



## Trees and Shrubs for Northern California Serpentine Landscapes

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### WHAT IS "SERPENTINE"?

The term "serpentine" refers to a group of minerals that make up serpentinite, California's state rock. The terms "serpentine" and "serpentinite" are often used interchangeably. Serpentinite is a metamorphic rock that forms when water and rock are exposed to low temperatures (about 400<sup>o</sup> to 600<sup>o</sup>C) and high pressures within the earth's crust. It has a distinctive waxy greenish-gray to bluish-gray appearance and often contains white streaks of minerals that contain naturally occurring asbestos (NOA) particles. Asbestos fibers are a known human health risk (see ANR Publication 8399, *Facts about Rock and Soil Containing Asbestos in California*, <http://anrcatalog.ucdavis.edu/pdf/8399.pdf>).

The best way to reduce the risk of exposure to NOAs in soils derived from serpentinite is to encourage vegetative cover. Vegetation protects soil from wind and water erosion. Plant residues can also reduce the risk of exposure to NOAs by providing mulch on the soil surface that suppresses dust and helps bind soil particles together. The chemical and physical properties of soils derived from serpentinite make the establishment of non-native plants difficult.

### SOIL CHARACTERISTICS

A variety of soils are formed from serpentinite. Most are unusually high in magnesium as well as heavy metals such as chromium, cobalt, iron, lead, and nickel. High levels of magnesium cause calcium deficiencies, resulting in poor plant growth in vegetation that is not adapted to survival in serpentine landscapes. This magnesium-induced calcium deficiency is highly variable among



serpentine landscapes, resulting in a wide range in productivity of soils derived from serpentinite throughout the state. Soils derived from serpentinite are prone to erosion because of the sparse vegetation, which leads to shallow or moderately deep soils with high rock fragment content and reduced water-holding capacity.

### SERPENTINE-TOLERANT PLANTS ARE UNIQUE

Serpentine landscapes can be recognized by their sparse vegetation and sometimes barren appearance. Plants growing in these soils must tolerate calcium deficiency, drought, poor-quality soils, exposure to heavy metals, and full sun. These conditions often cause the plants to have a stunted or “bonsai” appearance. Plant growth is also limited due to the lack of vital nutrients in the soil. Plants that tolerate these stark conditions are predominantly low-growing shrubs and a few varieties of trees. Their leaves are tough, silver or gray in color, and designed to reflect the hot afternoon sun. Some species have adapted to these harsh conditions so well that they grow exclusively in serpentine landscapes.

Serpentine soils produce a unique community of plants. Outcroppings of this shiny greenish-gray rock, along with associated plants such as gray pine, toyon, clarkia wildflower, and others, may be seen along major highways and roads throughout the serpentine areas of the state.

### LANDSCAPING ON SERPENTINE SOILS

It is very important to take precautions when establishing and maintaining landscapes on serpentine soil. If dust containing asbestos fibers is inhaled or swallowed, the fibers can remain in the lungs or travel to the lining of the lungs and abdominal cavity. This may eventually cause cancer and other diseases (see *Facts about Rock and Soil Containing Asbestos in California*). Twenty or more years may pass before symptoms of asbestos related disease are observed (smokers have an increased risk of lung cancer when exposed to asbestos).

Serpentine soils are an important natural resource in California. They support a wide range of unique and rare plant and animal life. Taking simple, common-sense precautions helps reduce the risk to residents who have serpentinitic soils or rock on their property. If possible, serpentine rock and associated soils should be left undisturbed and stabilized to reduce the release of fibers to the environment. As long as fibers remain undisturbed in rock or soil, they pose very little health threat.

### RECOMMENDED PRACTICES TO REDUCE EXPOSURE WHILE GARDENING

- Avoid working when it is dusty or windy.
- If digging in dry soil, minimize dust by thoroughly watering the area.
- Remove shoes before entering the house.
- Wash clothes that may have been exposed to asbestos dust separately from other clothes.

### TIPS AND POINTERS FOR PLANTING

- To reduce natural erosion and dust, cover gardens and yards with a layer of organic mulch or asbestos-free soil 3 to 6 inches deep.
- Replant serpentine-tolerant plants and water plants in the first few years until plants are well established.

### SERPENTINE-TOLERANT PLANTS

The following plants are endemic to or able to grow in serpentine soils. The Zones given below refer to Sunset Western Garden Book climate zones.

