Trees of the Santa Cruz Mountains

"Pay attention. Be astonished. Tell about it."
-- Mary Oliver

A dozen miles west of Silicon Valley stand the Santa Cruz Mountains. They're a series of ridges rising two or three thousand feet and cut by steep stream valleys. The forest covering these mountains is dominated by nine California native trees.

This book introduces you to those trees, first with picture galleries and then, at a deeper level, with a series of photo essays.

Have fun with it!

PlantID.net

By Bruce Homer-Smith

Introduction

I live near the Santa Cruz Mountains and love to get up into them, by car, bike or foot. I've noticed that the trees covering them are almost entirely made up of just nine California classics: Coast Redwood, Douglas Fir, Big-Leaf Maple, Black Oak, Live Oak, Tanoak, Bay Laurel, California Buckeye and Madrone.

This is cool on a couple of levels.

> First, we have a completely native set of dominant trees just a dozen miles from densely developed Silicon Valley.
>
> Second, these trees are easily distinguished from each other. That means you can quickly identify the species you're looking at, which opens the door to learning a ton about it – how it changes over the seasons, how it reproduces, and how it interacts with other living things.

Early pages of the book help you identify the tree you're considering, comparing the leaves, flowers, fruits and bark of our nine trees. The rest of the book presents photo essays that show true, beautiful and often surprising pictures of your tree, along with captions that describe what you're looking at.

If you notice a botanical term that you're not sure about, check out the Tree Sex Glossary at the back of the book.

You may be holding a printed version of this book or viewing it on a device. In either case, it's produced by the authors and artists of PlantID.net, a collaboration of volunteers who love learning about and describing plants. For more about how this works, see Notes, at the end of the book.

Have a suggestion or correction? Please write me, bruce@PlantID.net, and you may see your idea in the next version.

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Use the Galleries to discover key characteristics that distinguish these species. Use the Photo Essays to learn about them in detail.

Leaf Gallery

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Sequoia sempervirens

Short needles in flat bunches.

Douglas Fir
Pseudotsuga menziesii

Short needles pointing in all directions.

Big-Leaf Maple
Acer macrophyllum

Big maple-leaf shape.

Black Oak
Quercus kelloggii

Deep lobes with pointed tips. Not leathery.

Coast Live Oak
Quercus agrifolia

Leathery, with bristles along margin.

Tanbark Oak
Notholithocarpus densiflorus

Leathery, with many strong, straight, parallel veins.

California Bay Laurel
Umbellularia californica

Narrow, pointed ovals with smooth margins.

California Buckeye
Aesculus californica

Leaflets form a palm shape, connecting to each other.

Madrone
Arbutus menziesii

Similar to buckeye, but leaves connect separately to the branch.

Flower Gallery

Coast Redwood
Sequoia sempervirens

1/8” spheres release pollen in the air.

Douglas Fir
Pseudotsuga menziesii

½”-long bundles release pollen in the air.

Big-Leaf Maple
Acer macrophyllum

¼” flowers are pollinated by bees and other insects.

Black Oak
Quercus kelloggii

Tiny male flowers hang in catkins and release pollen in the air.

Coast Live Oak
Quercus agrifolia

Tiny male flowers hang in catkins and release pollen in the air.

Tanbark Oak
Notholithocarpus densiflorus

Tiny male flowers connect to rising spikes and release pollen in the air.

California Bay Laurel
Umbellularia californica

¼” flowers are pollinated by small insects.

California Buckeye
Aesculus californica

Fragrant flowers are often pollinated by native bees.

Madrone
Arbutus menziesii

Sweet-smelling ¼” urn-shaped flowers are often pollinated by honeybees.

Fruit Gallery

Coast Redwood
Sequoia sempervirens

1” cone with plate-tipped scales.

Douglas Fir
Pseudotsuga menziesii

Mouse-tails emerge between scales.

Big-Leaf Maple
Acer macrophyllum

Helicopter wings.

Black Oak
Quercus kelloggii

Cap scales are thin and triangular. They separate slightly at their margins.

Coast Live Oak
Quercus agrifolia

Cap scales lie flat against each other.

Tanbark Oak
Notholithocarpus densiflorus

Cap scales are slender, curling, and stick out.

California Bay Laurel
Umbellularia californica

¾” avocado-like fruits.

California Buckeye
Aesculus californica

A 2-3” mahogany-colored buckeye emerges from leathery skin.

Madrone
Arbutus menziesii

Lots of ¼” red berries.

Bark Gallery

Coast Redwood
Sequoia sempervirens

Soft, fibrous, rounded ridge edges, reddish, very thick.

Douglas Fir
Pseudotsuga menziesii

Mature bark has deep furrows, disorganized, bumpy, rough ridges.

Big-Leaf Maple
Acer macrophyllum

Gray, smooth, long, scaly plates. Ridged when old.

Black Oak
Quercus kelloggii

Mature bark is dark with broad, irregularly plated ridges, 1” thick.

Coast Live Oak
Quercus agrifolia

Smooth and silvery, like elephant skin. Fissured in old age.

Tanbark Oak
Notholithocarpus densiflorus

Pale and relatively smooth until old age.

California Bay Laurel
Umbellularia californica

Smooth, thin bark, turning somewhat scaly.

California Buckeye
Aesculus californica

Smooth, grey bark, growing thin shingles with age.

Madrone
Arbutus menziesii

Beautiful orange, red and brown surfaces peel easily.

Part 2

Photo Essays

Once you know a plant's name, there's a ton you can learn about it. These photo essays will get you started.

They're organized around pictures supported by captions. The images show something true, beautiful, and often surprising. The captions describe what you're looking at. I find this combination a very satisfying way to describe a plant.

The pictures come from a library of over 140,000 donated to PlantID.net, a website for curious people interested in California's wild plants. To the photographers, illustrators and painters that make this possible, thank you!

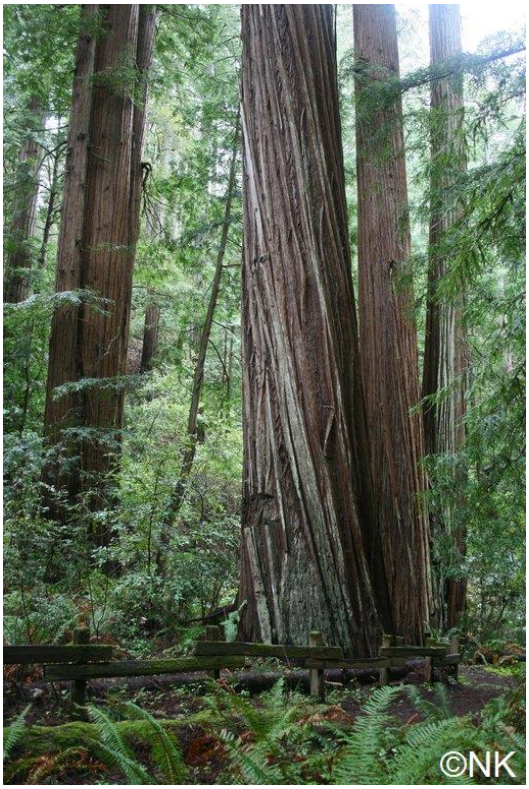
Coast Redwood

Sequoia sempervirens

Coast Redwoods can live over 2,000 years. They shade out their arboreal competitors and have excellent defenses against fire, flooding and disease.

The Santa Cruz Mountains are in the heart of the Redwoods' range, which is along the coast from Big Sur to Southern Oregon.

You can distinguish Coast Redwood by its flat needle organization, its splintery bark and its vertical, columnar trunks.



Redwoods are columnar giants. Their roots interlock, providing a stable foundation.

Groves of tall trees generally have few branches near the ground, creating a shady space filled with large pillars. Local temperatures are often 10 degrees cooler than outside the grove.

Redwood bark is reddish and splintery, peeling in vertical strips.

Redwood needles form a flat plane, forming new bunches each year. The pale ones are this year's growth.

After the recent Big Basin fire, redwoods are sprouting branches all along their fire-resistant, charred trunks.

