

## How to Manage Pests

### Pests in Gardens and Landscapes

#### Brooms

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Brooms are a group of shrubs that were introduced into North America from Europe and North Africa in the mid-1800s. Brooms can be found growing along roadsides, forestlands, coastlines, riparian areas, brushlands, and disturbed areas. Initially introduced as ornamentals, they were later promoted by federal and state agencies for erosion control along roadsides and in mined areas. As a result, five broom species have become naturalized in California and are classified as invasive weeds by many federal, state, and local jurisdictions.

These highly competitive shrubs grow rapidly and form dense stands that both people and wildlife find impenetrable. Their dense stems make regeneration of most other plant species difficult or impossible, and they create a dangerous fire hazard. In addition, as legumes, brooms can fix atmospheric nitrogen, increasing soil fertility and giving a competitive advantage to other non-native weeds that, unlike the local natives, thrive on high nitrogen levels.

The four most common broom species in California are [Scotch broom](#) (*Cytisus scoparius*), French broom (*Genista monspessulana*), Spanish broom (*Spartium junceum*), and [Portuguese broom](#) (*Cytisus striatus*).

Although many retailers have stopped selling the species mentioned above, some nurseries still sell these and other brooms, including many hybrids. Residents should avoid planting them as many of these have similar invasive characteristics. Some of the available species include sweet broom (*Cytisus x spachianus* and *Genista racemosa*) and multiple Scotch broom hybrids including Burkwood's broom (*Cytisus x burkwoodii*), Lilac Time, Moonlight, and Lena to name a few.

The safest approach is to avoid planting any broom species. Several alternate plant species have similar attributes but are not invasive. Contact your county [UC Master Gardener](#) office or visit [PlantRight.org](#) for a list of recommendations (See RESOURCES).

#### IDENTIFICATION AND BIOLOGY

Brooms are upright shrubs that grow 3 to 10 feet tall. They generally produce bright yellow, pea-shaped flowers from April to June.

Scotch and Portuguese brooms produce their flowers in the leaf axils, while French and Spanish brooms have flowers at the branch tips. The flowers of French broom are substantially smaller than those of the other three common species. In some areas, Scotch broom flowers can be [multicolored](#), with red or purple spots or petals. Bridal veil broom (*Retama monosperma*) is a white-flowered broom that has become invasive in parts of Southern California.

Stem shape can be used to distinguish between broom species. Scotch broom has a 5-angled stem (star-shaped when viewed in cross-section), French and Portuguese have an 8- to 10-angled stem, and Spanish broom has a finely ribbed stem, making it nearly round.

Leaf characteristics also identify the species. Spanish broom produces simple leaves, while the other three species have mostly trifoliate leaves. For most species, new leaves produced in spring are often lost during hot, dry summer months or periods of stress, giving the plants their characteristic whisk-broom appearance. Scotch, Portuguese, and Spanish brooms are deciduous while French broom is an evergreen. Table 1 shows identifying features of these four broom species.

All four broom species produce dark colored pods in mid- to late summer that contain shiny greenish-brown seeds. Invasion and spread of brooms are entirely driven by seed dispersal.

The pods ripen during the dry summer months, then explosively eject their seeds several feet away, making a popping noise audible for some distance. All brooms are prolific seed producers, with a single shrub producing as many as 2,000 to 3,500 pods containing up to 20,000 seeds.

Between 30% and 60% of seeds are expected to germinate the first year, with the rest staying dormant and germinating at lower rates in subsequent years. Germination rates vary across species, sites, and years. Under most conditions, the majority of new seedlings die, but even so, the large number of seeds produced by a single plant can result in many seedlings. The seeds have an impervious seed coat, enabling some seeds to remain dormant in the soil for decades and making long-term management difficult.

After germination, growth of seedlings for the first two years can be slow, such that people sometimes do not recognize that they have a broom problem until it is several years along. At that point, or sometimes earlier, growth becomes very rapid—with plants growing as much as 3 or 4 feet in one year. Rapid growth continues for another 3 to 4 years, followed by 6 to 8 years of relatively slow growth. Next is a period of senescence, with more dead woody tissue than green. Plants typically live 12 to 17 years but can survive for as long as a quarter-century.

