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## Invasive Plants of California's Wildland

### **Cytisus scoparius**

**Scientific name** *Cytisus scoparius***Additional name information:** (L.) Link.**Common name** Scotch broom, English broom, common broom**Synonymous scientific names** *Sarothamnus scoparius*, *Spartium scoparius***Closely related California natives** 0**Closely related California non-natives:** 7**Listed** CalEPPC List A-1, CDFA C**By:** Carla Bossard**Distribution****HOW DO I RECOGNIZE IT?****Distinctive features:**

Scotch broom (*Cytisus scoparius*) is a perennial shrub six to ten feet tall. Its sharply angled branches generally have five green ridges with hairs on them when young; as the branches mature the hairs fall off, and the branches become tan and lose the distinct ridges. Pods have hairs along the seams only. One or

two golden yellow pea-like flowers cluster between the leaf base and stem. About half the photosynthetic (green) tissue is in the leaves and half is in twig tissue. Sometimes this species is confused with French broom (*Genista monspessulana*), which has pods with hairs all over them, stems that are not ridged or green, and more than eighty-five percent of its photosynthetic tissue in leaf tissue (Bossard and Rejmánek 1994).

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**Description:**

Fabaceae. Long-lived shrub. Stems: 5 angled, green and hairy when young, later glabrous. Leaves: on young branches there is usually one sessile leaf or three leaflets 0.3-0.7 in (5-18 mm) long; leaf/leaflets oblong and pointed on both ends, hairs may be flattened against the leaf or absent. Inflorescence: 1-2 flowers clustered in leaf axis; pedicels <0.5 in (<12 mm), without hairs. Flowers: shaped like pea flowers; calyx without hairs, <0.3 in (<6 mm); corolla golden yellow, banner 0.6-0.7 in (15-18 mm) may curl backward. Fruit: 1-2 in (25-50 mm) flat pod, brown or black at maturity, hairs present only along seams of pods (Hickman 1993). Seeds: 3-12 seeds per pod, greenish brown to black, shiny, round to oval, with a cream to yellow eliasome (Hickman 1993).



**WHERE WOULD I FIND IT?**

Found along the California coast from Monterey north to Oregon border, Scotch broom is prevalent in interior mountains of northern California on lower slopes and very prevalent in Eldorado, Nevada, and Placer counties in the Sierra Nevada foothills. It is also reported from Los Angeles and San Bernardino counties. It is common in disturbed places, such as river banks, road cuts, and forest clearcuts, but can colonize undisturbed grassland, shrubland, and open canopy forest below 4,000 feet (<1300 m). Scotch broom prefers soil with pH less than 6.5; it is rare on limestone soils. It tolerates a wide range of soil moisture conditions and is competitive in low-fertility soils. Nitrogen-fixing bacteria found in small nodules on plant roots can fix nitrogen even at temperatures to 38 degrees F (4 degrees C) (Wheeler et al. 1988; Bossard 1991a; Partridge 1989).

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**WHERE DID IT COME FROM AND HOW IS IT SPREAD?**

Scotch broom is native to Europe and North Africa. Its natural range is broad, from Great Britain to the Ural Mountains and from Sweden to the Mediterranean. Introduced to California in the 1850s as an

ornamental in the Sierra Nevada foothills, it was later used to prevent erosion and stabilize dunes (Geickey 1957, Schwendiman 1977). It spreads by prodigious seed production. One medium-sized shrub can produce over 12,000 seeds a year. After ballistic dispersal, seeds are further dispersed by ants, animals, or in mud clinging to road grading or maintenance machinery. Scotch broom is also readily dispersed by rain wash on slopes (Bossard 1991b). Plants can resprout from the root crown after cutting or freezing and sometimes after fire (Bossard and Rejmánek 1994).

