Non-Native Invasive Plants in the Shasta and Tehama County Area

A Crash Course on their Origin, Threat, and Eradication

What Makes a Plant "Invasive"?

When plants that evolved in one region of the globe are moved by humans to another region, a few of them flourish, crowding out native vegetation and the wildlife that feeds on it.

Some invasives can even change ecosystem processes such as hydrology, fire regimes, and soil chemistry. These invasive plants have a competitive advantage because they are no longer controlled by their natural predators, and can quickly spread out of control.

In California, approximately 3% of the plant species growing in the wild are considered invasive, but they inhabit a much greater proportion of the landscape.

Bull thistle (*Cirsium vulgare*) invades Tioga Pass in Yosemite National Park

Photo by Bob Case

Why Should You Care About Invasive Plants?

...If you own a farm or ranch:

- Invasive plants crowd out crops and rangeland forage. These invaders can be low in nutrition or even toxic to livestock.
- Invasion can cause land values to drop, and management is often costly. Nationwide, invasive weeds in pastures and farmland cost an estimated $33 billion per year.

Klamathweed,
or St. John's Wort,
(Hypericum perforatum)
Toxic to light colored livestock
Photo from CAL-IPC

...If you enjoy the outdoors and watching wildlife:

- Invasive plants can blanket waterways, trails, and scenic landscapes, making boating, hiking and biking difficult, and lowering the land's value for photography and wildlife viewing.
- Invasive plants can significantly degrade wildlife habitat. Nationally, invasive species are the second-greatest threat to endangered species, after habitat destruction.

...If you hunt or fish:

- Invasive plants reduce habitat for game species. This stress on wildlife reduces hunting and fishing resources.
- Invasive aquatic plants form dense mats that restrict boat access and kill fish by reducing oxygen in the water.

Yellow Star thistle
(Centaurea solstitialis)
Photo by L. Rignanese

...If you live in the city or suburbs:

- Invasive ornamentals such as Scotch broom, pampas grass, and eucalyptus increase fire fuel loads and are dangerous near homes.

- Plants like giant reed (*Arundo donax*) clog creeks throughout California, reducing their water-carrying capacity and increasing the risk of floods during winter storms.

Eucalyptus globulus
Blue Gum Eucalyptus
Photo by N. Cramer

NIS Plant Species to be Targeted on this Project

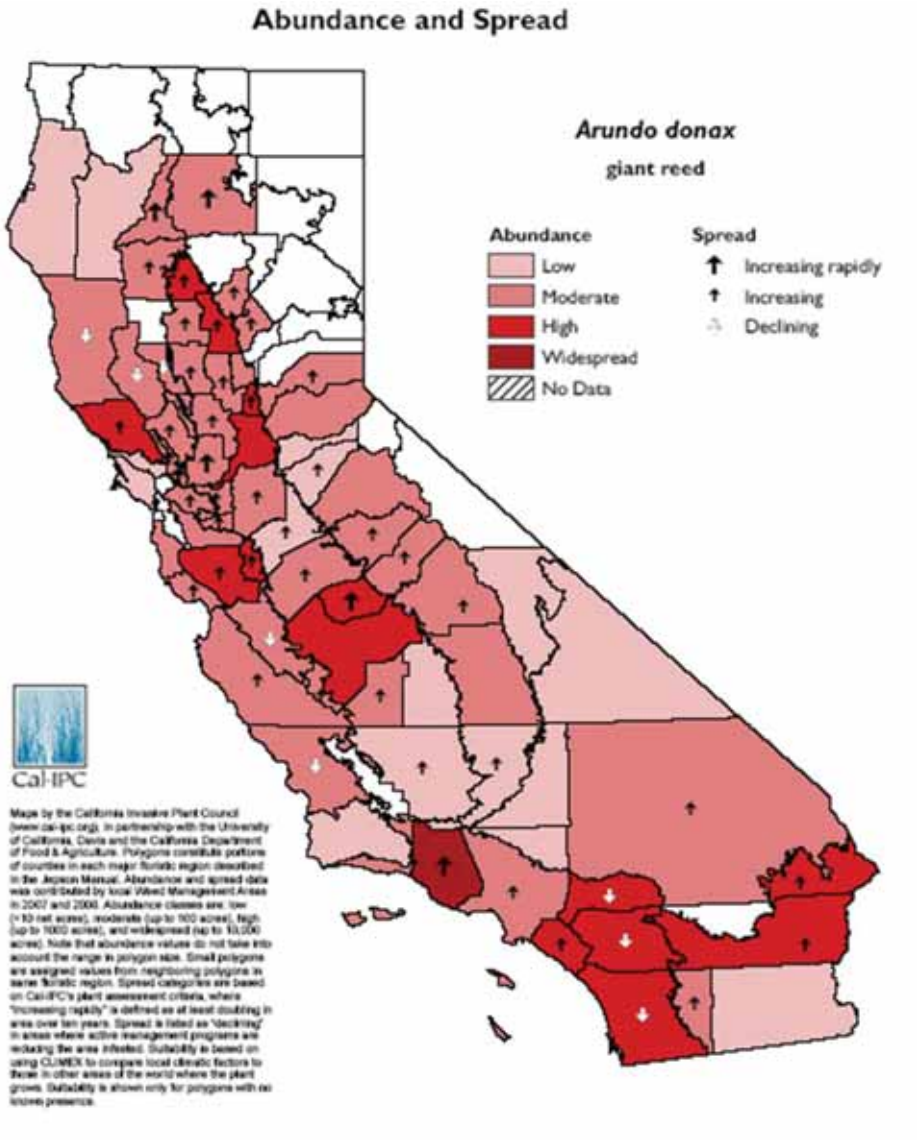
- Arundo (*Arundo donax*)
- Salt Cedar (*Tamarix ramosissima*)
- Tree of Heaven (Ailanthus altissima)
- Black Locust (*Robinia pseudoacacia*)
- Scotch broom (*Cytisus scoparius)*
- Pampas grass (*Cortaderia selloana*)