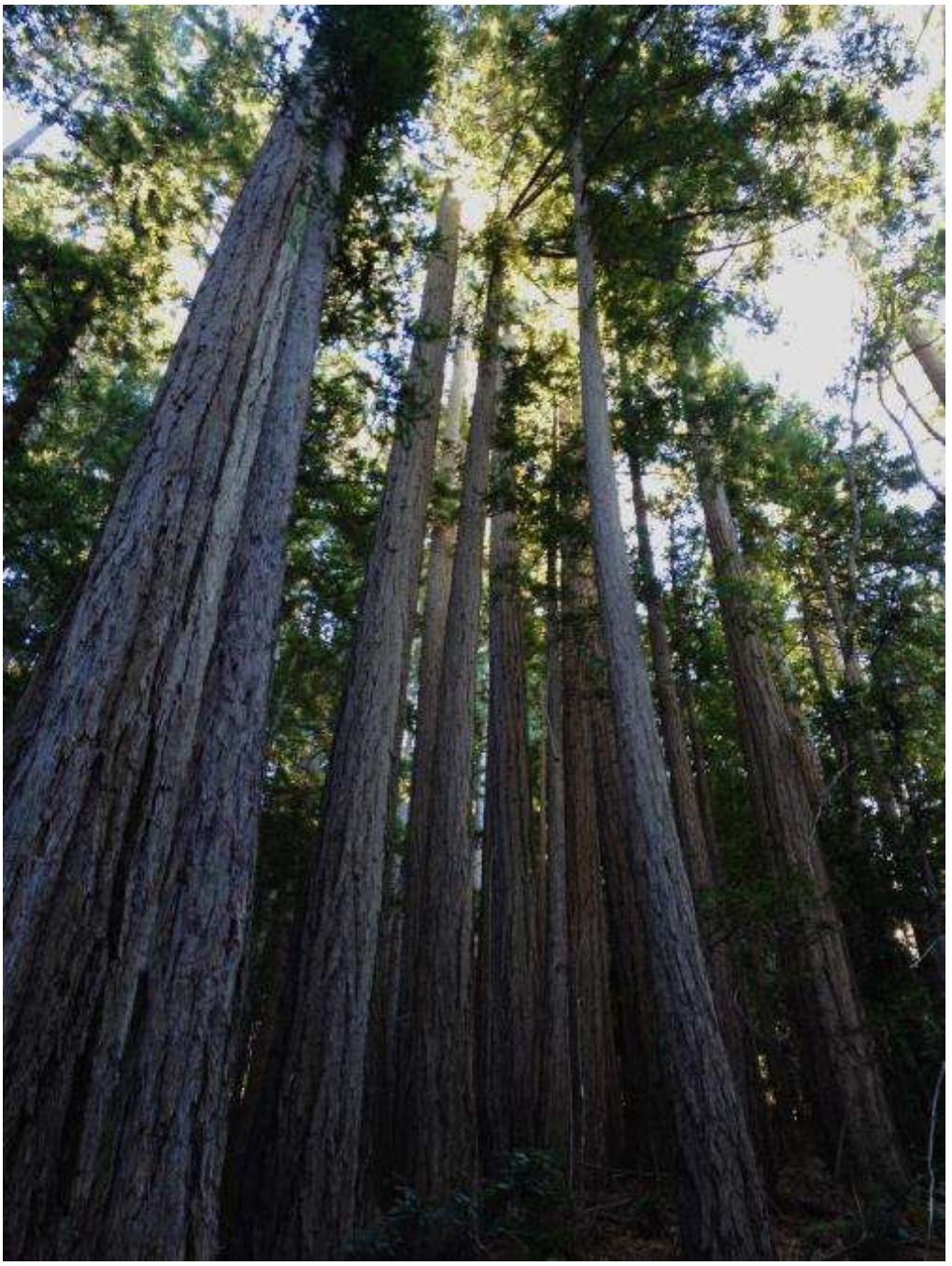
Coast Redwood

Sequoia sempervirens

Coast Redwoods are the tallest trees in the world and live hundreds of years. The tallest recorded Redwood is 379 feet tall.

They create quiet, cool, still places at their base. A special group of ferns, shrubs and flowers grow there, adapted to the moisture and acidic soil created by the Redwood needles.

Photo by Susan Mayne



Coast Redwood

Sequoia sempervirens

Coast Redwoods do best in cool, rainy, foggy valleys in the foothills near the Northern California coast.

They can receive up to 30% of their water from fog, through leaves and young branches. This is particularly useful for very tall trees where it is a challenge to draw water up to the top from the ground.

Photo by Zoya Akulova-Barlow

Coast Redwood

Sequoia sempervirens

Given room, Coast Redwoods are conical in overall shape.

Most branches stick straight out. This is useful if you like to climb trees - much easier than trying to climb, for instance, a maple with its soaring jug-handle-like branches.

Photo by Zoya Akulova-Barlow

Evergreen needles stay on the tree for more than one season. The darker needles in this picture are last year's growth. Eventually, older needles turn tan and fall to the ground.

Redwood needles come in two shapes. The most common is flat - generally found in shady parts of the tree. As a group, these needles form a horizontal surface, tapering at the end of each year's growth.

Photo by Susan Mayne

A second kind of needle has an awl-like shape that is shorter and thicker than the others. They don't form horizontal surfaces.

These needles form on fast-growing branches, those in the sun or near the top of the tree. Their shape and structure help them hold water that the tree needs for photosynthesis.

Photo by Zoya Akulova-Barlow

Sometimes these new branches don't make it and fall off as a unit.

Photo by Bruce Homer-Smith

Coast Redwood

Sequoia sempervirens

Coast Redwood's bark is soft and fibrous, insect and fire-resistant. It grows from the inside out throughout the tree's life and can become 1 foot thick.

The pale ring inside the bark holds xylem and phloem columns, transporting water and food up and down the tree.

Red heartwood in the center supports the tree's weight, allowing it to grow hundreds of feet tall.

Photo by Zoya Akulova-Barlow

Coast Redwood

Sequoia sempervirens

I can tell when I'm walking under redwoods without even looking up, because the forest floor becomes a tan color from all the needles that have fallen.

The needles contain tanin and are acidic, limiting the types of plants that can grow under them, often creating a park-like space between the trees.

Photo by Zoya Akulova-Barlow

Coast Redwood

Sequoia sempervirens

Coast Redwoods often live over 500 years. To do so, they must respond well to fire.

In this picture, seeds, roots and burls are sprouting quickly after a recent fire. Sprouts from a root or burl bud can grow 6 feet in a year. This vigorous response gives it a head start against competitors.

New growth can also sprout from the bark. In this picture, buds in the bark are promptly producing new growth in response to a fire that burned existing foliage.

The species name, sempervirens, is Latin for "evergreen" or "ever vigorous," a tribute to this tree's ability to cope with adversity.

Coast Redwood

Sequoia sempervirens

Lateral roots include buds that can sprout new trees if the parent tree starts to die.

This ring of daughter redwood trees is genetically identical to its parent tree.

Photo by Zoya Akulova-Barlow

Coast Redwood

Sequoia sempervirens

This Coast Redwood is at the edge of a road cut, so it has grown a buttress at the base of its trunk that helps it stay upright.

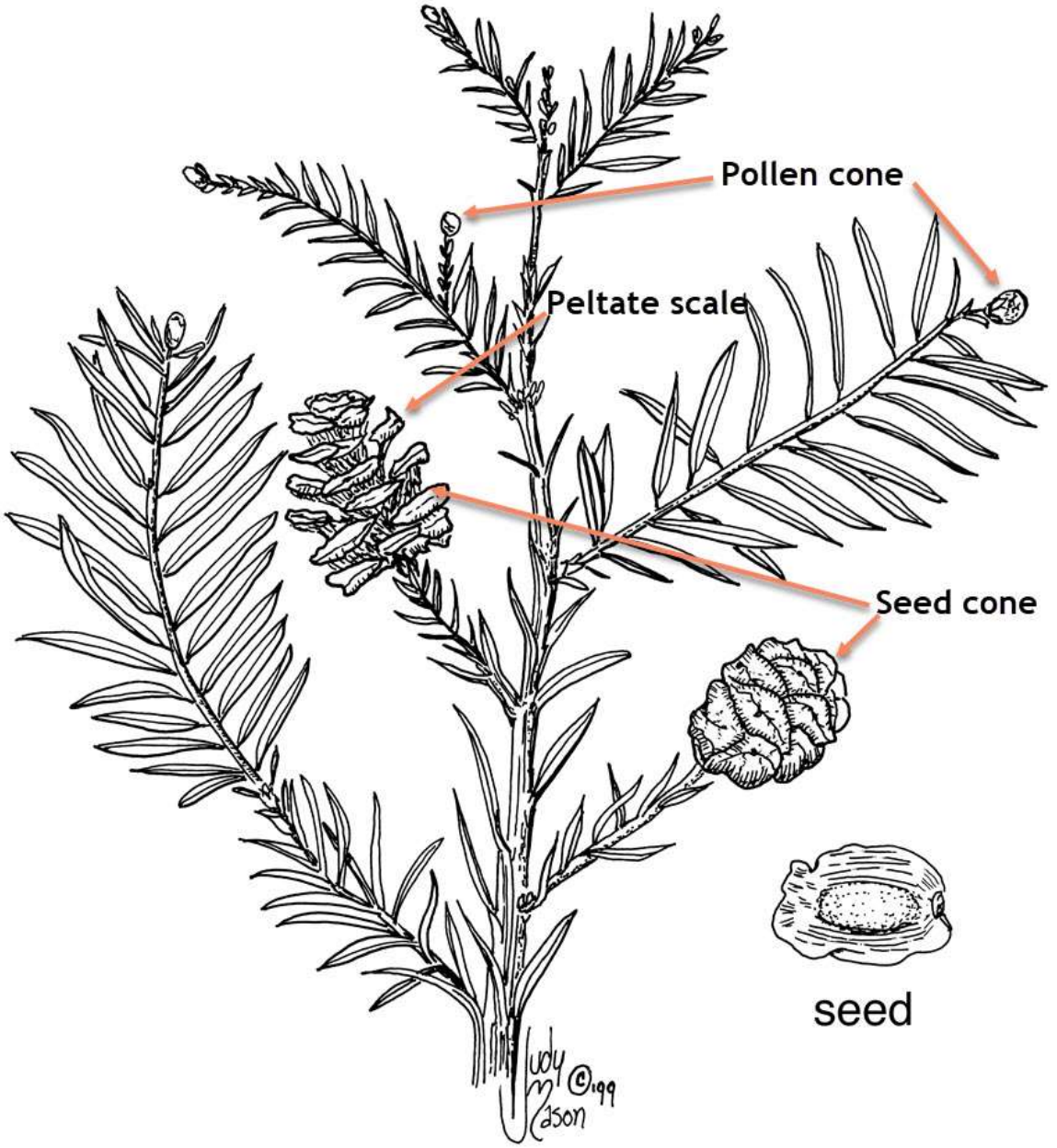
When root systems are stressed they send out new shoots to seek better conditions. At the bottom of the photo, a spherical burl is sending out several shoots that will seek ground to grow in.