In established broom stands, seeds often remain dormant until older plants are removed or soil disturbance occurs, at which point a carpet of seedlings will appear. Brooms don't usually reach flowering maturity until the second or third year of growth, which allows for targeted removal of established shrubs first, followed by seedlings and younger plants thereafter.



French broom invading a hillside near Bodega Bay, California.



Spanish broom.















Bridal veil broom.



Scotch broom gall mite.

## Distinguishing Features of Four Common Broom Species in California.

<b>Scotch broom</b> <i>(Cytisus scoparius)</i>	<b>French broom</b> <i>(Genista monspessulana)</i>	<b>Spanish broom</b> <i>(Spartium junceum)</i>	<b>Portuguese broom</b> <i>(Cytisus striatus)</i>
 <p><b>Stems:</b> 5-sided; star-shaped cross section  <b>Leaves:</b> compound, 3 leaflets, deciduous, sometimes single on new twigs</p>	 <p><b>Stems:</b> 8 to 10 ridges; nearly round cross section.  <b>Leaves:</b> compound, 3 leaflets, evergreen, usually dense</p>	 <p><b>Stems:</b> smooth or finely ribbed; round cross section  <b>Leaves:</b> simple, deciduous, sparse</p>	 <p><b>Stems:</b> 8 to 10 ridges; nearly round cross section  <b>Leaves:</b> compound, 3 leaflets, deciduous, sometimes single on new twigs</p>
 <p><b>Flowers:</b> single or paired in leaf axils  <b>Petals:</b> yellow or partially red</p>	 <p><b>Flowers:</b> 4 to 10 in clusters at end of short branches  <b>Petals:</b> yellow</p>	 <p><b>Flowers:</b> several in open racemes at branch tips  <b>Petals:</b> yellow</p>	 <p><b>Flowers:</b> single or paired in leaf axils  <b>Petals:</b> yellow</p>
 <p><b>Seed pods:</b> flattened, only margins hairy</p>	 <p><b>Seed pods:</b> slightly flattened, entirely covered with long hairs</p>	 <p><b>Seed pods:</b> slightly flattened with few, if any, long hairs</p>	 <p><b>Seed pods:</b> slightly inflated, entirely covered with long hairs</p>

## MANAGEMENT

The two primary methods for managing brooms are mechanical removal and treatment with herbicides (weed killers). Broom establishment is through seed dispersal, so maintaining a healthy cover of desirable vegetation and reducing soil disturbance may reduce the potential for broom invasion. Ongoing monitoring for new seedlings is crucial for successful management.

### Mechanical Control

Small infestations can be removed by hand-pulling or mechanical grubbing. A variety of tools can aid in removal, including shovels or picks, chains, or specialized tools such as the Brush Grubber or The Uprooter. It is easiest to remove plants in early spring or late fall when the soil is moist and roots can be dislodged. Grubbing when the soil is dry and hard usually will break off the stems, leaving rootstalks that may resprout. Fortunately, with brooms, fragments of stems do not survive to produce new roots as in some weedy species.

Mowing broom plants gives poor control unless performed repeatedly throughout the growing season. Within a couple months of germination, young plants usually have produced underground rootstocks large enough to recover from a single mowing. Use extreme caution when mowing during spring and summer because of the potential for wildfires. Mowing later in the season also can spread seeds.

Lopping mature plants near the base will provide some control if done when plants are moisture-stressed in late summer, or in late spring following a winter with little rainfall. Lopping at other times can lead to vigorous resprouting.

Under most conditions in California, brush rakes and bulldozers that leave pieces of rootstocks behind do not provide successful control. In some cases, brush removal in late summer, when plants experience moisture stress, can slow their ability to recover. However, using large equipment to clear land may also promote seedling establishment, making follow-up control essential.