Arundo (*Arundo donax*)

Arundo donax (giant reed) is a tall perennial grass that typically forms dense stands on disturbed sites, sand dunes, riparian areas, and wetlands.

Extent of Invasion

It has invaded central California River valleys in San Luis Obispo and Monterey counties, the San Francisco Bay Area, the Sacramento and San Joaquin River valleys and is also increasing in the North Coast region.



Background

- **How it got here:** Giant reed was brought to North America quite early, as it was abundant by 1820 in the Los Angeles River, where it was harvested for roofing material and fodder. This plant has played an important role in the development of music, as the cane was the source of the original Pan pipe or syrinx, and remains the source of reeds for woodwind instruments.
- **How it spreads:** Invasive populations almost certainly resulted from escapes and displacement of plants from managed habitats. It spreads vegetatively either by rhizomes or fragments.

Why is it so bad?

- It displaces native plants and associated wildlife species because of the massive stands it forms .
- It becomes a dominant component of the flora, and was estimated to comprise 68 percent of the riparian vegetation in the Santa Ana River.
- It reduces habitat and food supply, particularly insect populations, for several special status species such as least Bell's vireo, southwestern willow flycatcher, and yellow-billed cuckoo.
- It provides little shading to the in-stream habitat, leading to increased water temperatures and reduced habitat quality for aquatic wildlife.
- In the Sacramento-San Joaquin Delta region *Arundo donax* interferes with levee maintenance and wildlife habitat management.
- Giant reed is also suspected of altering hydrological regimes and reducing groundwater availability by transpiring large amounts of water from semi-arid aquifers. It alters channel morphology by retaining sediments and constricting flows, and in some cases may reduce stream navigability.
- Dense growth presents fire hazards, often near urbanized areas, more than doubling the available fuel for wildfires and promoting post-fire regeneration of even greater quantities of giant reed.
- It can promote bank erosion because its shallow root system is easily undercut and bank collapse may follow.

Control

Manual methods: Minor infestations can be eradicated by manual methods, especially where sensitive native plants and wildlife may be damaged by other methods. Hand pulling is effective with new plants less than six feet (2 m) in height, but care must be taken that all rhizome material is removed.

Prescribed burning: In most circumstances burning of live or chemically treated material should not be attempted, as it cannot kill the underground rhizomes. Cut material is often burned on site, subject to local fire regulations, because of the difficulty and expense involved in collecting and removing or chipping all material.

Biological Control: Insects and fungi: No biological control agents against *Arundo donax* have been approved by the USDA. **Grazing:** Vertebrate grazers such as cattle and sheep may be useful in controlling giant reed, and Angora goats have been partially successful in reducing this plant and other brush in southern California.

Chemical Control: In many, if not all, situations it may be necessary to use chemical methods to achieve eradication, especially in combination with mechanical removal. The most common herbicidal treatment against giant reed is glyphosate, primarily in the form of RodeoÂ®, which is approved for use in wetland.

Salt Cedar (*Tamarix ramosissima*)