Photo by Bruce Homer-Smith

Male pollen cones are about 1/8" across, and release yellow pollen on the wind in the spring.

Female seed cones are about 1" long. They open up many woody bracts, each with an interesting "peltate scale" at the tip. Peltate means the scale is attached on its side rather than at its edge.

Illustration by Judy Mason



Here's a closeup of pollen cones. They're little spheres, about 1/8" across. They release pollen the year they form but, like the needles, they stay attached to the tree another year.

Female cones tend to grow where there is sunlight to provide energy. They're often found at the top of the tree, on the end of branches with awl-like needles.

Cones are pollinated when the air fills with pollen in the spring. Cones with mature seeds drop in the fall.

Photo by William Follette

Coast Redwood

Sequoia sempervirens

Coast Redwoods dominate the forests where they grow, creating a predictable habitat of ferns and shrubs that do well in moist, shady conditions and acidic soil.

These tall trees are unique in the world, creating a distinctive ecosystem around them. We're lucky to have them in our state!

Coast Redwood

Sequoia sempervirens

California Distribution

Calflora Taxon Report:
http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=7531

Resources

Jepson Video: https://www.youtube.com/watch?v=lBWsQIkVgEk&feature=youtu.be

Jepson eFlora: http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=44175

Calphotos: https://calphotos.berkeley.edu/cgi/img_query?where-taxon=Sequoia+sempervirens

Wikipedia: https://en.wikipedia.org/wiki/Sequoia_sempervirens

Douglas Fir

Pseudotsuga menziesii

Coast Redwood and Douglas Fir are the dominant conifers in the Santa Cruz Mountains.

Cones have “mouse tails” hanging between the scales. They’re the only cones with these tails.

Douglas Fir is often found on ridgetops and open slopes. Redwoods and fir sometimes mix but generally the redwoods are farther down in the valleys.

Short needles point in all directions.

Even when you can’t see the needles because they’re too far away, you can distinguish Douglas Fir by its bark which is hard, brown turning grey, and shows thick, disorganized ridges.

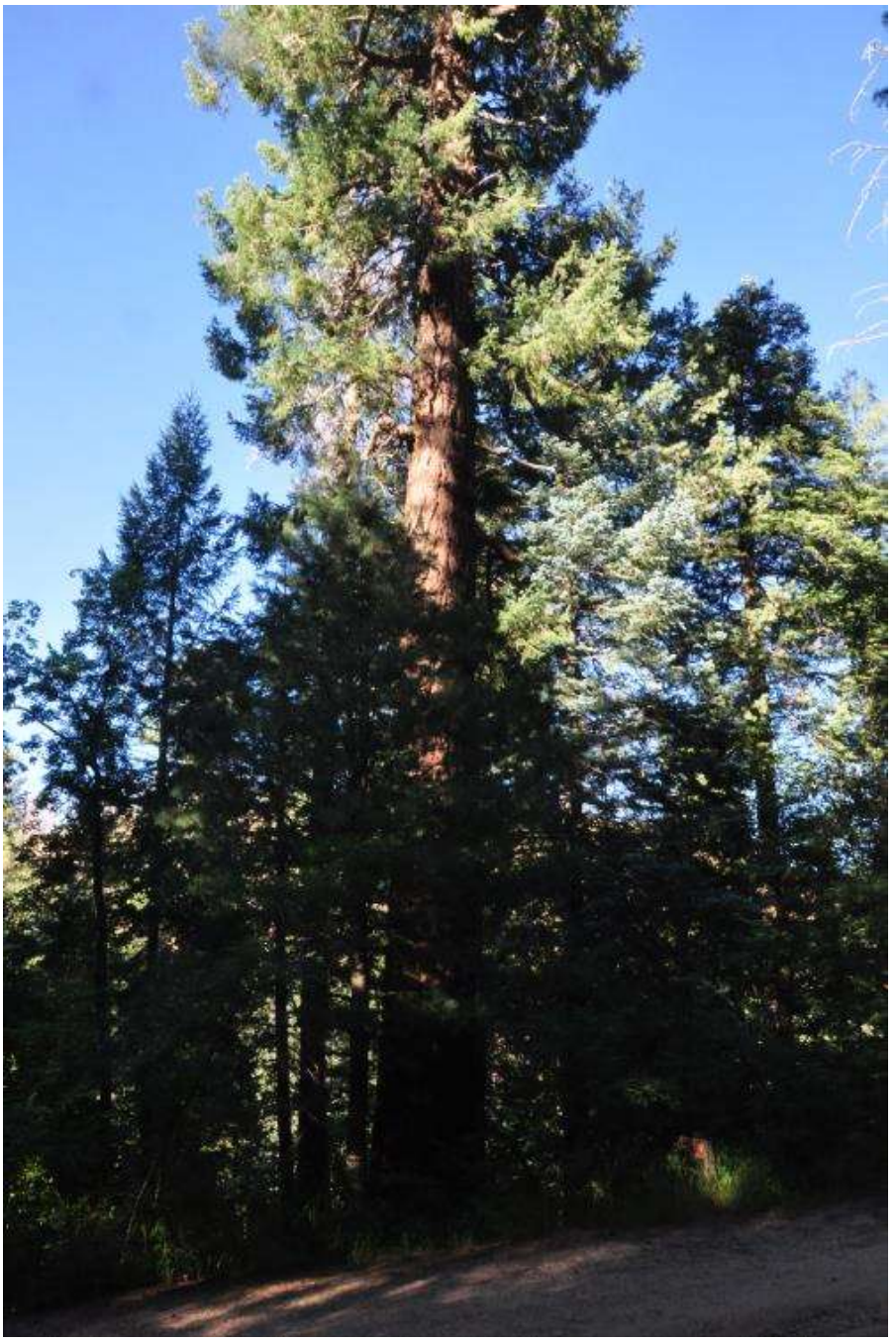
Douglas Fir

Pseudotsuga menziesii var. menziesii

In favorable conditions, Douglas Fir can grow over 200 feet tall and live for over 500 years.

It does best with plenty of water and well-draining soil. It's common along the northern California coast and Sierras, extending up to British Columbia.

Photo by Frank Rose



Douglas Fir

Pseudotsuga menziesii var. menziesii

Needles grow in all directions and are about 1" long. They stay on the tree about eight years.

Photo by Keir Morse

Notice the two pale lines on the underside of the needles. These are made up of stomata, tiny pores that allow the plant to exchange gasses with the atmosphere. Photosynthesis in the green needles absorbs carbon dioxide and emits oxygen through these pores.

Douglas Fir needles are flat and typically have blunt tips.

Photo by Frank Rose

As you can see in the picture, Douglas Fir needles connect to a lopsided, oval peg.

This differs from true fir needles, which connect directly to the branch. It's also different from spruce and hemlock needles whose pegs have level tops.

Photo by Keir Morse

Long, pointed buds have overlapping scales and grow 1/4 to 1/2" long.

They start forming in the fall and open up the following spring.

Buds can develop into vegetative shoots, male pollen cones, or female seed cones.

Photo by Zoya Akulova-Barlow

Male pollen cones are small (less than 1/2" long). They grow prolifically on branches that sprouted last year. They tend to be found in the lower half of the tree.

They're filled with orange-red pollen sacs that will release countless pollen grains when the temperature and dryness are right. Wind-dispersed pollen will typically drift about 10 tree heights from its source.

Photo by Keir Morse

Here is a brand new female seed cone emerging from an orange scaled bud.

These young cone scales are loose, allowing wind-borne pollen to get inside where the ovaries are.

Female cones tend to grow near the top of a tree, which helps avoid self-pollination from the same tree's male pollen cones, lower down.