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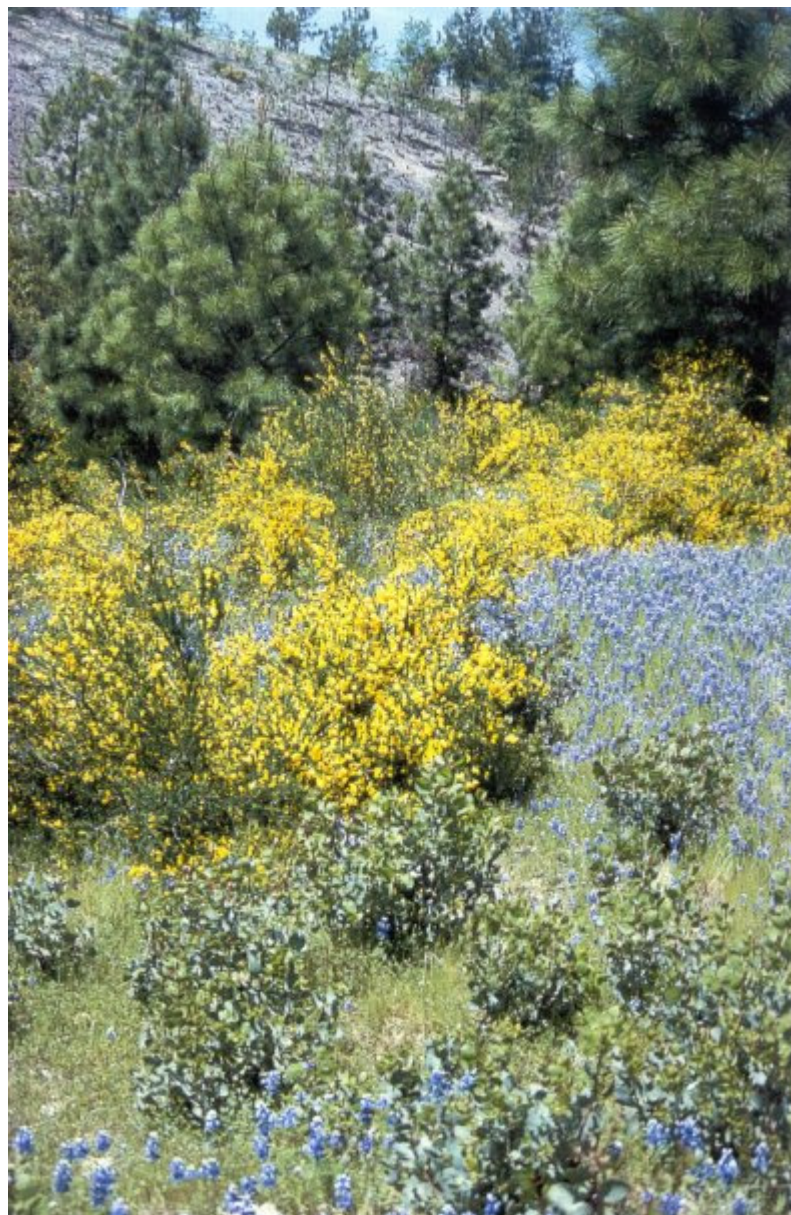
#### **WHAT PROBLEMS DOES IT CAUSE?**

Scotch broom currently occupies more than 700,000 acres in central to northwest coastal and Sierra Nevada foothill regions of California (Barbe, pers. comm.). It displaces native plant and forage species and makes reforestation difficult. It is a strong competitor and can dominate a plant community, forming a dense monospecific stand. Scotch broom infestations can attain a biomass of over 44,000 to 50,000 kg/hectare in three to four years (Bossard and Rejmánek 1994, Wheelor et al. 1988). Seeds are toxic to ungulates. Mature shoots are unpalatable and are not used for forage except by rabbits in the seedling stage (Bossard and Rejmánek 1994). Foliage causes digestive disorders in horses (Parsons 1992). Since Scotch broom can grow more rapidly than most trees used in forestry, it shades out tree seedlings in areas that are revegetated after tree harvest. Scotch broom burns readily and carries fire to the tree canopy, increasing both the frequency and intensity of fires (Parsons 1992). This species is difficult to control because of its substantial and long-lived seedbank.

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#### **HOW DOES IT GROW AND REPRODUCE?**

Scotch broom becomes reproductive at two to three years on reaching a height of two to three feet (60-100 cm). It flowers in late March to April inland, April to June on the coast. Flowers appear before leaves. Long-lived seeds are copiously produced (to 12,000+ seeds/mature shrub) and mature in June and July. Seeds initially disperse ballistically from the pod, with an audible pop, and are further dispersed by ants and rain wash on the ground (Bossard 1990b, 1993). Seeds are known to survive at least five years in the soil (Bossard unpubl. data) and possibly as long as thirty years (Carson 1998). The seedbank can build to over 2,000 seeds/sq ft.



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Seeds germinate from November to June inland, January to July along the coast (Bossard 1993) when provided with disturbance that creates open mineral soil.