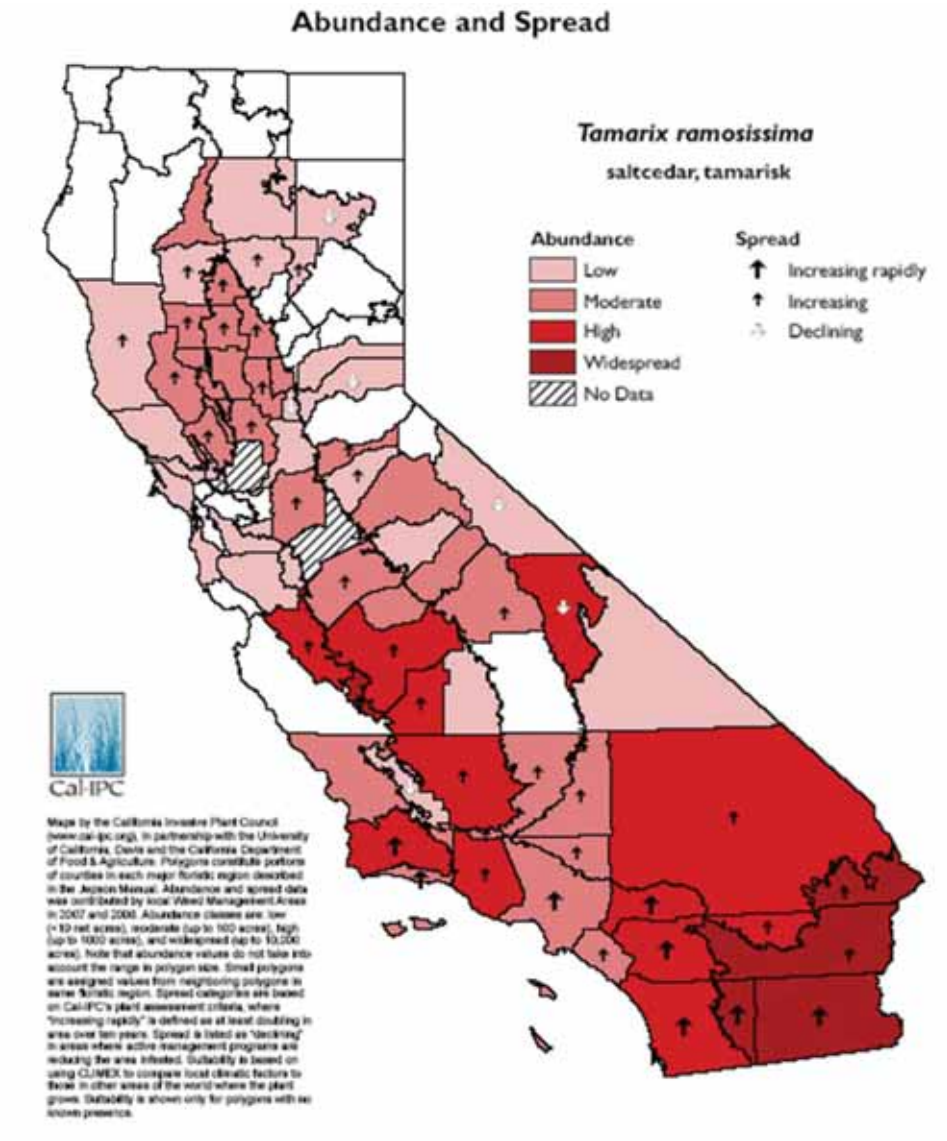
Tamarix ramosissima (saltcedar, tamarisk) is a shrub or a tree (family Tamaricaceae) and can be found along streams and lake shores, throughout California.

Tamarix ramosissima is associated with dramatic changes in geomorphology, groundwater availability, soil chemistry, fire frequency, plant community composition, and native wildlife diversity.

Four invasive Tamarix species have been identified in California: *T. ramosissima, T. chinensis, T. gallica*, and *T. parviflora*.

Extent of Invasion

Saltcedar is widely distributed throughout the Mojave and Colorado deserts, Owenâ€™s Valley, the Central and South coasts, and the San Joaquin Valley. It occurs in parts of the San Francisco Bay Area and the Sacramento Valley, particularly Yolo and Solano counties.



Background

How it got here: Saltcedar may have been introduced into North America by the Spaniards, but it did not gain recognition in the western United States until the 1800s (Robinson 1965). It was planted widely for erosion control, as a windbreak, for shade, and as an ornamental. It spreads by seed and vegetative growth. Individual plants can produce 500,000 tiny seeds per year.

How it spreads: It was planted widely for erosion control, as a windbreak, for shade, and as an ornamental. It spreads by seed and vegetative growth. Individual plants can produce 500,000 tiny seeds per year. Plants can regenerate from cuttings that fall on moist soil.

Why is it so bad?

- It is associated with dramatic changes in geomorphology, groundwater availability, soil chemistry, fire frequency, plant community composition, and native wildlife diversity.
- Geomorphological impacts include trapping and stabilizing alluvial sediments, which results in narrowing of stream channels and more frequent flooding.
- Saltcedar has been blamed for lowering water tables because of its high evapotranspiration rate, and, on a regional scale, dense saltcedar groves use far more water than native riparian plant associations.
- Soil salinities increase as a result of inputs of salt from glands on saltcedar leaves.
- Leaf litter from drought-deciduous saltcedar increases the frequency of fire. Saltcedar is capable of resprouting vigorously following fire and, coupled with changes in soil salinity, ultimately dominates riparian plant communities .
- Although saltcedar provides habitat and nest sites for some wildlife (e.g., white-winged dove, *Zenaida asiatica*), most authors have concluded that it has little value to most native amphibians, reptiles, birds, and mammals .