Photo by Keir Morse

As it matures, the seed cone turns brown and the scales press against each other, protecting the now-fertilized ovaries inside the cone.

"Mouse tail" bracts protrude from the scales and identify it as a Douglas Fir. For this variety, menziesii, the bracts are straight and long. For the Southern California variety, macrocarpa, the bracts are shorter.

Douglas Fir

Pseudotsuga menziesii var. menziesii

Douglas Fir seed cones do not typically break up, but we've opened up a cone so you can see the inside.

Rounded cone scales radiate from a central woody stalk. Each scale has a pair of naked (exposed) ovaries. In this picture, pollen has already found the ovaries, which are now developing into seeds with wings. When mature, the seeds will drop to the ground.

Photo by Zoya Akulova-Barlow

Douglas Fir

Pseudotsuga menziesii var. menziesii

Young trees have smooth, gray bark with horizontal blisters. The blisters are filled with resin, also known as pitch. It's a turpentine-tarry substance, useful for repelling insects from infesting this relatively soft wood. True firs, spruces, and hemlocks also use resin in this way.

Inside the bark is sap, a completely different substance that carries food up and down the tree.

Photo by Zoya Akulova-Barlow

Douglas Fir

Pseudotsuga menziesii var. menziesii

As the tree gets wider, the bark, which is quite hard and brittle, starts breaking into chaotic brown ridges and valleys. Notice the horizontal blisters still showing on the flat ridge tops.

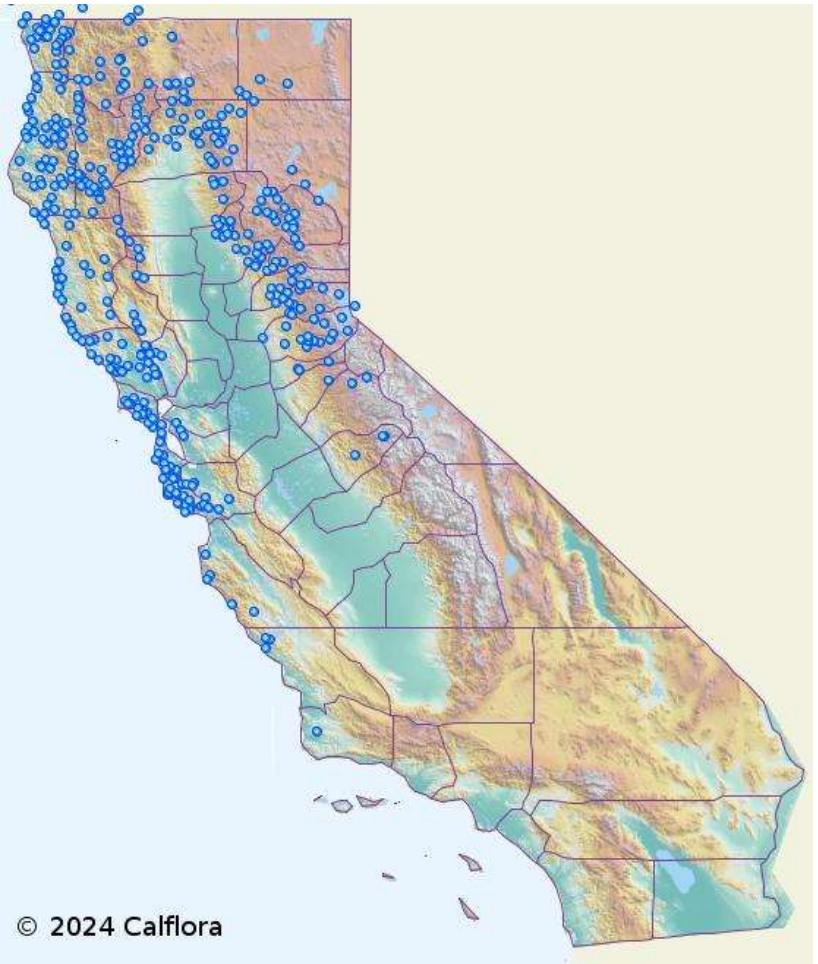
Photo by Zoya Akulova-Barlow

Over time, the brown bark color turns grey by interaction with ultra-violet light. Notice the small brown spot that is more sheltered.

Old tree bark is rough and gnarled, with a disorganized arrangement of furrows and heavy ridges.

Photo by Keir Morse

California Distribution



Calflora Taxon Report:
http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=6907

Resources

Jepson Video: https://www.youtube.com/watch?v=h82S8wLSSPg

Reproductive development:
https://www.oecd-ilibrary.org/docserver/9789264095434-8-en.pdf?expires=1600217674&id=id&accname=guest&checksum=2C6DAB456A415553BE82060EBA531905

Jepson eFlora: http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=64553

Calphotos:
https://calphotos.berkeley.edu/cgi/img_query?where-taxon=Pseudotsuga+menziesii+var.+menziesii

Wikipedia: https://en.wikipedia.org/wiki/Pseudotsuga_menziesii_var._menziesii

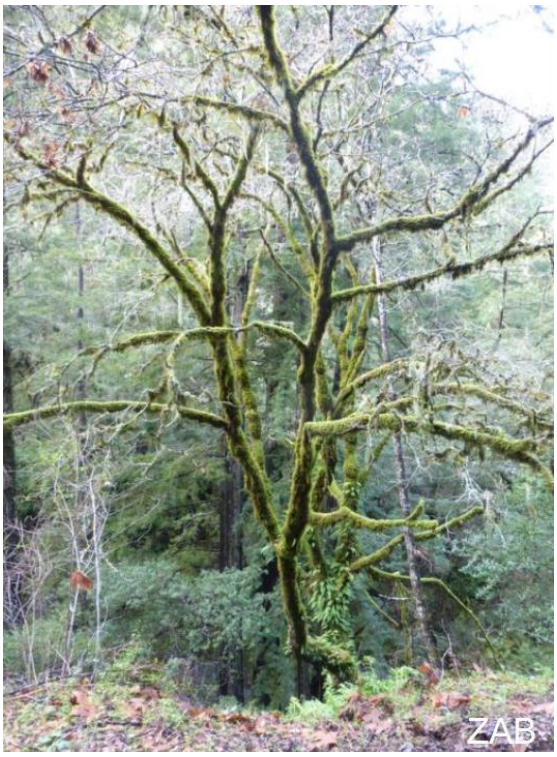
Big-Leaf Maple

Acer macrophyllum

In the Santa Cruz Mountains, Big Leaf Maple grow in places where light penetrates the canopy.

Maple leaves are big – up to 8” across.

In the spring, new leaves open up above a beautiful bunch of tiny flowers.



In the winter, Big Leaf Maple loses its leaves, showing its graceful shape.

They turn a beautiful yellow in the fall, coloring the sky and the ground.

After pollination, a pair of seeds develop wings that help them disperse on the wind.

Bark is hard, forming sharp vertical ridges when mature.

Winged seeds persist for a while after the leaves have fallen. They remind me of brown snowballs in the air.

Big-Leaf Maple

Acer macrophyllum

I remember asking a guy if he knew the name of that maple with the big leaves; he said "Big Leaf Maple."

I'll never have trouble identifying this leaf again.

Photo by Julie Kierstead Nelson

Twigs are stout, smooth, and round in cross-section. They have little bumpy lenticels - pores that allow gas exchange with internal tissues.

Twigs become bright green or bright red.

Buds, of course, are opposite each other, creating an opposite leaf arrangement.

Photo by Zoya Akulova-Barlow

Big-Leaf Maple

Acer macrophyllum

Every spring, new leaves emerge and large clusters of fragrant flowers hang below them.

