Plant and Pest Guide Los Angeles State Historic Park

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2016

METABOLIC STUDIO

Plant and Pest Guide

Los Angeles State Historic Park

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This guide for the Los Angeles State Historic Park is intended to help the Park staff identify common diseases and pests that could infect or feed on the plants found at the park. Plants should be monitored on a regular basis so that problems can be addressed before they spread. Park staff should refer to this guide and other appropriate resources to help them implement the Park's Integrated Pest Management (IPM) policy.

This pest identification guidebook was developed with the support from Metabolic Studio of Los Angeles and the cooperation of the staff at Los Angeles State Historic Park.

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Printed March 2016

UC IPM UC CE University of California Agriculture and Natural Resources METABOLIC STUDIO

Table of Contents

Plant Profiles

Grasses

Forbs

Palms

Reeds, Rushes, & Sedges

Shrubs

Succulents

Trees

Table of Contents

Pest Photos

Diseases

Invertebrates

Nematodes

Vertebrates

Weeds

Plant Profiles

Grasses

SMALL FESCUE
Vulpia microstachys

PLANT TYPE	Annual grass
PLANT SIZE	6-30 inches tall
CARE	Full sun; low-medium water needs; prefers thin, low-nutrient, sandy soils

POSSIBLE PESTS

Red brome, *Bromus rubens*

IMPACT Invasive weed that competes with establishment of small fescue. Requires less water than most native grasses to germinate.

MANAGEMENT OPTIONS Mow or hand remove red brome in early spring before it flowers. Repeated mowing (every 3 weeks) can reduce seed production. Dispose of plant material properly in order to prevent new infestations. Red brome is most vulnerable to herbicide application in the seedling stage.

» photos on page 219

Small fescue. Photo: Keir Morse.

HOOK THREE AWN
Aristida ternipes var. *hamulosa*

PLANT TYPE	Perennial grass
PLANT SIZE	1-3 feet tall
CARE	Full sun; low water needs

POSSIBLE PESTS

No known major pest problems

Hook three awn. Photo: Keir Morse.

RYE GRASS

Elymus condensatus 'Canyon Prince'

PLANT TYPE	Perennial evergreen grass
PLANT SIZE	2-3 feet tall by 3-4 feet wide
CARE	Full sun; low water needs—occasional watering needed, but overwatering will cause plant to wilt

POSSIBLE PESTS

No known major pest problems

Rye grass. Photo: Steve Matson.

IDAHO FESCUE

Festuca idahoensis

PLANT TYPE	Perennial evergreen grass
PLANT SIZE	1 foot tall with 18-24 inch flower stems
CARE	Full sun to light shade; low water needs—does not tolerate flooding, so do not overwater

POSSIBLE PESTS

Grasshoppers (multiple species)

IMPACT Generalist feeders that consume plant leaves and flowers. Damage is usually limited to early summer.

MANAGEMENT OPTIONS Major grasshopper infestations are difficult to manage once the insects have invaded an area. If severe grasshopper activity is anticipated (e.g. during years of grasshopper migration), baits or trap crops can be used around the perimeter of an area to protect species of concern. Small grasshopper nymphs are easier to control than larger nymphs or adults, so treatments are best applied earlier in the season. See ipm.ucanr.edu/pmg/pestnotes/pn74103.html.

» photos on page 189

Damping-off disease (caused by *Rhizoctonia* and *Pythium* fungi)

IMPACT Infection by these diseases may cause: seeds to decay before emerging; young plants to rot or partially rot near the soil surface, causing plants to fall or remain stunted before dying; infection at the root tips of young plants that progresses up the stem.

MANAGEMENT OPTIONS Damping-off is promoted by overwatering or poor soil drainage. Proper irrigation and soil aeration will help reduce susceptibility of young plants to infection. Excessive fertilization that injures seedlings or causes soft growth may also increase vulnerability to damping-off disease. See ipm.ucanr.edu/pmg/pestnotes/pn74132.html.

» photos on page 153

CONTINUED ON NEXT PAGE »

Idaho fescue. Photos: Keir Morse.

PESTS OF IDAHO FESCUE, CONTINUED

Deer mouse, *Peromyscus maniculatus*

IMPACT Vector of hantavirus.

MANAGEMENT OPTIONS Reduce protective vegetative cover, including overgrown shrubs, hedges, and weeds. Exclude deer mice from shelters and other structures by sealing openings larger than ¼ inch. Make sure that the material is rodent-proof, or mice will simply gnaw through the plug. See ipm.ucanr.edu/pmg/pestnotes/pn74161.html.

» photos on page 213

Voles, *Microtus* spp.

IMPACT Feed on garden, turf, and landscape plantings. May carry infectious pathogens and parasites.

MANAGEMENT OPTIONS Voles prefer the cover of dense vegetation. Reducing protective vegetative cover can make it easier to detect or discourage moles from inhabiting an area. Protect young trees and ornamentals with physical barriers such as wire mesh, sheet metal, hardware cloth, or heavy plastic. Concentrated populations in smaller areas can be managed by trapping. See ipm.ucanr.edu/pmg/pestnotes/pn7439.html.

» photos on page 218

MOKELUMNE WESTERN FESCUE
Festuca occidentalis

PLANT TYPE	Perennial grass (summer dormant)
PLANT SIZE	3 feet tall by 2 feet wide
CARE	Part sun to part shade; requires moderate to occasional watering (every 2-4 weeks)

POSSIBLE PESTS

No known major pest problems

Mokelumne western fescue. Photo: Steve Matson.

MOLATE RED FESCUE
Festuca rubra

PLANT TYPE	Perennial grass
PLANT SIZE	12-18 inches tall; spreading growth habit
CARE	Full sun to partial shade; low water needs

POSSIBLE PESTS

Billbugs, *Sphenophorus* spp.

IMPACT Larvae feed on stem and crown, then may move down to roots. Feeding evidenced by piles of fine frass on the soil surface at the base of turfgrass plants.

MANAGEMENT OPTIONS There are presently no curative treatments for billbug grubs. Preventative treatments need to be applied before eggs are laid and damage is detected. Sufficient irrigation may also help to prevent infestations, as drought-stress increases vulnerability. See ipm.ucanr.edu/PMG/r785300411.html.

» photos on page 180

CONTINUED ON NEXT PAGE »

Molate red fescue. Photo: Vernon Smith.

PESTS OF MOLATE RED FESCUE, CONTINUED

White grubs, *Cyclocephala* spp.

IMPACT Larvae feed on turfgrass roots, resulting in irregular dead patches of turf. Vertebrate predators (e.g. raccoons, skunks, coyotes) may dig up turf in search of grubs. Damage usually becomes apparent in late summer to fall.

MANAGEMENT OPTIONS While symptoms resemble drought stress, damage will persist despite sufficient irrigation. Certain pathogenic nematodes can provide effective control of white grubs in late summer. If treating with chemical pesticides, timing is crucial. Depending on the treatment, applications are most effective either before adults lay eggs or when grubs are in the early instar stage. See ipm.ucanr.edu/PMG/r785301311.html.

» photos on page 209

Dollar spot (caused by *Sclerotinia homeocarpa*, *Lanzia* spp., *Moellerodiscus* spp.)

IMPACT Affected turf appears in small, circular patches. Leaves appear water-soaked, then turn brown, often with a reddish band across the leaf. Necrosis occurs on the outer edges of the leaf blades. Lesions often have a distinctive "hourglass" shape.

MANAGEMENT OPTIONS Symptoms commonly appear in spring and fall. Disease is favored by moderate temperatures and high relative humidity, excess thatch, water stress, and/or nitrogen deficiency. Aeration, proper fertilization, minimizing thatch, adjusting irrigation, and raising mowing height help to alleviate conditions favorable to the disease. Fungicides are available if conditions such as temperature and humidity cause symptoms to persist. See ipm.ucanr.edu/PMG/r785101111.html.

» photos on page 155

Pythium blight (caused by *Pythium* spp.)

IMPACT Foliar form of *Pythium*, which may also cause damping-off disease. Causes small, roughly circular spots of blackened, withered, greasy-looking leaf blades. The blades tend to life flat, stick together, and then turn reddish brown.

MANAGEMENT OPTIONS Development of Pythium blight is favored by high temperatures and high relative humidity. Excess nitrogen also appears to make grass more susceptible to the disease, so avoid applying high levels of nitrogen during hot, humid weather. Practices and conditions that increase susceptibility to Pythium blight also include overwatering, mowing wet grass, and poor soil aeration and water drainage. Fungicides are best used preventively or as soon as symptoms are first evident. See ipm.ucanr.edu/PMG/r785100711.html.

» photos on page 166

Red thread (caused by *Laetisaria fuciformis*)

IMPACT Kills turfgrass in 2 to 8-inch diameter patches, or occurs over larger areas without killing plants. Disease can be identified by a pink web of fungal threads that bind leaves together, or by pink, gelatinous fungal crusts projecting from infected leaves.

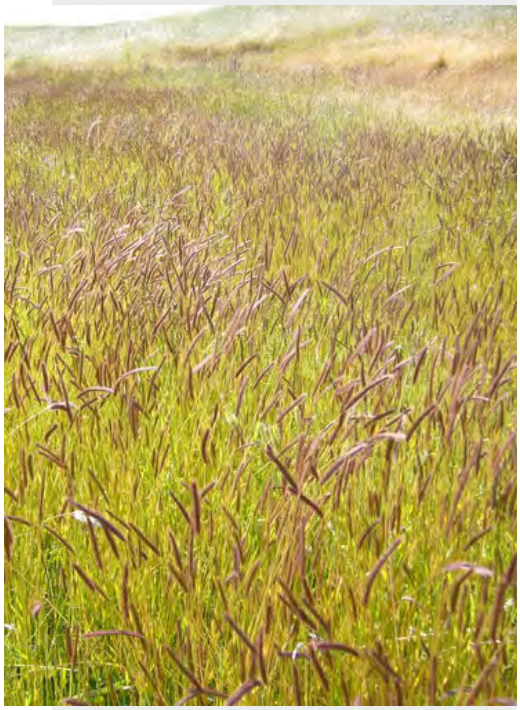
MANAGEMENT OPTIONS While rare in southern California, Red thread may occur during extended periods of leaf wetness and mild air temperatures. Nitrogen deficiency is associated with infected plants. Providing proper irrigation and fertilization will help to reduce the impact of the disease. Fungicides are rarely necessary. See ipm.ucanr.edu/PMG/r785102011.html.

» photos on page 167

CALIFORNIA BARLEY

Hordeum brachyantherum ssp. *californicum*

PLANT TYPE	Perennial grass
PLANT SIZE	1-3 feet tall
CARE	Full sun; low-moderate water needs



A field of California barley. Photo: Zoya Akulova.

POSSIBLE PESTS

Head smut (caused by *Ustilago bullata*)

IMPACT Reduced seedling establishment, dwarfed stems, release of brown or black spore masses when plants flower.

MANAGEMENT OPTIONS Preventive seed treatments and systemic fungicides are available for controlling Head smut, but management is not typically required outside of seed and forage production.

» **photos on page 159**

Rust (caused by *Puccinia* spp., *Uromyces* spp.)

IMPACT Causes discolored leaves with small yellow spots and reddish-brown to orange pustules on stems. Leaves are killed and overall plant vigor is reduced.

MANAGEMENT OPTIONS Favored by moderately warm, moist weather, rust can usually be managed by proper irrigation practices, proper mowing, and fertilization (it is made more severe by nitrogen deficiency).

» **photos on page 168**

RIO CREEPING WILDRYE

Leymus triticoides 'Rio'

PLANT TYPE	Perennial grass
PLANT SIZE	1-4 feet tall
CARE	Moderate water needs; flood-tolerant

POSSIBLE PESTS

Ergot (caused by *Claviceps purpurea*)

IMPACT Produces bluish-black, elongated sclerfotia on grain spikes. These sclerotia are toxic to humans and animals.

MANAGEMENT OPTIONS Manage ergot by using clean seed or deep tillage to bury sclerotia at least 4 inches underground. No chemical treatments have been recommended for this disease.

» photos on page 157

Take-all disease (caused by *Gaeumannomyces graminis*)

IMPACT The disease infects the root tissue of young plants, which then appear yellowed, stunted, and produce bleached seed heads after maturing too quickly.

MANAGEMENT OPTIONS Good soil drainage, proper irrigation (infrequent and deep), and well-aerated soil can help discourage disease development. If the disease persists, re-planting a non-host species may be necessary.

» photos on page 169

Rio creeping wildrye. Photo: Annie Young Mathews, USDA.

COAST RANGE MELIC

Melica imperfecta

PLANT TYPE	Perennial grass
PLANT SIZE	1-3 feet tall by 2-3 feet wide
CARE	Sun to partial shade; low water needs (watering every 3-4 weeks)

POSSIBLE PESTS

No known major pest problems

Coast range melic. Photo: Keir Morse.

DEERGRASS

Muhlenbergia rigens

PLANT TYPE	Perennial grass
PLANT SIZE	5 feet tall by 3-6 feet wide
CARE	Sun to partial shade; low water needs

Deergrass. Photo: Zoya Akulova.

POSSIBLE PESTS

Rabbits - Jackrabbit, *Lepus californicus*; Desert Cottontail, *Sylvilagus audubonii*; Brush Rabbit; *S. bachmani*

IMPACT Rabbits may feed on young Deergrass until it has become well established, which may take a year or longer.

MANAGEMENT OPTIONS Set up protective barriers around young plants until they have become more stablished. Bury the bottom of the barrier at least 6-10 inches into the ground. Bending a few inches of the bottom of the fence outward will also help deter rabbits from digging beneath it. If using chicken wire, use a mesh size of less than 1 inch to keep away young rabbits.

» photos on page 216

Ground squirrel, *Spermophilus beecheyi*

IMPACT Ground squirrels may feed on young Deergrass until it has become well established, which may take a year or longer.

MANAGEMENT OPTIONS Exclusion of ground squirrels is difficult to achieve. If only a few plants require protection, barriers such as those used for rabbits (see above) may deter ground squirrels. However, baiting or fumigation may also be necessary to manage ground squirrels. See ipm.ucanr.edu/pmg/pestnotes/pn7438.html.

» photos on page 214

SWITCHGRASS

Panicum virgatum 'Heavy Metal'

PLANT TYPE	Perennial grass
PLANT SIZE	3-6 feet tall by 2-3 feet wide
CARE	Full to partial sun; low water needs—requires only occasional watering once established

Switchgrass. Photo: Jeff McMillian.

POSSIBLE PESTS

Damping-off disease (caused by *Rhizoctonia* and *Pythium* fungi)

IMPACT Infection by these diseases may cause: seeds to decay before emerging; young plants to rot or partially rot near the soil surface, causing plants to fall or remain stunted before dying; infection at the root tips of young plants that progresses up the stem.

MANAGEMENT OPTIONS Damping-off is promoted by overwatering or poor soil drainage. Proper irrigation and soil aeration will help reduce susceptibility of young plants to infection. Excessive fertilization that injures seedlings or causes soft growth may also increase vulnerability to damping-off disease. See ipm.ucanr.edu/pmg/pestnotes/pn74132.html.

» photos on page 153

Rust (caused by *Puccinia* spp., *Uromyces* spp.)

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MANAGEMENT OPTIONS Favored by moderately warm, moist weather, rust can usually be managed by proper irrigation practices, proper mowing, and fertilization (it is made more severe by nitrogen deficiency).

» photos on page 168

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes stippling (light dots) on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of aesthetic concern and can be managed by providing adequate irrigation and managing dust. Outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

Plant Profiles

Forbs

CHINESE HOUSES
Collinsia heterophylla

PLANT TYPE	Herbaceous annual
PLANT SIZE	1-2 feet tall
CARE	Full sun to light shade; moderate water needs—prefers moist, but well-drained soil

POSSIBLE PESTS

No known major pest problems

Flowers of Chinese houses. Photo: Robert Potts © California Academy of Sciences.

DWARF GOLDFIELDS
Lasthenia californica

PLANT TYPE	Herbaceous annual or perennial
PLANT SIZE	Less than 1 foot tall
CARE	Full sun; moderate water needs—may require regular watering (every 3-7 days)

POSSIBLE PESTS

No known major pest problems

Flowering Dwarf goldfields. Photo: Barry Breckling.

STINGING LUPINE

Lupinus hirsutissimus

PLANT TYPE	Herbaceous annual
PLANT SIZE	1-3 feet tall
CARE	Full sun; low water needs

POSSIBLE PESTS

No known major pest problems

Flower of Stinging lupine. Photo: Keir Morse.

CALIFORNIA POPPY

Eschscholzia californica

PLANT TYPE	Herbaceous annual or perennial
PLANT SIZE	0.5-2 feet tall; low-spreading growth habit
CARE	Full sun; very low water needs—survives on rainfall once established; good drainage required

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT

Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS

Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178

California poppy. Photo: Jo-Ann Ordano © California Academy of Sciences.

CONTINUED ON NEXT PAGE »

PESTS OF CALIFORNIA POPPY, CONTINUED

Leafhoppers (multiple genera)

IMPACT Feeding causes stippled, pale, or brown leaves and curled or dead shoots. Some leafhopper species secrete honeydew, which then encourages the growth of black sooty mold.

MANAGEMENT OPTIONS Leafhoppers are extremely mobile and thus difficult to manage, but control is rarely needed. General natural predators often provide some control, and insecticidal soaps or narrow-range oil can be used to reduce high populations of leafhopper nymphs. No effective controls are recommended for adults. See ipm.ucanr.edu/pmg/garden/veges/pests/leafhopper.html.

» **photos on page 192**

Thrips, order *Thysanoptera*

IMPACT Feeding causes stippling, discolored flecking, or silvering of plant surfaces, accompanied by black flecks of frass. Damaged leaves become papery and distorted and drop prematurely. Flowers may develop dark streaks and spots, deform, or fail to open.

MANAGEMENT OPTIONS If thrip management becomes necessary, an integrated program of natural enemies, good cultural practices, and the most selective or least-toxic insecticide should be adapted to fit the situation. Keep plants properly irrigated, avoid excessive applications of nitrogen fertilizer, and remove spent flowers and nearby weeds, which can harbor thrips. It can be very difficult to control thrips with insecticide, which is rarely warranted in landscape situations. However, if insecticide use becomes necessary, use a selective herbicide that will not harm natural enemies. Timing of application is also extremely important. See ipm.ucanr.edu/pmg/pestnotes/pn7429.html.

» **photos on page 203**

SILVER LICORICE PLANT

Helichrysum petiolare

PLANT TYPE	Herbaceous annual or perennial
PLANT SIZE	1-2 feet tall by 3-4 feet wide
CARE	Full to partial sun; low-moderate water needs

Foliage of Silver licorice plant. Photo: Joseph M. DiTomaso, UC Regents.

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» photos on page 165

Thrips, order *Thysanoptera*

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» photos on page 203

JAPANESE HONEYSUCKLE

Lonicera japonica 'Halliana'

Flowers of Japanese honeysuckle. Photo: Neal Kramer.

PLANT TYPE	Herbaceous perennial
PLANT SIZE	Vine: climbs to 15 feet or more; groundcover: 2 feet tall
CARE	Full sun; low water needs once established

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

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» photos on page 203

WHITE YARROW

Achillea millefolium

PLANT TYPE	Herbaceous perennial
PLANT SIZE	1-3 feet tall
CARE	Full sun to partial shade; low to moderate water needs

White yarrow. Photo: Joseph M. DiTomaso, UC Regents.

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178

Foliage-feeding caterpillars (multiple genera)

IMPACT Feeding behavior varies by species; caterpillars may devour the entire leaf and stem, create "nests" in foliage, feed beneath a protective canopy of silk, or fold or roll leaves together to form shelters. Defoliation may kill the entire plant, but this has not been observed as a huge problem for White Yarrow.

MANAGEMENT OPTIONS Clip and dispose of infested foliage. Remove and dispose of any egg masses. Many foliage-feeding caterpillar populations are controlled by general predators, parasites, or naturally occurring viruses.

» photos on page 185

Rabbits - Jackrabbit, *Lepus californicus*; Desert Cottontail, *Sylvilagus audubonii*; Brush Rabbit; *S. bachmani*

IMPACT Rabbits may feed on the soft foliage of White Yarrow.

MANAGEMENT OPTIONS Set up protective barriers around individual young plants until they have become more stablished. Bury the bottom of the barrier at least 6-10 inches into the ground. Bending a few inches of the bottom of the fence outward will also help deter rabbits from digging beneath it. If using chicken wire, use a mesh size of less than 1 inch to keep away young rabbits. If feeding persists, rabbits may need to be excluded from the entire planting.

» photos on page 216

DEERWEED

Acmispon glaber (syn. *Lotus scoparius*)

PLANT TYPE	Herbaceous perennial
PLANT SIZE	1-3 feet tall
CARE	Full sun; low water needs

POSSIBLE PESTS

No known major pest problems

Deerweed flowers. Photo: Vernon Smith.

YERBA MANSA

Anemopsis californica

PLANT TYPE	Herbaceous perennial
PLANT SIZE	1-2 feet tall; spreading growth habit
CARE	Full sun; requires regular watering (every 3-7 days)

POSSIBLE PESTS

Foliage-feeding caterpillars (multiple genera)

IMPACT Feeding behavior varies by species; caterpillars may devour the entire leaf and stem, create "nests" in foliage, feed beneath a protective canopy of silk, or fold or roll leaves together to form shelters. Defoliation may kill the entire plant, but this has not been observed as a huge problem for Yerba Mansa.

MANAGEMENT OPTIONS Clip and dispose of infested foliage. Remove and dispose of any egg masses. Many foliage-feeding caterpillar populations are controlled by general predators, parasites, or naturally occurring viruses.

» **photos on page 185**

Yerba mansa. Photo: Gerald and Buff Corsi © California Academy of Sciences.

TALL SAGEBRUSH
Artemisia douglasiana

PLANT TYPE	Herbaceous perennial
PLANT SIZE	3-4 feet tall
CARE	Full sun to partial shade; low to moderate water needs (1-2 times monthly); cutting plants to ground in late fall/early winter will remove old stems and encourage new spring growth

POSSIBLE PESTS

No known major pest problems

Tall sagebrush. Photo: Richard Spellenberg.

BEACH EVENING PRIMROSE
Camissonia cheiranthifolia

PLANT TYPE	Herbaceous perennial
PLANT SIZE	1-3 feet wide by < 1 foot tall; dense, spreading growth habbit
CARE	Full sun, may tolerate partial shade; low to moderate water needs, but prefers moist soil

POSSIBLE PESTS

No known major pest problems

Beach evening primrose. Photo: Barry Breckling.

TROPICANNA GOLD CANNA

Canna indica 'Mactro'

PLANT TYPE	Herbaceous perennial
PLANT SIZE	4-6 feet tall
CARE	Partial to full sun; requires regular watering

POSSIBLE PESTS

Canna leaf roller, *Calpodes ethlius*

IMPACT Chews straight rows of holes on foliage. Young leaves are unable to open and may die. Groups of caterpillars may feed under their silk netting, while solitary larva will roll or fold leaves together before feeding.

MANAGEMENT OPTIONS Prune and destroy infested leaves. Dead foliage should also be removed during the winter, as larvae will overwinter in dead leaves. This will remove the majority of the next generation of leaf rollers. Certain insecticidal soaps and sprays have also been recommended; these are very effective when applied to the undersides of the leaves, where the larvae rest during the day. See: aces.edu/pubs/docs/A/ANR-1315/ANR-1315.pdf.

» photos on page 181

Rhizome Rot (caused by *Sclerotium rolfsii*, *Fusarium* spp.)

IMPACT Rhizomes to decay and stems rot at the base of the plant. Infection may be accompanied by a cottony fungal growth.

MANAGEMENT OPTIONS Discard damaged roots. Plantings should be regularly thinned and re-planted to improve vigor. The fungi are best controlled through selection of healthy rootstock.

CONTINUED ON NEXT PAGE »

Tropicanna gold canna. Photo: Moorea Biocode.

PESTS OF TROPICANNA GOLD CANNA, CONTINUED

Snails and slugs (multiple genera)

IMPACT Feed on a wide variety of living plants and decaying plant matter. They chew irregular holes with smooth edges in leaves and flowers and will also clip fruit, young bark, and other succulent plant parts. On Gold Canna, they prefer young, tender leaves that have not yet unfurled.

MANAGEMENT OPTIONS Avoid overwatering, as snails and slugs often indicate excess moisture. If possible, adjust irrigation schedule. Many commercial snail baits are effective at controlling damage. If baits cannot be used, removing debris under and around plants will eliminate daytime shelters for snails and slugs. Ornamentals in planter beds can be protected with several types of barriers, including copper flashing and screen. See ipm.ucanr.edu/pmg/pestnotes/pn7427.html.

» photos on page 200

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

Thrips, order *Thysanoptera*

IMPACT Feeding causes stippling, discolored flecking, or silvering of plant surfaces, accompanied by black flecks of frass. Thrips are sometimes found on the flowers of Gold Canna, which may develop dark streaks and spots, deform, or fail to open.

MANAGEMENT OPTIONS If thrip management becomes necessary, an integrated program of natural enemies, good cultural practices, and the most selective or least-toxic insecticide should be adapted to fit the situation. Keep plants properly irrigated, avoid excessive applications of nitrogen fertilizer, and remove spent flowers and nearby weeds, which can harbor thrips. It can be very difficult to control thrips with insecticide, which is rarely warranted in landscape situations. However, if insecticide use becomes necessary, use a selective herbicide that will not harm natural enemies. Timing of application is also extremely important. See ipm.ucanr.edu/pmg/pestnotes/pn7429.html.

» photos on page 203

RED VALERIAN

Centranthus ruber 'Coccineus'

PLANT TYPE	Herbaceous perennial
PLANT SIZE	2-3 feet tall by 2-3 feet wide
CARE	Full sun; low water needs, only occasional watering needed once established

POSSIBLE PESTS

No known major pest problems

Flowering Red valerian. Photo: Luigi Rignanese.

TICKSEED

Coreopsis 'Big Bang' Full Moon

PLANT TYPE	Herbaceous perennial
PLANT SIZE	2-3 feet tall by 1-2 feet wide
CARE	Partial to full sun; regular watering required (at least weekly, and more frequently in extreme heat)

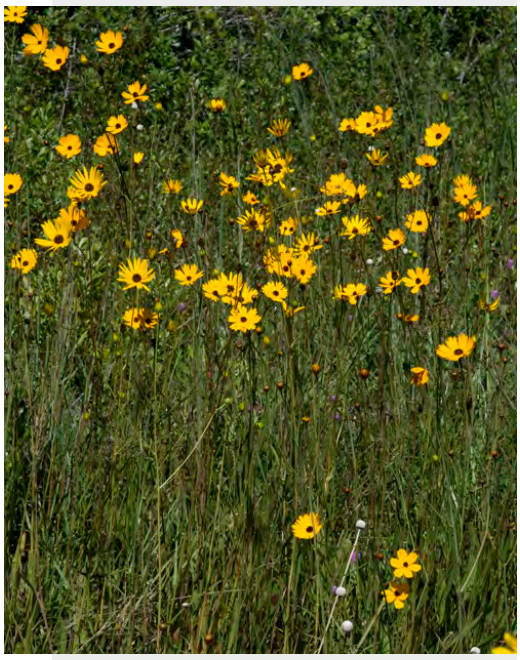
POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178



Coastal plain tickseed, *Coreopsis gladiata*. Photo: Richard Spellenberg.

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PESTS OF TICKSEED, CONTINUED

Leafhoppers (multiple genera)

IMPACT Feeding causes stippled, pale, or brown leaves and curled or dead shoots. Some leafhopper species secrete honeydew, which then encourages the growth of black sooty mold.

MANAGEMENT OPTIONS Leafhoppers are extremely mobile and thus difficult to manage, but control is rarely needed. General natural predators often provide some control, and insecticidal soaps or narrow-range oil can be used to reduce high populations of leafhopper nymphs. No effective controls are recommended for adults. See ipm.ucanr.edu/pmg/garden/veges/pests/leafhopper.html.

» photos on page 192

Root knot nematodes, *Meloidogyne* spp.

IMPACT Cause distinctive swellings (galls) on the roots of affected plants. Nematodes feed inside the galls, which constrict the water- and nutrient-conducting abilities of the roots. Galls may also crack open, allowing other disease-causing microorganisms to infect the plant. Aboveground, infested plants may wilt, have yellowed leaves, and appear otherwise water stressed.

MANAGEMENT OPTIONS Galls cannot be rubbed off the roots; this may also remove beneficial nodules. Management is generally very difficult and no chemical pesticides are available. The best way to manage nematodes is to avoid planting infested material or to select resistant plant varieties. Existing infestations need to be contained; these can spread via irrigation water runoff or in soil attached to tools and equipment. Soil solarization can temporarily reduce populations. See ipm.ucanr.edu/pmg/pestnotes/pn7489.html.