### Cultural Control

Burning alone is generally not an effective method for controlling brooms. Although burning can remove large amounts of debris, it can also increase the broom population, as it removes competitive vegetation and releases nutrients into the soil. A very hot burn will kill seeds, but a cooler burn will stimulate the germination of broom seeds left in the soil.

Cutting the aboveground vegetation of broom and allowing it to dry on site, followed by burning, can effectively control resprouting. Burning is more effective when followed by an herbicide application or subsequent burnings, and then by 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.

Grazing can provide control in small areas, if the grazing pressure is high enough to continually suppress growth. Goats and sheep have been shown to feed on resprouting shrubs, including brooms. In horses, however, ingestion of Scotch broom is reported to cause neurologic effects such as excitement and loss of muscle control and balance, as well as digestive and reproductive effects.

## Biological Control

In the 1960s, three insects were introduced as biological control agents on brooms—the Scotch broom seed beetle (*Bruchidius villosus*), the Scotch broom seed weevil (*Exapion fuscirostre*), and the Scotch broom twig miner moth (*Leucoptera spartifoliella*). The latter two species are specific to Scotch broom, while the seed beetle also attacks Portuguese broom, Spanish broom, and French broom. Although all three insects are established, none provide significant control.

Recently, a new agent called the Scotch broom gall mite (*Aceria genistae*) was found in California. Although this small arthropod was not officially released as a biocontrol agent, it has spread across much of Northern California and the Pacific Northwest. Observationally, the mite appears to reduce Scotch broom seed production and at high densities can cause extensive stem dieback and plant mortality. Because brooms are serious problems in many countries, the International Broom Initiative is evaluating other insects and pathogens in their native countries to determine their control potential.

## Chemical Control

California residents can use postemergence herbicides containing the active ingredients triclopyr and glyphosate for controlling brooms. These herbicides can be used either alone or as a combination of glyphosate with triclopyr or imazapyr.

In areas near rivers or streams, it is important to use the proper formulation of these herbicides. Ester formulations of triclopyr or imazapyr, for example, are not registered for use near water, and most glyphosate formulations cannot be used near water. Depending on the compound, these herbicides can be applied as foliar sprays, cut-stump treatments, or basal bark applications.

When using herbicides, be sure to prevent them from getting on desirable plants. Because glyphosate is a nonselective compound, it will damage or kill other vegetation. Triclopyr is a broadleaf herbicide that will not injure grasses but will damage or kill other broadleaf plants.

Home gardeners and professional applicators should always wear appropriate protective equipment as stated on the herbicide label.

**Foliar Sprays.** Herbicides applied to the canopy of broom are often applied when the plants are actively growing from April to July. In mild climates where young broom stems can stay green year-round, late fall and winter applications can also be effective.

Herbicides can be applied as foliar sprays using one of two methods. The first is “spray-to-wet,” where all leaves and stems should glisten following an application. Coverage, however, should not be to the point of runoff. Spray-to-wet applications are made using a backpack or hand sprayer with a flat fan or adjustable spray nozzle. The other foliar method is a low-volume technique called a “drizzle” application, using a [spray gun](#) fitted with an orifice disk.

Rather than spraying the entire canopy as in a spray-to-wet treatment, a drizzle application is made to the canopy using an [intermittent pattern](#). It is important to note that the two foliar techniques use the same amount of herbicide active ingredient on a given plant but within different total volumes of water. In a spray-to-wet application, total spray volume can range from 20 to 100 gallons per acre, while the total volume using the drizzle technique will be between 2 and 5 gallons per acre.

The drizzle application is useful for managing plants in areas that are difficult to access. The drizzle nozzle will reach a target plant 15 to 20 feet away, while a flat fan nozzle may only reach plants 2 to 3 feet away. Because of larger spray droplets, the drizzle method also minimizes herbicide drift. The lower volume of water used also reduces sprayer refilling requirements and total weight, potentially reducing applicator fatigue.