Photo by Keir Morse

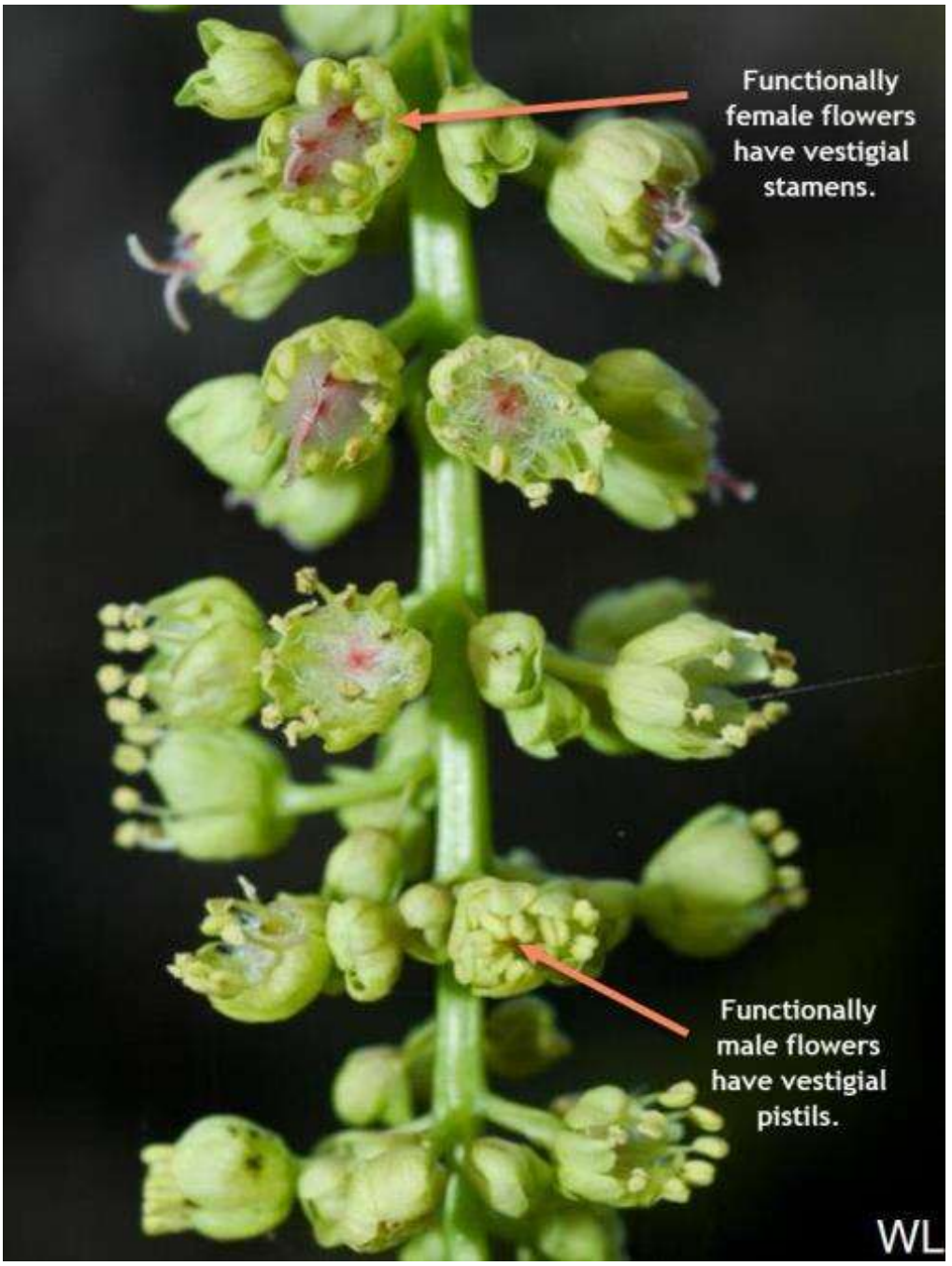
Big-Leaf Maple

Acer macrophyllum

Male and female flowers share the same drooping inflorescence.

Although they all have stamens and pistils, some flowers are functionally male and others female.

Photo by Wilde Legard

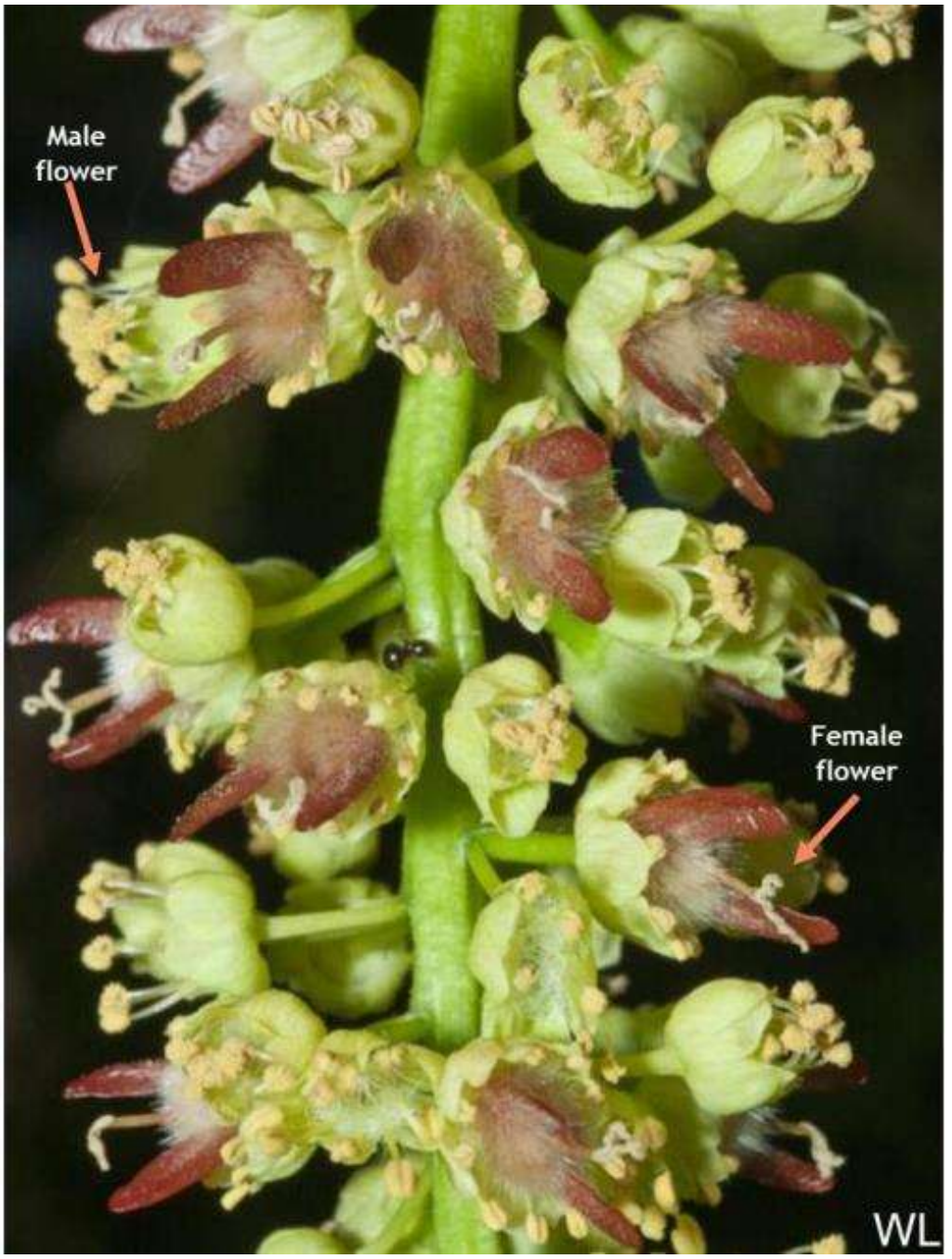


Big-Leaf Maple

Acer macrophyllum

Here's a closeup, showing a jumble of small male and female flowers. The flowers with prominent stamens, topped with yellow anthers, are male. The ones with stringy stigmas and red Mickey Mouse ears are female.

Photo by Wilde Legard



Female flowers show two stigmas, each connecting to its own ovule -containing carpel at the base of the flower. If both ovules are pollinated, they'll create a two-part fruit.

Even before pollination, the flower has the rudiments of hair and wings that will appear on the fruit.

Male stamens are present but are not functional.

Photo by Keir Morse

Maples depend on insect pollination to get pollen from male to female flowers. It offers flowers and nectar to attract insects, a process that evolved about 140 million years ago.

Other trees, such as oaks and pines, use an older method, simply releasing huge amounts of pollen in the air. Each method has its advantages: maples are more efficient but pines don't rely on pollinators to get the job done.

Photo by Scott Mitchell

In this picture, petal-like flower sepals are falling away, leaving just the winged fruit.