Control

Manual/mechanical methods: Saltcedar is difficult to kill with mechanical methods, as it is able to resprout vigorously following cutting or burning. Root plowing and cutting are effective ways of clearing heavy infestations initially, but these methods are successful only when combined with follow-up treatment with herbicide. Seedlings and small plants can be uprooted by hand.

Prescribed burning: Fire does not kill saltcedar roots, and plants return quickly after fire if untreated by other methods.

Flooding: Flooding thickets for one to two years can kill most saltcedar plants in a thicket.

Biological control: Insects and fungi: The USDA is currently using an international team of researchers to test thirteen species of natural enemies to control saltcedar. Of these, two have been recommended for field release in the United States, including a mealybug (*Trabutina mannipara*) from Israel and a leaf beetle (*Diorhabda elongata*) from China. Grazing: Grazing: Cattle have been shown to graze significant amounts of sprout growth.

Chemical Control: Heavy infestations may require stand thinning through controlled burns or mechanical removal with heavy equipment prior to treatment with herbicides. Six herbicides are commonly used to combat saltcedar, including; imazapyr, triclopyr, and glyphosate (Jackson 1996). Several proven methods exist for removing tamarisk. Perhaps the best method is to apply an imazapyr marketed as ArsenalÂ® to the foliage. This technique is especially effective when a tank mix is used with a glyphosate herbicide such as RodeoÂ® or RoundupProÂ.

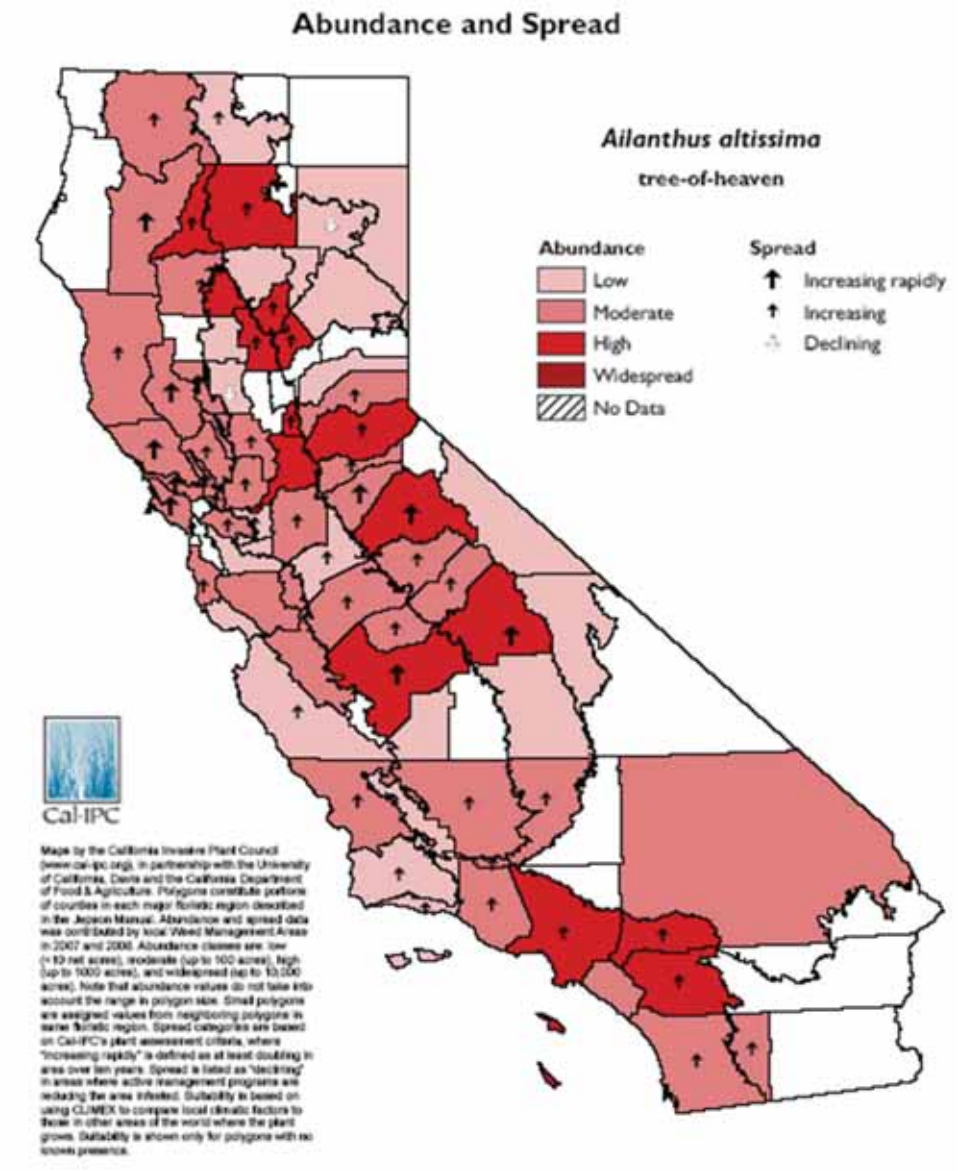
Tree of Heaven (Ailanthus altissima)

Ailanthus altissima (tree-of-heaven) is a tree (family Simaroubaceae) that is widely but discontinuously distributed in California.