#### California Buckeye (*Aesculus californica*)

A very attractive tree or shrub, the California buckeye grows to 40 feet tall. The new foliage is apple green, and the mature leaves are a rich green. The pear-shaped fruit splits when ripe, revealing shiny brown seeds. Leaves remain on the tree through fall if given water. It may be propagated by seeds sown in the autumn or stratified; it may also be propagated by budding, layering, and other propagation techniques. Zones 3–10, 14–24.

#### California Buckthorn (*Rhamnus californica*)

Also known as coffeeberry and redberry, the California buckthorn is an evergreen shrub that grows to 6 feet tall. The flowers are strikingly gray and velvety; the round fruit are three to a cluster. This shrub is generally resistant to garden pests. It is propagated by seeds planted outdoors in the fall. Zones 4–9, 14–24.

#### California Foothill Pine (*Pinus sabiniana*)

Also known as gray pine or digger pine, the California foothill pine grows to 40 to 80 feet tall. The needles are 9 to 12 inches long, the cones are up to 10 inches long, and the seeds are edible. It is propagated by seeds. Zones 3–10, 14–21.

### California Laurel (*Umbellularia californica*)

The California laurel (fig. 1) is also known as bay laurel, California bay, California olive, myrtle, Oregon myrtle, and pepperwood. This large, handsome tree grows to 60 feet tall and is frequently planted as an ornamental. It thrives in moist soils and may be grown from seed. Zones 4–9, 14–24.

### California Redbud (*Cercis orbiculata*)

The California redbud is a deciduous small tree or shrub that grows to 15 feet tall. It is often planted for its showy early flowers. It thrives in serpentine soils as well as in fertile sandy loam. The plant is propagated by seeds sown in spring or by layering, or by softwood cuttings in spring. Zones 2–24.

### Canyon Live Oak (*Quercus chrysolepis*)

An evergreen, canyon live oak is a beautiful, long-lived tree that grows to 90 feet tall. Commonly planted as an ornamental, it can be propagated by acorns planted in the fall or stratified over winter and planted in the spring. Zones 3–11, 14–24.

### Coulter Pine (*Pinus coulteri*)

The Coulter pine (fig. 2) grows to 75 feet tall, with needles to 12 inches long and cones to 14 inches long. The branches often form a drooping shape. It can be grown from seed. Zones 3–10, 14–23.



Figure 1. California laurel (*Umbellularia californica*).

### Coyotemint (*Monardella villosa*)

Coyotemint is an aromatic annual or perennial herb whose stems are usually square in cross-section. The plant has a tendency to bend down low to the ground. Its rose-purple flowers extend to 2 feet tall. It is propagated by seeds, divisions, or cuttings. Zones 7–9, 14–24.

### Deergrass (*Muhlenbergia rigens*)

A large, robust bunchgrass, deergrass grows in dense clumps to 1½ feet tall, with stiff, narrow, light-green blades. The tall flowering culms (elongated, erect stems) are up to 4 feet tall. It prefers sandy to gravelly places such as canyons and stream bottoms. It is propagated by seed. Zones 4–24.

### Eastern Mojave Buckwheat (*Eriogonum fasciculatum*)

Also known as California buckwheat, the eastern Mojave buckwheat is a herblike shrub that can grow to 4 feet tall. The stems are mostly square



Figure 2. Coulter pine (*Pinus coulteri*).

in cross-section. The solitary flowers grow in heads (umbels) and are usually red or yellow; they produce small black nutlets. The plant needs full sun and well-drained soil. It is propagated by seed. Zones 7–9, 12–24.

### Flannelbush (*Fremontodendron californicum*)

Flannelbush (fig. 3) is a small tree that grows to about 15 feet. The long, tough branchlets have short flower-bearing spurs; the flowers all bloom at one time. The leaves are dark green, and the flowers are lemon yellow. This unusual tree is fairly rare. It may be propagated from seeds or softwood cuttings over heat. Zones 4–24.

### Hollyleaf Cherry (*Prunus ilicifolia*)

Hollyleaf cherry is a shrub or small tree that grows to 25 feet tall. Broad rather than tall, it is a good plant for a hedge if pruned. The small flowers are red to yellow, and the fruit are long-lasting reddish berries. It may be propagated from seed sown in fall or stratified, or from cuttings. Zones 5–9, 12–24.