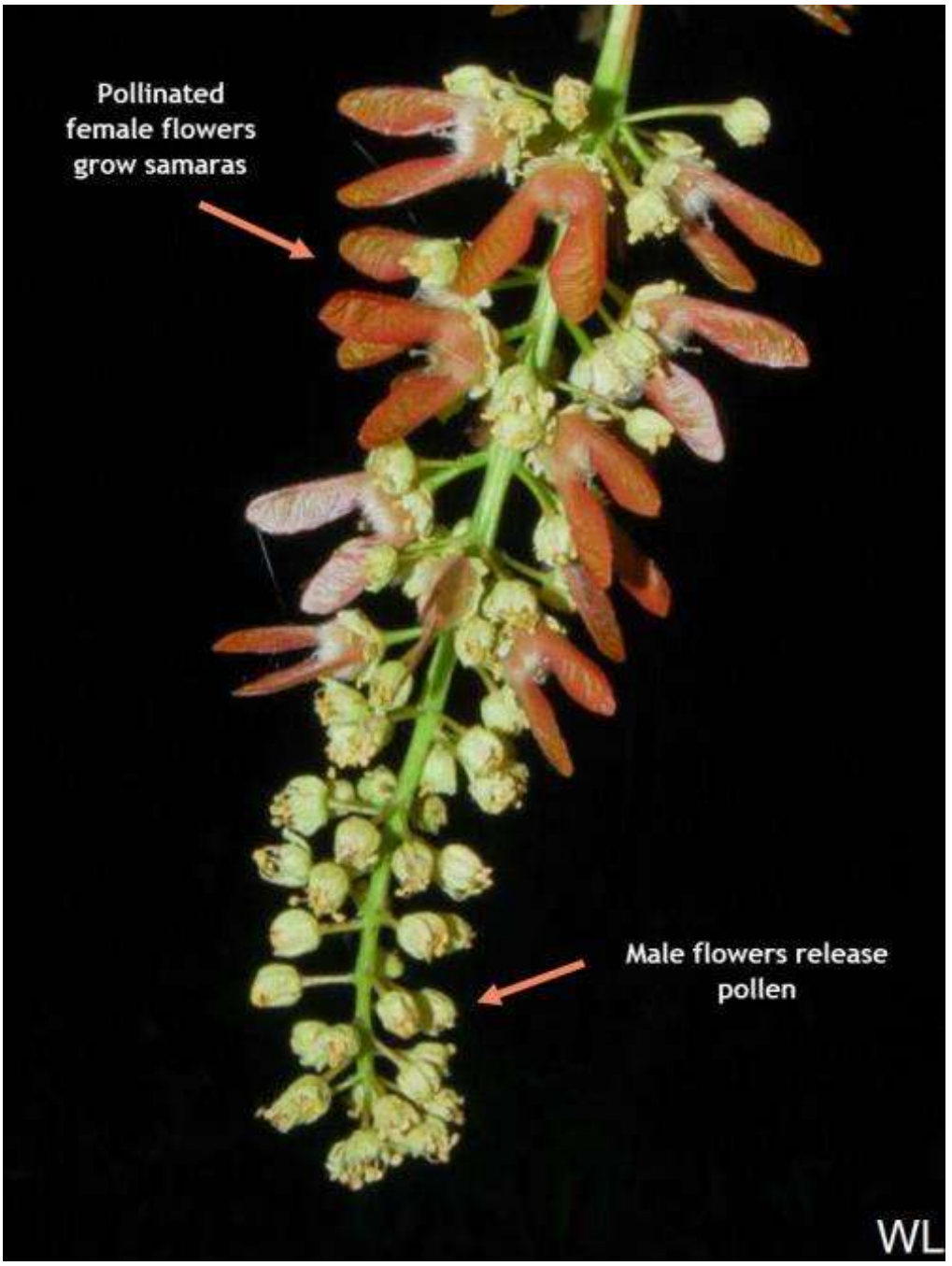
Thick hair coats the seeds. Perhaps this protects them from harsh weather or from herbivores.

Photo by Bruce Homer-Smith

Pollinated female flowers start growing winged fruits.

There are two carpels in each flower. Each carpel grows a 2" wing, creating a two-winged samara. When the mature seeds fall from the tree, the samaras act as helicopter wings, allowing the seeds to travel long distances from the mother tree.

Photo by Wilde Legard



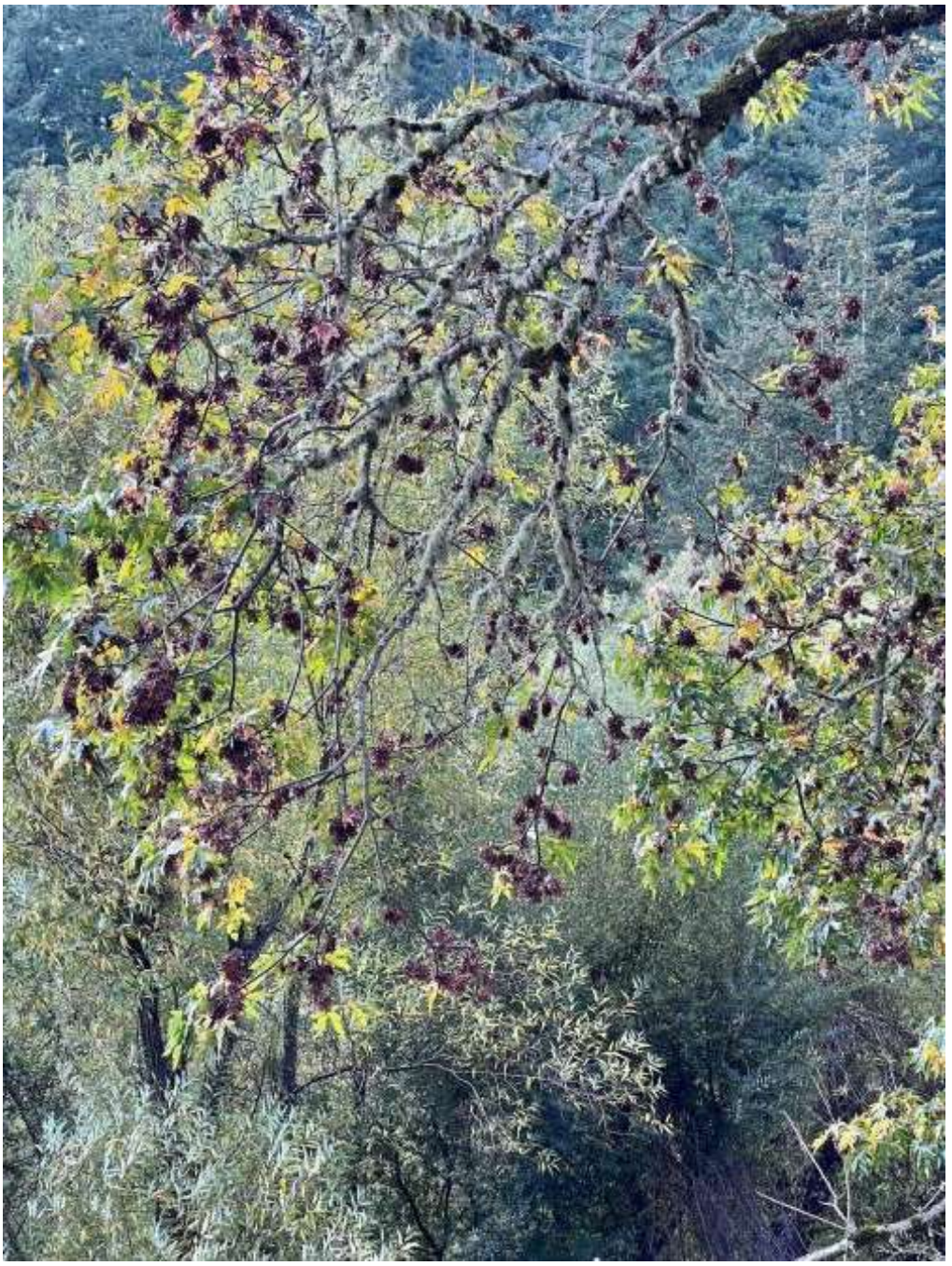
Big-Leaf Maple

Acer macrophyllum

Big Leaf Maple is deciduous, losing its leaves every fall.

Even after the leaves fall, brown bunches of samara-winged fruits linger on the tree until full maturity. These remind me of brown snowballs - a unique identifier visible from far away.

Photo by Bruce Homer-Smith



Big-Leaf Maple

Acer macrophyllum

Young trees have smooth and grayish bark. Middle-aged trees show shallow furrows, as here.

Photo by Keir Morse

Big-Leaf Maple

Acer macrophyllum

With age, the bark becomes darker brown, with furrows and plates. Older bark is often covered with lichens and mosses.

Photo by Wilde Legard

Big-Leaf Maple

Acer macrophyllum

Where there is no disturbance, Big Leaf Maple slowly overshadows willows and alders near streams. It also slowly replaces Madrone and some oaks in the uplands. It's considered a late succession tree, eventually being overshadowed by large shade trees like Coast Redwood and Douglas Fir.

After fire or logging, Big Leaf Maple vigorously sprouts from large basal burls, rushing to stake its claim in new sunlit areas.

Photo by Julie Kierstead Nelson

Big-Leaf Maple

Acer macrophyllum

It's not uncommon to see Big Leaf Maples filling a sunlit opening in an otherwise deeply shaded area. The sunlight highlights the leaves, making them especially impressive as they turn yellow in the fall.