It was introduced as a landscape ornamental but escapes gardens and spreads by seeds and creeping roots that produce many suckers.

Extent of Invasion

It is most abundant along the coast and in the Sierra foothills, primarily in wastelands and disturbed, semi-natural habitats.



Background

How it got here: A native of eastern China, ailanthus has been introduced throughout the northern hemisphere. In the 1740s it was introduced to Europe in the mistaken belief that it was the source of lacquer used in the production of polished wooden ware.

How it spreads: Ailanthus escapes from cultivation and spreads by root sprouts and wind-dispersed seeds. Seeds may also spread by water, birds, and on farm machinery. However, new patches do not occur as frequently as would be expected from the amount of seed produced.

Why is it so bad?

- By producing abundant root sprouts, ailanthus creates thickets of considerable area, displacing native vegetation In California its most significant displacement of native vegetation is in riparian zones.

- It also produces allelopathic chemicals that may contribute to displacement of native vegetation.

Control

If mechanical and/or chemical control is attempted, sites should be monitored several times per growing season. All new root sprouts should be removed, and monitoring should be continued for one year after the last sprout is removed.

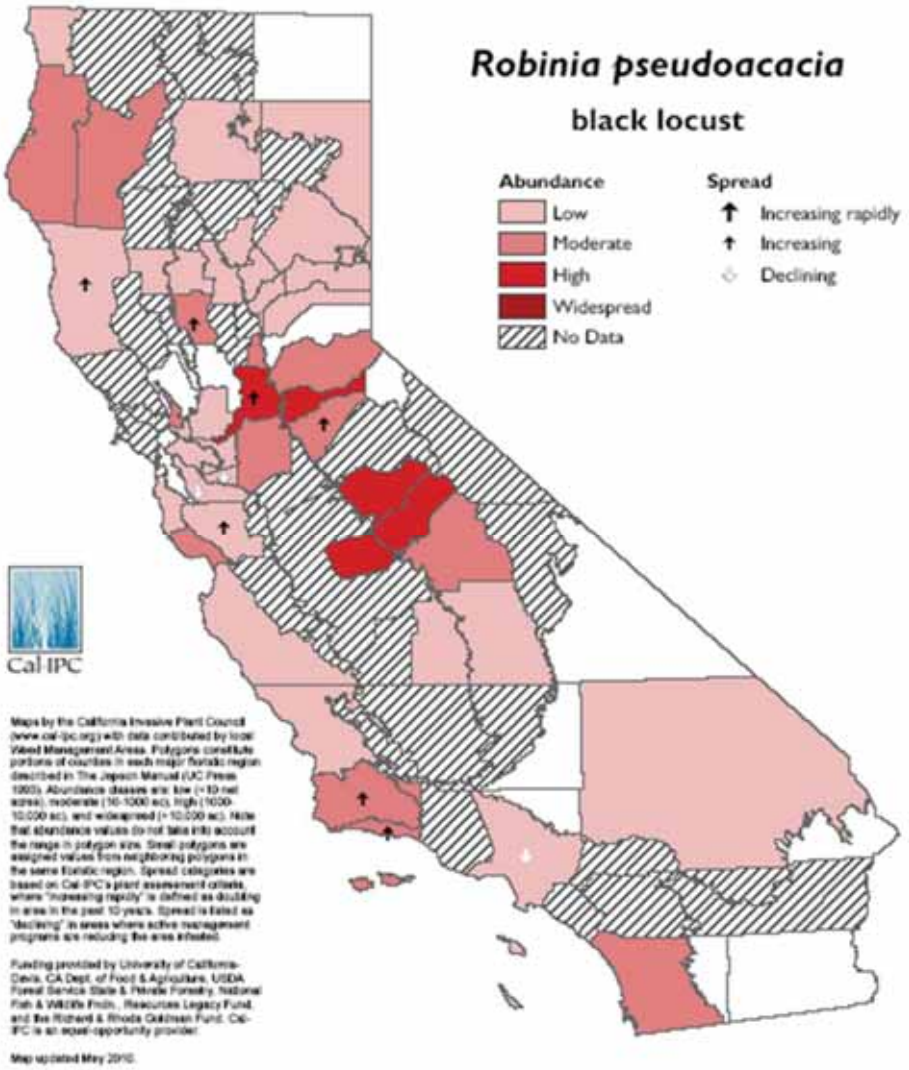
- **Hand pulling:** Young seedlings are best pulled after a rain when the soil is loose. This allows removal of the root system, which may resprout if left in the ground.
- **Hand digging:** Removal of rootstocks by hand digging is a slow but sure way of destroying weeds that resprout from roots. This technique is suitable only for small infestations and around trees and shrubs where other methods are not practical.
- **Cutting:** Manually operated tools such as brush cutters, power saws, axes, machetes, loppers, and clippers can be used to cut ailanthus. This is an important step before many other methods are tried, as it removes the above-ground portion of the plant.
- **Girdling:** This involves manually cutting away bark and cambial tissues around the trunks of undesirable trees. A relatively inexpensive method, girdling is done with an ordinary ax in spring when trees are actively growing. Hardwoods are known to resprout below the girdle unless the cut is treated with herbicides. Cutting an ailanthus stem induces prolific root suckering and the production of stump sprouts. After a stem is cut, its stump sprouts may grow over ten feet (3 m) per year and its root sprouts three to seven feet (1-2 m) per year (Pannill 1995). As a consequence, mechanical removal will be ineffective unless all stems are cut at least several times per year (Pannill 1995).
- **Prescribed burning:** This is probably not an effective technique for controlling ailanthus. Fire may kill main stems, but this will result in prolific sprouting.
- **Chemical:** Herbicide applications should be most effective in spring, just after leaves are fully expanded. Smaller sprouts probably can be controlled by spraying foliage with 4 percent glyphosate (as RoundupÂ®).