» photos on page 212

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» photos on page 165

Rust (caused by *Puccinia* spp. and others)

IMPACT Pustules, typically found on undersides of leaves, appear as powdery masses of yellow, orange, purple, black, or brown spores on leaves and sometimes stems.

MANAGEMENT OPTIONS As water is necessary for infection, overhead irrigation should be avoided when rust is an issue. Remove leaves with spores on them; these should be rapidly composted or buried. See ipm.ucanr.edu/pmg/r280101211.html.

» photos on page 168

CONTINUED ON NEXT PAGE »

PESTS OF TICKSEED, CONTINUED

Snails and slugs (multiple genera)

IMPACT Feed on a wide variety of living plants and decaying plant matter. They chew irregular holes with smooth edges in leaves and flowers and will also clip fruit, young bark, and other succulent plant parts.

MANAGEMENT OPTIONS Avoid overwatering, as snails and slugs often indicate excess moisture. If possible, adjust irrigation schedule. Many commercial snail baits are effective at controlling damage. If baits cannot be used, removing debris under and around plants will eliminate daytime shelters for snails and slugs. Ornamentals in planter beds can be protected with several types of barriers, including copper flashing and screen. See ipm.ucanr.edu/pmg/pestnotes/pn7427.html.

» photos on page 200

Rabbits - Jackrabbit, *Lepus californicus*; Desert Cottontail, *Sylvilagus audubonii*; Brush Rabbit; *S. bachmani*

IMPACT Rabbits may feed on young Tickseed until it has become well established.

MANAGEMENT OPTIONS Set up protective barriers around young plants until they have become more stablished. Bury the bottom of the barrier at least 6-10 inches into the ground. Bending a few inches of the bottom of the fence outward will also help deter rabbits from digging beneath it. If using chicken wire, use a mesh size of less than 1 inch to keep away young rabbits.

» photos on page 216

Ground squirrel, *Spermophilus beecheyi*

IMPACT Ground squirrels may feed on young Tickseed until it has become well established.

MANAGEMENT OPTIONS Exclusion of ground squirrels is difficult to achieve. If only a few plants require protection, barriers such as those used for rabbits (see above) may deter ground squirrels. However, baiting or fumigation may also be necessary to manage ground squirrels. See ipm.ucanr.edu/pmg/pestnotes/pn7438.html.

» photos on page 214

PURPLE REED STEM ORCHID

Epidendrum 'Purple'

PLANT TYPE	Herbaceous perennial
PLANT SIZE	2-3 feet tall by 2-3 feet wide
CARE	Light shade to partial sun; moderate water needs

Purple reed stem orchid. Photo: San Marcos Growers.

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178

Snails and slugs (multiple genera)

IMPACT Feed on a wide variety of living and decaying plant matter. They chew irregular, smooth-edged holes in leaves and flowers and will also clip fruit, young bark, and other succulent plant parts.

MANAGEMENT OPTIONS Avoid overwatering, as snails and slugs often indicate excess moisture. If possible, adjust irrigation schedule. Many commercial snail baits are effective at controlling damage. If baits cannot be used, removing debris under and around plants will eliminate daytime shelters for snails and slugs. Ornamentals in planter beds can be protected with several types of barriers, including copper flashing and screen. See ipm.ucanr.edu/pmg/pestnotes/pn7427.html.

» photos on page 200

Damping-off disease (caused by *Rhizoctonia* and *Pythium* fungi)

IMPACT Infection by these diseases may cause: seeds to decay before emerging; young plants to rot or partially rot near the soil surface, causing plants to fall or remain stunted before dying; infection at the root tips of young plants that progresses up the stem.

MANAGEMENT OPTIONS Damping-off is promoted by overwatering or poor soil drainage. Proper irrigation and soil aeration will help reduce susceptibility of young plants to infection. Excessive fertilization that injures seedlings or causes soft growth may also increase vulnerability to damping-off disease. See ipm.ucanr.edu/pmg/pestnotes/pn74132.html.

» photos on page 153

CONTINUED ON NEXT PAGE »

PESTS OF PURPLE REED STEM ORCHID, CONTINUED

Tobacco Mosaic Virus

IMPACT Causes distorted foliage or foliage streaked in irregular patterns (that go from shades or green to black).

MANAGEMENT OPTIONS No treatment is available for this plant virus. Infected plants should be isolated or destroyed. The virus can be spread very easily by aphids and other sucking insects, nonsterilized cutting tools, and fingernails.

» photos on page 171

ROUTE 66 CALIFORNIA FUCHSIA

Epilobium canum (syn. *Zauschneria californica*) 'Rt 66'

PLANT TYPE	Herbaceous perennial
PLANT SIZE	1-2 feet tall by 2-4 feet wide
CARE	Partial to full sun; low water needs, requires regular watering until well-established; in hot, dry conditions, supplemental irrigation is recommended

Flowers of California fuchsia. Photo: Robert Sikora.

POSSIBLE PESTS

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

EVENING PRIMROSE

Oenothera elata ssp. *hookeri*

PLANT TYPE	Herbaceous perennial
PLANT SIZE	3-6 feet tall
CARE	Full sun; low water needs, but prefers moist soils

POSSIBLE PESTS

No known major pest problems

Evening primrose. Photo: Neal Kramer.

BLUE-EYED GRASS

Sisyrinchium bellum

PLANT TYPE	Herbaceous perennial
PLANT SIZE	1 foot tall by 1-2 feet wide
CARE	Full to partial sun; low water needs, but prefers moist soil; more drought tolerant once well-established

POSSIBLE PESTS

No known major pest problems

Blue-eyed grass in bloom. Photo: David McClurg.

PURPLE WANDERING JEW

Tradescantia pallida 'Purple Heart'

PLANT TYPE	Herbaceous perennial
PLANT SIZE	1 foot tall by 2-4 feet wide
CARE	Full sun; moderate water needs

Purple wandering Jew. Photo courtesy of Missouri Botanical Garden.

POSSIBLE PESTS

Foliage-feeding caterpillars (multiple genera)

IMPACT Feeding behavior varies by species; caterpillars may devour the entire leaf and stem, create "nests" in foliage, feed beneath a protective canopy of silk, or fold or roll leaves together to form shelters. Defoliation may kill the entire plant. While caterpillars may feed on young Purple Wandering Jew shoots, they are not usually a problem on the hardier, well-established plants.

MANAGEMENT OPTIONS Clip and dispose of infested foliage. Remove and dispose of any egg masses. Many foliage-feeding caterpillar populations are controlled by general predators, parasites, or naturally occurring viruses.

» photos on page 185

Snails and slugs (multiple genera)

IMPACT Feed on a wide variety of living plants and decaying plant matter. They chew irregular holes with smooth edges in leaves and flowers and will also clip fruit, young bark, and other succulent plant parts. While snails may feed on young Purple Wandering Jew shoots, they are not usually a problem on the hardier, well-established plants.

MANAGEMENT OPTIONS Avoid overwatering, as snails and slugs often indicate excess moisture. If possible, adjust irrigation schedule. Many commercial snail baits are effective at controlling damage. If baits cannot be used, removing debris under and around plants will eliminate daytime shelters for snails and slugs. Ornamentals in planter beds can be protected with several types of barriers, including copper flashing and screen. See ipm.ucanr.edu/pmg/pestnotes/pn7427.html.

» photos on page 200

Plant Profiles

Palms

MEDITERRANEAN FAN PALM

Chamaerops humilis

PLANT TYPE	Palm
PLANT SIZE	10-15 feet tall
CARE	Partial to full sun; low water needs once established—regular watering schedule required during first growing season to establish root system

POSSIBLE PESTS

No known major pest problems

Mediterranean fan palm. Photos: Luigi Rignanese.

DWARF PALMETTO

Sabal minor

PLANT TYPE	Palm
PLANT SIZE	5-10 feet tall
CARE	Full sun to light shade; moderate water needs—regular watering schedule required during first growing season to establish root system

Dwarf palmetto. Photo: Gary Hollar.

POSSIBLE PESTS

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» **photos on page 199**

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» **photos on page 201**

Plant Profiles

Reeds, Rushes, & Sedges

PAPYRUS
Cyperus papyrus

PLANT TYPE	Perennial reed
PLANT SIZE	2-3 feet tall
CARE	Full sun to partial shade; high water needs

POSSIBLE PESTS

Rust (caused by *Puccinia* spp., *Uromyces* spp.)

IMPACT Causes discolored leaves with small yellow spots and reddish-brown to orange pustules on stems. Leaves are killed and overall plant vigor is reduced.

MANAGEMENT OPTIONS Favored by moderately warm, moist weather, rust can usually be managed by proper irrigation practices, proper mowing, and fertilization (it is made more severe by nitrogen deficiency).

» photos on page 168

Papyrus. Photo: Zoya Akulova.

COMMON CATTAIL
Typha latifolia

PLANT TYPE	Perennial reed
PLANT SIZE	4-10 feet tall, dense growth habit
CARE	Full sun to partial shade; requires wet conditions and can grow in water

POSSIBLE PESTS

No known major pest problems

Common cattail. Photo: Jean Pawek.

CAPE RUSH
Chondropetalum tectorum

PLANT TYPE	Perennial evergreen grass
PLANT SIZE	2-3 feet tall by 3-4 feet wide
CARE	Full sun; low water needs; needs only occasional watering once established, as overwatering may cause plant to wilt; carefully remove old stems to showcase new growth

POSSIBLE PESTS

No known major pest problems

Flowering cape rush. Photo: UCCE Master Gardeners, Marin County.

SPINY RUSH
Juncus acutus

PLANT TYPE	Perennial rush
PLANT SIZE	3-5 feet tall
CARE	Full sun to light shade; requires wet conditions and can grow in water

POSSIBLE PESTS

No known major pest problems

Spiny rush. Photo: Luigi Rignanese.

CALIFORNIA GRAY RUSH
Juncus patens

PLANT TYPE	Perennial rush
PLANT SIZE	1-2.5 feet tall by 1-2 feet wide
CARE	Full sun to part shade; requires regular water; may tolerate drier conditions once established

POSSIBLE PESTS

Rust (caused by *Puccinia* spp., *Uromyces* spp.)

IMPACT Causes discolored leaves with small yellow spots and reddish-brown to orange pustules on stems. Leaves are killed and overall plant vigor is reduced.

MANAGEMENT OPTIONS Favored by moderately warm, moist weather, rust can usually be managed by proper irrigation practices, proper mowing, and fertilization (it is made more severe by nitrogen deficiency).

» **photos on page 168**

California gray rush, also called spreading rush. Photo: Neal Kramer.

BASKET RUSH
Juncus textilis

PLANT TYPE	Perennial rush
PLANT SIZE	3-6 feet tall; spreading growth habit
CARE	Full sun to light shade; requires regular water

POSSIBLE PESTS

No known major pest problems

Basket rush. Photo: Anthony Valois, National Park Service.

BERKELEY SEDGE

Carex divulsa

PLANT TYPE	Perennial, evergreen sedge
PLANT SIZE	1-3 feet tall; 1-3 feet wide
CARE	Full sun to partial shade; moderate water needs, may tolerate drier conditions once established

Flower of Berkeley Sedge. Photo: Jean Claude.

POSSIBLE PESTS

While there are no known pest problems specific to Berkeley Sedge, many *Carex* species can be affected by:

Leaf spot disease (caused by many fungi)

IMPACT Caused by a variety of fungi on many different hosts, symptoms range from small discrete dots and raised areas to irregular yellow or brownish patches. Leaves may fall off the tree if problem is severe.

MANAGEMENT OPTIONS Damage is rarely long term and infections can usually be tolerated by hosts. Fungicide use is rarely warranted. Excess moisture can favor the fungi that cause the disease, so avoid overhead sprinklers and irrigate early in the day so that foliage dries more quickly. Fallen leaves and debris should be removed promptly to avoid spreading the disease.

» **photos on page 161**

Rust (caused by *Puccinia* spp., *Uromyces* spp.)

IMPACT Causes discolored leaves with small yellow spots and reddish-brown to orange pustules on stems. Leaves are killed and overall plant vigor is reduced.

MANAGEMENT OPTIONS Favored by moderately warm, moist weather, rust can usually be managed by proper irrigation practices, proper mowing, and fertilization (it is made more severe by nitrogen deficiency).

» **photos on page 168**

SAN DIEGO SEDGE
Carex spissa

PLANT TYPE	Perennial, evergreen sedge
PLANT SIZE	3-4 feet tall by 2-3 feet wide
CARE	Full sun to light shade; requires moderate to regular water

POSSIBLE PESTS

See possible pests of Berkeley Sedge, *Carex divulsa*

San Diego sedge. Photo: Keir Morse.

FOOTHILL SEDGE
Carex tumulicola

PLANT TYPE	Perennial, semi-evergreen sedge
PLANT SIZE	1 foot tall by 1-2 feet wide
CARE	Partial to full sun; moderate water needs, but tolerates periods of dryness

POSSIBLE PESTS

See possible pests of Berkeley Sedge, *Carex divulsa*

Foothill sedge. Photo: Monica Dimson, UC Cooperative Extension.

FLAX LILY

Dianella tasmanica 'Silver Streak'

PLANT TYPE	Perennial sedge
PLANT SIZE	1-2 feet tall
CARE	Light shade; tolerates full coastal sun; moderate water needs—less water required once established

POSSIBLE PESTS

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» **photos on page 199**

Flax lily. Photo: San Marcos Growers.

NEW ZEALAND FLAX

Phormium 'Ed Carmen'

PLANT TYPE	Perennial sedge
PLANT SIZE	2-3 feet tall by 2-3 feet wide
CARE	Full sun to light shade; moderate water needs

POSSIBLE PESTS

No known major pest problems

New Zealand flax. Photo courtesy of Missouri Botanical Garden.

Plant Profiles

Shrubs

COYOTE BUSH

Baccharis pilularis

PLANT TYPE	Evergreen shrub
PLANT SIZE	4-8 feet tall by 4-8 feet wide
CARE	Full sun; very low water needs; drought tolerant once established; does not tolerate dust on foliage

POSSIBLE PESTS

Flatheaded borers (multiple genera)

IMPACT Larvae tunnel beneath the bark, causing wet, sappy areas on the bark of the main trunk, which may crack. Boring may kill limbs or entire trees.

MANAGEMENT OPTIONS Prevention is the most effective management approach for flatheaded borers, which typically attack trees that have been previously injured or damaged. Providing proper care and protecting landscape plants from injury will make them less attractive to the borers. Avoid pruning spring-summer while adults are active. Properly dispose of infested wood material, as beetles may emerge from logs and attack nearby plants. See ipm.ucanr.edu/pmg/garden/plants/invert/flatheaded.html.

» photos on page 184

Foliage-feeding caterpillars (multiple genera)

IMPACT Feeding behavior varies by species; caterpillars may devour the entire leaf and stem, create "nests" in foliage, feed beneath a protective canopy of silk, or fold or roll leaves together to form shelters. Defoliation may kill the entire plant, but this has not been observed as a huge problem for Coyote Bush.

MANAGEMENT OPTIONS Clip and dispose of infested foliage. Remove and dispose of any egg masses. Many foliage-feeding caterpillar populations are controlled by general predators, parasites, or naturally occurring viruses.

» photos on page 185

CONTINUED ON NEXT PAGE »

Coyote bush. Photo: Monica Dimson, UC Cooperative Extension.

Coyote bush flowers. Photo: Keir Morse.

PESTS OF COYOTE BUSH, CONTINUED

Gall and blister mites, family *Eriophyidae*

IMPACT Cause warty, woody swellings on twigs and green or brown raised blisters on leaves. Blistered leaves may curl or become distorted.

MANAGEMENT OPTIONS Landscape plants can usually tolerate some gall and blister mite damage, and no controls are known for most species. Aesthetic damage can be managed by pruning and disposing of infested leaves. When mites are abundant, it is important to conserve natural enemies and to keep plants healthy and vigorous. See ipm.ucanr.edu/pmg/garden/plants/invert/gallblistermites.html.

» photos on page 186

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Coyote bush can be affected by Greedy scale, Black scale, or Wax scale. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» photos on page 199

Whitefly (multiple genera)

IMPACT Cause distortion, discoloration, or silvering of leaves while feeding. Excrete honeydew, which encourages the growth of black sooty mold.

MANAGEMENT OPTIONS Whiteflies develop rapidly in warm weather. They can usually be controlled by natural predators and parasites, but populations will build if their natural enemies are destroyed by broad-spectrum insecticides. Whiteflies themselves are not well controlled with any available insecticides. Early infestations can be managed by vigilantly removing infested leaves, vacuuming adults, or hosing down with water sprays. See ipm.ucanr.edu/pmg/pestnotes/pn7401.html.

» photos on page 210

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» photos on page 165

MULEFAT
Baccharis salicifolia

PLANT TYPE	Evergreen shrub
PLANT SIZE	3-10 feet tall; fast growing plant
CARE	Full sun to partial shade; moderate water use

POSSIBLE PESTS

No known major pest problems

Mulefat shrub. Photo: Jean Pawek.

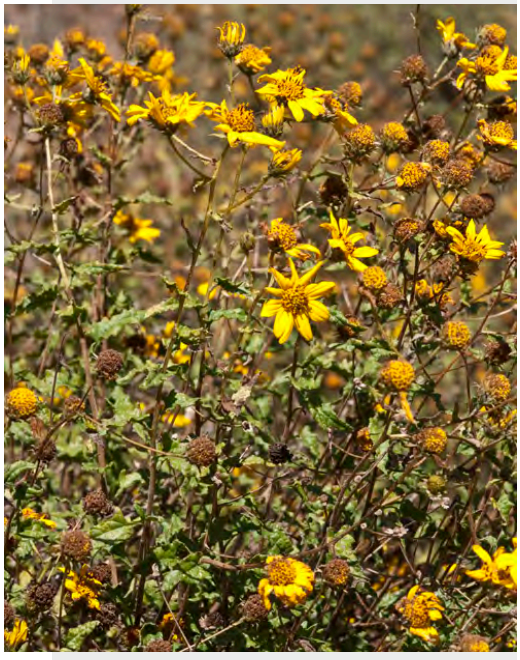
Mulefat flowers. Photo: Keir Morse.

SAN DIEGO SUNFLOWER
Bahiopsis laciniata (syn. *Viguiera laciniata*)

PLANT TYPE	Evergreen shrub
PLANT SIZE	3-5 feet tall by 5-10 feet wide
CARE	Full to partial sun; low water needs

POSSIBLE PESTS

No known major pest problems



San Diego sunflower in bloom. Photo: Richard Spellenberg.

BUTTERFLY BUSH

Buddleja davidii 'Alba'

PLANT TYPE	Semi-evergreen shrub
PLANT SIZE	6-8 feet tall by 3-5 feet wide
CARE	Full sun; moderate water needs

Butterfly bush flower. Photo: Wikipedia user Cillas.

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178

Foliage-feeding caterpillars (multiple genera)

IMPACT Feeding behavior varies by species; caterpillars may devour the entire leaf and stem, create "nests" in foliage, feed beneath a protective canopy of silk, or fold or roll leaves together to form shelters. In some cases, defoliation may kill the entire plant.

MANAGEMENT OPTIONS Clip and dispose of infested foliage. Remove and dispose of any egg masses. Many foliage-feeding caterpillar populations are controlled by general predators, parasites, or naturally occurring viruses.

» photos on page 185

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes stippling (light dots) on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of aesthetic concern and can be managed by providing adequate irrigation and managing dust. Outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

NATAL PLUM

Carissa macrocarpa

PLANT TYPE	Evergreen shrub
PLANT SIZE	2-3 feet tall by 3 feet wide
CARE	Full sun; regular water required

POSSIBLE PESTS

Damping-off disease (caused by *Rhizoctonia* and *Pythium* fungi)

IMPACT

Infection by these diseases may cause: seeds to decay before emerging; young plants to rot or partially rot near the soil surface, causing plants to fall or remain stunted before dying; infection at the root tips of young plants that progresses up the stem.

MANAGEMENT OPTIONS

Damping-off is promoted by overwatering or poor soil drainage. Proper irrigation and soil aeration will help reduce susceptibility of young plants to infection. Excessive fertilization that injures seedlings or causes soft growth may also increase vulnerability to damping-off disease. See ipm.ucanr.edu/pmg/pestnotes/pn74132.html.

» photos on page 153

Leaf spot disease (caused by many fungi)

IMPACT

Caused by a variety of fungi on many different hosts, symptoms range from small discrete dots and raised areas to irregular yellow or brownish patches. Severe infection may cause defoliation.

MANAGEMENT OPTIONS

Damage is rarely long term and infections can usually be tolerated by hosts. Fungicide use is rarely warranted. Excess moisture can favor the fungi that cause the disease, so avoid overhead sprinklers and irrigate early in the day so that foliage dries more quickly. Fallen leaves and debris should be removed promptly to avoid spreading the disease.

» photos on page 161

CONTINUED ON NEXT PAGE »

Fruit and flowers of Natal plum. Photo: Marco Schmidt.

PESTS OF NATAL PLUM, CONTINUED

Mealybugs (multiple genera)

IMPACT Congregate in large numbers, forming white, cottony masses on plants. May feed on stems or leaves, slowing plant growth and causing premature leaf drop or twig dieback.

MANAGEMENT OPTIONS Moderate mealybug feeding will not cause significant damage. Natural predators and parasites typically provide adequate control of most species. Conserve these natural enemies by avoiding broad-spectrum insecticide sprays and by managing ants, which are attracted to mealybug honeydew and may protect them from beneficial insects. Removing overwintering sites (e.g. loose bark) can reduce populations. See: ipm.ucanr.edu/pmg/garden/plants/invert/mealybugs.html.

» **photos on page 193**

Soft scales, family *Coccidae*

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» **photos on page 199**

WILD LILAC

Ceanothus 'Concha'

PLANT TYPE	Evergreen shrub
PLANT SIZE	6-8 feet tall by 6-12 feet wide
CARE	Full sun; low water needs

Wild lilac shrub and foliage.
Photos: UC Cooperative Extension.

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which may protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178

Mealybugs (multiple genera)

IMPACT Congregate in large numbers, forming white, cottony masses on plants. May feed on stems or leaves, slowing plant growth and causing premature leaf drop or twig dieback.

MANAGEMENT OPTIONS Moderate mealybug feeding will not cause significant damage. Natural enemies typically provide adequate control of most mealybug species. Conserve natural predators and parasites by avoiding broad-spectrum insecticide sprays and by managing ants, which are attracted to mealybug honeydew and may protect them from beneficial insects. Removing overwintering sites (e.g. loose bark) can reduce populations. See: ipm.ucanr.edu/pmg/garden/plants/invert/mealybugs.html.

» photos on page 193

Pacific flatheaded borer, *Chrysobothris malis*

IMPACT Larvae tunnel beneath the bark, causing wet, sappy areas on the bark of the main trunk, which may crack. Boring may kill limbs or entire trees.

MANAGEMENT OPTIONS Prevention is the most effective management of flatheaded borers, which typically attack trees that have been previously injured or damaged. Providing proper care and protecting landscape plants from injury will make them less attractive to the borers. Avoid pruning spring-summer while adults are active. Properly dispose of infested wood material, as beetles may emerge from logs and attack nearby plants. Insecticide treatment is not recommended. See ipm.ucanr.edu/pmg/garden/plants/invert/flatheaded.html.

» photos on page 184

CONTINUED ON NEXT PAGE »

PESTS OF WILD LILAC, CONTINUED

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, prune infested twigs and branches. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» photos on page 199

Sycamore borer, *Synanthedon resplendens*

IMPACT Impact: Larvae bore into host bark, causing rough or gnarled bark, trunk and branch swellings, sap exudation, and sawdustlike frass.

MANAGEMENT OPTIONS Preventing attack by providing proper cultural care is the primary management strategy for Sycamore borer. Oak and sycamore trees can tolerate extensive boring activity from this pest. If they become a serious threat to Ceanothus, traps are available for the *Synanthedon* species. These are typically used for detection, but may also help to provide some management. See ipm.ucanr.edu/pmg/pestnotes/pn7477.html.

» photos on page 202

Whitefly (multiple genera)

IMPACT Cause distortion, discoloration, or silvering of leaves while feeding. Excrete honeydew, which encourages the growth of black sooty mold.

MANAGEMENT OPTIONS Whiteflies develop rapidly in warm weather. They can usually be controlled by natural predators and parasites, but populations will build if their natural enemies are destroyed by broad-spectrum insecticides. Whiteflies themselves are not well controlled with any available insecticides. Early infestations can be managed by vigilantly removing infested leaves, vacuuming adults, or hosing down with water sprays. See ipm.ucanr.edu/pmg/pestnotes/pn7401.html.

» photos on page 210

Rabbits - Jackrabbit, *Lepus californicus*; Desert Cottontail, *Sylvilagus audubonii*; Brush Rabbit; *S. bachmani*

IMPACT Rabbits may feed on young Ceanothus until it has become more established.

MANAGEMENT OPTIONS Set up protective barriers around young plants until they have become more stablished. Bury the bottom of the barrier at least 6-10 inches into the ground. Bending a few inches of the bottom of the fence outward will also help deter rabbits from digging beneath it. If using chicken wire, use a mesh size of less than 1 inch to keep away young rabbits.

» photos on page 216

BLUE MOUNTAIN LILAC
Ceanothus thyrsiflorus 'Skylark'

PLANT TYPE	Evergreen shrub
PLANT SIZE	4-5 feet tall by 6-7 feet wide
CARE	Full sun; requires low to moderate water; less water required once established

POSSIBLE PESTS

See possible pests of Wild Lilac, *Ceanothus* 'Concha'

Blue mountain lilac in bloom.
Photo: Steve Matson.

SAGELEAF ROCKROSE
Cistus salviifolius 'Prostratus'

PLANT TYPE	Evergreen shrub
PLANT SIZE	1-2 feet tall by 4-6 feet wide
CARE	Full sun; low water needs

POSSIBLE PESTS

No known major pest problems

Flowering Sageleaf rockrose.
Photo: Hans Hillewaert.

PINK ROCKROSE
Cistus x skanbergii

PLANT TYPE	Evergreen shrub
PLANT SIZE	2-3 feet tall by 2-3 feet wide
CARE	Full sun; low water needs

POSSIBLE PESTS

No known major pest problems

Pink rockrose. Photo: UCCE Marin County Master Gardeners.

CALIFORNIA BUCKWHEAT
Eriogonum fasciculatum

PLANT TYPE	Evergreen shrub
PLANT SIZE	1-3 feet tall by 4-5 feet wide
CARE	Full sun to partial shade; low water needs

POSSIBLE PESTS

No known major pest problems

California buckwheat. Photo: Wynn Anderson.

GOLDEN YARROW
Eriophyllum confertiflorum

PLANT TYPE	Semi-evergreen shrub
PLANT SIZE	1-2 feet tall
CARE	Full sun; low water needs

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» **photos on page 178**

Golden yarrow. Photo: Keir Morse.

YELLOW CRANESBILL
Erodium chrysanthum

PLANT TYPE	Evergreen shrub
PLANT SIZE	< 1 foot tall by 1-2 feet wide
CARE	Full sun; moderate water needs

POSSIBLE PESTS

No known major pest problems

Yellow cranesbill flower. Photo: Réginald Hulhoven.

FLANNEL BUSH

Fremontodendron 'Ken Taylor'

PLANT TYPE	Evergreen shrub
PLANT SIZE	4-6 feet tall by 10+ feet wide
CARE	Full sun; low water needs once established; prefers well-drained soils and drier conditions

Flannel bush in bloom. Photo: Steven Thorsted.

POSSIBLE PESTS

Damping-off disease (caused by *Rhizoctonia* and *Pythium* fungi)

IMPACT Infection by these diseases may cause: seeds to decay before emerging; young plants to rot or partially rot near the soil surface, causing plants to fall or remain stunted before dying; infection at the root tips of young plants that progresses up the stem.

MANAGEMENT OPTIONS Damping-off is promoted by overwatering or poor soil drainage. Flannel Bush requires dry conditions, so special care must be taken to ensure that proper irrigation and soil aeration are practiced. This will help reduce susceptibility of young plants to infection. Excessive fertilization that injures seedlings or causes soft growth may also increase vulnerability to damping-off disease. See ipm.ucanr.edu/pmg/pestnotes/pn74132.html.

» photos on page 153

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

MINIATURE GARDENIA

Gardenia jasminoides 'Radicans'

PLANT TYPE	Evergreen shrub
PLANT SIZE	< 1 foot tall by 2-3 feet wide; spreading growth habit
CARE	Partial to full sun; regular water required

Miniature gardenia flower. Photo: Wiki user KENPEI.

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178

Root knot nematodes, *Meloidogyne* spp.