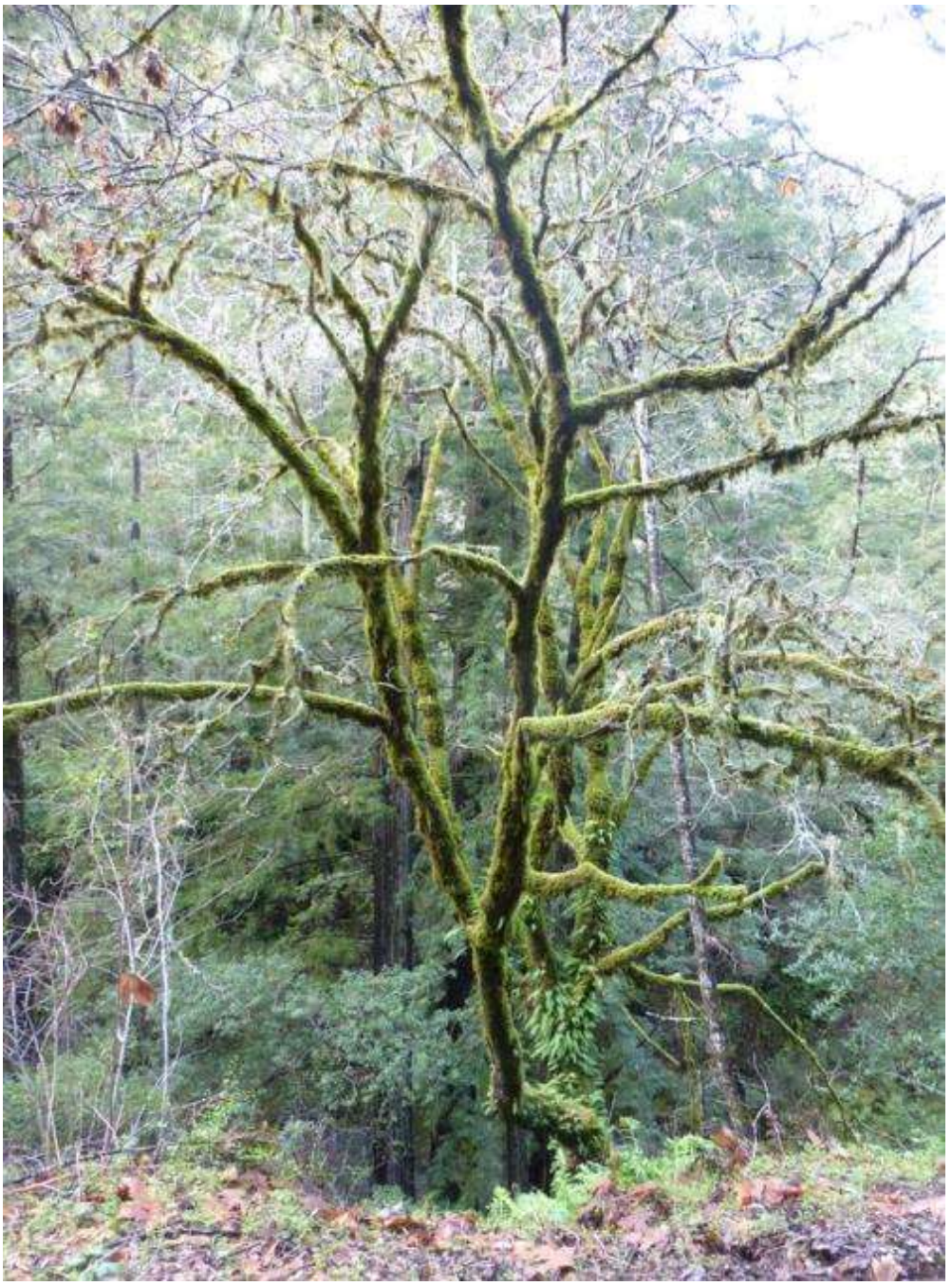
Photo by William Follette

Big-Leaf Maple

Acer macrophyllum

After Big Leaf Maple loses its leaves, you can see the beautiful arching shape of the main branches. They're covered in epiphytic ferns, mosses, and lichens - more than any other tree in the Pacific Northwest.

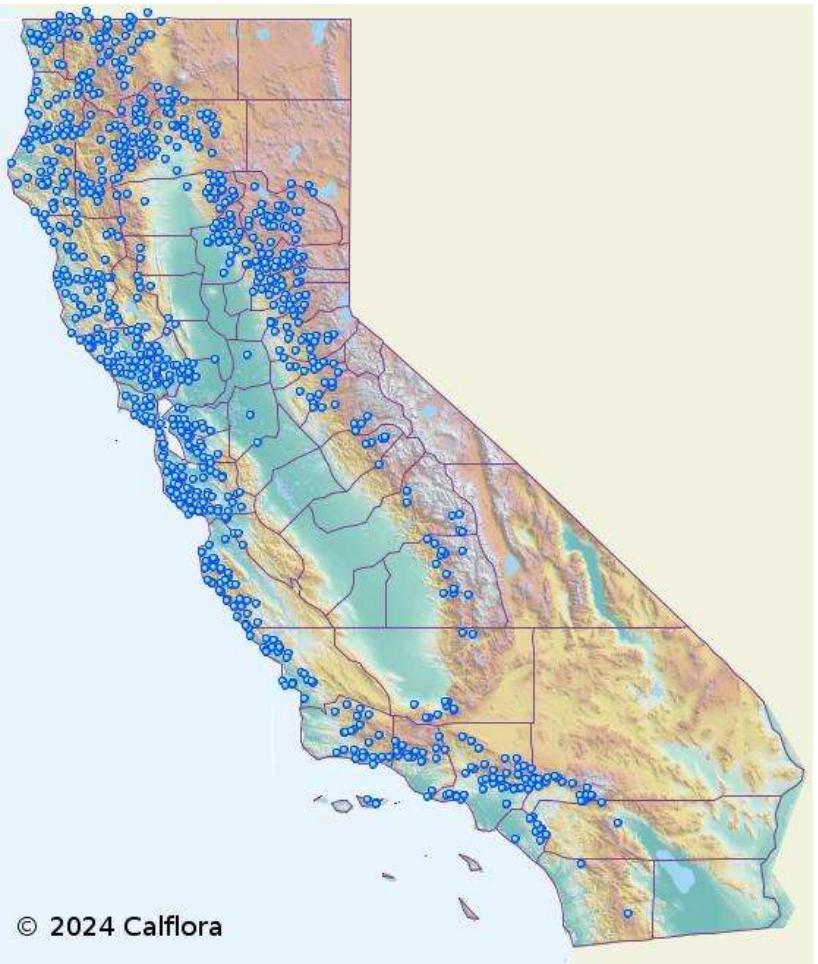
Photo by Zoya Akulova-Barlow



Big-Leaf Maple

Acer macrophyllum

California Distribution



Calflora Taxon Report:
http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=59

Resources

Jepson Video: https://www.youtube.com/watch?v=HjEK4ElkobM

Jepson eFlora: http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=11746

Calphotos: https://calphotos.berkeley.edu/cgi/img_query?where-taxon=Acer+macrophyllum

Wikipedia: https://en.wikipedia.org/wiki/Acer_macrophyllum

Black Oak

Quercus kelloggii

Like Big Leaf Maples, Black Oaks grow in places where the sun gets in, for instance along ridges and roadsides.

Black Oak leaves have short bristles at their lobe tips.

In spring, new leaves grow, red at first and then green when their chlorophyl comes in.

In fall, leaves pass their nutrients back to the parent, and drop to the ground.

These acorns take two years to develop. They have soft caps with overlapping tan scales.

The acorn cap is wooly inside.

Male catkins hang down from new growth, spreading pollen on the wind. Some pollen falls on tiny female flowers, which then generate an acorn.

Bare winter trunks are heavy, straightish, and rising.

Black Oak

Quercus kelloggii

The easiest way to identify a Black Oak in California is to look at its leaves.

Black Oak leaves have deep lobes that end in 1-3 points, each point tipped with a bristle. These bristles mark it as a member of the Red Oak group.

Oaks without leaf bristles, such as Valley Oak and Blue Oak, are in the White Oak group.

Black Oak

Quercus kelloggii

Black Oak's deciduous leaves are flat and fairly thin. They're a great source of food for deer and also for insects.

Interestingly, while most plants have strategies to deter herbivores, Black Oak has evolved to share its leaves and acorns with many animals in its habitat. This makes Black Oaks a magnet for species diversity, creating a rich habitat for all.

Photo by Wilde Legard

Black Oak

Quercus kelloggii

Young branches have thin, smooth, reddish-brown bark.

Terminal buds are large, pointed, and clustered.

Photo by Zoya Akulova-Barlow

Black Oak

Quercus kelloggii

As spring days get longer, new leaves grow slowly. They start red and velvety, perhaps to escape attention from deer looking for green leaves with no fuzz on them.

Unlike tulips, for instance, Black Oak's male and female parts develop in separate flowers. Male flowers cluster on hanging catkins that grow to 6 inches long. These emerging catkins begin a process that ends in planting a new generation, two years later.

This picture shows dozens of male flowers per catkin. Each flower has 5 tiny sepals and 10 stamens. Each stamen has a stalk topped by an anther that holds hundreds of pollen grains.

Doing the math, perhaps 100,000 pollen grains are contained in this picture. If there are many of these catkin clusters on a tree, it will release well over a million pollen grains into the air - enough to create a reasonable chance that one will land on a Black Oak female flower on another tree.

Photo by Wilde Legard

Female flowers are basic, presenting stigma surfaces to receive pollen. Note, this photo is actually of Eastern Black Oak. If you have an equivalent photo for Western Black Oak, please send it to bruce@plantid.net!