Black Locust (*Robinia pseudoacacia*)

Robinia pseudoacacia (black locust) is a deciduous tree (family Fabaceae) that grows to 100 feet tall. It is found throughout California below 6,300 feet. Historically planted as a landscape tree, black locust has escaped cultivation and become invasive in California and elsewhere. It can grow on a wide range of sites, but grows best on rich, moist, limestone-derived soils.

Extent of Invasion

Black locust is widespread, particularly in northern California, below about 6,300 feet (1,910 m) elevation (Hickman 1993). It is also common in the Great Basin area.



Background

How it got here: Black locust is native to eastern North America from Pennsylvania and southern Indiana south to Georgia and Louisiana and west to Iowa, Missouri, and Oklahoma It was probably brought to California by the gold-rush era settlers, although it is not included in lists of early introductions.

How it spreads: It spreads by seed dispersal (by gravity and wind) and by root sprouts. Black locust produces root and stump sprouts. Sprout production is stimulated by top damage. Root suckers usually are more important to reproduction than are seedlings.

Why is it so bad?

- Black locust creates large stands that displace native vegetation.
- Its seeds, leaves, and bark are toxic to humans and livestock.

Control

- **Mechanical methods:** Cutting or girdling a black locust stem will result in prolific root suckering. Mechanical removal therefore will be ineffective in controlling black locust unless all stems are cut several times per year. Repeated cutting of sprouts can kill the tree. Cutting probably will need to be repeated for several years. Mowing may not be effective in controlling seedlings and sprouts.
- **Prescribed burning:** Burning has not been effective in controlling black locust.
- **Biological control:** Black locust suffers considerable damage from insects, particularly the black locust borer, Megacylline robinine. However, no USDA biological control program for black locust has been attempted, and no USDA approved biocontrol agents exist for this species.
- **Chemical control:** Black locust has been effectively controlled with herbicides (Gouin 1979, Liegel et al. 1984, Scheerer and Jackson 1989, Smith 1993). Herbicide applications should be most effective in spring, just after leaves are fully expanded. Smaller sprouts may be controlled by spraying all foliage with 4 percent glyphosate.

Scotch broom (*Cytisus scoparius*)

Cytisus scoparius (Scotch broom) is a perennial shrub (family Fabaceae), which grows in sunny sites with dry sandy soil, and spreads rapidly through pastures, borders of forests, and roadsides.

Cytisus scoparius can be found from the coast to the Sierra foothills.

Extent of Invasion

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

Background

How it got here: 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

How it spreads: It spreads by prodigious seed production. One medium-sized shrub can produce over 12,000 seeds a year.

- This weed crowds out native species, has a seedbank that can remain dormant for up to 80 years, diminishes habitat for grazing animals, and increases risk for wildland fires.

Why is it so bad?

- Scotch broom currently occupies more than 700,000 acres in central to northwest coastal and Sierra Nevada foothill regions of California. It displaces native plant and forage species and makes reforestation difficult. It is a strong competitor and can dominate a plant community.
- Seeds are toxic to ungulates. Foliage causes digestive disorders in horses.
- Scotch broom burns readily and carries fire to the tree canopy, increasing both the frequency and intensity of fires.
- This species is difficult to control because of its substantial and long-lived seedbank. Seeds are known to survive at least five years in the soil (Bossard unpubl. data) and possibly as long as thirty years.