IMPACT Cause distinctive swellings (galls) on the roots of affected plants. Nematodes feed inside the galls, which constrict the water- and nutrient-conducting abilities of the roots. Galls may also crack open, allowing other disease-causing microorganisms to infect the plant. Aboveground, infested plants may wilt, have yellowed leaves, and appear otherwise water stressed.

MANAGEMENT OPTIONS Galls cannot be rubbed off the roots; this may also remove beneficial nodules. Management is generally very difficult and no chemical pesticides are available. The best way to manage nematodes is to avoid planting infested material or to select resistant plant varieties. Existing infestations need to be contained; these can spread via irrigation water runoff or in soil attached to tools and equipment. Soil solarization can temporarily reduce populations. See ipm.ucanr.edu/pmg/pestnotes/pn7489.html.

» photos on page 212

CONTINUED ON NEXT PAGE »

PESTS OF MINIATURE GARDENIA, CONTINUED

Soft scales, family *Coccidae*

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, prune infested twigs and branches. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» photos on page 199

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

Whitefly (multiple genera)

IMPACT Cause distortion, discoloration, or silvering of leaves while feeding. Excrete honeydew, which encourages the growth of black sooty mold.

MANAGEMENT OPTIONS Whiteflies develop rapidly in warm weather. They can usually be controlled by natural predators and parasites, but populations will build if their natural enemies are destroyed by broad-spectrum insecticides. Whiteflies themselves are not well controlled with any available insecticides. Early infestations can be managed by vigilantly removing infested leaves, vacuuming adults, or hosing down with water sprays. See ipm.ucanr.edu/pmg/pestnotes/pn7401.html.

» photos on page 210

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

TOYON

Heteromeles arbutifolia

PLANT TYPE	Evergreen shrub
PLANT SIZE	6-10 feet tall by 6-8 feet wide
CARE	Full sun to partial shade; low water needs

POSSIBLE PESTS

Flatheaded borers (multiple genera)

IMPACT

Larvae tunnel beneath the bark, causing wet, sappy areas on the bark of the main trunk, which may crack. Boring may kill limbs or entire trees.

MANAGEMENT OPTIONS

Prevention is the most effective management of flatheaded borers, which typically attack previously injured or damaged trees. Providing proper care and protecting landscape plants from injury will make them less attractive to the borers. Avoid pruning spring-summer while adults are active. Properly dispose of infested wood material, as beetles may emerge from logs and attack nearby plants. See ipm.ucanr.edu/pmg/garden/plants/invert/flatheaded.html.

» photos on page 184

Foliage-feeding caterpillars (multiple genera)

IMPACT

Feeding behavior varies by species; caterpillars may devour the entire leaf and stem, create "nests" in foliage, feed beneath a protective canopy of silk, or fold or roll leaves together to form shelters. Defoliation may kill the entire plant, but this is unlikely to occur on Toyon.

MANAGEMENT OPTIONS

Clip and dispose of infested foliage. Remove and dispose of any egg masses. Many foliage-feeding caterpillar populations are controlled by general predators, parasites, or naturally occurring viruses.

» photos on page 185

CONTINUED ON NEXT PAGE »

A fruiting Toyon shrub. Photo: Keir Morse.

Toyon flowers. Photo: Barry Breckling.

PESTS OF TOYON, CONTINUED

Soft scales, family *Coccidae*

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» **photos on page 199**

Thrips, order *Thysanoptera*

IMPACT Feeding causes stippling, discolored flecking, or silvering of plant surfaces, accompanied by black flecks of frass. Damaged leaves become papery and distorted and drop prematurely. Flowers may develop dark streaks and spots, deform, or fail to open.

MANAGEMENT OPTIONS If thrip management becomes necessary, an integrated program of natural enemies, good cultural practices, and the most selective or least-toxic insecticide should be adapted to fit the situation. Keep plants properly irrigated, avoid excessive applications of nitrogen fertilizer, and remove spent flowers and nearby weeds, which can harbor thrips. It can be very difficult to control thrips with insecticide, which is rarely warranted in landscape situations. However, if insecticide use becomes necessary, use a selective herbicide that will not harm natural enemies. Timing of application is also extremely important. See ipm.ucanr.edu/pmg/pestnotes/pn7429.html.

» **photos on page 203**

Whitefly (multiple genera)

IMPACT Cause distortion, discoloration, or silvering of leaves while feeding. Excrete honeydew, which encourages the growth of black sooty mold.

MANAGEMENT OPTIONS Whiteflies develop rapidly in warm weather. They can usually be controlled by natural predators and parasites, but populations will build if their natural enemies are destroyed by broad-spectrum insecticides. Whiteflies themselves are not well controlled with any available insecticides. Early infestations can be managed by vigilantly removing infested leaves, vacuuming adults, or hosing down with water sprays. See ipm.ucanr.edu/pmg/pestnotes/pn7401.html.

» **photos on page 210**

CONTINUED ON NEXT PAGE »

PESTS OF TOYON, CONTINUED

Fire blight (caused by *Erwinia amylovora*)

IMPACT Most commonly infects open flowers and may extend into twigs and branches, causing flowers and small shoots to wilts. Dead, blackened leaves and fruit cling to branches throughout the season (hence the disease name). Causes branch and trunk cankers, which are small and inconspicuous at first. As the infection advances, cankers exude a watery, light tan bacterial ooze. This darkens as it is exposed to air and streaks the trunk and branches. Infected wood underneath the bark has pink to orange-red streaks.

MANAGEMENT OPTIONS Monitor trees regularly and remove and destroy infected flowers and shoots. Infected wood must be pruned out. Preventative sprays are available, but will not eliminate wood infections. Avoid excess nitrogen fertilization and heavy pruning, both of which encourage the growth vulnerable succulent tissue. The disease is favored by moderate to warm temperatures of 75-85°F combined with intermittent rain or hail.

» **photos on page 158**

Leaf spot diseases (caused by many fungi)

IMPACT Caused by a variety of different fungi on a many different hosts, symptoms range from small discrete dots and raised areas to irregular yellow or brownish patches. Leaves may fall off the tree in problem is severe.

MANAGEMENT OPTIONS Damage is rarely long term and infections can usually be tolerated by hosts. Fungicide use is rarely warranted. Excess moisture can favor the fungi that cause the disease, so avoid overhead sprinklers and irrigate early in the day so that foliage dries more quickly. Fallen leaves and debris should be removed promptly to avoid spreading the disease.

» **photos on page 161**

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» **photos on page 164**

MISSION RED MONKEY FLOWER

Mimulus aurantiacus var. *puniceus*

PLANT TYPE	Evergreen shrub
PLANT SIZE	2-3 feet tall by 1-3 feet wide
CARE	Partial shade; moderate water needs; avoid overwatering

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT

Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS

Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» **photos on page 178**

Mission red monkey flower in bloom. Photos: Keir Morse.

Flowers of Mission red monkey flower. Photos: Keir Morse.

PACIFIC WAX MYRTLE

Myrica californica

PLANT TYPE	Evergreen shrub
PLANT SIZE	20-30 feet tall by 10-20 feet wide
CARE	Full sun; moderate to regular water needs

Pacific wax myrtle. Photo: Wiki user Daderot.

POSSIBLE PESTS

Soft scales, family *Coccidae*

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» **photos on page 199**

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» **photos on page 201**

CONTINUED ON NEXT PAGE »

PESTS OF PACIFIC WAX MYRTLE, CONTINUED

Whitefly (multiple genera)

IMPACT Cause distortion, discoloration, or silvering of leaves while feeding. Excrete honeydew, which encourages the growth of black sooty mold.

MANAGEMENT OPTIONS Whiteflies develop rapidly in warm weather. They can usually be controlled by natural predators and parasites, but populations will build if their natural enemies are destroyed by broad-spectrum insecticides. Whiteflies themselves are not well controlled with any available insecticides. Early infestations can be managed by vigilantly removing infested leaves, vacuuming adults, or hosing down with water sprays. See ipm.ucanr.edu/pmg/pestnotes/pn7401.html.

» photos on page 210

Anthracnose (caused by multiple genera of fungi)

IMPACT Causes dark, sunken lesions on leaves, stems, flowers, and fruits. Infected leaves may have small tan, brown, black, or tarlike spots, depending on the species. New leaves are more affected than mature leaves. On some trees, cankers may develop on twigs, branches, and the trunk. However, anthracnose rarely causes permanent damage to trees in California.

MANAGEMENT OPTIONS Anthracnose cannot be effectively controlled during the same season that symptoms develop or become severe. Rake and dispose of fallen leaves and twigs during the growing season and in fall. Prune during winter to increase air circulation in the canopy and remove the previous season's infected twigs and branches. The disease is favored by wet conditions; a wet spring or irrigation that hits foliage could result in a disease outbreak. See ipm.ucanr.edu/pmg/pestnotes/pn7420.html.

» photos on page 145

Leaf spot diseases (caused by many fungi)

IMPACT Caused by a variety of different fungi on a many different hosts, symptoms range from small discrete dots and raised areas to irregular yellow or brownish patches. Leaves may fall off the tree in problem is severe.

MANAGEMENT OPTIONS Damage is rarely long term and infections can usually be tolerated by hosts. Fungicide use is rarely warranted. Excess moisture can favor the fungi that cause the disease, so avoid overhead sprinklers and irrigate early in the day so that foliage dries more quickly. Fallen leaves and debris should be removed promptly to avoid spreading the disease.

» photos on page 161

DWARF MYRTLE

Myrtus communis 'Compacta'

PLANT TYPE	Evergreen shrub
PLANT SIZE	2-3 feet tall by 2-3 feet wide
CARE	Full sun; low water needs after establishment

POSSIBLE PESTS

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

Dwarf myrtle.
Photo: Gardenology.org.

PRICKLY PEAR
Opuntia littoralis

PLANT TYPE	Evergreen shrub; succulent foliage
PLANT SIZE	2-4 feet tall by 2-3 feet wide
CARE	Full sun to light shade; low water needs; avoid overwatering

POSSIBLE PESTS

Mealybugs (multiple genera)

IMPACT Congregate in large numbers, forming white, cottony masses on plants. May feed on stems or leaves, slowing plant growth and causing premature leaf drop or twig dieback.

MANAGEMENT OPTIONS Moderate mealybug feeding will not cause significant damage. Natural predators and parasites typically provide adequate control of most mealybug species. Conserve these natural enemies by avoiding broad-spectrum insecticide sprays and by managing ants, which are attracted to mealybug honeydew and may protect them from beneficial insects. Removing their overwintering sites (e.g. loose bark) can reduce populations. See: ipm.ucanr.edu/pmg/garden/plants/invert/mealybugs.html.

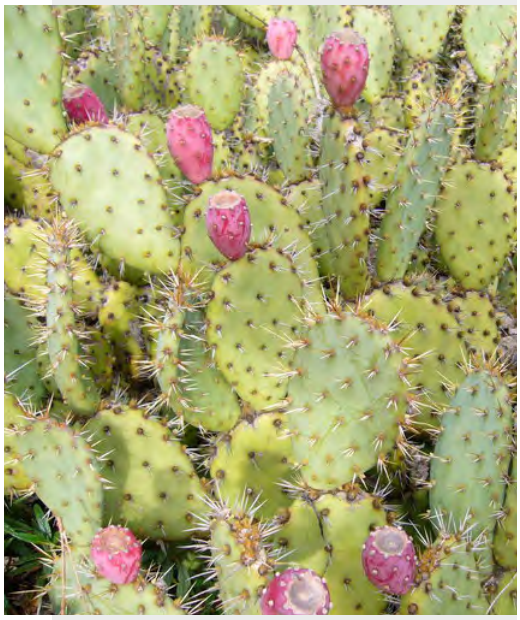
» **photos on page 193**

Soft scales, family *Coccidae*

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» **photos on page 199**



Fruits of Prickly pear. Photo: Zoya Akulova.

Flowers of Prickly pear. Photo: Keir Morse.

SWEET FRAGRANT OLIVE

Osmanthus fragrans

PLANT TYPE	Evergreen shrub
PLANT SIZE	8-10 feet tall by 6-8 feet wide
CARE	Partial to full sun; requires regular water

Sweet fragrant olive. Photo: Wiki user Achillu.

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» **photos on page 178**

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» **photos on page 199**

WINTERBORN PHILODENDRON

Philodendron xanadu

PLANT TYPE	Evergreen shrub
PLANT SIZE	2-3 feet tall by 3-4 feet wide
CARE	Light shade to cool sun; moderate water needs

Winterborn philodendron foliage. Photo: Zoya Akulova.

POSSIBLE PESTS

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» **photos on page 199**

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» **photos on page 201**

SILVER PLECTRANTHUS

Plectranthus argentatus

PLANT TYPE	Evergreen shrub
PLANT SIZE	2-3 feet tall by 4-6 feet wide
CARE	Partial shade; no direct sun; moderate water needs

POSSIBLE PESTS

Mealybugs (multiple genera)

IMPACT Congregate in large numbers, forming white, cottony masses on plants. May feed on stems or leaves, slowing plant growth and causing premature leaf drop or twig dieback.

MANAGEMENT OPTIONS Moderate mealybug feeding will not cause significant damage. Natural predators and parasites typically provide adequate control of most mealybug species. Conserve these natural enemies by avoiding broad-spectrum insecticide sprays and by managing ants, which are attracted to mealybug honeydew and may protect them from beneficial insects. Removing their overwintering sites (e.g. loose bark) can reduce populations. See: ipm.ucanr.edu/pmg/garden/plants/invert/mealybugs.html.

» photos on page 193

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» photos on page 199

CONTINUED ON NEXT PAGE »

Silver plectranthus foliage. Photos: Zoya Akulova.

Silver plectranthus flowers. Photos: Zoya Akulova.

PESTS OF SILVER PLECTRANTHUS, CONTINUED

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

CALIFORNIA COFFEE BERRY

Rhamnus californica

PLANT TYPE	Evergreen shrub
PLANT SIZE	6-8 feet tall by 6-8 feet wide
CARE	Full sun, but shade tolerant; low water needs

POSSIBLE PESTS

Rust (caused by *Puccinia* spp., *Uromyces* spp.)

IMPACT Causes discolored leaves with small yellow spots and reddish-brown to orange pustules on stems. Leaves are killed and overall plant vigor is reduced.

MANAGEMENT OPTIONS Favored by moderately warm, moist weather, rust can usually be managed by proper irrigation practices, proper mowing, and fertilization (it is made more severe by nitrogen deficiency).

» **photos on page 168**

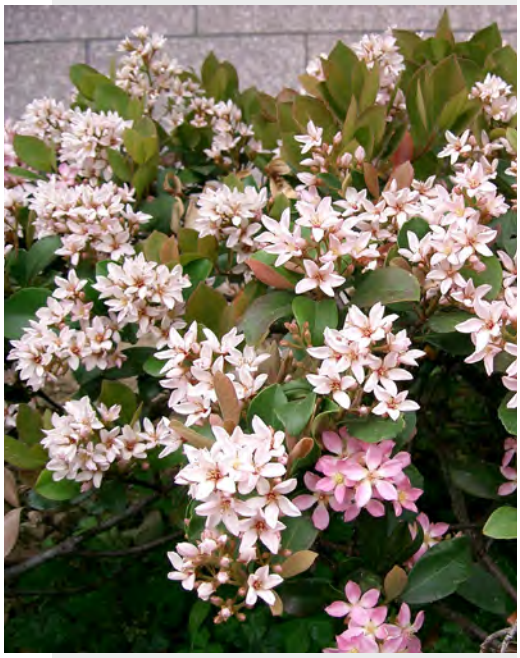
California coffee berry foliage. Photo: Monica Dimson, UC Cooperative Extension.

Fruit and flowers of *Rhamnus californica ssp. occidentalis.* Photo: Keir Morse.

YEDDO HAWTHORN

Rhaphiolepis umbellata

PLANT TYPE	Evergreen shrub
PLANT SIZE	4-6 feet tall by 4-6 feet wide
CARE	Full sun; low water needs



Flowering Yeddo hawthorn. Photos: Wiki user KENPEI.

Fruit of Yeddo Hawthorn. Photos: Wiki user KENPEI.

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» **photos on page 178**

Flatheaded borers (multiple genera)

IMPACT Larvae tunnel beneath the bark, causing wet, sappy areas on the bark of the main trunk, which may crack. Boring may kill limbs or entire trees.

MANAGEMENT OPTIONS Prevention is the most effective management of flatheaded borers, which typically attack previously injured or damaged trees. Providing proper care and protecting landscape plants from injury will make them less attractive to the borers. Avoid pruning spring-summer while adults are active. Properly dispose of infested wood material, as beetles may emerge from logs and attack nearby plants. See ipm.ucanr.edu/pmg/garden/plants/invert/flatheaded.html.

» **photos on page 184**

CONTINUED ON NEXT PAGE »

PESTS OF YEDDO HAWTHORN, CONTINUED

Root knot nematodes, *Meloidogyne* spp.

IMPACT Cause distinctive swellings (galls) on the roots of affected plants. Nematodes feed inside the galls, which constrict the water- and nutrient-conducting abilities of the roots. Galls may also crack open, allowing other disease-causing microorganisms to infect the plant. Aboveground, infested plants may wilt, have yellowed leaves, and appear otherwise water stressed.

MANAGEMENT OPTIONS Galls cannot be rubbed off the roots; this may also remove beneficial nodules. Management is generally very difficult and no chemical pesticides are available. The best way to manage nematodes is to avoid planting infested material or to select resistant plant varieties. Existing infestations need to be contained; these can spread via irrigation water runoff or in soil attached to tools and equipment. Soil solarization can temporarily reduce populations. See ipm.ucanr.edu/pmg/pestnotes/pn7489.html.

» photos on page 212

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» photos on page 199

Fire blight (caused by *Erwinia amylovora*)

IMPACT Most commonly infects open flowers and may extend into twigs and branches, causing flowers and small shoots to wilts. Dead, blackened leaves and fruit cling to branches throughout the season (hence the disease name). Causes branch and trunk cankers, which are small and inconspicuous at first. As the infection advances, cankers exude a watery, light tan bacterial ooze. This darkens as it is exposed to air and streaks the trunk and branches. Infected wood underneath the bark has pink to orange-red streaks.

MANAGEMENT OPTIONS Monitor trees regularly and remove and destroy infected flowers and shoots. Infected wood must be pruned out. Preventative sprays are available, but will not eliminate wood infections. Avoid excess nitrogen fertilization and heavy pruning, both of which encourage the growth vulnerable succulent tissue. The disease is favored by moderate to warm temperatures of 75-85°F combined with intermittent rain or hail.

» photos on page 158

CONTINUED ON NEXT PAGE »

PESTS OF YEDDO HAWTHORN, CONTINUED

Leaf spot diseases (caused by many fungi)

IMPACT Caused by a variety of different fungi on a many different hosts, symptoms range from small discrete dots and raised areas to irregular yellow or brownish patches. Leaves may fall off the tree in problem is severe.

MANAGEMENT OPTIONS Damage is rarely long term and infections can usually be tolerated by hosts. Fungicide use is rarely warranted. Excess moisture can favor the fungi that cause the disease, so avoid overhead sprinklers and irrigate early in the day so that foliage dries more quickly. Fallen leaves and debris should be removed promptly to avoid spreading the disease.

» photos on page 161

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

Verticillium wilt (caused by *Verticillium* spp.)

IMPACT Foliage turns faded green, yellow, or brown and sometimes wilts in scattered portions of the canopy or on scattered branches. Shoots and branches wilt and die, usually beginning on side of the plant. Dark stains can be seen along the grain of the wood of newly infected branches.

MANAGEMENT OPTIONS Affected branches can be pruned out. Severely diseased trees may need to be removed. The best way to avoid or combat the disease is to keep plants otherwise healthy, for infected trees are capable of recovering with proper cultural care. No fungicides are available to cure infected trees. See ipm.ucanr.edu/pmg/garden/plants/diseases/vertwilt.html.

» photos on page 173

SUGAR BUSH
Rhus ovata

PLANT TYPE	Evergreen shrub
PLANT SIZE	6-10 feet tall by 8-10 feet wide
CARE	Full sun to light shade; low water needs

POSSIBLE PESTS

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» **photos on page 164**

Sugar bush. Photo: Keir Morse.

Flowers of Catalina currant. Photos: Steve Matson.

CATALINA CURRANT
Ribes viburnifolium

PLANT TYPE	Evergreen shrub
PLANT SIZE	3-4 feet tall by 4-6 feet wide
CARE	Full sun to light shade; low water needs

POSSIBLE PESTS

No known major pest problems

Catalina currant foliage. Photos: Steve Matson.

YELLOW LADY BANKS ROSE

Rosa banksiae 'Lutea'

PLANT TYPE	Semi-evergreen vine
PLANT SIZE	15-20 feet long; vining growth habit
CARE	Full sun; requires regular water

Flowering Yellow lady banks rose. Photo: Wiki user Cillas.

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

Black spot (caused by *Diplocarpon rosae*)

IMPACT Causes dark purple or black patches on the upper leaf surface. Leaves with dark spots may turn yellow or drop prematurely. Loss of foliage may greatly reduce plant vigor.

MANAGEMENT OPTIONS Black spot requires free water to reproduce and grow. Generally, it is not a problem during dry California summers, but overhead sprinklers can or rainy or humid summers can provide favorable conditions for the fungi. Provide good air circulation around bushes, and water earlier in the day so that leaves never remain wet for more than 7 hours. See ipm.ucanr.edu/pmg/garden/plants/diseases/blackspot.html.

» photos on page 148

CONTINUED ON NEXT PAGE »

PESTS OF YELLOW LADY BANKS ROSE, CONTINUED

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» photos on page 165

Flowers of Yellow Lady Banks Rose. Photo: T. Kiya.

UPRIGHT ROSEMARY

Rosmarinus officinalis 'Tuscan Blue'

PLANT TYPE	Evergreen shrub
PLANT SIZE	4-6 feet tall by 4-5 feet wide
CARE	Full sun; low water needs

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178

Flowers of rosemary, *Rosmarinus officinalis*. Photo: Luigi Rignanese.

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PESTS OF UPRIGHT ROSEMARY, CONTINUED

Whitefly (multiple genera)

IMPACT Cause distortion, discoloration, or silvering of leaves while feeding. Excrete honeydew, which encourages the growth of black sooty mold.

MANAGEMENT OPTIONS Whiteflies develop rapidly in warm weather. They can usually be controlled by natural predators and parasites, but populations will build if their natural enemies are destroyed by broad-spectrum insecticides. Whiteflies themselves are not well controlled with any available insecticides. Early infestations can be managed by vigilantly removing infested leaves, vacuuming adults, or hosing down with water sprays. See ipm.ucanr.edu/pmg/pestnotes/pn7401.html.

» photos on page 210

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» photos on page 165

WHITE SAGE
Salvia apiana

PLANT TYPE	Evergreen shrub; drought deciduous
PLANT SIZE	4-5 feet tall by 4-5 feet wide
CARE	Full sun; low water needs

POSSIBLE PESTS

No known major pest problems

White sage. Photo: Gary A. Monroe.

GERMANDER SAGE
Salvia chamaedryoides

PLANT TYPE	Evergreen shrub
PLANT SIZE	1-3 feet tall by 3-4 feet wide
CARE	Full sun to very light shade; low water needs

POSSIBLE PESTS

Mealybugs (multiple genera)

IMPACT
Congregate in large numbers, forming white, cottony masses on plants. May feed on stems or leaves, slowing plant growth and causing premature leaf drop or twig dieback.

MANAGEMENT OPTIONS
Moderate mealybug feeding will not cause significant damage. Natural predators and parasites typically provide adequate control of most mealybug species. Conserve these natural enemies by avoiding broad-spectrum insecticide sprays and by managing ants, which are attracted to mealybug honeydew and may protect them from beneficial insects. Removing their overwintering sites (e.g. loose bark) can reduce populations. See: ipm.ucanr.edu/pmg/garden/plants/invert/mealybugs.html.

» photos on page 193

Germander sage. Photo: Zoya Akulova.

CONTINUED ON NEXT PAGE »

PESTS OF GERMANDER SAGE, CONTINUED

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes stippling (light dots) on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of aesthetic concern and can be managed by providing adequate irrigation and managing dust. Outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

Damping-off disease (caused by *Rhizoctonia* and *Pythium* fungi)

IMPACT Infection by these diseases may cause: seeds to decay before emerging; young plants to rot or partially rot near the soil surface, causing plants to fall or remain stunted before dying; infection at the root tips of young plants that progresses up the stem.

MANAGEMENT OPTIONS Damping-off is promoted by overwatering or poor soil drainage. Proper irrigation and soil aeration will help reduce susceptibility of young plants to infection. Excessive fertilization that injures seedlings or causes soft growth may also increase vulnerability to damping-off disease. See ipm.ucanr.edu/pmg/pestnotes/pn74132.html.

» photos on page 153

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» photos on page 165

CREEPING SAGE

Salvia sonomensis

PLANT TYPE	Evergreen shrub
PLANT SIZE	Up to 1 foot tall by 3-4 feet wide; spreading growth habit
CARE	Full to partial sun; low water needs; requires good drainage

Creeping sage. Photos: Gary A. Monroe.

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT On Creeping Sage, aphids prefer new growth. Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» **photos on page 178**

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» **photos on page 165**

Creeping sage flowers. Photos: Gary A. Monroe.

MEXICAN MARIGOLD

Tagetes lemmonii

PLANT TYPE	Evergreen shrub
PLANT SIZE	4-6 feet tall by 4-6 feet wide
CARE	Full sun; low water needs

Mexican marigold. Photo: Stan Shebs.

POSSIBLE PESTS

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

Whitefly (multiple genera)

IMPACT Cause distortion, discoloration, or silvering of leaves while feeding. Excrete honeydew, which encourages the growth of black sooty mold.

MANAGEMENT OPTIONS Whiteflies develop rapidly in warm weather. They can usually be controlled by natural predators and parasites, but populations will build if their natural enemies are destroyed by broad-spectrum insecticides. Whiteflies themselves are not well controlled with any available insecticides. Early infestations can be managed by vigilantly removing infested leaves, vacuuming adults, or hosing down with water sprays. See ipm.ucanr.edu/pmg/pestnotes/pn7401.html.

» photos on page 210

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» photos on page 165

STAR JASMINE

Trachelospermum jasminoides

PLANT TYPE	Evergreen shrub
PLANT SIZE	2-6 feet tall; spreading growth habit
CARE	Partial sun; moderate water needs

POSSIBLE PESTS

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» **photos on page 199**

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» **photos on page 201**

CONTINUED ON NEXT PAGE »

Star jasmine flowers. Photo: Luigi Rignanese.

Star jasmine foliage. Photo: Monica Dimson, UC Cooperative Extension.

PESTS OF STAR JASMINE, CONTINUED

Armillaria root rot (caused by *Armillaria mellea*)

IMPACT Infects and kills cambial tissue, causing major roots and the trunk near the ground to die. Aboveground symptoms include undersized, discolored, and prematurely dropping leaves. Branch dieback often begins near the tops of plants. White mycelial plaques may form on the bark, with clusters of mushrooms forming at the base of the trunk. Black or dark reddish brown root-like structures (rhizomorphs) may be attached to the surface of the roots or root crown.

MANAGEMENT OPTIONS Preventing infection and selecting resistant species are the only controls for this root rot. See ipm.ucanr.edu/pmg/garden/plants/diseases/armillariartrot.html.

» **photos on page 146**

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» **photos on page 164**

Plant Profiles

Succulents

BLUE FOX TAIL AGAVE

Agave attenuata 'Arboleda Blue'

PLANT TYPE	Succulent
PLANT SIZE	3-4 feet tall by 3-4 feet wide
CARE	Full sun to some light; low water needs; requires well-drained soil

Fox tail agave. Photo: Monica Dimson, UC Cooperative Extension.

POSSIBLE PESTS

Agave snout weevil, *Scyphophorus acupunctatus*

IMPACT Female weevils chew into the plant base (look for a small, pencil-sized hole towards the base of a leaf), where they lay their eggs and infect the plant with a species of *Erwinia* bacteria. Hatched larvae feed on the rotting plant material. The bacterial infection is what actually causes the most damage; it induces wilting, accompanied by a putrid odor, and may cause the plant to collapse and die.

MANAGEMENT OPTIONS Remove all infected plant parts from the area and search surrounding soil for adult weevils or larvae. Preventative pesticides are available where snout weevil infestations are known to occur; these can be applied around the base of the plant in early April and late May. Selecting non-host species of agave is the best way to avoid an infestation; preferred species include varieties of *Agave Americana, A. murpheyi, A. parryi, A. tequilana,* and *A. weberi*.

» photos on page 175

Flowering stalks of fox tail agave. Photo: Forest and Kim Starr.

Mealybugs (multiple genera)

IMPACT Congregate in large numbers, forming white, cottony masses on plants. May feed on stems or leaves, slowing plant growth and causing premature leaf drop or twig dieback.

