Linaria vulgaris Miller

Yellow toadflax

Family: Scrophulariaceae
Range: Throughout North America and every state except Hawaii.
Habitat: Fields, pastures, riparian areas, rangeland and disturbed sites such as roadsides, forest clearings, and agricultural fields. Grows in most environments and can tolerate many soil types. Often inhabits moist, coarse soils, particularly gravelly or sandy soils. Although it often invades disturbed areas, it has been shown to move into relatively undisturbed prairies and riparian habitats. Tolerates sub-arctic conditions.
Origin: Native to Europe and the Mediterranean region and brought to North America as a garden ornamental in the mid-1600s.
Impacts: Yellow toadflax is highly competitive for soil moisture with winter annuals and shallow-rooted perennials. Large colonies that displace desirable vegetation can develop in natural areas. The plant decreases forage for domestic livestock and some big game species and decreases habitat for associated animal communities. Yellow toadflax contains quinazoline alkaloids that could possibly pose toxicity problems to livestock if ingested in sufficient quantity, but intoxications of livestock have not been reported. Goats and sheep have been known to graze the plants with little effect.
Western states listed as Noxious Weed: Idaho, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Washington, Wyoming

Yellow toadflax is an herbaceous creeping rooted perennial that can reach a height of about 3 ft, but is generally about 1 ft tall. The stems are erect, glabrous to glandular-hairy near the top, but with a woody base. The leaves are pale green, 1 to 2 inches long, linear to narrow, alternate, and sessile.

The flowers are bilateral, resembling snapdragon flowers, and on dense racemes of 15 to 20 flowers in the axils of the upper portion of the stem. The flowers are about 1 inch long, yellow to pale yellow with an orange bearded throat and yellow spur in which nectar collects. The fruits are brown capsules, 0.25 to 0.5 inch long, ovate, and contain multiple flat, dark brown seeds that have a papery wing to aid dispersal. Reproduction is by seed and vegetatively from creeping lateral roots. Most seed falls near the parent plant. Seeds germinate in spring and fall when conditions become favorable. Seedlings compete poorly for soil moisture with established vegetation. Plants can rapidly colonize a site by vegetative reproduction from creeping roots. It is not known how long the seed survive in the soil, but because they are so small, it is likely that they do not survive for more than a couple of years. Yellow and Dalmatian toadflax readily cross to produce a very vigorous intermediate.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Hand pulling is only effective on seedlings before plants become established and the extensive creeping root system develops. Mowing can prevent the plant from going to seed, but mowing also stimulates vegetative reproduction from the lateral roots and rhizomes. Tilling on arable lands can be effective but tilling needs to be done every 7 to 10 days over the course of the season and repeated yearly for several years to eradicate resprouting root fragments.
Cultural	Grazing is not considered an effective control option. Overgrazing can reduce competition and increase site disturbance, creating an ideal environment for toadflax establishment. The plant is not preferred by grazing

	livestock and contains quinazoline alkaloids that are moderately toxic. Fire is not effective because the underground root system is not damaged and will resprout. Reseeding with competitive annual and perennial grasses reduces survival and helps prevent further spread.
Biological	Two insects active on yellow toadflax were accidentally introduced into the United States in the early 1900s. The toadflax flower feeding beetle (*Brachypterolus pulicarius*) and the toadflax capsule weevil (*Gymnetron antirrhini*) are well established in the Pacific Northwest. Both significantly reduce seed production, but do not have a significant impact on populations. However, the most promising biocontrol agent is the toadflax stem-mining weevil (*Mecinus janthinus*). It is too early to know how successful this insect will be.