Control

- Manual/mechanical removal: Pulling with weed wrenches is effective for broom removal. However, the resultant soil disturbance tends to increase the depth of the seedbank. Saw cutting removes above-ground portions of shrubs, but depending on the time of cutting, may result in high rates of resprouting.
- 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.
- 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. 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.
- Chemical control: Foliar sprayed until wet, 2 percent glyphosate (as RoundupÂ®) has been used to kill mature plants of Scotch broom. Adding surfactant improves effectiveness.

Scotch broom (*Cytisus scoparius*)

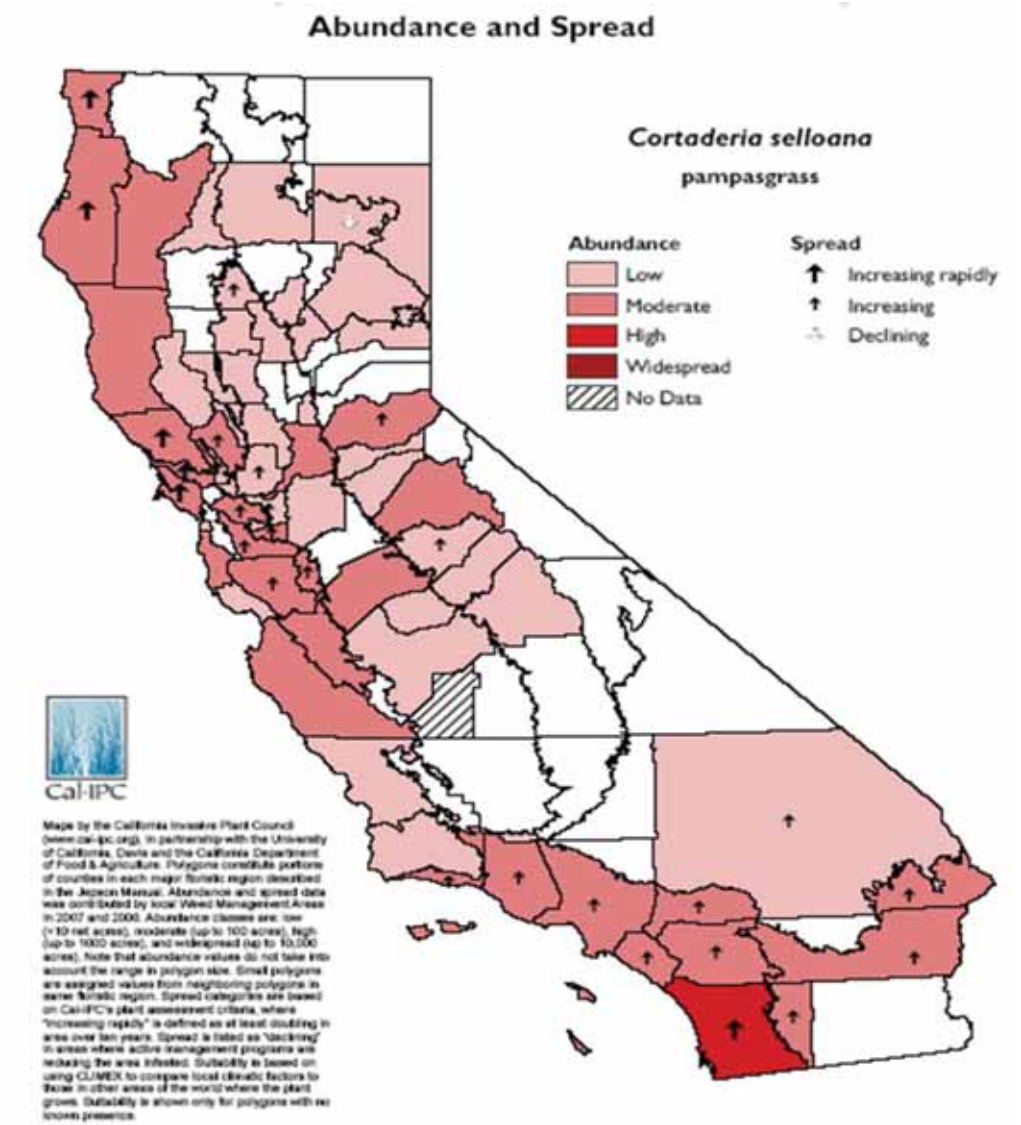
Cytisus scoparius (Scotch broom) is a perennial shrub (family Fabaceae), which grows in sunny sites with dry sandy soil, and spreads rapidly through pastures, borders of forests, and roadsides.

Pampas grass (*Cortaderia selloana*)

Cortaderia selloana (pampasgrass) is a large perennial grass (family Poaceae). Pampasgrass favors dunes, bluffs, coastal shrublands and marshes, inland riparian areas, and disturbed areas.

Extent of Invasion

Pampas grass is found along the coast of California, and in the Coast Ranges, Central Valley, Western Transverse Ranges, and Mojave Desert.