MANAGEMENT OPTIONS Moderate mealybug feeding will not cause significant damage. Natural predators and parasites may provide adequate control of most species. Conserve natural enemies by avoiding broad-spectrum insecticide sprays and by managing ants, which are attracted to mealybug honeydew and may protect them from beneficial insects. Removing overwintering sites may help to reduce populations. See: ipm.ucanr.edu/pmg/garden/plants/invert/mealybugs.html.

» photos on page 193

CONTINUED ON NEXT PAGE »

PESTS OF BLUE FOX TAIL AGAVE, CONTINUED

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and give plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, infested parts can be pruned. Pruning during hot summers can also help to increase air circulation and reduce populations of certain scale species.

» photos on page 199

Anthracnose (caused by multiple genera of fungi)

IMPACT Causes dark, sunken lesions on leaves, stems, flowers, and fruits. Infected leaves may have small tan, brown, black, or tarlike spots, depending on the species. New leaves are more affected than mature leaves. However, anthracnose rarely causes permanent damage to trees in California.

MANAGEMENT OPTIONS Anthracnose cannot be effectively controlled during the season that symptoms develop or become severe. Rake and dispose of fallen plant parts during the growing season and in fall. Prune during winter to increase air circulation and remove the previous season's infected foliage. The disease is favored by wet conditions; a wet spring or irrigation that hits foliage could result in a disease outbreak. See ipm.ucanr.edu/pmg/pestnotes/pn7420.html.

» photos on page 145

Damping-off disease (caused by *Rhizoctonia* and *Pythium* fungi)

IMPACT Infection by these diseases may cause: seeds to decay before emerging; young plants to rot or partially rot near the soil surface, causing plants to fall or remain stunted before dying; infection at the root tips of young plants that progresses up the stem.

MANAGEMENT OPTIONS Damping-off is promoted by overwatering or poor soil drainage. Proper irrigation and soil aeration will help reduce susceptibility of young plants to infection. Excessive fertilization that injures seedlings or causes soft growth may also increase vulnerability to damping-off disease. See ipm.ucanr.edu/pmg/pestnotes/pn74132.html.

» photos on page 153

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected plants may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Plants that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger plants are also vulnerable to rapid decline. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

DASYLIRION AGAVE
Agave dasylirioides

PLANT TYPE	Succulent
PLANT SIZE	2-3 feet tall by 1-2 feet wide
CARE	Full sun to light shade; low water needs; requires well-drained soil

POSSIBLE PESTS

See possible pests of Blue Fox Tail Agave, *Agave attenuata* 'Arboleda Blue'

Dasylirion Agave. Photo: San Marcos Growers.

COASTAL AGAVE
Agave shawii

PLANT TYPE	Succulent
PLANT SIZE	2-3 feet tall by 3-4 feet wide
CARE	Full sun to light shade; low water needs; requires well-drained soil

POSSIBLE PESTS

See possible pests of Blue Fox Tail Agave, *Agave attenuata* 'Arboleda Blue'

Coastal agave. Photo: Keir Morse.

SUNRISE TEQUILA AGAVE

Agave tequilana 'Sunrise'

PLANT TYPE	Succulent
PLANT SIZE	4-6 feet tall by 4-6 feet wide
CARE	Full sun to light shade; low water needs; requires well-drained soil

POSSIBLE PESTS

See possible pests of Blue Fox Tail Agave, *Agave attenuata* 'Arboleda Blue'

Sunrise tequila agave. Photo: Stan Shebs.

OCTOPUS AGAVE

Agave vilmoriniana

PLANT TYPE	Succulent
PLANT SIZE	3-4 feet tall by 3-4 feet wide
CARE	Full sun to light shade; low water needs; requires well-drained soil

POSSIBLE PESTS

See possible pests of Blue Fox Tail Agave, *Agave attenuata* 'Arboleda Blue'

Octopus agave. Photo: Zoya Akyulova.

BAUER'S DRACAENA PALM

Cordyline 'Baueri'

PLANT TYPE	Perennial shrub
PLANT SIZE	5-10 feet tall by 3-5 feet wide
CARE	Partial to full sun; low water needs once established—regular watering schedule required to establish root system

Dracaena palm. Photo: Doreen Wynja, Monrovia.

POSSIBLE PESTS

Foliage-feeding caterpillars (multiple genera)

IMPACT Feeding behavior varies by species; caterpillars may devour the entire leaf and stem, create "nests" in foliage, feed beneath a protective canopy of silk, or fold or roll leaves together to form shelters. Defoliation is unlikely to kill Bauer's Dracaena Palm.

MANAGEMENT OPTIONS Clip and dispose of infested foliage. Remove and dispose of any egg masses. Many foliage-feeding caterpillar populations are controlled by general predators, parasites, or naturally occurring viruses.

» photos on page 185

Mealybugs (multiple genera)

IMPACT Usually found toward the leaf bases on Cordyline. Congregate in large numbers, forming white, cottony masses on plants. May feed on stems or leaves, slowing plant growth and causing premature leaf drop or twig dieback.

MANAGEMENT OPTIONS Moderate mealybug feeding will not cause significant damage. Natural predators and parasites typically provide adequate control of most species. Conserve these natural enemies by avoiding broad-spectrum insecticide sprays and by managing ants, which are attracted to mealybug honeydew and may protect them from beneficial insects. Removing overwintering sites can help to reduce populations. See: ipm.ucanr.edu/pmg/garden/plants/invert/mealybugs.html.

» photos on page 193

CONTINUED ON NEXT PAGE »

PESTS OF BAUER'S DRACAENA PALM, CONTINUED

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Leaves may turn yellow and drop prematurely, giving plants a scorched appearance. On Cordyline, lower leaves are usually more affected. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. Small infestations can be wiped off of leaves, or the leaves themselves can be removed. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» photos on page 199

Cordyline slime flux (caused by multiple species of bacteria)

IMPACT Enters the plant through pre-existing wounds, typically caused by frost damage. Wounds may ooze a white liquid that may be frothy, have a slight orange tint, or have a foul odor. There may also be black stains beneath the ooze. Younger plants are more prone to frost damage, which can cause plants to wilt and appear to be rotting at the stem and the growing center.

MANAGEMENT OPTIONS The disease is not fatal, but because it is associated with frost damage, the affected plants parts may need to be removed. The ooze can be wiped or scrubbed off, but there is curative treatment available.

» photos on page 151

GIANT CHALK DUDLEYA

Dudleya brittonii

PLANT TYPE	Succulent
PLANT SIZE	< 1 foot tall by 1-2 feet wide
CARE	Full sun; low water needs; requires well-drained soil

Giant chalk dudleya. Photo: Zoya Akulova.

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Attracted to the flowering stalks of Dudleya. Feeding may produce honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178

Mealybugs (multiple genera)

IMPACT Congregate in large numbers, forming white, cottony masses on plants. May feed on stems or leaves, slowing plant growth and causing premature leaf drop or twig dieback.

MANAGEMENT OPTIONS Moderate mealybug feeding will not cause significant damage. Natural predators and parasites may provide adequate control of most species. Conserve natural enemies by avoiding broad-spectrum insecticide sprays and by managing ants, which are attracted to mealybug honeydew and may protect them from beneficial insects. Removing overwintering sites may help to reduce populations. See: ipm.ucanr.edu/pmg/garden/plants/invert/mealybugs.html.

» photos on page 193

CONTINUED ON NEXT PAGE »

PESTS OF GIANT CHALK DUDLEYA, CONTINUED

Snails and slugs (multiple genera)

IMPACT Feed on a wide variety of living plants and decaying plant matter. They chew irregular holes with smooth edges in leaves and flowers and will also clip fruit, young bark, and other succulent plant parts.

MANAGEMENT OPTIONS Avoid overwatering, as snails and slugs often indicate excess moisture. If possible, adjust irrigation schedule. Many commercial snail baits are effective at controlling damage. If baits cannot be used, removing debris under and around plants will eliminate daytime shelters for snails and slugs. Ornamentals in planter beds can be protected with several types of barriers, including copper flashing and screen. See ipm.ucanr.edu/PMG/PESTNOTES/pn7427.html.

» photos on page 200

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» photos on page 165

Alterneria diseases

IMPACT Dark brown to black spots that develop in a target pattern of concentric rings.

MANAGEMENT OPTIONS Avoid overwatering and plant dudleya so that water does not collect and pool in the leaves. Growth and spread of *Alternaria* fungi are typically facilitated by periods of rain, heavy dew, or moist soil conditions. Free moisture must be available for infection. Fungicides are available for some species of *Alternaria*. See anrcatalog.ucanr.edu/pdf/8040.pdf.

» photos on page 144

OUR LADY'S CANDLE

Hesperoyucca whipplei ssp. *intermedia*
(syn. *Yucca whipplei* ssp. *intermedia*)

PLANT TYPE	Succulent
PLANT SIZE	2-3 feet tall by 3-4 feet wide
CARE	Full sun; low water needs; requires well-drained soil

POSSIBLE PESTS

Spider mite, *Tetranychus* spp.

IMPACT
Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover foliage.

MANAGEMENT OPTIONS
Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

Our Lady's Candle, *Hesperoyucca whipplei*. Photo: Keir Morse.

SOFT LEAF YUCCA

Yucca recurvifolia

PLANT TYPE	Succulent
PLANT SIZE	6-8 feet tall
CARE	Full sun; low water needs—requires regular watering after planting, which can be reduced after establishment; prefers well-drained soil

Soft leaf yucca. Photo: Wiki user Cillas.

POSSIBLE PESTS

Spider mite, *Tetranychus* spp.

IMPACT Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover foliage.

MANAGEMENT OPTIONS Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» photos on page 201

Ground squirrel, *Spermophilus beecheyi*

IMPACT Ground squirrels may feed on young Yucca plants until they have become well established.

MANAGEMENT OPTIONS Exclusion of ground squirrels is difficult to achieve. If only a few plants require protection, barriers such as those used for rabbits (see above) may deter ground squirrels. However, baiting or fumigation may also be necessary to manage ground squirrels. See ipm.ucanr.edu/pmg/pestnotes/pn7438.html.

» photos on page 214

Rabbits - Jackrabbit, *Lepus californicus*; Desert Cottontail, *Sylvilagus audubonii*; Brush Rabbit; *S. bachmani*

IMPACT Rabbits may feed on young Yucca plants until they have become well established.

MANAGEMENT OPTIONS Set up protective barriers around young plants until they have become more stablished. Bury the bottom of the barrier at least 6-10 inches into the ground. Bending a few inches of the bottom of the fence outward will also help deter rabbits from digging beneath it. If using chicken wire, use a mesh size of less than 1 inch to keep away young rabbits.

» photos on page 216

Plant Profiles

Trees

WHITE ALDER
Alnus rhombifolia

PLANT TYPE	Deciduous tree
PLANT SIZE	50-90 feet tall
CARE	Full sun to partial shade; moderate to regular water needs

White alder tree. Photo: C. Stubler, M. Ritter, W. Mark and J. Reimer.

POSSIBLE PESTS

Alder flea beetle, *Macrohaltica ambiens*

IMPACT Both larvae and adults feed on leaves, skeletonizing leaves and causing defoliation that may be confused with dieback or herbicide sprays.

MANAGEMENT OPTIONS Lasting damage from flea beetle defoliation is rare, and insecticide use is rarely warranted. Minimize use of broad spectrum pesticides in order to conserve natural enemy populations, which usually provide adequate control of the beetle. Maintaining plant vigor through proper cultural care will also help the host tree tolerate the infestation.

» photos on page 176

Flatheaded borers (multiple genera)

IMPACT Larvae tunnel beneath the bark, causing wet, sappy areas on the bark of the main trunk, which may crack. Boring may kill limbs or entire trees.

MANAGEMENT OPTIONS Prevention is the most effective management of flatheaded borers, which typically attack trees that have been previously injured or damaged. Providing proper care and protecting landscape plants from injury will make them less attractive to the borers. Avoid pruning spring-summer while adults are active. Properly dispose of infested wood material, as beetles may emerge from logs and attack nearby plants. See ipm.ucanr.edu/pmg/garden/plants/invert/flatheaded.html.

» photos on page 184

White alder foliage. Photo: Keir Morse.

CONTINUED ON NEXT PAGE »

PESTS OF WHITE ALDER, CONTINUED

Foliage-feeding caterpillars (multiple genera)

IMPACT Feeding behavior varies by species; caterpillars may devour the entire leaf and stem, create "nests" in foliage, feed beneath a protective canopy of silk, or fold or roll leaves together to form shelters. Defoliation may kill the entire plant, but this has not been observed as a huge problem for White Alder.

MANAGEMENT OPTIONS Clip and dispose of infested foliage. Remove and dispose of any egg masses. Many foliage-feeding caterpillar populations are controlled by general predators, parasites, or naturally occurring viruses.

» photos on page 185

Polyphagous shot hole borer, *Euwallacea* sp. and Fusarium dieback (caused by *Fusarium euwallaceae*)

IMPACT Beetle vectors the Fusarium dieback disease, which damages the host tree's xylem vessels and may lead to branch dieback and overall decline. The beetle bores perfectly round, < 1 mm entry-holes into trunks and primary branches. It then creates galleries in the wood where it lays its eggs and grows the Fusarium fungus. On Alder, wet, dark stains (or white/yellow stains when dry) appear around the entry-hole. Alder is a reproductive host of PSHB, meaning that it is both susceptible to the Fusarium dieback disease and can support beetle reproduction.

MANAGEMENT OPTIONS Currently, most heavily infested or isolated host trees need to be removed entirely or pruned (if the infestation is confined to a few branches). Because the beetle can survive for several months in cut wood, infested material must be handled properly to prevent spreading the insect to uninfested sites. Ideally, wood should be chipped to less than < 1 inch in diameter, then solarized, composted, or taken to a landfill for use as Alternative Daily Cover. If wood cannot be chipped, logs must be solarized, frozen, or kiln-dried. Chemical treatment requires a bark spray for the beetles combined with soil injection/soil drench of a fungicide. Efficacies of various insecticides and fungicides are currently being researched. Visit pshb.org or eskalenlab.ucr.edu for research updates and contact information.

» photos on page 197

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» photos on page 199

CONTINUED ON NEXT PAGE »

PESTS OF WHITE ALDER, CONTINUED

Collar rot (caused by *Phytophthora siskiyouensis*)

IMPACT Cankers form around the root base or near the soil line. Dark brown to black spots and patches on the bark ooze a dark reddish-brown fluid. Bleeding may be accompanied by cracks in the bark. Beneath the bark, the vascular tissue will be a cinnamon to dark brown color. May or may not show canopy dieback.

MANAGEMENT OPTIONS Collar rot is favored by saturated soils and can be found in areas that are subject to flooding or overwatering. Improve drainage and keep the lower trunk dry. This may require adjusting sprinklers that hit tree trunks. While no fungicides are specifically registered for use on Alder, certain treatments may help protect plants if drainage and irrigation issues are addressed.

» photos on page 150

Nectria canker (caused by *Neonectria major*)

IMPACT Early infection is indicated by spots on the bark that secrete a dark exudate. These spots gradually enlarge, cracks begin to form in the bark, and cankers (often with a cat-eyed shape) develop. May result in tree death. Pathogens may enter the host through any natural opening.

MANAGEMENT OPTIONS Weakened or drought-stressed trees are more susceptible to infection. It is important to maintain plant vigor and to avoid wounds through which the pathogens may infect the host. Infected hosts can be thinned during the winter or early spring to potentially reduce pathogens. Severely cankered or dead branches or trees should be removed and destroyed.

» photos on page 162

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» photos on page 165

Root knot nematodes, *Meloidogyne* spp.

IMPACT Cause distinctive swellings (galls) on the roots of affected plants. Nematodes feed inside the galls, which constrict the water- and nutrient-conducting abilities of the roots. Galls may also crack open, allowing other disease-causing microorganisms to infect the plant. Aboveground, infested plants may wilt, have yellowed leaves, and appear otherwise water stressed.

MANAGEMENT OPTIONS Galls cannot be rubbed off the roots; this may also remove beneficial nodules. Management is generally very difficult and no chemical pesticides are available. The best way to manage nematodes is to avoid planting infested material or to select resistant plant varieties. Existing infestations need to be contained; these can spread via irrigation water runoff or in soil attached to tools and equipment. Soil solarization can temporarily reduce populations. See ipm.ucanr.edu/pmg/pestnotes/pn7489.html.

» photos on page 212

MARINA STRAWBERRY TREE

Arbutus 'Marina'

PLANT TYPE	Evergreen tree
PLANT SIZE	40-50 feet tall by 25-40 feet wide
CARE	Full sun or light shade in hot areas; low water needs; requires regular water while young trees are becoming established

POSSIBLE PESTS

Foliage-feeding caterpillars (multiple genera)

IMPACT Feeding behavior varies by species; caterpillars may devour the entire leaf and stem, create "nests" in foliage, feed beneath a protective canopy of silk, or fold or roll leaves together to form shelters. Caterpillars rarely pose a serious threat to Strawberry Tree health.

MANAGEMENT OPTIONS Caterpillars are easily managed by pruning infested foliage. Remove and dispose of any egg masses. Many foliage-feeding caterpillar populations are controlled by general predators, parasites, or naturally occurring viruses.

» photos on page 185

Madrone psyllid, *Euphyllura arbuti*

IMPACT Commonly found around Strawberry Tree flowers. Produces copious amounts of a white, wax-like material.

MANAGEMENT OPTIONS Madrone psyllids are not considered a major pest and can be easily controlled by pruning.

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Marina strawberry tree, flowers and foliage, and peeling bark. Photos: Monica Dimson, UC Cooperative Extension.

PESTS OF MARINA STRAWBERRY TREE, CONTINUED

Annosus root disease (caused by *Heterobasidion annosum* or *Fomes annosus*)

IMPACT Infects the roots or butt of host tree. May cause extensive root decay and gradual tree death. Bark may separate from the tree, revealing dark brown streaks on the wood beneath. Silver or whitish flecks may appear on the inner bark surface, with small whitish mycelial growths on the outer bark. Conks may form on the root crown. These may form a small button, seashell-like bracket, or amorphous whitish, gray, or light brown growth.

MANAGEMENT OPTIONS Avoid wounding trees, as wounds may become infection sites. Borax can be applied to fresh cuts to avoid infection if *H. annosum* is known to be in the area.

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

Twig dieback and trunk cankers (caused by *Neofusicoccum arbuti, Botryosphaeria dothidea*)

IMPACT Damage and kill the cambium, which is responsible for tree growth. Vigorous trees may be able to tolerate multiple cankers for several years, but some infected trees rapidly decline and die within 1-2 years. Bark becomes discolored, then peels off to reveal blackened and cracked wood. The two diseases are often present together. Twig dieback starts at branch tips and works downward. Cankers tend to occur on the main trunk or major branches, but may also be on smaller twigs. Cankers spiral around the trunk or branch, typically developing after bark injury.

MANAGEMENT OPTIONS Monitor trees for early signs of the diseases so that they can be caught early. Pruning infested branches, shoots, and flowering stalks can be somewhat effective at slowing the progression of the disease. However, if the diseases become established in the trunk, control options are limited. No fungicides are known to be effective. Minimize host susceptibility by providing good cultural care: avoid bark injury to prevent cankers and apply deep waterings to help prevent twig dieback. The diseases are usually associated with drought, but it is also important to avoid overwatering and to provide good drainage as the trees are also susceptible to root and crown rot.

» photos on page 172

INCENSE CEDAR

Calocedrus decurrens

PLANT TYPE	Evergreen tree
PLANT SIZE	70-90 feet tall
CARE	Full sun to light shade; low water needs; requires a few deep waterings during summer to avoid drought injury

POSSIBLE PESTS

Mountain pine beetle, *Dendroctonus ponderosae*

IMPACT Attacks the mid-trunk of large trees. Boring activity causes the canopy to turn yellow to red within 8-10 months of attack. Brown, pink, or white pitch tubes (resin masses) appear where the beetle has bored into the trunk. Infestation may also be evidenced by woodpecker feeding on trunk and the presence of long, J-shaped galleries in the wood or eggs, over-wintering larvae, pupae, and/or adults under the bark.

MANAGEMENT OPTIONS Improving host vigor often makes trees less susceptible to this beetle, which typically seeks stressed, damaged, or older trees. Leave adequate space between trees and thin susceptible stands if necessary. Sprays are available for short-term or preventative control. See ipm.ucanr.edu/pmg/pestnotes/pn7421.html.

» photos on page 194

Western conifer seed bug, *Leptoglossus occidentalis*

IMPACT Consumes large amounts of seed by sucking out the pulp. Large numbers of adults may suddenly invade buildings in search of overwintering sites or congregate on the outside of structures.

MANAGEMENT OPTIONS Exclude the insects from buildings with well-fitting window screens and doors.

» photos on page 206

CONTINUED ON NEXT PAGE »

Incense cedar. Photo: Scott Loring.

Incense cedar fruit and foliage. Photo: Daniel Passarini.

Incense cedar bark. Photo: Jean Pawek.

PESTS OF INCENSE CEDAR, CONTINUED

Annosus root disease (caused by *Heterobasidion annosum* or *Fomes annosus*)

IMPACT Infects the roots or butt of host tree. May cause extensive root decay and gradual tree death. Bark may separate from the tree, revealing dark brown streaks on the wood beneath. Silver or whitish flecks may appear on the inner bark surface, with small whitish mycelial growths on the outer bark. Conks may form on the root crown. These may form a small button, seashell-like bracket, or amorphous whitish, gray, or light brown growth.

MANAGEMENT OPTIONS Avoid wounding trees, as wounds may become infection sites. Borax can be applied to fresh cuts to avoid infection if *H. annosum* is known to be in the area.

Dry pocket rot (caused by *Oligoporus amarus*)

IMPACT Causes heartwood to rot. Early indicators include yellowish-brown discoloration in the heartwood. Advance decay indicated by round-ended pockets of dark brown, crumbly dry rot with long vertical shrinkage cracks; annual hoof-shaped, whitish to bright yellow conks appear on the bark, these are soft and moist at first, then dry with age; woodpecker feeding on insects that attack the conks.

MANAGEMENT OPTIONS Dry pocket rot is mainly a problem on older trees and trees growing in excessively wet conditions (i.e. poorly-drained areas or areas that retain a lot of surface moisture). Adjust irrigation and/or drainage as necessary. Avoid wounding trees, as hosts become infected primarily through open wounds, large open knots, and broken branch stubs. Trees with conks pose a hazard in recreation areas and should be removed.

» photos on page 156

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

EASTERN REDBUD

Cercis canadensis 'Forest Pansy'

PLANT TYPE	Deciduous tree
PLANT SIZE	20-30 feet tall by 15-25 feet wide
CARE	Full sun; regular water required

Eastern redbud foliage. Photo: Ethan Simonoff.

POSSIBLE PESTS

Foliage-feeding caterpillars (multiple genera)

IMPACT Feeding behavior varies by species; caterpillars may devour the entire leaf and stem, create "nests" in foliage, feed beneath a protective canopy of silk, or fold or roll leaves together to form shelters. Defoliation is unlikely to cause serious harm to redbud.

MANAGEMENT OPTIONS Clip and dispose of infested foliage. Remove and dispose of any egg masses. Many foliage-feeding caterpillar populations are controlled by general predators, parasites, or naturally occurring viruses.

» photos on page 185

Treehoppers (*Platycotis vittata, Stictocephala bisonia*)

IMPACT Suck plant juices from foliage and produce honeydew, which supports the growth of sooty mold. Create slits or punctures in the bark where they lay their eggs, causing bark to appear roughened and potential twig dieback. On redbud, damage is slight, but the white, sticky honeydew covering the treehopper eggs can be very noticeable.

MANAGEMENT OPTIONS Insecticidal soaps or narrow-range oil can be applied during the dormant season to kill overwintering eggs. Like leafhoppers, treehopper adults can be difficult to control. See ipm.ucanr.edu/pmg/garden/plants/invert/treehopper.html.

» photos on page 205

Eastern redbud flowers. Photo: Gary A. Monroe.

CONTINUED ON NEXT PAGE »

PESTS OF EASTERN REDBUD, CONTINUED

Twig dieback and trunk canker (caused by *Botryosphaeria ribis*)

IMPACT Damages and kills the cambium, which is responsible for tree growth. Vigorous trees may be able to tolerate multiple cankers for several years, but some infected trees rapidly decline and die within 1-2 years. Twig dieback, seen as wilted and brown foliage, starts at branch tips and works downward. Dark, sunken cankers with black centers may girdle and kill branches.

MANAGEMENT OPTIONS Monitor trees for early signs of the diseases so that they can be caught early. Pruning infested branches, shoots, and flowering stalks can be somewhat effective at slowing the progression of the disease. However, if the diseases become established in the trunk, control options are limited. No fungicides are known to be effective. Minimize host susceptibility by providing good cultural care. Avoid bark injury and prune dead or dying branches; the disease may enter the host through these wounds or weakened limbs. While the disease is usually associated with drought, but it is also important to avoid overwatering and to provide good drainage.

» photos on page 172

Verticillium wilt (caused by *Verticillium* spp.)

IMPACT Foliage turns faded green, yellow, or brown and sometimes wilts in scattered portions of the canopy or on scattered branches. Shoots and branches wilt and die, usually beginning on side of the plant. Dark stains can be seen along the grain of the wood of newly infected branches.

MANAGEMENT OPTIONS Affected branches can be pruned out. Severely diseased trees may need to be removed. The best way to avoid or combat the disease is to keep plants otherwise healthy, for infected trees are capable of recovering with proper cultural care. No fungicides are available to cure infected trees. See ipm.ucanr.edu/pmg/garden/plants/diseases/vertwilt.html.

» photos on page 173

WESTERN REDBUD

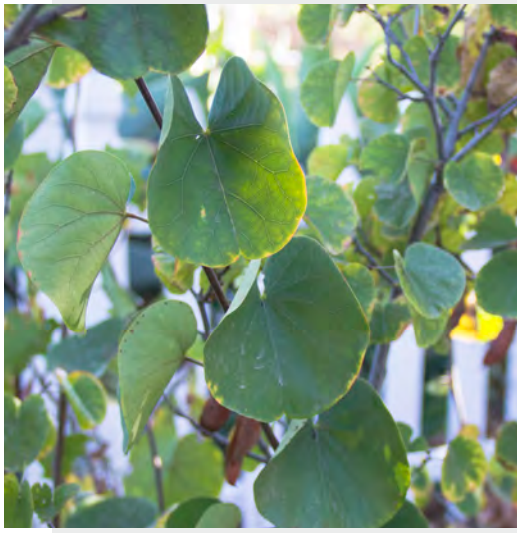
Cercis occidentalis

PLANT TYPE	Deciduous tree
PLANT SIZE	12-20 feet tall by 10-15 feet wide
CARE	Full to partial sun; low water needs; may require regular water to establish

POSSIBLE PESTS

See possible pests of Eastern redbud, *Cercis canadensis* 'Forest Pansy'

Western redbud. Photo: Barry Rice.



Western redbud foliage. Photo: Monica Dimson, UC Cooperative Extension.

Western redbud flowers. Photo: Gary A. Monroe.

VALENCIA ORANGE

Citrus sinensis

PLANT TYPE	Evergreen tree
PLANT SIZE	Up to 25 feet tall by 20 feet wide
CARE	Full to partial sun; requires regular water

POSSIBLE PESTS

Ants

Common species: Argentine ant, *Linepithema humile*; Native gray ant, *Formica aerata*; Red imported fire ant, *Solenopsis invicta*; Southern fire ant, *S. xyloni*

IMPACT

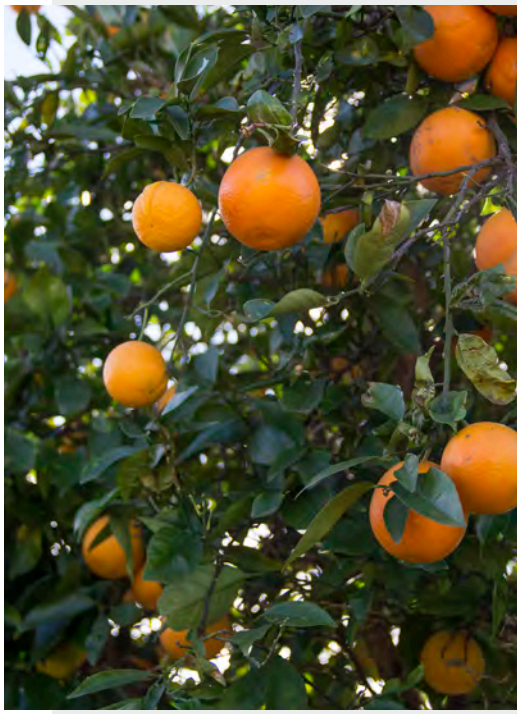
Most pest ants feed on the honeydew produced by sap-sucking pests like aphids, mealybugs, scale, and whiteflies. They protect and tend to these insects, fighting off natural predators and parasites. The subsequent increase in the number of honeydew-producing insects then leads to exacerbated growth of sooty mold fungus. Some ants may also strip bark from young trees. Others may bite or sting when disturbed.