For spray-to-wet applications, products containing at least 41% glyphosate as the active ingredient can provide good to excellent control of brooms when applied at 2.5 ounces of product per gallon of water (2% of the total solution). Some products available for use in the home landscape with this concentration of active ingredient are Roundup Pro, FarmWorks Grass & Weed Killer 41% Glyphosate Concentrate, RM43 Total Vegetation Control, Compare-N-Save Grass & Weed Killer Concentrate, and Remuda Full Strength.

Glyphosate products that have a lower concentration of active ingredient, such as Roundup Concentrate (18% active ingredient), will require about 6 ounces of product per gallon of water (4.7% of the total solution) for effective control.

Triclopyr is available in either ester or amine formulations. Triclopyr ester is more effective on brooms, since this formulation is more easily absorbed into the foliage and stems. Products containing a minimum of 61% active ingredient of triclopyr ester can provide good to excellent control when applied at 1 to 1.25 ounces of product per gallon of water (0.75% to 1.5% of the total solution). One such product with this concentration is Brushtox Brush Killer with Triclopyr. Other less concentrated formulations, such as Crossbow, are also available.

Mixing triclopyr ester with commercially available seed oils can offer better penetration. One available product is Hasten-EA modified vegetable oil concentrate. Mix this at 1.25 ounces of product per gallon of herbicide solution (1% of the total solution).

Amine formulations of triclopyr include Bayer BioAdvanced Brush Killer Plus, Ortho GroundClear Poison Ivy & Tough Brush Killer1, and Monterey Brush & Vine Control.

For drizzle applications (low volume, as per product labels), products containing at least 41% glyphosate can provide good to excellent control of brooms when applied at 13 ounces of product per gallon of water (10% of the total solution).

Triclopyr ester can also be applied using the drizzle method. Products containing 61% active ingredient should be applied using 13 ounces of product (10% of the total solution) and 13 ounces of seed oil (10% of the total solution) per gallon of water.

Since drizzle applications use more concentrated herbicide solutions, one gallon of herbicide solution may adequately treat up to one-half acre of densely populated broom.

When air temperatures are higher than 80°F, it is better to use glyphosate or the amine formulation of triclopyr, since triclopyr ester is subject to vaporization.

**Cut-Stump Application.** Cut-stump treatments can be done throughout the year. Immediately after cutting, apply the herbicide to the cut surface with a paint brush, spray bottle, or plastic squeeze bottle. Delaying application will result in poor control, because the cut surface will quickly dry, preventing movement of the chemical into the plant.

For small stumps, completely cover the cut surface. For large stumps, it is only necessary to wet the outer ring of wood next to and including the bark. For small-stemmed shrubs, cut the stems with loppers or clippers and paint or sponge the herbicide solution onto each cut end.

For triclopyr ester products containing 61% active ingredient, use 1 part product and 4 parts water. For triclopyr products containing 8% amine, such as Ortho Poison Ivy Tough Brush Killer1 use undiluted.

Glyphosate can also be used as a cut-stump application. If using a product containing 18% glyphosate, make a 1:1 solution of the product and water or use undiluted. For products that contain 41% glyphosate, use 1 part product and 3 parts water.

**Basal Bark Application.** Concentrated formulations of triclopyr ester can be applied to the trunks of broom using a backpack sprayer, spray bottle or wick applicator. Thoroughly cover a 6-inch band around the basal trunk of the shrub. Basal bark applications can be made almost any time of the year, even after leaves have senesced. For triclopyr ester products with 61% active ingredient, the application ratio is 13 ounces of product (10% of the total solution) and 25 ounces of seed oil (20% of the total solution) per gallon of water.

Glyphosate and the amine formulation of triclopyr provide poor control using this technique.

After implementing a control technique, it is important to monitor the area for regrowth. One application of an herbicide does not always completely control brooms. Watch treated areas closely for at least a year and retreat as necessary.

#### [WARNING ON THE USE OF CHEMICALS](#)



## RESOURCES

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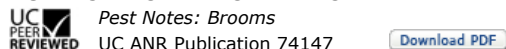
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