings and rosettes. **Remarks:** Chlorsulfuron has mixed selectivity, but is generally safe on grasses. Use a surfactant for postemergence applications. Chlorsulfuron is not recommended for late-season applications when the chances for rainfall for incorporation are low. The herbicide has long soil residual activity. *Telar* can be used near water, but cannot be applied to water.
Imazapic *Plateau*	**Rate:** 8 to 12 oz product/acre (2 to 3 oz a.e./acre) **Timing:** Postemergence to rosettes or bolting plants. **Remarks:** Imazapic is will not injure most native grasses. It has mixed selectivity and tends to favor members of the Asteraceae and some grasses. It has some soil residual activity. Use a methylated seed oil surfactant at 0.25%. Imazapic is not registered for use in California.
Metsulfuron *Escort*	**Rate:** 0.5 to 1 oz product/acre (0.3 to 0.6 oz a.i./acre) **Timing:** Postemergence to rapidly growing plants up to early flowering. **Remarks:** Metsulfuron has mixed selectivity, but is generally safe on grasses. Tolerance to metsulfuron increases as the flowering stage progresses. This herbicide applied at any stage has been found to reduce seed development. It can be tank mixed with 2,4-D. Use a surfactant. Metsulfuron is not registered for use in California. Dyer's woad is also on the *Opensight* label (metsulfuron + aminopyralid) at 3.3 oz product/acre. However, this will provide only suppression and a second treatment may be necessary. The addition of 0.5 lb a.e./acre 2,4-D may improve control.

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.