MANAGEMENT OPTIONS

Ant control is often necessary in order to reduce numbers of honeydew producers. Skirt pruning (removing branches within 12-30 inches of the ground) and/or applying sticky materials to the trunk can prevent them from climbing into the canopy. Avoid using oil-based sticky materials, which can cause phytotoxicity. If snails are also a problem, choose a material containing tribasic copper sulfate to exclude both pests. Some sticky materials can cause bark damage if applied directly to the trunk. To prevent bark cracking, the material can be applied on top of a tree wrap. This is more labor intensive and may be reserved for younger or already weakened trees, which are more susceptible to bark damage. Apply the material higher above the ground to keep it from being wet by irrigation or collecting dirt too quickly. For various treatment options, see ipm.ucanr.edu/pmg/r107300211.html. For identification tips, see ipm.ucanr.edu/pmg/C107/m107bpants.html.

» photos on page 177

Valencia orange tree. Photo: Monica Dimson, UC Cooperative Extension.



Valencia orange fruit and foliage. Photo: Monica Dimson, UC Cooperative Extension.

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PESTS OF VALENCIA ORANGE, CONTINUED

Asian citrus psyllid, *Diaphorina citri*, and Huanglongbing disease (caused by *Candidatus Liberibacter asiaticus*)

IMPACT Asian citrus psyllid (ACP) attacks new citrus leaf growth and causes new leaf tips to twist or burn back. The primary concern over ACP is that it can carry and spread Huanglongbing (HLB) disease, which is considered one of the most destructive diseases of citrus worldwide. On HLB-infected trees, leaves are smaller than normal, yellow, and asymmetrically blotchy; fruit is also small, lopsided, and discolored with aborted seeds and bitter juice. Infected trees may be killed within 5-8 years.

MANAGEMENT OPTIONS There is no cure for HLB. As the disease is not yet widely distributed throughout California, rapid tree removal is critical for prevention of spread. Controlling ACP, the disease vector, can help to prevent HLB infection. Monitor regularly for ACP damage and treat as needed. Note that contact insecticides typically do not control all life stages and tend to show better efficacy against one stage over another. Releases of parasitic wasps began in 2012. While the wasps do provide some control, their populations have not reached high enough numbers to sufficiently control ACP and prevent the spread of HLB. Avoid using broad spectrum pesticides in order to preserve local parasitoid populations. See ipm.ucanr.edu/pmg/r107304411.html.

» photos on page 179

Citrus leafminer, *Phyllocnistis citrella*

IMPACT Adult moths are attracted to new flush growth and lay their eggs on the underside of new leaves. Larvae feed by creating shallow tunnels (or mines) in young foliage, causing the leaves to curl and distort.

MANAGEMENT OPTIONS Leafminers prefer young, tender foliage and cannot tunnel in hardened leaves. Avoid applying nitrogen fertilizer while populations are high, or the new growth will be severely damaged. As pruning too frequently can also stimulate new flush growth, avoid pruning live branches more than once a year, so that cycles of flush growth are uniform and short. Do not prune off leaves that have been mined—the undamaged areas of the leaf are still able to produce food for the tree. Citrus leafminer damage is primarily aesthetic, and these cultural practices usually provide sufficient control. Tree growth and fruit production are unlikely to be affected in mature citrus trees. Younger citrus trees (less than 4 years old), however, may experience retarded growth if heavily infested. Various treatments are available for citrus leafminer control, but avoid using broad-spectrum insecticides in order to conserve the pest's natural enemies. See ipm.ucanr.edu/pmg/r107303211.html.

» photos on page 182

CONTINUED ON NEXT PAGE »

PESTS OF VALENCIA ORANGE, CONTINUED

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales unless disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» photos on page 199

Snails and slugs (multiple genera)

IMPACT Feed on a wide variety of living plants and decaying plant matter. They chew irregular holes with smooth edges in leaves and flowers and will also clip fruit, young bark, and other succulent plant parts. On citrus trees, snails feed extensively on ripe or ripening fruit, leaving circular chewed areas in the rind. Damaged citrus leaves have large chewed areas along the margins. Snails and slugs are also food for rodents.

MANAGEMENT OPTIONS Avoid overwatering, as snails and slugs often indicate excess moisture. If possible, adjust irrigation schedule. Many commercial snail baits are effective at controlling damage. If baits cannot be used, removing debris under and around plants will eliminate daytime shelters for snails and slugs. Ornamentals in planter beds can be protected with several types of barriers, including copper flashing and screen. See ipm.ucanr.edu/pmg/r107500111.html or ipm.ucanr.edu/pmg/pestnotes/pn7427.html.

» photos on page 200

Ground squirrel, *Spermophilus beecheyi*

IMPACT Ground squirrels may be attracted to fruit and establish destructive burrows in the area. They will also gnaw on plastic irrigation heads and irrigation lines.

MANAGEMENT OPTIONS Regularly remove fallen fruit to make the area less attractive to foraging ground squirrels. Exclusion is difficult to achieve. If only a few plants require protection, barriers such as those used for rabbits (see above) may deter ground squirrels. However, baiting or fumigation may also be necessary to manage ground squirrels. See ipm.ucanr.edu/pmg/pestnotes/pn7438.html.

» photos on page 214

CONTINUED ON NEXT PAGE »

PESTS OF VALENCIA ORANGE, CONTINUED

Pocket gopher, *Thomomys* spp.

IMPACT Pocket gophers may be attracted to fruit. Their burrow mounds and tunnels can pose a hazard to park visitors and divert and carry off irrigation water, leading to soil erosion. They will also gnaw and damage plastic water lines and lawn sprinkler systems.

MANAGEMENT OPTIONS Address gopher problems as soon as their presence is detected. Regularly remove fallen fruit to make the area less attractive to gophers. Small areas with valuable hosts can be protected with underground fencing—extended at least 1 foot aboveground to deter gophers on the surface. Placing sprinkler lines or utility cables in 6-8 inches of coarse gravel can help to exclude gnawing gophers. Trapping provides effective control, but traps may pose a hazard to park visitors and dogs. Baiting and fumigation have similar risks. See ipm.ucanr.edu/pmg/pestnotes/pn7433.html.

» photos on page 215

Rats, *Rattus* spp.

IMPACT Roof rats (*Rattus rattus*) and occasional Norway rats (*R. norvegicus*) are attracted to fruits, nuts, slugs, and snails. Roof rats are especially fond of citrus and often eat fruit that is still on the tree. They gnaw a hole through the rind and then remove the entire contents of mature fruit, leaving the hollowed-out rind on the tree. Once in the area, they will also cause damage to structures by gnawing on or tearing electrical wires, wooden material, and insulation material. Rats carry a number of diseases that can be transmitted to humans and animals.

MANAGEMENT OPTIONS Management requires a combination of sanitation, exclusion measures, and, if necessary, population control. Collect and dispose of fallen fruit and other plant debris. Garbage should also be collected frequently, and trash cans should have tight-fitting lids to discourage scavenging. Thin out dense vegetation to make habitat less desirable to roof rats especially. Keep the rodents out of buildings by sealing cracks or openings in the foundation, around water pipes, electric wires, vents, etc.; installing tightly fitted doors, windows, and screens; and removing overhanging tree limbs within 3 feet of the roof so that it is more difficult for roof rats to move between them. Coarse steel wool, wire screen, and lightweight sheet metal are good materials for rat exclusion. Trapping is effective for population control, but traps must be kept away from park visitors and pets. See ipm.ucanr.edu/pmg/pestnotes/pn74106.html.

» photos on page 217

RUSTLEAF FIG

Ficus rubiginosa

PLANT TYPE	Evergreen tree
PLANT SIZE	35-50 feet tall by 35-60 feet wide
CARE	Full to partial sun; moderate water needs

POSSIBLE PESTS

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT

Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS

Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» **photos on page 199**

Spider mite, *Tetranychus* spp.

IMPACT

Feeding causes a stippling of light dots on leaves, which eventually turn yellow or red and drop off. Large amounts of webbing may cover leaves and twigs.

MANAGEMENT OPTIONS

Damage is primarily of an aesthetic concern and can be managed by providing adequate irrigation and managing dust. Mite outbreaks often follow applications of broad-spectrum insecticides for other pests; use these materials carefully, for they also kill natural predators that typically provide good control of spider mites. See ipm.ucanr.edu/pmg/pestnotes/pn7405.html.

» **photos on page 201**

CONTINUED ON NEXT PAGE »

Rustleaf fig. Photo: M. Ritter, J. Reimer and C. Stubler via SelecTree.

Rustleaf fig foliage. Photo: M. Ritter, J. Reimer and C. Stubler via SelecTree.

Rustleaf fig fruit. Photo: M. Ritter, J. Reimer and C. Stubler via SelecTree.

PESTS OF RUSTLEAF FIG, CONTINUED

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT

Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS

Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» **photos on page 164**

JACARANDA

Jacaranda mimosifolia

PLANT TYPE	Semi-evergreen tree
PLANT SIZE	25-40 feet tall by 15-30 feet wide
CARE	Full sun; moderate water needs

POSSIBLE PESTS

Oleander leaf scorch (caused by *Xylella fastidiosa*)

IMPACT

Interferes with the host tree's ability to transfer water and nutrients. Leaves or one or more branches on diseased trees may turn yellow and droop. Leaf margins turn a deeper yellow or brown and eventually die. The primary vector of the disease is the glassy-winged sharpshooter (GWSS), which transfers the bacteria when feeding.

MANAGEMENT OPTIONS

There is no known cure for oleander leaf scorch. Symptomatic branches can be pruned, but this will not save the plant. Removing the entire plant may help to reduce the source of the bacteria, thus preventing local GWSS from spreading it to other plants (it is possible for some species to harbor the bacteria without showing any symptoms of disease). Do not confuse leaf scorch symptoms with symptoms of drought or salt or boron toxicity. Drought stressed trees can sometimes recover when watered, but extra irrigation will not improve the appearance of a tree infected with leaf scorch. Salt or boron toxicity may cause leaf margins to brown, but the toxicity does not cause leaves to droop, and symptoms are typically more evident in older leaves. See ipm.ucanr.edu/pmg/pestnotes/pn7480.html.

» **photos on page 163**

Jacaranda in bloom. Photo: M. Ritter, W. Mark, and J. Reimer via SelecTree.

Jacaranda foliage. Photo: M. Ritter, W. Mark, and J. Reimer via SelecTree.

CALIFORNIA WALNUT

Juglans regia 'Howard' and 'Franquette'

PLANT TYPE	Deciduous tree
PLANT SIZE	40-80 feet tall by 30-60 feet wide
CARE	Full sun; requires regular water

POSSIBLE PESTS

Codling moth, *Cydia pomonella*

IMPACT Larvae feed on walnut kernels. If damaged early in the season, small walnuts will quickly drop off trees. Damaged fruit may have frass-filled holes and contain pink to whitish larvae with brown heads.

MANAGEMENT OPTIONS Codling moth prefers apples or pears to walnuts and is unlikely to become too problematic on non-commercial walnut trees. Sanitation is the first and most important step for codling moth management. Collect and dispose of infested walnuts, whether on the tree or dropped onto the ground. Traps and insecticides are also available, but should be applied in conjunction with sanitation methods. See ipm.ucanr.edu/pmg/pestnotes/pn7412.html.

» photos on page 183

Deep bark canker (caused by *Erwinia rubrifaciens*)

IMPACT Causes deep cracks that run down tree scaffolds and trunks. Cracks ooze a reddish to dark brown substance from late spring through early fall. Beneath the bark surface, wood may be stained with dark brown to black streaks that run several feet up and down the trunk or affected branches. Numerous small, round, dark-colored spots extend into the wood beneath the cankered areas.

MANAGEMENT OPTIONS Management options: Keep trees healthy so that they can tolerate some deep bark canker. Host trees will often respond to an improvement in cultural practices, including adjustments to water, fertilizer, and pruning activities. Hosts will only fail to recover if adverse growing conditions are not or cannot be addressed.

» photos on page 154

CONTINUED ON NEXT PAGE »

California walnut. Photo: C. Stubler, W. Mark, and J. Reimer via SelecTree.

California walnut fruit and foliage. Photo: C. Stubler, W. Mark, and J. Reimer via SelecTree.

California walnut flowers. Photo: C. Stubler, W. Mark, and J. Reimer via SelecTree.

PESTS OF CALIFORNIA WALNUT, CONTINUED

Crown gall (caused by *Agrobacterium tumefaciens*)

IMPACT Causes rough, wart-like growths (galls), primarily on the root crown at the soil line or just below the soil surface. Galls are initially smooth, then develop rapidly into larger, rough, warty, or cracked swellings. Typically will not cause serious harm to woody plants unless galls appear in the root crown area when plants are young. On young plants, crown gall may cause stunting, make the tree more susceptible to wind damage and drought stress, or girdle and kill the tree.

MANAGEMENT OPTIONS Purchase clean nursery stock and avoid injuring trees during transplanting. Take special care to avoid wounds where the tree comes into contact with soil. Plants can become infected through wounds, growth cracks, injured roots, or freezing injuries. If galls are found, they may be removed by cutting into healthy wood around galls, then exposing the tissue to drying. This must be performed during the dry season only, and minimal cuts should be made. Disinfect pruning tools before using on other plants. Severely infected plants may need to be removed and destroyed, but larger plants can usually tolerate gall development. See ipm.ucanr.edu/pmg/garden/plants/diseases/crowngall.html.

» photos on page 152

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

Thousand cankers disease (caused by *Geosmithia morbida*) and Walnut twig beetle, *Pityophthorus juglandis*

IMPACT The disease damages the cambium of the host tree, causing flagging and branch dieback. On the bark surface, the pinhole-sized emergence holes of the walnut twig beetle, which vectors the disease, can be seen. Dark wet cankers are often found next to beetle holes. As the disease and beetle spread through the tree, new cankers form and girdle the branches. The beetle's galleries, 1-2 inches long, can be seen underneath the bark. On its own, walnut twig beetle is not considered a major pest. The beetle attacks many species of walnut, but the impact of Thousand cankers disease is more severe on native black walnut species.

MANAGEMENT OPTIONS There are no known controls or pesticides for thousand cankers disease. Preventing the spread of the disease through the beetle vector is extremely important. Infected trees should be removed and destroyed immediately by chipping to keep beetles from escaping. Report possible infections to the LA Agricultural Commissioner or UC Cooperative Extension. See ipm.ucanr.edu/exotic/thousandcankers.html.

» photos on page 170

GOLDENRAIN TREE

Koelreuteria paniculata

PLANT TYPE	Deciduous tree
PLANT SIZE	30-40 feet tall by 30-40 feet wide
CARE	Full sun; moderate water needs; may be able to tolerate some drought

POSSIBLE PESTS

Flatheaded borers (multiple genera)

IMPACT Larvae tunnel beneath the bark, causing wet, sappy areas on the bark of the main trunk, which may crack. Boring may kill limbs or entire trees.

MANAGEMENT OPTIONS Prevention is the most effective management of flatheaded borers, which typically attack trees that have been previously injured or damaged. Providing proper care and protecting landscape plants from injury will make them less attractive to the borers. Avoid pruning spring-summer while adults are active. Properly dispose of infested wood material, as beetles may emerge from logs and attack nearby plants. See ipm.ucanr.edu/pmg/garden/plants/invert/flatheaded.html.

» photos on page 184

Verticillium wilt (caused by *Verticillium* spp.)

IMPACT Foliage turns faded green, yellow, or brown and sometimes wilts in scattered portions of the canopy or on scattered branches. Shoots and branches wilt and die, usually beginning on side of the plant. Dark stains can be seen along the grain of the wood of newly infected branches.

MANAGEMENT OPTIONS Affected branches can be pruned out. Severely diseased trees may need to be removed. The best way to avoid or combat the disease is to keep plants otherwise healthy, for infected trees are capable of recovering with proper cultural care. No fungicides are available to cure infected trees. See ipm.ucanr.edu/pmg/garden/plants/diseases/vertwilt.html.

» photos on page 173

CONTINUED ON NEXT PAGE »

Goldenrain tree. Photo: M. Ritter, W. Mark, and J. Reimer via SelecTree.

Flowers and foliage of Goldenrain tree. Photo: M. Ritter, W. Mark, and J. Reimer via SelecTree.

Dried seed pods of Golderain tree. Photo: Jean Pawek.

PESTS OF GOLDENRAIN TREE, CONTINUED

Polyphagous shot hole borer, *Euwallacea* sp. and Fusarium dieback (caused by *Fusarium euwallaceae*)

IMPACT

Beetle vectors the Fusarium dieback disease, which damages the host tree's xylem vessels and may lead to branch dieback and overall decline. The beetle bores perfectly round, < 1 mm entry-holes into trunks and primary branches. It then creates galleries in the wood where it lays its eggs and grows the *Fusarium* fungus. On Goldenrain tree, wet stains and golden colored, translucent gumming appears around the entry-hole. Goldenrain tree has not yet shown to be a reproductive host of the beetle (i.e. it cannot support PSHB reproduction), but it is susceptible to Fusarium dieback.

MANAGEMENT OPTIONS

This beetle/disease complex is relatively new to Southern California. Currently, most heavily infested or isolated host trees need to be removed entirely or pruned (if the infestation is confined to a few branches). Because the beetle can survive for several months in cut wood, infested material must be handled properly to prevent spreading the insect to uninfested sites. Ideally, wood should be chipped to less than < 1 inch in diameter, then solarized, composted, or taken to a landfill for use as Alternative Daily Cover. If wood cannot be chipped, logs must be solarized, frozen, or kiln-dried. Chemical treatment requires a bark spray for the beetles combined with soil injection/soil drench of a fungicide. Efficacies of various insecticides and fungicides are currently being researched. Visit pshb.org or eskalenlab.ucr.edu for research updates and contact information.

» **photos on page 197**

FRUITLESS WHITE MULBERRY

Morus alba

PLANT TYPE	Deciduous tree
PLANT SIZE	30-40 feet tall by 30-40 feet wide
CARE	Full sun to light shade; moderate water needs

Fruitless white mulberry tree. Photo: M. Ritter and J. Reimer via SelecTree.

Fruitless white mulberry tree foliage. Photo: M. Ritter and J. Reimer via SelecTree.

POSSIBLE PESTS

Glassy-winged sharpshooter, *Homalodisca vitripennis*

IMPACT

Feeds on fluids in plant tissue, which may cause small plants to wilt in hot weather if populations are heavy. Feeding is usually less problematic than the copious amounts of liquid excreted by the insect. Liquid makes leaves and fruit appear whitewashed when dry. The main concern with glassy-winged sharpshooter (GWSS) is that it is a vector for *Xylella fastidiosa*, which causes oleander leaf scorch and Pierce's disease. One strain of the bacteria causes mulberry leaf scorch.

MANAGEMENT OPTIONS

There is no cure for any of the *X. fastidiosa*-associated diseases at this time, but it appears that low numbers of GWSS may actually be vectoring the diseases. Controlling the insect is also difficult. The available chemical treatments have limited application, but are not usually necessary. See ipm.ucanr.edu/pmg/pest-notes/pn7492.html.

» photos on page 187

Mealybugs (multiple genera)

IMPACT

Congregate in large numbers, forming white, cottony masses on plants. May feed on stems or leaves, slowing plant growth and causing premature leaf drop or twig dieback.

MANAGEMENT OPTIONS

Moderate mealybug feeding will not cause significant damage. Natural predators and parasites typically provide adequate control of most mealybug species. Conserve these natural enemies by avoiding broad-spectrum insecticide sprays and by managing ants, which are attracted to mealybug honeydew and may protect them from beneficial insects. Removing their overwintering sites (e.g. loose bark) can reduce populations. See: ipm.ucanr.edu/pmg/garden/plants/invert/mealybugs.html.

» photos on page 193

CONTINUED ON NEXT PAGE »

PESTS OF FRUITLESS WHITE MULBERRY, CONTINUED

Whitefly (multiple genera)

IMPACT Cause distortion, discoloration, or silvering of leaves while feeding. Excrete honeydew, which encourages the growth of black sooty mold.

MANAGEMENT OPTIONS Whiteflies develop rapidly in warm weather. They can usually be controlled by natural predators and parasites, but populations will build if their natural enemies are destroyed by broad-spectrum insecticides. Whiteflies themselves are not well controlled with any available insecticides. Early infestations can be managed by vigilantly removing infested leaves, vacuuming adults, or hosing down with water sprays. See ipm.ucanr.edu/pmg/pestnotes/pn7401.html.

» photos on page 210

Armillaria root rot (caused by *Armillaria mellea*)

IMPACT Infects and kills cambial tissue, causing major roots and the trunk near the ground to die. Aboveground symptoms include undersized, discolored, and prematurely dropping leaves. Branch dieback often begins near the tops of plants. White mycelial plaques may form on the bark, with clusters of mushrooms forming at the base of the trunk. Black or dark reddish brown root-like structures (rhizomorphs) may be attached to the surface of the roots or root crown.

MANAGEMENT OPTIONS Preventing infection and selecting resistant species are the only controls for this root rot. See ipm.ucanr.edu/pmg/garden/plants/diseases/armillariartrot.html.

» photos on page 146

Bacterial blight (caused by *Pseudomonas syringae*)

IMPACT Causes small, black angular spots or large, irregular brown spots on foliage. Branch cankers and brown streaks in the wood may also occur. On some host twigs, elongated lesions may appear that ooze during wet weather. Symptoms are usually more extensive in wetter areas.

MANAGEMENT OPTIONS Bacterial blight is favored by overfertilization or overhead irrigation that keeps foliage wet. Good air circulation and avoiding pruning during the wet season helps make infection less likely to occur. If symptoms appear on foliage only, trees can often recover. Severely affected branches or branches showing dieback should be pruned (during the dry season). However, if cankers appear on the trunk, the tree will probably decline and should be removed. See ipm.ucanr.edu/pmg/garden/plants/diseases/baclfblight.html.

» photos on page 147

Nectria canker (caused by *Neonectria major*)

IMPACT Early infection is indicated by spots on the bark that secrete a dark exudate. These spots gradually enlarge, cracks begin to form in the bark, and cankers (often with a cat-eyed shape) develop. May result in tree death. Pathogens may enter the host through any natural opening.

MANAGEMENT OPTIONS Weakened or drought-stressed trees are more susceptible to infection. It is important to maintain plant vigor and to avoid wounds through which the pathogens may infect the host. Infected hosts can be thinned during the winter or early spring to potentially reduce pathogens. Severely cankered or dead branches or trees should be removed and destroyed.

» photos on page 162

FRUITLESS OLIVE

Olea europaea 'Majestic Beauty'

PLANT TYPE	Evergreen tree
PLANT SIZE	25-30 feet tall by up to 25 feet wide
CARE	Full sun; low water needs; requires regular water to establish; requires good drainage

Fruitless olive. Photo: J. Reimer via SelecTree.

POSSIBLE PESTS

Glassy-winged sharpshooter, *Homalodisca vitripennis*

IMPACT

Feeds on fluids in plant tissue, which may cause small plants to wilt in hot weather if populations are heavy. Feeding is usually less problematic than the copious amounts of liquid excreted by the insect. Liquid makes leaves and fruit appear whitewashed when dry. The main concern with glassy-winged sharpshooter (GWSS) is that it is a vector for *Xylella fastidiosa*, which causes oleander leaf scorch and Pierce's disease. One strain of the bacteria causes a bacterial leaf scorch on olive.

MANAGEMENT OPTIONS

There is no cure for any of the *X. fastidiosa*-associated diseases at this time, but it appears that low numbers of GWSS may actually be vectoring the diseases. Controlling the insect is also difficult. The available chemical treatments have limited application, but are not usually necessary. See ipm.ucanr.edu/pmg/pestnotes/pn7492.html.

» photos on page 187

Olive psyllid, *Euphyllura olivina*

IMPACT

Feeds on buds, flowers, tender shoots, and small fruit. Produces honeydew, which increases sooty mold development, and secretes a waxy substance that causes flower and fruit drop and protects the insect from controls. Large populations may slow the growth of young trees.

MANAGEMENT OPTIONS

In areas with hot temperatures, pruning out center limbs helps to enhance circulation and reduce psyllid numbers. Trees may be able to tolerate low numbers of olive psyllid, but it is best to control the first generation before populations increase. Monitoring between March and May is most useful. See ipm.ucanr.edu/pmg/r583301411.html.

» photos on page 195

Fruitless olive foliage. Photo: J. Reimer via SelecTree.

CONTINUED ON NEXT PAGE »

PESTS OF FRUITLESS OLIVE, CONTINUED

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» photos on page 199

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

Verticillium wilt (caused by *Verticillium* spp.)

IMPACT Foliage turns faded green, yellow, or brown and sometimes wilts in scattered portions of the canopy or on scattered branches. Shoots and branches wilt and die, usually beginning on side of the plant. Dark stains can be seen along the grain of the wood of newly infected branches.

MANAGEMENT OPTIONS Affected branches can be pruned out. Severely diseased trees may need to be removed. The best way to avoid or combat the disease is to keep plants otherwise healthy, for infected trees are capable of recovering with proper cultural care. No fungicides are available to cure infected trees. See ipm.ucanr.edu/pmg/garden/plants/diseases/vertwilt.html.

» photos on page 173

CALIFORNIA SYCAMORE

Platanus racemosa

PLANT TYPE	Deciduous tree
PLANT SIZE	30-80 feet tall by 25-50 feet wide
CARE	Full sun; low water needs; may require regular water to establish

POSSIBLE PESTS

Polyphagous shot hole borer, *Euwallacea* sp. and Fusarium dieback (caused by *Fusarium euwallaceae*)

IMPACT

Beetle vectors the Fusarium dieback disease, which damages the host tree's xylem vessels and may lead to branch dieback and overall decline. The beetle bores perfectly round, < 1 mm entry-holes into trunks and primary branches. It then creates galleries in the wood where it lays its eggs and grows the *Fusarium* fungus. On CA sycamore, wet, dark stains (or white/yellow stains when dry) appear around the entry-hole. CA sycamore is a reproductive host of PSHB, meaning that it is both susceptible to the Fusarium dieback disease and can support beetle reproduction.

MANAGEMENT OPTIONS

This beetle/disease complex is relatively new to Southern California. Currently, most heavily infested or isolated host trees need to be removed entirely or pruned (if the infestation is confined to a few branches). Because the beetle can survive for several months in cut wood, infested material must be handled properly to prevent spreading the insect to uninfested sites. Ideally, wood should be chipped to less than < 1 inch in diameter, then solarized, composted, or taken to a landfill for use as Alternative Daily Cover. If wood cannot be chipped, logs must be solarized, frozen, or kiln-dried. Chemical treatment requires a bark spray for the beetles combined with soil injection/soil drench of a fungicide. Efficacies of various insecticides and fungicides are currently being researched. Visit pshb.org or eskalenlab.ucr.edu for research updates and contact information.

» **photos on page 197**

CONTINUED ON NEXT PAGE »

California sycamore. Photo: C. Stubler, M. Ritter, W. Mark and J. Reimer via SelecTree.

California sycamore foliage. Photo: C. Stubler, M. Ritter, W. Mark, and J. Reimer via SelecTree.

California sycamore seeds pods. Photo: Monica Dimson, UC Cooperative Extension.

PESTS OF CALIFORNIA SYCAMORE, CONTINUED

Sycamore borer, *Synanthedon resplendens*

IMPACT Larvae bore into host bark, causing rough or gnarled bark, trunk and branch swellings, sap exudation, and sawdustlike frass.

MANAGEMENT OPTIONS Preventing attack by providing proper cultural care is the primary management strategy for Sycamore borer. Oak and sycamore trees can tolerate extensive boring activity from this pest. If they become a serious threat to Ceanothus, traps are available for the *Synanthedon* species. These are typically used for detection, but may also help to provide some management. See ipm.ucanr.edu/pmg/pestnotes/pn7477.html.

» photos on page 202

Western sycamore lace bug, *Corythucha confraterna*

IMPACT Feed on the underside of leaves by sucking fluids from plant tissue, causing pale stippling and bleaching that becomes more obvious on the upper leaf surface by mid to late summer. Produce specks of dark, varnish-like excrement that may drip onto pavement or surfaces below infested plants. This kind of damage can be caused by various other pests; lace bugs are about 1/8 inch long with an elaborately sculptured thorax and forewings that form an expanded cover over their body. The thorax and forewings have tiny clear cells that have a lace-like appearance.

MANAGEMENT OPTIONS Lace bug feeding is not a serious threat to plant health. Prolonged high populations may cause premature leaf drop and a minor reduction in plant growth rate, but injury is primarily aesthetic. Conserve natural enemies of lace bugs by avoiding broad-spectrum sprays and use good cultural practices to keep plants in good health. See ipm.ucanr.edu/pmg/pestnotes/pn7428.html.