**Figure 3.** Flannelbush (*Fremontodendron californicum*).

### Hummingbird Trumpet (*Epilobium canum*)

The tubular flowers of hummingbird trumpet (fig. 4) are 1½ inches long with four notched lobes, and they regularly attract hummingbirds. The dark green leaves are narrow to rounded and may have toothed edges. This native low-growing shrub is usually between 1½ to 3 feet tall at maturity. It grows in rocky canyons and blooms from summer to late fall. Zones 1, 2, 7, 9, 14–17.

### Leather Oak (*Quercus durata*)

A spreading evergreen shrub to 5 feet tall, leather oak has sharply pointed, dark green leaves. It requires little water. It is propagated by seeds in fall or stratified. Zones 5, 7–10, 14–24.

### MacNab Cypress (*Cupressus macnabiana*)

MacNab cypress (fig. 5) is a small, open, spreading tree, 20 to 60 feet tall, that is sometimes bushy or growing as a low shrub. It has smooth gray bark and bluish green leaves. The cones are globe shaped; berries are aromatic, ½ to ¾ inch in size, and reddish brown. The plant is found in dry hills and flats in chaparral and serpentine soils. It may be started in the spring from seeds, cuttings, or grafting on selected rootstock. This cypress is native to Northern California. It is widely distributed and can be found growing in chaparral, oak woodlands,



**Figure 4.** Hummingbird trumpet (*Epilobium canum*).



**Figure 5.** MacNab cypress (*Cupressus macnabiana*).

and coniferous woodlands along the inner northern Coast Ranges and the Sierra Nevada foothills. Zones 7–9, 14, 15.

### **Naked Buckwheat (*Eriogonum nudum*)**

An herblike shrub, naked buckwheat can reach 2 to 3 feet tall. The long, bare stems support flower heads (umbels) that are white with rose-colored veins. The plant requires full sun and well-drained soil. It is propagated from seed. Zones 1, 4, 7–9, 15–17.

### **Oceanspray (*Holodiscus discolor*)**

A deciduous shrub or small tree, oceanspray (also known as creambush) has reddish stems with green foliage and cream-white flowers in panicles 3 to 12 inches long. The maximum height at maturity is 12 feet. It is planted as an ornamental and thrives in sunny, well-drained areas. It may be propagated by seeds, cuttings, or layering. Zones 1–9, 14–19.

### **Oracle Oak (*Quercus × moreha Kellogg*)**

Oracle oak is a small nearly evergreen tree that generally grows to 20 to 40 feet tall, but it may

sometimes grow as a shrub. It is one of the best native shrubs for serpentine landscapes. The leaves are dark glossy green; flowers are small and white. The plant is propagated by second-year acorns. Zones 6–10.

### **Sargent's Cypress (*Cupressus sargentii*)**

Sargent's cypress is a slender bushy tree that grows to 45 feet tall. The bark is dark gray, thick, and fibrous; the needles are thin and narrow, gray-green, and fragrant; the female cones are up to 1 inch in diameter. It is best grown from seeds that mature in 2 years. Zones 4–17.

### **Styrax (*Styrax benzoin*)**

Styrax is a large shrub or small tree that grows to 20 feet tall with showy white flowers. Its 100 subspecies can be propagated by seeds, cuttings, or layering. Zones 6–8.

### **Toyon (*Heteromeles arbutifolia*)**

Toyon is an evergreen treelike shrub that grows to 30 feet tall. Hardy in mild climates, it may be propagated by seeds, cuttings, or layering. It is widely planted as an ornamental and can be used for holiday decorations. Zones 5–9, 14–24.

### **Van Houtte's Columbine (*Aquilegia eximia*)**

Also known as serpentine columbine, Van Houtte's columbine is a desirable small shrub that grows to 3 feet tall with small reddish flowers. It may be propagated from seeds or cuttings. Zones 15–24.

### **Woodbalm (*Lepechinia calycina*)**

Similar to pitchersage (also *Lepechinia* spp.), woodbalm is a large shrub that grows from 2 to 6 feet tall, with dark green lower leaves and light green upper leaves. The flowers are white to light pink to lavender, open-mouthed, and tube-shaped. The plant thrives best in full sun but will also grow in light shade. It is tolerant of deer feeding and drought. It is propagated from seed or cuttings. Zones 7, 14–17, 23–24.

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## METRIC CONVERSIONS

English	Conversion factor for English to metric	Conversion factor for metric to English	Metric
inch (in)	2.54	0.394	centimeter (cm)
foot (ft)	0.3048	3.28	meter (m)

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