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:** 2 to 4 pt product/acre (0.95 to 1.9 lb a.e./acre) **Timing:** Postemergence when plants are growing rapidly. Applications in spring provide best control. **Remarks:** 2,4-D is a selective herbicide for broadleaf species. In areas where desirable grasses are growing around toadflax, 2,4-D can be used without non-target damage. Good coverage is necessary. Efficacy is improved when tank-mixed with picloram, chlorsulfuron, or metsulfuron.
Aminocyclopyrachlor + chlorsulfuron *Perspective*	**Rate:** 4 to 6 oz product/acre plus 0.25 to 0.5% v/v surfactant **Timing:** Postemergence when plants are growing rapidly in the bud to bloom 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).
Picloram *Tordon 22K*	**Rate:** 2 qt product/acre (1 lb a.e./acre) plus 0.25 to 0.5% v/v surfactant **Timing:** Postemergence when plants are growing rapidly in spring before full bloom, or in late summer to early fall. **Remarks:** High levels of picloram can give long-term soil activity for broadleaves. Picloram at 2 pt product/acre plus 6 oz *Overdrive*/acre controlled yellow toadflax better (98% control) than picloram at 2 qt product/acre (70% control) 2 years after treatment. *Tordon 22K* is a federally restricted use pesticide. It is not registered for use in California.
Picloram + 2,4-D *Tordon 101M*	**Rate:** 2 qt product/acre plus 0.25 to 0.5% v/v surfactant **Timing:** Postemergence when plants are growing rapidly in spring before full bloom. **Remarks:** May require annual treatment for 2 to 3 years. High levels of picloram can give long-term soil activity for broadleaves. *Tordon 101M* is a federally restricted use pesticide. It is not registered for use in California.
Picloram + chlorsulfuron *Tordon 22K* + *Telar*	**Rate:** 1 qt product/acre *Tordon 22K* + 1.25 oz product/acre *Telar* plus 0.25 to 0.5% v/v surfactant **Timing:** Postemergence when plants are growing rapidly from bloom through fall. Fall treatments give best control. **Remarks:** High levels of picloram can give long-term soil activity for broadleaves. Retreatment may be necessary. *Tordon 22K* is a federally restricted use pesticide. It is not registered for use in California.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate	**Rate:** Broadcast treatment: 1 to 2 qt product (*Roundup ProMax*)/acre (1.1 to 2.25 lb a.e./acre). Spot

Roundup, Accord XRT II, and others	treatment: 1.5 to 2% solution v/v *Roundup* (or other trade name) and water to thoroughly wet all leaves **Timing:** Postemergence when plants are growing rapidly. Applications in early spring provide best control. **Remarks:** Glyphosate is a nonselective systemic herbicide with no soil activity. Repeated applications may be necessary for complete control.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Chlorsulfuron *Telar*	**Rate:** 2 to 2.6 oz product/acre (1.5 to 1.95 oz a.i./acre) plus 0.25 to 0.5% v/v surfactant **Timing:** Postemergence when plants are growing rapidly in the bud to bloom stage. **Remarks:** Chlorsulfuron is a selective herbicide effective for controlling broadleaves and grasses. While it is often stated that *Telar* provides only suppression of yellow toadflax and is often tank mixed with picloram or 2,4-D, this depends on the timing of the application. *Telar* will control yellow toadflax, but timing is of critical importance. In a research report, 1.75 oz product/acre *Telar* gave 76 to 98% control 2 years after treatment. This treatment was applied when most of the shoots had already flowered so that adventitious root bud activity had begun.
Imazapic *Plateau*	**Rate:** 12 oz product/acre (3 oz a.e./acre) plus 1 qt/acre methylated seed oil in the spray mix **Timing:** Postemergence in fall when top 25% of the plant is necrotic, usually after a hard frost. **Remarks:** Imazapic is a selective postemergence herbicide effective for controlling broadleaf weeds and some grasses. It is not registered for use in California.
Imazapyr *Arsenal, Habitat, Stalker, Chopper, Polaris*	**Rate:** 3 pt product/acre (12 oz a.e./acre) plus 0.25 to 0.5% v/v surfactant **Timing:** Postemergence when plants are growing rapidly. **Remarks:** Imazapyr is a preemergent and postemergence herbicide effective for controlling broadleaf weeds and grasses. It has fairly long soil residual activity and at the high rates needed, it will often leave bare ground. Best used in spot treatments.
Metsulfuron *Escort*	**Rate:** 1.5 to 2 oz product/acre (0.9 to 1.2 oz a.i./acre) plus 0.25 to 0.5% v/v surfactant; efficacy is improved with the addition of 2,4-D at a rate of 1 qt product/acre **Timing:** Early postemergence. **Remarks:** Metsulfuron is a selective herbicide for broadleaf species. It provides only suppression of yellow toadflax. In areas where desirable grasses are growing around toadflax, metsulfuron can be used without non-target damage. It is not registered for 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.