» photos on page 208

Anthracnose (caused by multiple genera of fungi)

IMPACT Causes dark, sunken lesions on leaves, stems, flowers, and fruits. Infected leaves may have small tan, brown, black, or tarlike spots, depending on the species. New leaves are more affected than mature leaves. On some trees, cankers may develop on twigs, branches, and the trunk. However, anthracnose rarely causes permanent damage to trees in California.

MANAGEMENT OPTIONS Anthracnose cannot be effectively controlled during the season that symptoms develop or become severe. Rake and dispose of fallen leaves and twigs during the growing season and in fall. Prune during winter to increase air circulation in the canopy and remove the previous season's infected twigs and branches. The disease is favored by wet conditions; a wet spring or irrigation that hits foliage could result in a disease outbreak. See ipm.ucanr.edu/pmg/pestnotes/pn7420.html.

» photos on page 145

CONTINUED ON NEXT PAGE »

PESTS OF CALIFORNIA SYCAMORE, CONTINUED

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» photos on page 165

FREMONT COTTONWOOD

Populus fremontii

PLANT TYPE	Deciduous tree
PLANT SIZE	Up to 90 feet tall
CARE	Full sun; requires regular water

POSSIBLE PESTS

Gall and blister mites, family *Eriophyidae*

IMPACT Cause warty, woody swellings on twigs and green or brown raised blisters on leaves. Blistered leaves may curl or become distorted.

MANAGEMENT OPTIONS Landscape plants can usually tolerate some gall and blister mite damage, and no controls are known for most species. Aesthetic damage can be managed by pruning and disposing of infested leaves. When mites are abundant, it is important to conserve natural enemies and to keep plants healthy and vigorous. See ipm.ucanr.edu/pmg/garden/plants/invert/gallblistermites.html.

» photos on page 186

Poplar and willow borer, *Cryptorhynchus lapathi*

IMPACT Adults chews bark and lay eggs on current-year green shoots. Larvae chew mines 1-3 inches long beneath and in bark and wood. Fine brown boring dust can be seen around the entrances to these galleries. Some dieback may occur.

MANAGEMENT OPTIONS Prune and dispose of infested or dying limbs or trees. Persistent insecticide treatments may be necessary to control heavy infestations. See ipm.ucanr.edu/pmg/garden/plants/invert/poplrwilborer.html.

» photos on page 198

CONTINUED ON NEXT PAGE »

Top to bottom: Fremont cottonwood tree, foliage, and young fruit. Photos: C. Stubler, M. Ritter, W. Mark, and J. Reimer via SelecTree.

PESTS OF FREMONT COTTONWOOD, CONTINUED

Polyphagous shot hole borer, *Euwallacea* sp. and Fusarium dieback (caused by *Fusarium euwallaceae*)

IMPACT Beetle vectors the Fusarium dieback disease, which damages the host tree's xylem vessels and may lead to branch dieback and overall decline. The beetle bores perfectly round, < 1 mm entry-holes into trunks and primary branches. It then creates galleries in the wood where it lays its eggs and grows the Fusarium fungus. On Fremont cottonwood, wet, dark stains (or white/yellow stains when dry) appear around the entry-hole, which may also contain dark frass. Fremont cottonwood is a reproductive host of PSHB, meaning that it is both susceptible to the Fusarium dieback disease and can support beetle reproduction.

MANAGEMENT OPTIONS This beetle/disease complex is relatively new to Southern California. Currently, most heavily infested or isolated host trees need to be removed entirely or pruned (if the infestation is confined to a few branches). Because the beetle can survive for several months in cut wood, infested material must be handled properly to prevent spreading the insect to uninfested sites. Ideally, wood should be chipped to less than < 1 inch in diameter, then solarized, composted, or taken to a landfill for use as Alternative Daily Cover. If wood cannot be chipped, logs must be solarized, frozen, or kiln-dried. Chemical treatment requires a bark spray for the beetles combined with soil injection/soil drench of a fungicide. Efficacies of various insecticides and fungicides are currently being researched. Visit pshb.org or eskalenlab.ucr.edu for research updates and contact information.

» photos on page 197

Armillaria root rot (caused by *Armillaria mellea*)

IMPACT Infects and kills cambial tissue, causing major roots and the trunk near the ground to die. Aboveground symptoms include undersized, discolored, and prematurely dropping leaves. Branch dieback often begins near the tops of plants. White mycelial plaques may form on the bark, with clusters of mushrooms forming at the base of the trunk. Black or dark reddish brown root-like structures (rhizomorphs) may be attached to the surface of the roots or root crown.

MANAGEMENT OPTIONS Preventing infection and selecting resistant species are the only controls for this root rot. See ipm.ucanr.edu/pmg/garden/plants/diseases/armillariartrot.html.

» photos on page 146

CONTINUED ON NEXT PAGE »

PESTS OF FREMONT COTTONWOOD, CONTINUED

Bacterial blight (caused by *Pseudomonas syringae*)

IMPACT Causes small, black angular spots or large, irregular brown spots on foliage. Branch cankers and brown streaks in the wood may also occur. On some host twigs, elongated lesions may appear that ooze during wet weather. Symptoms are usually more extensive in wetter areas.

MANAGEMENT OPTIONS Bacterial blight is favored by overfertilization or overhead irrigation that keeps foliage wet. Good air circulation and avoiding pruning during the wet season helps make infection less likely to occur. If symptoms appear on foliage only, trees can often recover. Severely affected branches or branches showing dieback should be pruned (during the dry season). However, if cankers appear on the trunk, the tree will probably decline and should be removed. See ipm.ucanr.edu/pmg/garden/plants/diseases/baclfblight.html.

» photos on page 147

Powdery mildew (*Podosphaera* spp., *Sphaerotheca* spp.)

IMPACT White to gray powdery mycelium and spore growth forms on the leaves, flowers, fruits, and shoots of infected plants.

MANAGEMENT OPTIONS Powdery mildew is favored by shade and moderate temperatures. Planning for adequate sun, providing good air circulation, and avoiding excess fertilizer applications help prevent disease development. See ipm.ucanr.edu/pmg/pestnotes/pn7494.html.

» photos on page 165

Wetwood (associated with several bacteria species)

IMPACT Evidenced by stained, discolored or water-soaked areas of wood. Infected bark cracks or wounds may exude a sour or rancid reddish-brown fluid. Severely infected trees may experience foliage wilt and branch dieback. Symptoms usually appear on trees that are at least 10 years old. Management options:

MANAGEMENT OPTIONS Prevent infection by avoiding injuries to bark and wood. Trees can also become infected through pesticide injection wounds. Note that while symptoms may be unsightly, infected wood is often just as strong as healthy wood. See ipm.ucanr.edu/pmg/garden/plants/diseases/wetwoodsslime.html.

» photos on page 174

FRUITING POMEGRANATE

Punica granatum 'Wonderful'

PLANT TYPE	Deciduous tree
PLANT SIZE	10-20 feet tall by 10-20 feet wide
CARE	Full sun; low water needs; requires regular water to establish

POSSIBLE PESTS

Leaffooted bug, *Leptoglossus* spp.

IMPACT

Feed on leaves, shoots, and fruit by piercing plant tissue and sucking out fluids. Nymphs feed more shallowly than adults. Damage to foliage on non-commercial trees is minimal and of little concern. On pomegranate fruit, late season feeding generally causes no external damage but may cause the seeds to darken and wither, especially if the fungal yeast (*Eremothecium coryli*) associated with leaffooted bug enters the fruit. Large populations of the insect can also leave excrement on the fruit surface, reducing aesthetic appeal.

MANAGEMENT OPTIONS

Damage to landscape pomegranates is typically negligible, as leaffooted bug populations are low enough most years. Outbreaks can be managed by removing overwintering sites (in woodpiles, the culls of pomegranate fruit, or outbuildings), eliminating weeds that harbor the insects during winter and spring, physically removing insects from trees and smashing them on the ground, and by conserving natural enemies, particularly the tiny wasp (*Gryon pennsylvanicum*) that parasitizes leaffooted bug. See ipm.ucanr.edu/pmg/pestnotes/pn74168.html.

» **photos on page 191**

CONTINUED ON NEXT PAGE »

Top to bottom: Flowering pomegranate branches, pomegranate foliage, pomegranate fruit. Photos: W. Mark, J. Reimer, M. Ritter via SelecTree.

PESTS OF FRUITING POMEGRANATE, CONTINUED

Mealybugs (multiple genera)

IMPACT Congregate in large numbers, forming white, cottony masses on plants. May feed on stems or leaves, slowing plant growth and causing premature leaf drop or twig dieback.

MANAGEMENT OPTIONS Moderate mealybug feeding will not cause significant damage. Natural predators and parasites typically provide adequate control of most species. Conserve these natural enemies by avoiding broad-spectrum insecticide sprays and by managing ants, which are attracted to mealybug honeydew and may protect them from beneficial insects. Removing overwintering sites (e.g. loose bark) can reduce populations. See: ipm.ucanr.edu/pmg/garden/plants/invert/mealybugs.html.

» photos on page 193

Soft scales, family *Coccidae*

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» photos on page 199

Armillaria root rot (caused by *Armillaria mellea*)

IMPACT Impact: Infects and kills cambial tissue, causing major roots and the trunk near the ground to die. Aboveground symptoms include undersized, discolored, and prematurely dropping leaves. Branch dieback often begins near the tops of plants. White mycelial plaques may form on the bark, with clusters of mushrooms forming at the base of the trunk. Black or dark reddish brown root-like structures (rhizomorphs) may be attached to the surface of the roots or root crown.

MANAGEMENT OPTIONS Preventing infection and selecting resistant species are the only controls for this root rot. See ipm.ucanr.edu/pmg/garden/plants/diseases/armillariartrot.html.

» photos on page 146

CONTINUED ON NEXT PAGE »

PESTS OF FRUITING POMEGRANATE, CONTINUED

Botrytis blight (caused by *Botrytis cinerea*)

IMPACT Infected plants may have spotted or discolored flowers that may fail to open; rotten buds; discolored, wilting, decayed leaves and shoots; premature leaf drop; and/or twig dieback. Fungus can be diagnosed by gray-brown spore masses.

MANAGEMENT OPTIONS Favored by high humidity, botrytis blight can be managed or prevented by avoiding overhead watering, thinning the plant canopy to improve air circulation, and otherwise providing proper cultural care. Dying tissue can be pruned out. Fallen leaves and debris around the plants should also be removed and disposed. See ipm.ucanr.edu/pmg/garden/plants/diseases/botrytis.html.

» photos on page 149

Ground squirrel, *Spermophilus beecheyi*

IMPACT Ground squirrels may be attracted to pomegranate fruit and establish destructive burrows in the area. They will also gnaw on plastic irrigation heads and irrigation lines.

MANAGEMENT OPTIONS Regularly remove fallen fruit to make the area less attractive to foraging ground squirrels. Exclusion is difficult to achieve. If only a few plants require protection, barriers such as those used for rabbits (see above) may deter ground squirrels. However, baiting or fumigation may also be necessary to manage ground squirrels. See ipm.ucanr.edu/pmg/pestnotes/pn7438.html.

» photos on page 214

Pocket gopher, *Thomomys* spp.

IMPACT Pocket gophers may be attracted to pomegranate fruit. Their burrow mounds and tunnels can pose a hazard to park visitors and divert and carry off irrigation water, leading to soil erosion. They will also gnaw and damage plastic water lines and lawn sprinkler systems.

MANAGEMENT OPTIONS Address gopher problems as soon as their presence is detected. Regularly remove fallen fruit to make the area less attractive to gophers. Small areas with valuable hosts can be protected with underground fencing—extended at least 1 foot aboveground to deter gophers on the surface. Placing sprinkler lines or utility cables in 6-8 inches of coarse gravel can help to exclude gnawing gophers. Trapping provides effective control, but traps may pose a hazard to park visitors and dogs. Baiting and fumigation have similar risks. See ipm.ucanr.edu/pmg/pestnotes/pn7433.html.

» photos on page 215

COAST LIVE OAK

Quercus agrifolia

PLANT TYPE	Evergreen tree
PLANT SIZE	Up to 90 feet tall by 30-80 feet wide
CARE	Full sun; tolerates some shade; low water needs

POSSIBLE PESTS

Goldspotted oak borer (GSOB), *Agrilus auroguttatus*

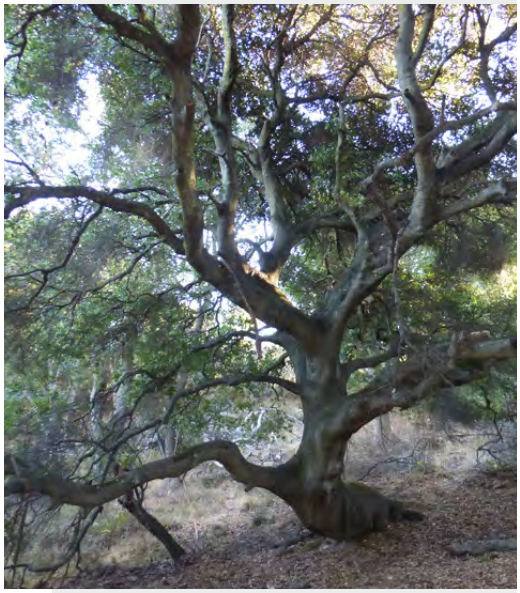
IMPACT

Attacks coast live, canyon live, and California black oaks. Tends to attack older, mature trees and has not yet been observed in small diameter oaks (<12 cm at breast height). Larvae create feeding galleries under the bark surface, causing red or black staining, blistering, and oozing on the tree surface. After beetles pupate, they leave characteristic D-shaped holes where they emerge from the tree. Infested trees exhibit twig and branch die-back, premature leaf loss, gray or brown foliage, and overall crown thinning. Trees die after several years of GSOB activity.

MANAGEMENT OPTIONS

A native pest of Arizona, GSOB has not yet been detected in LA County, but is known to occur in San Diego, Orange, and Riverside Counties. As there are currently no effective tools for controlling the pest once it has infested a tree, it is extremely important to contain GSOB's range in California. Inspect all oak wood material or firewood that is brought into the park. Immediately report any signs or symptoms of GSOB to the local UC Cooperative Extension and County Agricultural Commissioner. Infested trees may need to be removed and destroyed. See ucanr.edu/sites/gsobinfo.

» photos on page 188



Mature coast live oak. Photo: Zoya Akulova.

Coast live oak foliage. Photo: M. Ritter, W. Mark, J. Reimer via SelecTree.

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PESTS OF COAST LIVE OAK, CONTINUED

Western oak bark beetle, *Pseudopityophthorus pubipennis*, and Foamy bark canker disease (caused by *Geosmithia pallida*)

IMPACT The beetle is native to California. It bores under the bark to create shallow galleries in which it lays its eggs. Its tiny entryholes are smaller than those of Polyphagous shot hole borer and are typically accompanied by frass. The beetle was recently discovered to be vectoring a disease called Foamy bark canker, which causes necrosis in the cambial layer of the host tree near the beetle's entryholes. The entryholes may ooze a reddish sap followed by copious amounts of a whitish foamy liquid. Advanced infections result in tree mortality.

MANAGEMENT OPTIONS On its own, the beetle was considered a minor pest of trees already weakened by drought or otherwise stressed. Control is usually unnecessary for the beetle alone. Unfortunately, foamy bark canker disease was only recently discovered and no controls are currently available. Suspected infections should be immediately reported to the local UC Cooperative Extension, County Agricultural Commissioner, or the Eskalen Lab at UC Riverside. See eskalenlab.ucr.edu/coastliveoak.html.

» photos on page 207

Polyphagous shot hole borer, *Euwallacea* sp. and Fusarium dieback (caused by *Fusarium euwallaceae*)

IMPACT Beetle vectors the Fusarium dieback disease, which damages the host tree's xylem vessels and may lead to branch dieback and overall decline. The beetle bores perfectly round, < 1 mm entry-holes into trunks and primary branches. It then creates galleries in the wood where it lays its eggs and grows the Fusarium fungus. On coast live oak, wet, dark stains (white/yellow when dry) appear around the entry-hole. PSHB tends to attack the branches, rather than trunk, of this host. Coast live oak is a reproductive host of PSHB, meaning that it is both susceptible to the Fusarium dieback disease and can support beetle reproduction.

MANAGEMENT OPTIONS This beetle/disease complex is relatively new to Southern California. Currently, most heavily infested or isolated host trees need to be removed entirely or pruned (if the infestation is confined to a few branches). Because the beetle can survive for several months in cut wood, infested material must be handled properly to prevent spreading the insect to uninfested sites. Ideally, wood should be chipped to less than < 1 inch in diameter, then solarized, composted, or taken to a landfill for use as Alternative Daily Cover. If wood cannot be chipped, logs must be solarized, frozen, or kiln-dried. Chemical treatment requires a bark spray for the beetles combined with soil injection/soil drench of a fungicide. Efficacies of various insecticides and fungicides are currently being researched. Visit pshb.org or eskalenlab.ucr.edu for research updates and contact information.

» photos on page 197

Sycamore borer, *Synanthedon resplendens*

IMPACT Larvae bore into host bark, causing rough or gnarled bark, trunk and branch swellings, sap exudation, and sawdustlike frass.

MANAGEMENT OPTIONS Preventing attack by providing proper cultural care is the primary management strategy for Sycamore borer. Oak and sycamore trees can tolerate extensive boring activity from this pest. See ipm.ucanr.edu/pmg/pestnotes/pn7477.html.

» photos on page 202

CONTINUED ON NEXT PAGE »

PESTS OF COAST LIVE OAK, CONTINUED

Anthracnose (multiple genera of fungi)

IMPACT Causes dark, sunken lesions on leaves, stems, flowers, and fruits. Infected leaves may have small tan, brown, black, or tarlike spots, depending on the species. New leaves are more affected than mature leaves. On some trees, cankers may develop on twigs, branches, and the trunk. However, anthracnose rarely causes permanent damage to trees in California.

MANAGEMENT OPTIONS Anthracnose cannot be effectively controlled during the season that symptoms develop or become severe. Rake and dispose of fallen leaves and twigs during the growing season and in fall. Prune during winter to increase air circulation in the canopy and remove the previous season's infected twigs and branches. The disease is favored by wet conditions; an outbreak may result from a wet spring or irrigation that hits foliage. See ipm.ucanr.edu/pmg/pestnotes/pn7420.html.

» photos on page 145

Armillaria root rot (caused by *Armillaria mellea*)

IMPACT Infects and kills cambial tissue, causing major roots and the trunk near the ground to die. Aboveground symptoms include undersized, discolored, and prematurely dropping leaves. Branch dieback often begins near the tops of plants. White mycelial plaques may form on the bark, with clusters of mushrooms forming at the base of the trunk. Black or dark reddish brown root-like structures (rhizomorphs) may be attached to the surface of the roots or root crown.

MANAGEMENT OPTIONS Preventing infection and selecting resistant species are the only controls for this root rot. See ipm.ucanr.edu/pmg/garden/plants/diseases/armillariartrot.html.

» photos on page 146

Nectria canker (caused by *Neonectria major*)

IMPACT Early infection is indicated by spots on the bark that secrete a dark exudate. These spots gradually enlarge, cracks begin to form in the bark, and cankers (often with a cat-eyed shape) develop. May result in tree death. Pathogens may enter the host through any natural opening.

MANAGEMENT OPTIONS Weakened or drought-stressed trees are more susceptible to infection. It is important to maintain plant vigor and to avoid wounds through which the pathogens may infect the host. Infected hosts can be thinned during the winter or early spring to potentially reduce pathogens. Severely cankered or dead branches or trees should be removed and destroyed.

» photos on page 162

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

CORK OAK

Quercus suber

PLANT TYPE	Evergreen tree
PLANT SIZE	40-60 feet tall by 30-50 feet wide
CARE	Full sun; tolerates light shade; low water needs

POSSIBLE PESTS

Polyphagous shot hole borer, *Euwallacea* sp. and Fusarium dieback (caused by *Fusarium euwallaceae*)

IMPACT

Beetle vectors the Fusarium dieback disease, which damages the host tree's xylem vessels and may lead to branch dieback and overall decline. The beetle bores perfectly round, < 1 mm entry-holes into trunks and primary branches. It then creates galleries in the wood where it lays its eggs and grows the Fusarium fungus. On cork oak, wet, dark stains appear around the entry-hole. Cork oak is a reproductive host of PSHB, meaning that it is both susceptible to the Fusarium dieback disease and can support beetle reproduction.

MANAGEMENT OPTIONS

This beetle/disease complex is relatively new to Southern California. Currently, most heavily infested or isolated host trees need to be removed entirely or pruned (if the infestation is confined to a few branches). Because the beetle can survive for several months in cut wood, infested material must be handled properly to prevent spreading the insect to uninfested sites. Ideally, wood should be chipped to less than < 1 inch in diameter, then solarized, composted, or taken to a landfill for use as Alternative Daily Cover. If wood cannot be chipped, logs must be solarized, frozen, or kiln-dried. Chemical treatment requires a bark spray for the beetles combined with soil injection/soil drench of a fungicide. Efficacies of various insecticides and fungicides are currently being researched. Visit pshb.org or eskalenlab.ucr.edu for research updates and contact information.

» photos on page 197

CONTINUED ON NEXT PAGE »

Thick bark characteristic of cork oak. Photo: Zoya Akulova.

Cork oak foliage. Photo: M. Ritter, W. Mark, J. Reimer via SelecTree.

PESTS OF CORK OAK, CONTINUED

Anthracnose (multiple genera of fungi)

IMPACT Causes dark, sunken lesions on leaves, stems, flowers, and fruits. Infected leaves may have small tan, brown, black, or tarlike spots, depending on the species. New leaves are more affected than mature leaves. On some trees, cankers may develop on twigs, branches, and the trunk. However, anthracnose rarely causes permanent damage to trees in California.

MANAGEMENT OPTIONS Anthracnose cannot be effectively controlled during the season that symptoms develop or become severe. Rake and dispose of fallen leaves and twigs during the growing season and in fall. Prune during winter to increase air circulation in the canopy and remove the previous season's infected twigs and branches. The disease is favored by wet conditions; an outbreak may result from a wet spring or irrigation that hits foliage. See ipm.ucanr.edu/pmg/pestnotes/pn7420.html.

» photos on page 145

Armillaria root rot (caused by *Armillaria mellea*)

IMPACT Infects and kills cambial tissue, causing major roots and the trunk near the ground to die. Aboveground symptoms include undersized, discolored, and prematurely dropping leaves. Branch dieback often begins near the tops of plants. White mycelial plaques may form on the bark, with clusters of mushrooms forming at the base of the trunk. Black or dark reddish brown root-like structures (rhizomorphs) may be attached to the surface of the roots or root crown.

MANAGEMENT OPTIONS Preventing infection and selecting resistant species are the only controls for this root rot. See ipm.ucanr.edu/pmg/garden/plants/diseases/armillariartrot.html.

» photos on page 146

Nectria canker (caused by *Neonectria major*)

IMPACT Early infection is indicated by spots on the bark that secrete a dark exudate. These spots gradually enlarge, cracks begin to form in the bark, and cankers (often with a cat-eyed shape) develop. May result in tree death. Pathogens may enter the host through any natural opening.

MANAGEMENT OPTIONS Weakened or drought-stressed trees are more susceptible to infection. It is important to maintain plant vigor and to avoid wounds through which the pathogens may infect the host. Infected hosts can be thinned during the winter or early spring to potentially reduce pathogens. Severely cankered or dead branches or trees should be removed and destroyed.

» photos on page 162

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

WILLOW
Salix spp.

PLANT TYPE	Evergreen or deciduous tree
PLANT SIZE	Varies by species
CARE	Full sun; requires regular water

POSSIBLE PESTS

Polyphagous shot hole borer, *Euwallacea* sp. and Fusarium dieback (caused by *Fusarium euwallaceae*)

IMPACT

Beetle vectors the Fusarium dieback disease, which damages the host tree's xylem vessels and may lead to branch dieback and overall decline. The beetle bores perfectly round, < 1 mm entry-holes into trunks and primary branches. It then creates galleries in the wood where it lays its eggs and grows the Fusarium fungus. On willow species, wet, dark stains, often accompanied by frass, appear around the entry-hole. Several of species of willow are reproductive hosts of PSHB, meaning that they are both susceptible to the Fusarium dieback disease and can support beetle reproduction. These include red willow (*Salix laevigata*), Gooding's black willow (*S. goodingii*), and weeping willow (*S. babylonica*).

MANAGEMENT OPTIONS

This beetle/disease complex is relatively new to Southern California. Currently, most heavily infested or isolated host trees need to be removed entirely or pruned (if the infestation is confined to a few branches). Because the beetle can survive for several months in cut wood, infested material must be handled properly to prevent spreading the insect to uninfested sites. Ideally, wood should be chipped to less than < 1 inch in diameter, then solarized, composted, or taken to a landfill for use as Alternative Daily Cover. If wood cannot be chipped, logs must be solarized, frozen, or kiln-dried. Chemical treatment requires a bark spray for the beetles combined with soil injection/soil drench of a fungicide. Efficacies of various insecticides and fungicides are currently being researched. Visit pshb.org or eskalenlab.ucr.edu for research updates and contact information.

» **photos on page 197**

CONTINUED ON NEXT PAGE »

Flowering branches of Arroyo willow, a California native. Photo: Jean Pawek.

Arroyo willow foliage. Photo: W. Mark and J. Reimer via SelecTree.

Flowers and foliage of Red willow, a California native. Photo: Keir Morse.

PESTS OF WILLOW, CONTINUED

Poplar and willow borer, *Cryptorhynchus lapathi*

IMPACT Adults chews bark and lay eggs on current-year green shoots. Larvae chew mines 1-3 inches long beneath and in bark and wood. Fine brown boring dust can be seen around the entrances to these galleries. Some dieback may occur.

MANAGEMENT OPTIONS Prune and dispose of infested or dying limbs or trees. Persistent insecticide treatments may be necessary to control heavy infestations. See ipm.ucanr.edu/pmg/garden/plants/invert/poplrwilborer.html.

» photos on page 198

Willow leaf gall sawfly, *Pontania pacifica*

IMPACT While laying their eggs in young willow leaves, female sawflies inject a fluid that causes the formation of reddish, berrylike galls. Galls are globular or elongate and about 1/3 of an inch long.

MANAGEMENT OPTIONS The leaf galls may be considered unsightly, but they do not cause any apparent harm to the host plant. Thus, no controls are recommended or known for willow leaf gall sawfly. It has several natural enemies, including at least one weevil, one moth, and several wasps, which appear to play an important role in controlling sawfly populations. Avoid using persistent, broad-spectrum insecticides that may interfere with natural parasitoids and predators. See ipm.ucanr.edu/pmg/garden/plants/invert/gallmakers.html.

» photos on page 211

Bacterial blight (caused by *Pseudomonas syringae*)

IMPACT Causes small, black angular spots or large, irregular brown spots on foliage. Branch cankers and brown streaks in the wood may also occur. On some host twigs, elongated lesions may appear that ooze during wet weather. Symptoms are usually more extensive in wetter areas.

MANAGEMENT OPTIONS Bacterial blight is favored by overfertilization or overhead irrigation that keeps foliage wet. Good air circulation and avoiding pruning during the wet season helps make infection less likely to occur. If symptoms appear on foliage only, trees can often recover. Severely affected branches or branches showing dieback should be pruned (during the dry season). However, if cankers appear on the trunk, the tree will probably decline and should be removed. See ipm.ucanr.edu/pmg/garden/plants/diseases/baclfblight.html.

» photos on page 147

CONTINUED ON NEXT PAGE »

PESTS OF WILLOW, CONTINUED

Crown gall (caused by *Agrobacterium tumefaciens*)

IMPACT Causes rough, wart-like growths (galls), primarily on the root crown at the soil line or just below the soil surface. Galls are initially smooth, then develop rapidly into larger, rough, warty, or cracked swellings. Typically will not cause serious harm to woody plants unless galls appear in the root crown area when plants are young. On young plants, crown gall may cause stunting, make the tree more susceptible to wind damage and drought stress, or girdle and kill the tree.

MANAGEMENT OPTIONS Purchase clean nursery stock and avoid injuring trees during transplanting, and take special care to avoid wounds where the tree will come into contact with soil. Plants can become infected through wounds, growth cracks, injured roots, or freezing injuries. If galls are found, they may be removed by cutting into healthy wood around galls, then exposing the tissue to drying. This must be performed during the dry season only, and minimal cuts should be made. Disinfect pruning tools before using on other plants. Severely infected plants may need to be removed and destroyed, but larger plants can usually tolerate gall development. See ipm.ucanr.edu/pmg/garden/plants/diseases/crowngall.html.