Background

How it got here: Pampas grass is native to Argentina, Brazil, and Uruguay, where it grows in damp soils along river margins (Connor and Charlesworth 1989). It was first introduced to Europe by a Scottish horticulturist between 1775 and 1862. Samples were introduced to California about 1848 by Joseph Sexton, a nurseryman from Santa Barbara. Commercial production began in 1874 in both California and Europe.

How it spreads: Pampas grass is typically propagated for ornamental purposes through division of mature plants. In nature it produces flowers two to three years after germination, but spread by seed is limited-- selection for ornamental plants in California has been for the showier plumes of the female plants. Consequently, few opportunities exist for seed production.

Why is it so bad?

- In forests it competes with seedling trees and can slow their establishment and growth.
- Pampas grass creates a fire hazard with excessive build-up of dry leaves, leaf bases, and flowering stalks. In addition, heavy infestations can block access to plantations and pose a significant fire hazard.
- In conservation areas pampas grass competes with native vegetation, reduces the aesthetic and recreational value of these areas, and also increases the fire potential.

Control

Manual methods: Pulling or hand grubbing Cortaderia selloana seedlings is highly effective. For larger plants however, a pulaski, mattock, or shovel are the safest and most effective tools for removing established clumps. However, detached plants left lying on the soil surface may take root and reestablish under moist soil conditions.

Biological control: Insects and fungi: No insect or fungal control efforts have been investigated for any species of Cortaderia.
Grazing: The success of grazing has not been reported in the United States, but cattle have been shown to provide effective control for pampas grass in commercial forests of New Zealand.

Chemical control: Control of pampas grass can be achieved by spot treatment with a post-emergence application of glyphosate at about 2 percent solution or eight qts/100 gal. The addition of a non-ionic or silicone-based surfactant may enhance foliar penetration of the herbicide.

What You Can Do

In 2004, Cal-IPC helped form the California Horticultural Invasive Prevention (Cal-HIP) partnership. The partnership is facilitated by the nonprofit Sustainable Conservation.

The partnership develops voluntary measures to reduce the number of invasive plant species sold in California and to prevent further invasions from horticulture. Industry participants include representatives from growers, nurseries, Master Gardeners, and professional associations

Pennisetum setaceum) is an invasive Fountain grass *(* plant that was introduced as an ornamental landscaping plant

CAL-HIP Info

The Cal-HIP partnership has compiled a list of ornamental plants that have become invasive in California and that are still available through horticulture, and which ornamentals can serve as suitable alternatives. The PlantRight campaign has been developed to bring this information to the public.

http://www.cal-ipc.org/landscaping/calhip.php

Plant Right!

PlantRight is a voluntary partnership to help gardeners and the horticultural industry to proactively address the problem of invasive plants in the trade. It is guided by a steering committee called California Horticultural Invasives Prevention (Cal-HIP).

http://www.plantright.org/

CAL-IPC

Cal-IPC's mission is to protect California's lands and waters from ecologically-damaging invasive plants through science, education and policy. We work closely with agencies, industry and other nonprofit organizations to support research, restoration work, and public education.

The *Don't Plant a Pest!* program started in 2003 with initial meetings between representatives of the ecological restoration and horticultural communities. The first regional *Don't Plant a Pest!* brochures, suggesting safe alternatives for invasive plants still used in landscaping, were published in 2004.

http://www.cal-ipc.org/

Bad Plants and Their Alternatives

DO NOT PLANT (groundcovers):

English Ivy; Algerian Ivy, Irish Ivy, Periwinkle.

PLANT INSTEAD: Star Jasmin, Coral Bells, Heartleaf bergenia, Pachysandra, Common Yarrow, California Wild Lilac.

DO NOT PLANT: (ornamental grasses)

Arundo, Fountaingrass, Pampass grass

PLANT INSTEAD: Giant wildrye, New Zealand Flax, Deergrass, Bamboo (may be a pest), Lavender, Lindheimer's muhly

Source: CAL IPC Brochure

Bad Plants and Their Alternatives cont'd

DO NOT PLANT (Shrubs):
Brooms, Scarlet wisteria
PLANT INSTEAD:
Bush poppy, Forsythia, Cleveland sage,
Golden currant, Jerusalem sage, Toyon

DO NOT PLANT (Trees):
Eucalyptus, Chinese tallowtree, Saltcedar (Tamarisk), Black Locust
PLANT INSTEAD:
Marina strawberry tree, Tupelo, Crape myrtle, Fern pine,
Valley oak, Eastern/western Redbud

Source: CAL-IPC Brochure

CAUTION - -POTENTIAL PESTS!!

- Bamboo
- Privet
- Common Olive
- Chinese Pistache
- Silktree/Mimosa
- Firethorn
- White mulberry
- Catalpa
- Sweet Fennel
- Edible Fig
- Italian Arum
- Osage Orange
- Ravennagrass
- Silver Wattle

Source: CAL-IPC Brochure

QUESTIONS?