(click on photos to view larger image)



[ip/management/ipcw/images/5974.jpg]

Germination may be enhanced by fire, but relies less heavily on water, wind, or animal distribution than do some other invasive plants, although its tough seed coat provides good protection from abrasion associated with water transportation (Carson 1998). Seedlings can tolerate even 90 percent shade. Approximately 35 percent of each seed crop becomes part of a rapidly developed seedbank. Plants can resprout from the root crown when cut, particularly during the rainy season (Bossard and Rejmánek 1994).

Scotch broom is host to nitrogen-fixing bacteria, which assists both its establishment on poor and disturbed sites and its ability to outcompete native species. It tends to acidify the soil (although not as strongly as does gorse, a relative). The period of most rapid vegetative growth is May to July, with some dieback occurring during seasonal periods of drought (Bossard and Rejmánek 1994). Most photosynthate is moving upward in the shrub toward branch tips during flowering, bud break, and seed set, which occur in late March to mid-April, April, and May, respectively). Photosynthate starts moving down toward roots after seeds are well grown but before seed release (Bossard, unpubl. data). On dry, hot sites Scotch broom will drop its leaves in late July or August. Its life span in California is longer than in its native range, with some individuals surviving up to seventeen years (Bossard 1990a). Broom is considered to be primarily an early serial colonizer that will be shaded out once native species are established. There is, however, concern that its vigorous and prolific growth, along with acidification of the soil, inhibits establishment of other species.

### HOW CAN I GET RID OF IT?

The best method for removal of a Scotch broom infestation depends on the climate and topography of the site, the age and size of the infestation, the relative importance of impact to non-target species, and the type and quantity of resources available to remove and control broom at a given site. All methods require appropriate timing and follow-up monitoring.

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#### **Physical control:**

Manual/mechanical removal: Pulling with weed wrenches is effective for broom removal. The wrench

removes the entire mature shrub, eliminating resprouting. However, the resultant soil disturbance tends to increase the depth of the seedbank (Bossard 1991, Ussery and Krannitz 1998). Wrench removal is labor-intensive, but can be used in most kinds of terrain and allows targeting of broom plants with low impact on desirable species in the area. Golden Gate National Park has had success in using volunteers to remove broom with weed wrenches and then closely monitoring and removing broom seedlings for five to ten years.

Ussery and Krannitz (1998) found significantly more trampling of native species, and more soil disturbance and broom seedling regeneration, when adult broom plants were removed by pulling rather than cutting in British Columbia. Brush hogs, which twist off above-ground biomass, can be used for broom removal. They are less labor-intensive, but heavily impact non-target species and cannot be used on steep slopes. The twisting action is more destructive to tissues that initiate resprouting than is clean cutting. However, depending on the season of brush hog removal, resprouting can still be a serious problem. Brush hog removal has been used with limited success in Redwood National Park (Popenoe, pers. comm. 1997).

Saw cutting removes above-ground portions of shrubs, but depending on the time of cutting, may result in high rates of resprouting. In the Sierra Nevada foothills saw cutting undertaken at the end of the summer drought period (August to October) resulted in a resprouting rate of less than 7 percent, whereas cutting done at other times resulted in resprouting rates of 40 to 100 percent (Bossard and Rejmánek 1994). In British Columbia plants greater than one-quarter inch (3 mm) in diameter cut below two inches (5 cm) from the soil surface in July were found to have less than 1.5 percent resprout rate (Ussery and Krannitz 1998).

Prescribed burning: Burning uncut broom has been used with some success on Angel Island. Reburn of the removal site is usually necessary two and four years after the initial burn (Boyd, pers. comm. 1997). For prescribed burning of pretreated or cut broom see below under integrated methods.

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### ***Biological control:***

Insects and fungi: Two USDA approved insects, a stem miner, *Leucoptera spartifoliella*, and a seed beetle, *Apion fusciostre*, were introduced in the 1960s as biocontrol agents, but have had limited success in California. New insect biocontrol agents are being tested in England and France for use on broom in Australia and New Zealand (Hoskings 1994). If proved safe and effective in California, these insects may ultimately become available for use as biocontrol agents in California.

Grazing: Heavy grazing by goats during the growing season for four to five years has been reported effective in New Zealand, and grazing by llamas has been tried at a few sites in California (Archbald, pers. comm. 1997). The disadvantage associated with using goats is that they are not selective, and native species that start to revegetate the area are also eaten.

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### ***Chemical control:***

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