» photos on page 152

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» photos on page 164

Wetwood (associated with several species of bacteria)

IMPACT Evidenced by stained, discolored or water-soaked areas of wood. Infected bark cracks or wounds may exude a sour or rancid reddish-brown fluid. Severely infected trees may experience foliage wilt and branch dieback. Symptoms usually appear on trees that are at least 10 years old.

MANAGEMENT OPTIONS Prevent infection by avoiding injuries to bark and wood. Trees can also become infected through pesticide injection wounds. Note that while symptoms may be unsightly, infected wood is often just as strong as healthy wood. See ipm.ucanr.edu/pmg/garden/plants/diseases/wetwoodsslime.html.

» photos on page 174

BLUE ELDERBERRY

Sambucus mexicana

PLANT TYPE	Deciduous tree
PLANT SIZE	25-40 feet tall by 15-30 feet wide
CARE	Full sun to part shade; moderate water needs

POSSIBLE PESTS

Aphids (multiple genera)

IMPACT Feeding causes yellowed leaves, stunted shoots, and honeydew, which often turns black with sooty mold fungus. Certain species of aphid can transmit viruses from plant to plant. Damage is primarily aesthetic, and aphids rarely kill a host plant.

MANAGEMENT OPTIONS Prune out infested areas and remove nearby weeds that may harbor aphids. Limit nitrogen fertilizer applications, as high levels of nitrogen favor aphid reproduction. Insecticides are rarely needed, as most plants can tolerate low to moderate levels of aphid activity. It may be necessary to manage honeydew-feeding ants, which sometimes protect aphids from natural predators. See ipm.ucanr.edu/pmg/pestnotes/pn7404.html.

» photos on page 178

Soft scales, family *Coccidae*

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Heavily infested branches and other plant parts may die. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth.

MANAGEMENT OPTIONS Natural predators and parasites often supply sufficient control of scales, unless these natural enemies are disrupted by ants, dust, or applications of broad-spectrum insecticides. If infestations are limited to a few parts of smaller plants, these infested twigs and branches can be pruned. Pruning during hot summers can also help to open up canopies and reduce populations of certain scale species.

» photos on page 199

CONTINUED ON NEXT PAGE »

Wild blue elderberry shrub. Photo: Keir Morse.

Blue elderberry fruit. Photo: Keir Morse.

PESTS OF BLUE ELDERBERRY, CONTINUED

Nectria canker (caused by *Neonectria major*)

IMPACT Early infection is indicated by spots on the bark that secrete a dark exudate. These spots gradually enlarge, cracks begin to form in the bark, and cankers (often with a cat-eyed shape) develop. May result in tree death. Pathogens may enter the host through any natural opening.

MANAGEMENT OPTIONS Weakened or drought-stressed trees are more susceptible to infection. It is important to maintain plant vigor and to avoid wounds through which the pathogens may infect the host. Infected hosts can be thinned during the winter or early spring to potentially reduce pathogens. Severely cankered or dead branches or trees should be removed and destroyed.

» photos on page 162

Twig dieback and branch canker (caused by *Botryosphaeria* sp.)

IMPACT Damages and kills the cambium, which is responsible for tree growth. Vigorous trees may be able to tolerate multiple cankers for several years, but some infected trees rapidly decline and die within 1-2 years. Twig dieback, seen as wilted and brown foliage, starts at branch tips and works downward. Dark, sunken cankers with black centers may girdle and kill branches.

MANAGEMENT OPTIONS Monitor trees for early signs of the diseases so that they can be caught early. Pruning infested branches, shoots, and flowering stalks can be somewhat effective at slowing the progression of the disease. However, if the diseases become established in the trunk, control options are limited. No fungicides are known to be effective. Minimize host susceptibility by providing good cultural care. Avoid bark injury and prune dead or dying branches; the disease may enter the host through these wounds or weakened limbs. While the disease is usually associated with drought, but it is also important to avoid overwatering and to provide good drainage.

» photos on page 172

Blue elderberry flowers. Photo: Barry Breckling.

CALIFORNIA PEPPER

Schinus molle

PLANT TYPE	Evergreen tree
PLANT SIZE	25-40 feet tall by 25-40 feet wide
CARE	Full sun; very low water needs; requires well-drained soil

POSSIBLE PESTS

Peppertree psyllid, *Calophya rubra*

IMPACT Feed on host foliage by sucking fluids from the plant tissue. On California pepper, leaves develop a pit around the spot where each psyllid settles and feeds. However, the foliar distortion caused by peppertree psyllid feeding can be easily overlooked on the finely divided leaves of California pepper. Peppertree psyllid excretes relatively low amounts of honeydew compared to other psyllids.

MANAGEMENT OPTIONS A parasitic wasp (*Tamarixia schina*) usually provides sufficient control of peppertree psyllid, and no additional control is needed. Improving the host's health will increase its ability to tolerate psyllid activity. Provide adequate soil drainage and remove landscape plants or turf growing near trunks. See ipm.ucanr.edu/pmg/pestnotes/pn7423.html.

» photos on page 196

Scales, family *Diaspididae* (armored) or *Coccidae* (soft)

IMPACT Different hosts are affected by different scale species. Infested plants are weakened, grow more slowly, and appear water stressed. Leaves may turn yellow and drop prematurely or turn brown and remain on dead branches, giving plants a scorched appearance. Some scales secrete honeydew, which encourages ant activity and sooty mold growth. Heavily infested plant parts may die.

MANAGEMENT OPTIONS Natural enemies often supply sufficient control of scales unless disrupted by ants, dust, or applications of broad-spectrum insecticides. Infestations limited to a few parts of smaller plants can be pruned. Pruning during hot summers can help to open up canopies and reduce populations of certain scale species.

» photos on page 199

CONTINUED ON NEXT PAGE »

Foliage and flowers of California pepper. Photo: M. Ritter, W. Mark, J. Reimer via SelecTree.

California pepper tree. Photo: M. Ritter, W. Mark, J. Reimer via SelecTree.

PESTS OF CALIFORNIA PEPPER, CONTINUED

Armillaria root rot (caused by *Armillaria mellea*)

IMPACT Infects and kills cambial tissue, causing major roots and the trunk near the ground to die. Aboveground symptoms include undersized, discolored, and prematurely dropping leaves. Branch dieback often begins near the tops of plants. White mycelial plaques may form on the bark, with clusters of mushrooms forming at the base of the trunk. Black or dark reddish brown root-like structures (rhizomorphs) may be attached to the surface of the roots or root crown.

MANAGEMENT OPTIONS Preventing infection and selecting resistant species are the only controls for this root rot. See ipm.ucanr.edu/pmg/garden/plants/diseases/armillariartrot.html.

» photos on page 146

Verticillium wilt (caused by *Verticillium* spp.)

IMPACT Foliage turns faded green, yellow, or brown and sometimes wilts in scattered portions of the canopy or on scattered branches. Shoots and branches wilt and die, usually beginning on side of the plant. Dark stains can be seen along the grain of the wood of newly infected branches.

MANAGEMENT OPTIONS Affected branches can be pruned out. Severely diseased trees may need to be removed. The best way to avoid or combat the disease is to keep plants otherwise healthy, for infected trees are capable of recovering with proper cultural care. No fungicides are available to cure infected trees. See ipm.ucanr.edu/pmg/garden/plants/diseases/vertwilt.html.

» photos on page 173

Fruiting California pepper tree. Photo: Luigi Rignanese.

TIPU TREE

Tipuana tipu

PLANT TYPE	Semi-evergreen tree
PLANT SIZE	40-50 feet tall by 30-60 feet wide; older trees have been observed growing up to 70 feet tall by 100 feet wide
CARE	Full sun; moderate water needs

POSSIBLE PESTS

Tipu psyllid, *Platycorypha nigrivirga*

IMPACT

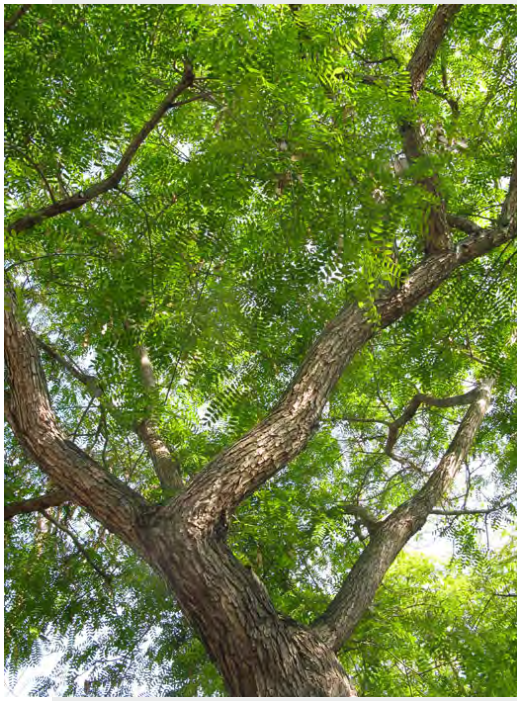
Invasive, exotic psyllid that attacks young foliage and branches. Extensive feeding may cause distorted shoots, curled leaves, and premature leaf drop. Adults and nymphs produce copious amounts of honeydew, which fosters the growth of black sooty mold on leaves and branches. Nymphs also produce pellets of wax-like residue.

MANAGEMENT OPTIONS

Tipu psyllid is a recent introduction to Southern California with no known biological control agents (natural enemies). Provide the appropriate amount of irrigation and avoid applying excessive nitrogen fertilizer to suppress populations. Proper pruning can also help to lower psyllid numbers; make cuts just above branch crotches and nodes instead of shearing off terminals, which stimulates the new growth that psyllids prefer for feeding and egg laying. Most damage, however, is aesthetic, and psyllids will not require management. See ipm.ucanr.edu/pmg/pestnotes/pn7423.html.

» photos on page 204

Tipu tree. Photo: R. Baldwin, M. Ritter, J. Reimer via SelecTree.



Tipu tree canopy. Photo: R. Baldwin, M. Ritter, J. Reimer via SelecTree.

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PESTS OF TIPU TREE, CONTINUED

Phytophthora Root and Crown Rot (caused by *Phytophthora* spp.)

IMPACT

Different species of *Phytophthora* fungus cause different symptoms, but general tree symptoms include reddish brown streaks on the outer and inner bark, as well as gum or dark sap oozing from the diseased area. Infected trees may appear drought stressed as leaves turn dull green, yellow, or red. Plants may experience overall wilting. Decline may occur slowly, over several years, or rapidly, within the first warm weather of the season.

MANAGEMENT OPTIONS

Phytophthora pathogens are favored by wet conditions, and risk of disease can be reduced with good water management. The disease tends to affect plants in poorly drained areas, where susceptible plants are surrounded by standing water or saturated soil for prolonged periods of time. Provide adequate drainage and know the water needs of individual plants. Trees that have evolved in dry conditions can be especially susceptible to Phytophthora when planted in an irrigated landscape. Younger trees are also vulnerable to rapid decline as their root systems and crowns are smaller. See ipm.ucanr.edu/pmg/pestnotes/pn74133.html.

» **photos on page 164**

Tipu tree leaves. Photo: R. Baldwin, M. Ritter, J. Reimer via SelecTree.

Dried up fruit of Tipu tree. Photo: R. Baldwin, M. Ritter, J. Reimer via SelecTree.

CALIFORNIA BAY

Umbellularia californica

PLANT TYPE	Evergreen tree
PLANT SIZE	Up to 75 feet tall
CARE	Full sun to part shade; low water needs; requires regular water to establish

POSSIBLE PESTS

Leadcable borer, *Scobicia declivis*

IMPACT Borers tunnel into twigs or branches, often at the crotch. May cause twig dieback. Adult beetles are black or brown and about 1/4 inch long.

MANAGEMENT OPTIONS Prune out affected plant parts. Remove and dispose of nearby dead wood, which is where the beetles breed. Chemical control is ineffective once beetles have infested a tree.

» photos on page 190

Western oak bark beetle, *Pseudopityophthorus pubipennis*

IMPACT The beetle is native to California. It bores under the bark to create shallow galleries in which it lays its eggs. Its tiny entryholes are smaller than those of Polyphagous shot hole borer and are typically accompanied by frass.

MANAGEMENT OPTIONS The beetle is considered a minor pest and tends to attack trees that have already been weakened by drought or are otherwise stressed. Control is usually unnecessary for the beetle alone. The Foamy bark canker disease now associated with Western oak bark beetle on Coast live oak has not been observed on California bay.

» photos on page 207

CONTINUED ON NEXT PAGE »

California bay tree. Photo: Barry Breckling.

California bay flowers. Photo: Barry Breckling.

California bay fruit. Fruit turns brown or purple as it ripens. Photo: W. Mark, J. Reimer, C. Stubler via SelecTree.

PESTS OF CALIFORNIA BAY, CONTINUED

Whitefly (multiple genera)

IMPACT Cause distortion, discoloration, or silvering of leaves while feeding. Excrete honeydew, which encourages the growth of black sooty mold.

MANAGEMENT OPTIONS Whiteflies develop rapidly in warm weather. They can usually be controlled by natural predators and parasites, but populations will build if their natural enemies are destroyed by broad-spectrum insecticides. Whiteflies themselves are not well controlled with any available insecticides. Early infestations can be managed by vigilantly removing infested leaves, vacuuming adults, or hosing down with water sprays. See ipm.ucanr.edu/pmg/pestnotes/pn7401.html.

» photos on page 210

Anthracnose (multiple genera of fungi)

IMPACT Causes dark, sunken lesions on leaves, stems, flowers, and fruits. Infected leaves may have small tan, brown, black, or tarlike spots, depending on the species. New leaves are more affected than mature leaves. On some trees, cankers may develop on twigs, branches, and the trunk. However, anthracnose rarely causes permanent damage to trees in California.

MANAGEMENT OPTIONS Anthracnose cannot be effectively controlled during the season that symptoms develop or become severe. Rake and dispose of fallen leaves and twigs during the growing season and in fall. Prune during winter to increase air circulation in the canopy and remove the previous season's infected twigs and branches. The disease is favored by wet conditions; a wet spring or irrigation that hits foliage could result in a disease outbreak. See ipm.ucanr.edu/pmg/pestnotes/pn7420.html.

» photos on page 145

Bacterial blight (caused by *Pseudomonas syringae*)

IMPACT Causes small, black angular spots or large, irregular brown spots on foliage. Branch cankers and brown streaks in the wood may also occur. On some host twigs, elongated lesions may appear that ooze during wet weather. Symptoms are usually more extensive in wetter areas.

MANAGEMENT OPTIONS Bacterial blight is favored by overfertilization or overhead irrigation that keeps foliage wet. Good air circulation and avoiding pruning during the wet season helps make infection less likely to occur. If symptoms appear on foliage only, trees can often recover. Severely affected branches or branches showing dieback should be pruned (during the dry season). However, if cankers appear on the trunk, the tree will probably decline and should be removed. See ipm.ucanr.edu/pmg/garden/plants/diseases/baclfblight.html.

» photos on page 147

CONTINUED ON NEXT PAGE »

PESTS OF CALIFORNIA BAY, CONTINUED

Heart rot (caused by *Ganoderma applanatum*)

IMPACT Causes white rot of the sapwood and heartwood in roots and trunks. Forms semicircular conks on the bark that are 2-30 inches wide and 1-8 inches thick. Conks are brown on the upper surface and white on the lower surface.

MANAGEMENT OPTIONS Avoid injury to trees, as the *Ganoderma* fungus enters the tree through wounds. Heart rot can be managed by cutting infected trees down to a height of 7 inches and allowing them to stump sprout. See ipm.ucanr.edu/pmg/pestnotes/pn74109.html.

» photos on page 160

Nectria canker (caused by *Neonectria major*)

IMPACT Early infection is indicated by spots on the bark that secrete a dark exudate. These spots gradually enlarge, cracks begin to form in the bark, and cankers (often with a cat-eyed shape) develop. May result in tree death. Pathogens may enter the host through any natural opening.

MANAGEMENT OPTIONS Weakened or drought-stressed trees are more susceptible to infection. It is important to maintain plant vigor and to avoid wounds through which the pathogens may infect the host. Infected hosts can be thinned during the winter or early spring to potentially reduce pathogens. Severely cankered or dead branches or trees should be removed and destroyed.

» photos on page 162

Twig dieback and trunk canker (caused by *Botryosphaeria* sp.)

IMPACT Damages and kills the cambium, which is responsible for tree growth. Vigorous trees may be able to tolerate multiple cankers for several years, but some infected trees rapidly decline and die within 1-2 years. Twig dieback, seen as wilted and brown foliage, starts at branch tips and works downward. Dark, sunken cankers with black centers may girdle and kill branches.

MANAGEMENT OPTIONS Monitor trees for early signs of the diseases so that they can be caught early. Pruning infested branches, shoots, and flowering stalks can be somewhat effective at slowing the progression of the disease. However, if the diseases become established in the trunk, control options are limited. No fungicides are known to be effective. Minimize host susceptibility by providing good cultural care. Avoid bark injury and prune dead or dying branches; the disease may enter the host through these wounds or weakened limbs. While the disease is usually associated with drought, but it is also important to avoid overwatering and to provide good drainage.

» photos on page 172

Pest Photos

Alternaria diseases
caused by *Alternaria* fungi

Leaf lesions caused by Alternaria. Photo: Jack Kelly Clark/UC IPM.

Alternaria leaf spots on almond leaves. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Giant chalk dudleya** **(p. 88)**

Anthracnose
caused by multiple genera of fungi

Anthracnose on sycamore leaves. Photo: Jack Kelly Clark/UC IPM.

Anthracnose damage on sycamore. Photo: Jack Kelly Clark/UC IPM.

Anthracnose on coast live oak leaves. Photo: Monica Dimson, UC Cooperative Extension.

AFFECTED PLANTS INCLUDE:

- **Agave spp. (p. 81-84)**
- **California bay (p. 141)**
- **California sycamore (p. 118)**
- **Coast live oak (p. 128)**
- **Cork oak (p. 130)**
- **Pacific wax myrtle (p. 59)**

Armillaria root rot
caused by *Armillaria mellea*

Mushrooms of *Armillaria mellea*. Photo: Jack Kelly Clark/UC IPM.

Mycelial fans of *Armillaria mellea* on star jasmine root. Photo: Steven W. Swain/UC IPM.

A healthy cherry tree (left) next to a tree infected by Armillaria root rot (right). Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **California pepper (p. 137)**
- **Coast live oak (p. 128)**
- **Cork oak (p. 130)**
- **Fremont cottonwood (p. 121)**
- **Fruiting pomegranate (p. 124)**
- **Fruitless white mulberry (p. 114)**
- **Star jasmine (p. 79)**

Bacterial blight
caused by *Pseudomonas syringae*

Wilted, blackened leaves infected with bacterial blight. Photo: Jack Kelly Clark/ UC IPM.

Foliar lesions caused by bacterial blight. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **California bay** (p. 141)
- **Fremont cottonwood** (p. 122)
- **Fruitless white mulberry** (p. 114)
- **Willow spp.** (p. 132)

Black spot
caused by *Diplocarpon rosae*

Rose leaves infected by black spot. Photo: Jack Kelly Clark/UC IPM.

Rose leaves infected by black spot. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Yellow lady banks rose** (p. 71)

Botrytis blight
caused by *Botrytis cinerea*

Botrytis blight damage. Photo: Jack Kelly Clark/UC IPM.

Foliage killed by botrytis blight. Photo: Themis J. Michailides/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Fruiting pomegranate (p. 125)**

Collar rot
caused by *Phytophthora siskiyouensis*

Trunk bleeding caused by collar rot on an alder tree.
Photo: Laura Sims/Pacific Northwest Plant Disease Management Handbook.

AFFECTED PLANTS INCLUDE:

- **White alder (p. 94)**

Cordyline slime flux
caused by multiple species of bacteria

White frothing caused by Cordyline slime flux. Photo: Royal Horticultural Society.

AFFECTED PLANTS INCLUDE:

- **Bauer's Dracaena palm** (p. 86)

Crown gall
caused by *Agrobacterium tumefaciens*

Crown gall. Photo: Steven A. Tjosvold, UC Cooperative Extension Santa Cruz.

Crown gall. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **California walnut (p. 110)**
- **Willow spp. (p. 133)**

Damping-off disease
(caused by *Rhizoctonia* and *Pythium* fungi

Roots of seedlings damaged by damping-off disease. Photo: Jack Kelly Clark/ UC IPM.

Seedlings damaged by damping-off disease (right) next to healthy seedlings (left). Phoo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Agave spp. (pp. 81-84)**
- **Flannel bush (p. 51)**
- **Germander sage (p. 75)**
- **Idaho fescue (p. 4)**
- **Natal plum (p. 44)**
- **Purple reed stem orchid (p. 26)**
- **Switchgrass (p. 11)**

Deep bark canker
caused by *Erwinia rubrifaciens*

Internal wood damage from deep bark canker. Photo: Jack Kelly Clark/UC IPM.

Long cracks in a branch infected by deep bark canker. Wounds may ooze reddish-brown sap. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

California walnut (p. 109)

Dollar spot
caused by *Sclerotinia homeocarpa, Lanzia* spp., *Moellerodiscus* spp.

Dollar spot symptoms on turf. Photo: Arthur H. McCain.

Turf affected by dollar spot. Photo: M. Ali Harivandi/UC IPM.

AFFECTED PLANTS INCLUDE:

Molate red fescue (p. 7)

Dry pocket rot
caused by *Oligoporus amarus*

AFFECTED PLANTS INCLUDE:

Incense cedar (p. 98)

Conk (fruiting body) of *Oligoporus amarus*. Photo: Mushroom Observer user Gerry.

Damage from dry pocket rot. Photo: Darvin DeShazer.

Ergot
caused by *Claviceps purpurea*

Ergot damage to a grain head. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Rio creeping wildrye** (p. 9)

Fire blight
caused by *Erwinia amylovora*

Foliage infected by fire blight. Photo: Jack Kelly Clark/UC IPM.

Wilted foliage due to fire blight. Photo: Jack Kelly Clark/UC IPM.

Trunk oozing caused by fire blight. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Toyon (p. 56)**
- **Yeddo hawthorn (p. 68)**

Head smut
caused by *Ustilago bullata*

AFFECTED PLANTS INCLUDE:

California barley (p. 8)

Head smut damages the kernels of healthy grass. Photo: Marsha L. Campbell /UC IPM.

Healthy kernels (left) replaced by head smut teliospores (right). Photo: Jack Kelly Clark/UC IPM.

Heart rot
caused by *Ganoderma applanatum*

Heart rot in a conifer trunk. Photo: Jack Kelly Clark/UC IPM.

Heart rot damage. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **California bay (p. 142)**

Leaf spot diseases
caused by many fungi

Leaf spot symptoms on hawthorn. Photo: Jack Kelly Clark/UC IPM.

Leaf spot symptoms on a maple leaf. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Berkeley sedge (p. 36)**
- **Foothill sedge (p. 37)**
- **Natal plum (p. 44)**
- **Pacific wax myrtle (p. 59)**
- **San Diego sedge (p. 37)**
- **Toyon (p. 56)**
- **Yeddo hawthorn (p. 69)**

Nectria canker
caused by *Neonectria major*

Cat-eye shaped wounds caused by nectria canker. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Blue elderberry (p. 135)**
- **California bay (p. 142)**
- **Coast live oak (p. 128)**
- **Cork oak (p. 130)**
- **Fruitless white mulberry (p. 114)**
- **White alder (p. 94)**

Oleander leaf scorch
caused by *Xylella fastidiosa*

Foliar symptoms of Oleander leaf scorch. Photo: Monica Dimson, UC Cooperative Extension.

Shrubs damaged by Oleander leaf scorch. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Jacaranda (p. 108)**

Phytophthora root and crown rot
caused by *Phytophthora* spp.

Dark streaking in roots infected by Phytophthora. Photo: Jack Kelly Clark/UC IPM.

Canopy dieback on a tree infected by Phytophthora. Photo: Jack Kelly Clark/UC IPM.

Phytophthora canker. Photo: John M. Mircetich.

AFFECTED PLANTS INCLUDE:

- **Agave spp. (pp. 81-84)**
- **California sycamore (p. 119)**
- **California walnut (p. 110)**
- **Coast live oak (p. 128)**
- **Cork oak (p. 130)**
- **Flannel bush (p. 51)**
- **Fruitless olive (p. 116)**
- **Incense cedar (p. 98)**
- **Marina strawberry tree (p. 96)**
- **Miniature gardenia (p. 53)**
- **Rustleaf fig (p. 107)**
- **Silver plectranthus (p. 65)**
- **Star jasmine (p. 79)**
- **Sugar bush (p. 70)**
- **Tipu tree (p. 139)**
- **Toyon (p. 56)**
- **Upright rosemary (p. 73)**
- **Willow spp. (p. 133)**
- **Yeddo hawthorn (p. 69)**

Powdery mildew
caused by *Podosphaera* spp., *Sphaerotheca* spp.

Wilted shoots infected with powdery mildew. Photo: Jack Kelly Clark/UC IPM.

Powdery mildew on the underside of a leaf. Photo: Jack Kelly Clark/UC IPM.

Blossom damage from powdery mildew. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **California sycamore (p. 119)**
- **Coyote bush (p. 41)**
- **Creeping sage (p. 76)**
- **Fremont cottonwood (p. 122)**
- **Germander sage (p. 75)**
- **Giant chalk dudleya (p. 88)**
- **Japanese honeysuckle (p. 17)**
- **Mexican marigold (p. 77)**
- **Silver licorice plant (p. 16)**
- **Tickseed (p. 24)**
- **Upright rosemary (p. 73)**
- **White alder (p. 94)**
- **Yellow lady banks rose (p. 72)**

Pythium blight
caused by *Pythium* spp.

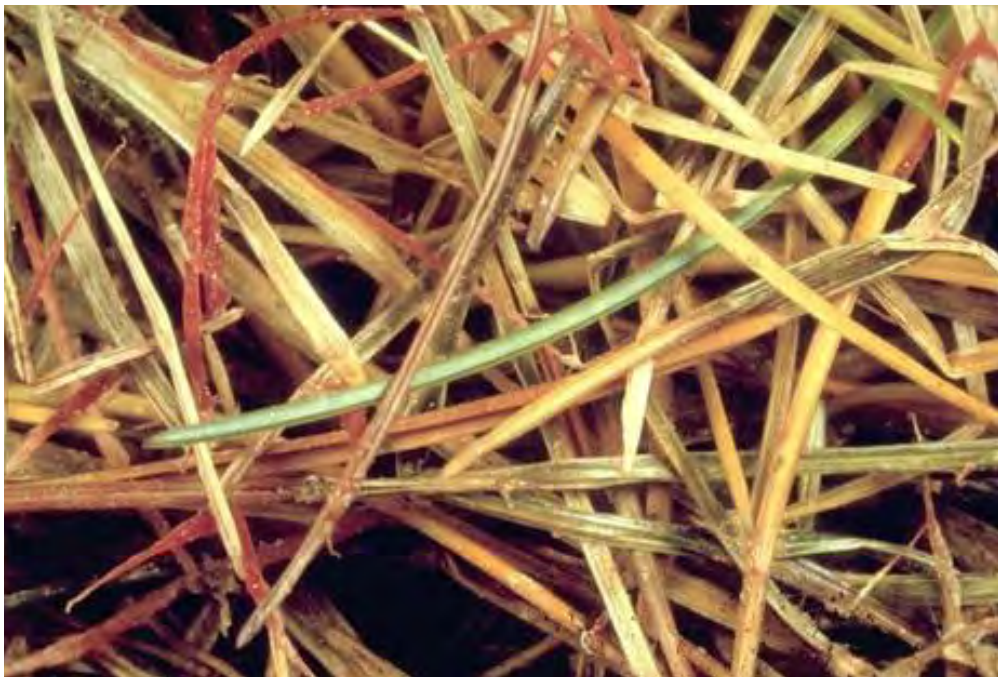
Turf infected by pythium blight. Photo: M. Ali Haviland/UC IPM.

Turf infected by pythium blight. Photo: M. Ali Haviland/UC IPM.

AFFECTED PLANTS INCLUDE:

Molate red fescue (p. 7)

Red thread
caused by *Laetisaria fuciformis*



Turf affected by red thread. Photo: Arthur H. McCain.

AFFECTED PLANTS INCLUDE:

- **Molate red fescue (p. 7)**

Rust

caused by *Puccinia* spp., *Uromyces* spp.

Rust patches on the upper side of an infected leaf. Photo: Jack Kellly Clark/UC IPM.

Rust pustules on the under side of an infected leaf. Photo: Monica Dimson, UC Cooperative Extension.

Rust on blades of ryegrass. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Berkeley sedge** (p. 36)
- **California barley** (p. 8)
- **California coffee berry** (p. 66)
- **California gray rush** (p. 35)
- **Foothill sedge** (p. 37)
- **Papyrus** (p. 34)
- **San Diego sedge** (p. 37)
- **Switchgrass** (p. 11)
- **Tickseed** (p. 24)

Take-all disease
caused by *Gaeumannomyces graminis*

Damaged roots of grasses affected by take-all disease. Photo: M. V. Wiese.

Take-all disease symptoms include circular patches of affected grass. Photo: W. W. Bockus.

AFFECTED PLANTS INCLUDE:

- **Rio creeping wildrye** (p. 9)

Thousand cankers disease

caused by *Geosmithia morbida* and vectored by Walnut twig beetle, *Pityophthorus juglandis*

AFFECTED PLANTS INCLUDE:

California walnut (p. 110)

Yellow foliage and branch dieback caused by thousand cankers disease. Photo: Steven J. Seybold.

Trunk stains symptomatic of thousand cankers disease. Photo: Larry L. Strand/UC IPM.

Dead tissue caused by thousand cankers disease. Photo: Larry L. Strand/UC IPM.

Tobacco mosaic virus

Tobacco mosaic virus can cause "shoestring" leaf symptoms. Photo: Jack Kelly Clark/ UC IPM.

Tomato leaves affected by tobacco mosaic virus. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Purple reed stem orchid** (p. 27)

Twig dieback and trunk cankers
caused by *Neofusicoccum arbuti, Botryosphaeria dothidea*

Dead foliage caused by twig dieback and trunk cankers on California bay. Photo: Jack Kelly Clark/UC IPM.

Twig dieback and trunk canker symptoms. Photo: Jeff Hitchcock.

AFFECTED PLANTS INCLUDE:

- **Blue elderberry (p. 135)**
- **California bay (p. 142)**
- **Eastern redbud (p. 100)**
- **Marina strawberry tree (p. 96)**
- **Western redbud (p. 101)**

Verticillium wilt
caused by *Verticillium* spp.

Yellow patches on sycamore leaves, caused by Verticillium wilt. Photo: Jack Kelly Clark/UC IPM.

Dead foliage on maple, caused by Verticillium wilt. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **California pepper (p. 137)**
- **Eastern redbud (p. 100)**
- **Fruitless olive (p. 116)**
- **Goldenrain tree (p. 111)**
- **Western redbud (p. 101)**
- **Yeddo hawthorn (p. 69)**

Wetwood
associated with several species of bacteria

Wetwood staining symptoms. Photo: Jack Kelly Clark/UC IPM.

Wetwood symptoms on tree bark. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Fremont cottonwood** (p. 122)
- **Willow spp.** (p. 133)

Agave snout weevil
Scyphophorus acupunctatus

Adult agave snout weevil. Photo: Wiki user Nanosanchez.

Agave plant damaged by agave snout weevil. Photo: UC Cooperative Extension, Riverside.

Rotted plant base caused by agave snout weevil. Photo: UC Cooperative Extension, Riverside.

AFFECTED PLANTS INCLUDE:

Agave spp. (p. 81-84)

Alder flea beetle
Macrohaltica ambiens

AFFECTED PLANTS INCLUDE:

White alder (p. 92)

Adult alder flea beetle. Photo: US Forest Service.

Skeletonized leaves caused by alder leaf beetle feeding. Photo: US Forest Service.

Larvae of alder leaf beetle on the underside of a leaf. Photo: US Forest Service.

Ants

Common species: Argentine ant, *Linepithema humile;* Native gray ant, *Formica aerata;* Red imported fire ant, *Solenopsis invicta;* Southern fire ant, *S. xyloni*

AFFECTED PLANTS INCLUDE:

Valencia orange (p. 102)

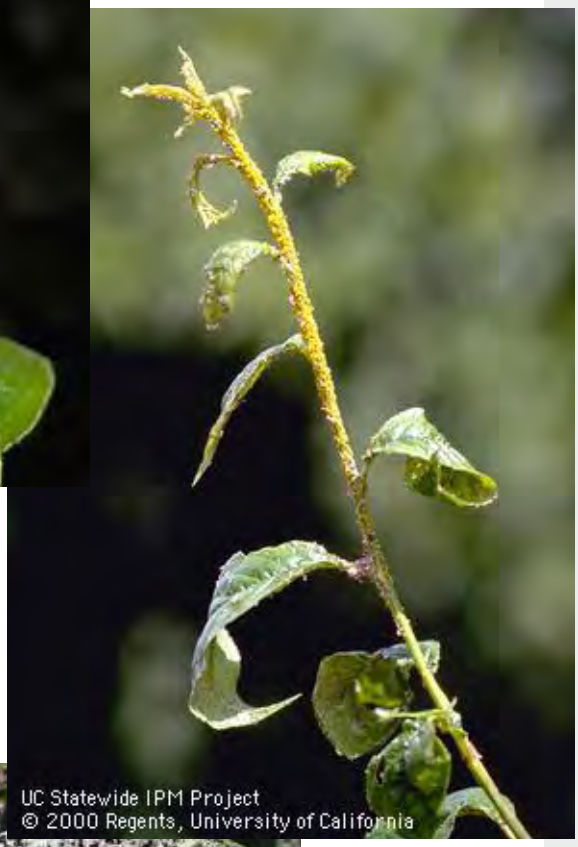
Argentine ants tend to scales on a citrus tree. Photo: Monica Dimson, UC Cooperative Extension.

Red imported fire ant (RIFA) mound at the base of a tree. Photo: Les Greenberg, UC Riverside.

RIFA mound built around an irrigation head. Photo: Les Greenberg, UC Riverside.

Aphids
multiple genera

Foliage covered by aphids. Photo: Jack Kelly Clark/UC IPM.



New growth stunted by aphid activity. Photo: Jack Kelly Clark/UC IPM.

Honeydew secreted by aphids encourages black sooty mold. Photo: Jack Kelly Clark/ UC IPM.

AFFECTED PLANTS INCLUDE:

- **Blue elderberry (p. 134)**
- **Blue mountain lilac (p. 48)**
- **Butterfly bush (p. 43)**
- **California poppy (p. 14)**
- **Creeping sage (p. 76)**
- **Giant chalk dudleya (p. 87)**
- **Golden yarrow (p. 50)**
- **Japanese honeysuckle (p. 17)**
- **Miniature gardenia (p. 52)**
- **Mission red monkey flower (p. 57)**
- **Purple reed stem orchid (p. 26)**
- **Silver licorice plant (p. 16)**
- **Sweet fragrant olive (p. 62)**
- **Tickseed (p. 23)**
- **Upright rosemary (p. 72)**
- **White yarrow (p. 18)**
- **Wild lilac (p. 46)**
- **Yeddo hawthorn (p. 67)**
- **Yellow lady banks rose (p. 71)**

Asian citrus psyllid (ACP)

Diaphorina citri, vector of Huanglongbing disease (caused by *Candidatus Liberibacter asiaticus*)

AFFECTED PLANTS INCLUDE:

- **Valencia orange (p. 103)**

ACP nymphs and the wax they secrete. Photo: Michael E. Rogers, University of Florida.

Ants are attracted to ACP secretions. Photo: Michael E. Rogers, University of Florida.

Parasitized ACP. Avoid broad spectrum pesticides when parasitoids are present. Photo: Mark Hoddle, Center for Invasive Species Research, UC Riverside.

Billbugs
Sphenophorus spp.

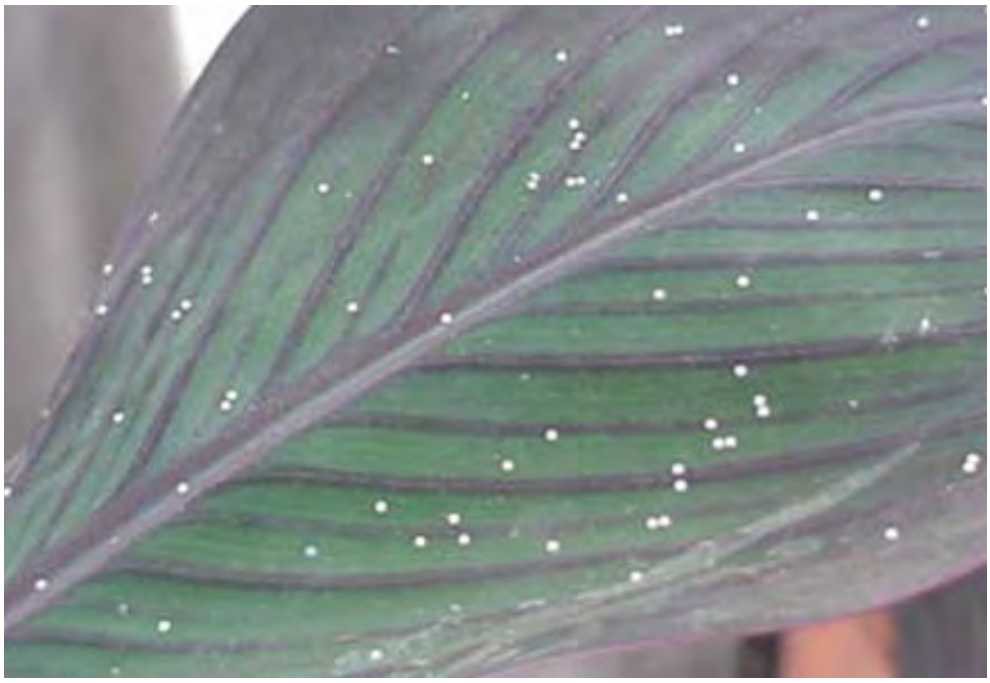
Adult billbugs. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

Molate red fescue (p. 6)

Canna leaf roller
Calpodes ethlius

Larvae of canna leaf roller. Photo: Kim King, University of Western Ontario.



Canna leaf roller eggs on the underside of a leaf. Photo: Kim King, University of Western Ontario.

AFFECTED PLANTS INCLUDE:

- **Tropicanna gold canna** (**p. 21**)

Citrus leafminer
Phyllocnistis citrella

Signs of citrus leafminer include the tunnels created by larvae. Photo: David R. Haviland.

Citrus leafminer activity causes leaves to curl and distort. Photo: David Rosen/UC IPM.

Curled, distorted leaves affected by citrus leafminer can be pruned off, but do not generally harm the tree. Photo: Larry L. Strand/ UC IPM.

AFFECTED PLANTS INCLUDE:

Valencia orange (p. 103)

Codling moth
Cydia pomonella

Adult codling moth. Photo: Jack Kelly Clark/UC IPM.

Crop damage from codling moth Photo: Jack Kelly Clark/UC IPM.

Codling moth pupa. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

California walnut (p. 109)

Flatheaded borers
multiple genera

Flatheaded borer damage. Photo: Jack Kelly Clark/ UC IPM.

Emergence holes of Pacific flatheaded borer, *Chrysobothris malis*. Photo: Jack Kelly Clark/UC IPM.

Larva of Pacific flatheaded borer. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Coyote bush (p. 40)**
- **Goldenrain tree (p. 111)**
- **Toyon (p. 54)**
- **White alder (p. 92)**
- **Yeddo hawthorn (p. 67)**

PACIFIC FLATHEADED BORER:

- **Blue mountain lilac (p. 48)**
- **Wild lilac (p. 46)**

Foliage-feeding caterpillars
multiple genera

Larvae of gypsy moth feeding on foliage. Photo: Roger Zerillo.

Red-humped caterpillar. Photo: Jack Kelly Clark/UC IPM.

Frass, like that of California oakworm, is a sign of foliage-feeding caterpillars. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Bauer's Dracaena palm (p. 85)**
- **Butterfly bush (p. 43)**
- **Coyote bush (p. 40)**
- **Eastern redbud (p. 99)**
- **Marina strawberry tree (p. 95)**
- **Purple wandering Jew (p. 29)**
- **Toyon (p. 54)**
- **Western redbud (p. 101)**
- **White alder (p. 93)**
- **White yarrow (p. 18)**
- **Yerba mansa (p. 19)**

Gall and blister mites
family *Eriophyidae*

Symptoms of gall and blister mites. Photo: Jack Kelly Clark/ UC IPM.

Symptoms of gall and blister mites. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Coyote bush (p. 41)**
- **Fremont cottonwood (p. 120)**

Glassy-winged sharpshooter (GWSS)
Homalodisca vitripennis

GWSS adult. Photo: Jack Kelly Clark/UC IPM.

Chalky sharpshooter "rain" causes foliage to appear white-washed. Photo: Jack Kelly Clark/UC IPM.

Chalky sharpshooter "rain" on white-washed foliage. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Fruitless olive (p. 115)**
- **Fruitless white mulberry (p. 113)**

Goldspotted oak borer (GSOB)

Agrilus auroguttatus

D-shaped GSOB emergence holes. Photo: Tom W. Coleman/ USDA.

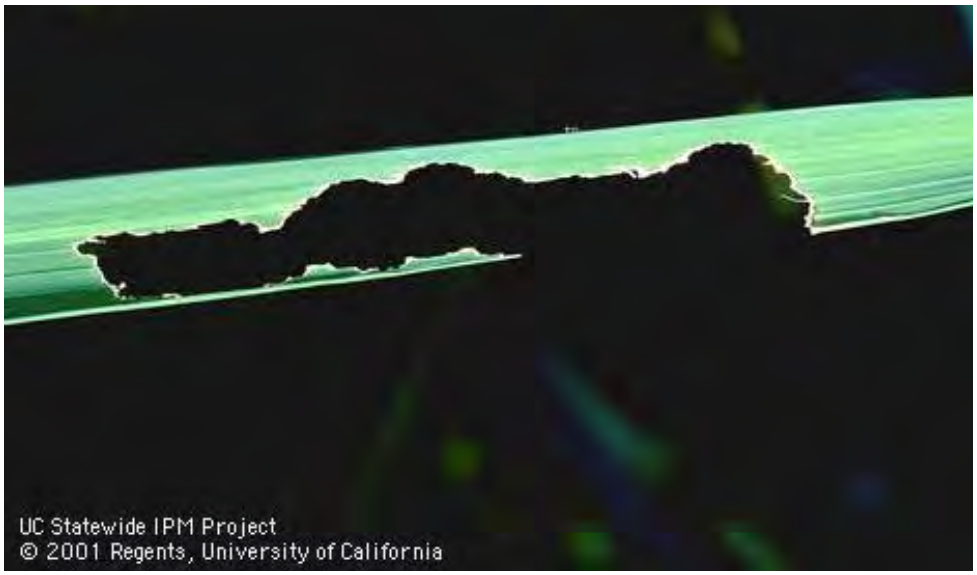
GSOB galleries. Photo: Michael I. Jones/UC Davis.

Crown thinning due to GSOB infestation. Photo: Tom W. Coleman/ USDA.

AFFECTED PLANTS INCLUDE:

Coast live oak (p. 126)

Grasshoppers
multiple species



Rough-edged holes chewed by grasshoppers. Photo: Jack Kelly Clark/UC IPM.

Grasshopper adult. Photo: Jack Kelly Clark/UC IPM.

Grasshopper adult and feeding damage. Photo: David Rosen/ UC IPM.

AFFECTED PLANTS INCLUDE:

- **Idaho fescue (p. 4)**

Leadcable borer
Scobicia declivis

Adult leadcable borer. Photo: Jack Kelly Clark/UC IPM.

Leadcable borer wood damage. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **California bay (p. 140)**

Leaffooted bug
Leptoglossus spp.

Adult leaffooted bug. Photo: David R. Haviland/UC IPM.

Leaffooted bugs aggregating on pomegranate. Photo: David R. Haviland/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Fruiting pomegranate (p. 123)**

Leafhoppers
multiple genera

Leafhoppers caught in spider webs. Photo: David Rosen/UC IPM.

Leafhoppers feed on the underside of the leaf (left), causing stippling on the leaf surface (right). Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **California poppy (p. 15)**
- **Tickseed (p. 24)**

Mealybugs
multiple genera

Cottony mass of mealybugs on citrus. Photo: Jack Kelly Clark/ UC IPM.

Mealybug honeydew attracts ants, which will ward off mealybug predators. Photo: Mark C. Battany.

Ants tend to mealybugs on tree bark. Photo: Larry L. Strand/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Agave spp. (pp. 81-84)**
- **Bauer's Dracaena palm (p. 85)**
- **Blue mountain lilac (p. 48)**
- **Fruiting pomegranate (p. 124)**
- **Fruitless white mulberry (p. 113)**
- **Germander sage (p. 74)**
- **Giant chalk dudleya (p. 87)**
- **Natal plum (p. 45)**
- **Prickly pear (p. 61)**
- **Silver plectranthus (p. 64)**
- **Wild lilac (p. 46)**

Mountain pine beetle
Dendroctonus ponderosae

AFFECTED PLANTS INCLUDE:

Incense cedar (p. 97)

Pitch tubes indicate mountain pine beetle gallery holes. Photo: Padraic Ryan.

Mountain pine beetle pitch tube. Photo: Wiki user Hustvedt.

Olive psyllid
Euphyllura olivina

AFFECTED PLANTS INCLUDE:

Fruitless olive (p. 115)

White, waxy material produced by olive psyllid nymphs. Photo: Marshall W. Johnson.

Foliage covered in olive psyllid secretions. Photo: David Rosen/UC IPM.

Olive psyllid adult. Photo: Gevork Arakelian/LA County Department of Agriculture.

Peppertree psyllid
Calophya rubra

Peppertree psyllid adult and damage caused by peppertree psyllid nymphs. Photo: Jack Kelly Clark/UC IPM.

Peppertree psyllid damage to foliage. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

California pepper (p. 136)

Polyphagous shot hole borer (PSHB)

Euwallacea sp., vector of Fusarium Dieback (caused by *Fusarium euwallaceae*)

Female PSHB adults and galleries in castor bean. Photo: Akif Eskalen, UC Riverside.

Willows in the Tijuana River heavily infested by the closely related Kuroshio shot hole borer and a similar Fusarium disease. Photo: John Kabashima, UC Cooperative Extension.

Common staining and gumming symptoms on sycamore (left) and Goldenrain (right). Photos: Monica Dimson and John Kabashima, UC Cooperative Extension.

AFFECTED PLANTS INCLUDE:

- **California sycamore** (p. 117)
- **Coast live oak** (p. 127)
- **Cork oak** (p. 129)
- **Fremont cottonwood** (p. 121)
- **Goldenrain tree** (p. 112)
- **White alder** (p. 93)
- **Willow spp.** (p. 131)

Poplar and willow borer
Cryptorhynchus lapathi

Poplar and willow borer adult. Photo: Arthur L. Antonelli.

Poplar and willow borer damage. Photo: Bill Zanze, Portland Parks.

Branch cross-section showing boring damage. Photo: Bill Zanze, Portland Parks.

AFFECTED PLANTS INCLUDE:

- **Fremont cottonwood (p. 120)**
- **Willow spp. (p. 132)**

Scales
family *Diaspididae* (armored) or *Coccidae* (soft)

Adult oak lecanium scales. Photo: Jack Kelly Clark/UC IPM.

California red scale. Photo: Jack Kelly Clark/UC IPM.

Golden oak and pitting scales. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Agave spp. (pp. 81-84)**
- **Bauer's Dracaena palm (p. 86)**
- **Blue mountain lilac (p. 48)**
- **California pepper (p. 136)**
- **Coyote bush (p. 41)**
- **Dwarf palmetto (p. 32)**
- **Flax lily (p. 38)**
- **Fruitless olive (p. 116)**
- **Rustleaf fig (p. 106)**
- **Silver plectranthus (p. 64)**
- **Star jasmine (p. 78)**
- **Sweet fragrant olive (p. 62)**
- **Valencia orange (p. 104)**
- **White alder (p. 93)**
- **Wild lilac (p. 47)**
- **Winterborn philodendron (p. 63)**
- **Yeddo hawthorn (p. 68)**

PLANTS PRIMARILY AFFECTED BY SOFT SCALE:

- **Blue elderberry (p. 134)**
- **Fruiting pomegranate (p. 124)**
- **Miniature gardenia (p. 53)**
- **Natal plum (p. 45)**
- **Pacific wax myrtle (p. 58)**
- **Prickly pear (p. 61)**
- **Toyon (p. 55)**

Snails and slugs
multiple genera

Adult brown garden snails chew irregular-shaped holes in foliage. Photo: Jack Kelly Clark/UC IPM.

Foliar damage to citrus leaves. Photo: David Rosen/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Giant chalk dudleya (p. 88)**
- **Purple reed stem orchid (p. 26)**
- **Purple wandering Jew (p. 29)**
- **Tickseed (p. 25)**
- **Tropicanna gold canna (p. 22)**
- **Valencia orange (p. 104)**

Spider mite
Tetranychus spp.

Spider mites and webbing. Photo: Jack Kelly Clark/UC IPM.

Leaf stippling caused by spider mite feeding. Photo: Jack Kelly Clark/UC IPM.

Webbing and leaf mottling caused by spider mite activity. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Switchgrass (p. 11)**
- **Route 66 California fuschia (p. 27)**
- **Dwarf palmetto (p. 32)**
- **Butterfly bush (p. 43)**
- **Miniature gardenia (p. 53)**
- **Pacific wax myrtle (p. 58)**
- **Dwarf myrtle (p. 60)**
- **Tropicanna gold canna (p. 22)**
- **Silver plectranthus (p. 65)**
- **Winterborn philodendron (p. 63)**
- **Germander sage (p. 75)**
- **Mexican marigold (p. 77)**
- **Star jasmine (p. 78)**
- **Our lady's candle (p. 89)**
- **Soft leaf yucca (p. 90)**
- **Rustleaf fig (p. 106)**
- **Yellow lady banks rose (p. 71)**

Sycamore borer
Synanthedon resplendens

Signs of sycamore borer include red frass and pupal cases. Photo: Monica Dimson, UC Cooperative Extension.

Roughened bark caused by sycamore borer activity may look dramatic, but generally will not seriously damage the tree. Photo: Akif Eskalen/ UC Riverside.

Sycamore borer larva. Photo: Jack Kelly Clark/ UC IPM.

AFFECTED PLANTS INCLUDE:

- **Blue mountain lilac** (p. 48)
- **California sycamore** (p. 118)
- **Coast live oak** (p. 127)
- **Wild lilac** (p. 46)

Thrips
order *Thysanoptera*

Browned foliage damaged by thrips. Photo: Jack Kelly Clark/UC IPM.

Myoporum and Cuban laurel thrips can cause rolled, podlike leaf terminals to occur. Photo: Jack Kelly Clark/UC IPM.

Silvering of walnut foliage caused by thrip activity. Photo: Wilbur O. Reil.

AFFECTED PLANTS INCLUDE:

- **California poppy (p. 15)**
- **Japanese honeysuckle (p. 17)**
- **Silver licorice plant (p. 16)**
- **Toyon (p. 55)**
- **Tropicanna gold canna (p. 22)**

Tipu psyllid
Platycorypha nigrivirga

Adult tipu psyllid. Photo: Gevork Arakelian/ LA County Department of Agriculture.

Foliage with tipu psyllid excretions (top) and unaffected foliage (bottom). Photo: Gevork Arakelian/ LA County Department of Agriculture.

Adult tipu psyllids and nymphs and their residue. Photo: Gevork Arakelian/ LA County Department of Agriculture.

AFFECTED PLANTS INCLUDE:

Tipu psyllid (p. 138)

Treehoppers

Platycotis vittata, Stictocephala bisonia

Treehopper cast. Photo: Jack Kelly Clark/UC IPM.

Buffalo treehopper. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Eastern redbud (p. 99)**
- **Western redbud (p. 101)**

Western conifer seed bug
Leptoglossus occidentalis

Western conifer seed bug. Photo: Didier Descouens.

Western conifer seed bug. Photo: Wiki user Walcoford.

AFFECTED PLANTS INCLUDE:

- **Incense cedar (p. 97)**

Western oak bark beetle
Pseudopityophthorus pubipennis

Western oak bark beetle. Photo: Jack Kelly Clark/UC IPM.

Frass around the gallery holes of western oak bark beetle. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **California bay (p. 140)**
- **Coast live oak (p. 127)**

Western sycamore lace bug
Corythucha confraterna

Bleached, stippled foliage caused by western sycamore lace bug feeding.
Photo: Jack Kelly Clark/UC IPM.

Bleached, discolored foliage caused by western sycamore lace bug feeding.
Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

California sycamore
(p. 118)

White grubs
Cyclocephala spp.

Patches of turf damaged by white grubs. Photo: Jack Kelly Clark/UC IPM.

Larvae of predatory ground beetle and masked chafer. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

Molate red fescue (p. 7)

Whitefly
multiple genera

Giant whitefly excretions produce waxy, beardlike strands. Photo: Jack Kelly Clark/UC IPM.

Woolly whitefly eggs, pupae, and honeydew. Photo: Jack Kelly Clark/UC IPM.

Nymphs of crown whitefly and black sooty mold. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Blue mountain lilac (p. 48)**
- **California bay (p. 141)**
- **Coyote bush (p. 41)**
- **Fruitless white mulberry (p. 114)**
- **Mexican marigold (p. 77)**
- **Miniature gardenia (p. 53)**
- **Pacific wax myrtle (p. 59)**
- **Toyon (p. 55)**
- **Upright rosemary (p. 73)**
- **Wild lilac (p. 47)**

Willow leaf gall sawfly
Pontania pacifica

Symptoms of willow leaf gall sawfly. Photo: Jack Kelly Clark/UC IPM.

Larvae of willow leaf gall sawfly feed inside these bright red galls. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

Willow spp. (p. 132)

Root knot nematodes
Meloidogyne spp.

Root galls symptomatic of a root knot nematode infestation. Photo: Jack Kelly Clark/UC IPM.

A healthy root (left) and root infested by root knot nematodes (right). Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Miniature gardenia (p. 52)**
- **Tickseed (p. 24)**
- **White alder (p. 94)**
- **Yeddo hawthorn (p. 68)**

Deer mouse
Peromyscus maniculatus

Adult deer mouse. Photo: Jack Kelly Clark/UC IPM.

Fruit damaged by deer mice, which will typically eat the nut of the fruit.
Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Idaho fescue (p. 5)**

Ground squirrel
Spermophilus beecheyi

Adult California ground squirrel. Photo: Jack Kelly Clark/UC IPM.

Ground squirrel burrow entrance in pavement. Photo: Jack Kelly Clark/UC IPM.

Ground squirrel damage to an irrigation line. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Deergrass (p. 10)**
- **Fruiting pomegranate (p. 125)**
- **Soft leaf yucca (p. 90)**
- **Tickseed (p. 25)**
- **Valencia orange (p. 104)**

Pocket gopher
Thomomys spp.

Adult pocket gopher. Photo: Jack Kelly Clark/UC IPM.

Crescent-shaped pocket gopher mound. Entrances to burrows are typically plugged. Photo: Jack Kelly Clark/UC IPM.

Bark on this tree's root crown has been stripped by pocket gophers. Photo: Roger G. Platt.

AFFECTED PLANTS INCLUDE:

- **Fruiting pomegranate (p. 125)**
- **Valencia orange (p. 105)**

Rabbits

Jackrabbit, *Lepus californicus;* Desert Cottontail, *Sylvilagus audubonii;* Brush Rabbit, *S. bachmani*

Desert cottontail (left) and blacktailed jackrabbit (right). Photos: Ross O'Connell (left) and David Johnson (right).

Bark damage from jackrabbits. Photo: Jack Kelly Clark/UC IPM.

Blacktailed jackrabbit droppings. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Blue mountain lilac (p. 48)**
- **Deergrass (p. 10)**
- **Soft leaf yucca (p. 90)**
- **Tickseed (p. 25)**
- **White yarrow (p. 18)**
- **Wild lilac (p. 47)**

Rats
Rattus spp.

Norway rat. Photo: Jack Kelly Clark/UC IPM.

Rat burrow in a weedy area. Photo: Jack Kelly Clark/UC IPM.

Roof rat damage to fruit. Photo: Rex E. Marsh.

AFFECTED PLANTS INCLUDE:

- **Valencia orange (p. 105)**

Voles

Microtus spp.

Adult vole, also called a meadow mouse. Photo: Jack Kelly Clark/UC IPM.

Shallow vole burrows are connected by visible runways. Photo: Jack Kelly Clark/UC IPM.

Voles will strip the bark from the lower trunk, sometimes girdling the crown. Photo: Jack Kelly Clark/UC IPM.

AFFECTED PLANTS INCLUDE:

- **Idaho fescue (p. 5)**

Red brome
Bromus rubens

Red brome. Photo: Robb Hannawacker, Joshua Tree National Park.

A stand of red brome. Photo: Stan Shebs.

AFFECTED PLANTS INCLUDE:

- **Small fescue (p. 2)**

Commissioned by Metabolic Studio in collaboration with the staff of the Los Angeles State Historic Park, this guide is intended to support the implementation of the Park's Integrated Pest Management Policy and help identify common diseases and pests that could infect or feed on the plants within the park.

METABOLIC STUDIO