Once pollinated, the female ovule starts growing an acorn fruit, with the area behind the ovule developing into an acorn cap. Acorn development takes two years, as with most other trees in the Red Oak group.

Photo by Jim Conrad

These acorns are green as they develop. They'll turn a mahogany brown when mature. Their rounded tips end in a conical point.

Photo by Wilde Legard

In years when many flowers are pollinated, more acorns may be started than the tree can support. In that case, the tree drops the smallest, least promising acorns while they are still green and immature, saving its resources for the most promising acorns.

Photo by Julie Kierstead Nelson

Black Oak

Quercus kelloggii

Acorn caps have overlapping triangular scales that separate slightly from the nut near their margin. They're thin, smooth, and tan.

Scales often cover 1/2 or more of the nut.

As fall approaches, leaves change colors and mature acorns fall to the ground. Squirrels, deer, rodents, and others eat as many as they can. They also bury acorns to store them for when acorns are scarce.

Of course, some animals won't live to retrieve their acorns or may forget about them. Those buried acorns are left planted to produce the next generation of Black Oaks.

Black Oak

Quercus kelloggii

Because Black Oak is deciduous, we can admire its skeletal structure during the winter.

The primary trunk is massive, supporting tons of branches above it through 100 years and more of storms. Main branches are also heavy and almost always ascend, rarely bending back toward the ground. Smaller branches fill gaps but don't create tight wads of twigs as, for instance, California live oaks do.

Photo by Zoya Akulova-Barlow

Black Oak

Quercus kelloggii

Bark on older trees grows about 1" thick, a good defense against fire and invading pathogens.

It develops dark, broad, irregularly plated ridges.

Photo by Wilde Legard

Black Oak

Quercus kelloggii

Black Oak is a keystone species, hosting a physical environment of importance to many mammals, birds, and insects. Butterflies lay their larvae on the leaves. Birds nest in hollows and eat caterpillars started by the butterflies. Deer and squirrel populations vary with acorn yields.

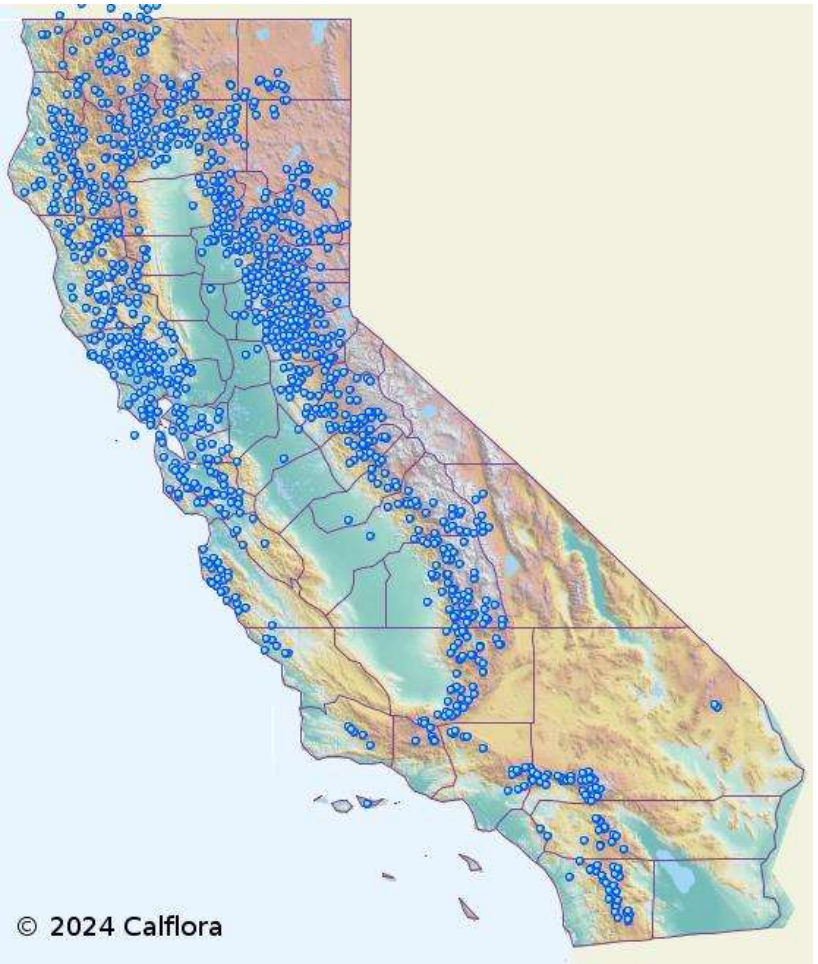
California Black Oak has existed as a species for over 20 million years, sufficient time for many other species to develop intricate interconnections with it.

Photo by Wilde Legard

Black Oak

Quercus kelloggii

California Distribution



Calflora Taxon Report:
http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=7000

Resources

Jepson eFlora: http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=40652

Calphotos: https://calphotos.berkeley.edu/cgi/img_query?where-taxon=Quercus+kelloggii

Wikipedia: https://en.wikipedia.org/wiki/Quercus_kelloggii

Coast Live Oak

Quercus agrifolia

Once established, Coast Live Oak grows a tight canopy of evergreen leaves, big enough to command its own exposure to light from the sky.

Leathery leaves curl and often have spiny edges.

Acorns develop in just one year. They have soft caps with overlapping tan scales.

Male catkins hang down from new growth, spreading pollen on the wind. Some pollen falls on tiny female flowers, which then generate an acorn.

Green acorns are developing, brown acorns are mature.

Skin is silvery and reflective. It reminds me of elephant skin.

Smallish leaves often grow in fairly tight groups.

Massive branches end in a thicket of tiny branches and leaves, creating a shady, open space underneath.

Leaves are evergreen and leathery, lasting for several seasons. The leaf top is shiny, has indented veins, and often has spiny edges.

Although they're always leathery, Live Oak leaves are highly variable. Leaves high in the canopy tend to be smaller and thicker, while leaves inside the canopy are wider and thinner. Margins on leaves of the same tree may be spiny near the bottom, deterring herbivores, and completely smooth higher up.

Photo by Keir Morse

Coast Live Oak

Quercus agrifolia var. agrifolia

Coast Live Oak leaves often curl under, although trees with no stress can have flat leaves.

Notice the "hairy armpits" where the lateral veins touch the mid vein. Although not always present, these tiny brown hairs distinguish it from the closely related Interior Live Oak.

Photo by Keir Morse

Male flowers open up quickly on warm spring days. Long hanging catkins hold dozens of flowers, each with 6 stamens. Each anther releases thousands of tiny yellow pollen grains on the wind.

Photo by Keir Morse

Inconspicuous female flowers nestle at the base of new leaves. When pollen in the air settles on one of the receptive stigmas (green in this photo), it pollinates the ovary which starts developing into an acorn.

There are no petals. The female parts are surrounded by leafy bracts that eventually develop into the acorn cap.

Photo by Bruce Homer-Smith

Coast Live Oak

Quercus agrifolia var. agrifolia

Acorn cap scales lie flat against each other and the acorn. Note that Black Oak scales are similar but leave some space between them and the acorn.

Acorn shapes vary. Those shown here are long and thin but others are stubby.

Photo by Keir Morse

Acorns start green and turn brown at maturity. Notice this mature acorn is nestled among this year's leaves, at the end of the twig, indicating that the acorn matured in one season.

Interior Live Oak acorns take two years to grow, so by the time they turn brown, they're found behind this year's leaves on the twig.

Photo by Tony Corelli

Live Oak bark is silver grey and fairly reflective. I find this a helpful identifying feature even from a distance.

As the tree matures and develops deep fissures, the silvery "elephant skin" is still generally easy to pick out.

The trunk of mature trees is 1 to 4 feet in diameter.

Photo by Zoya Akulova-Barlow

Coast Live Oak

Quercus agrifolia var. agrifolia

Coast Live Oak has heavy limbs that reach outward. It can grow to 40 feet tall, with a crown 130 feet across.

Photo by Keir Morse

Coast Live Oak

Quercus agrifolia var. agrifolia

Coast Live Oaks are quite common in the California coastal area from Mendocino south.

They provide a rich habitat for many plants and animals. They're often covered with moss and lichens. They host galls and mistletoe. They provide cavities for nesting and food storage. Many animals depend on their acorns.

Photo by Keir Morse

California Distribution

Calflora Taxon Report:
http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=6984

Resources

Coast or Interior Live Oak?: http://Classic.PlantiD.net/LinkArticles/Coast or Interior Live Oak.htm

Friends of Edgewood Guide: http://friendsofedgewood.org/coast-live-oak

Jepson eFlora: http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=64703

Calphotos:
https://calphotos.berkeley.edu/cgi/img_query?where-taxon=Quercus+agrifolia+var.+agrifolia

Tanbark Oak

Notholithocarpus densiflorus

Before 1850, massive Tanbark Oaks dominated the Santa Cruz Mountains. However, they were extensively logged for their tannin, a high-value commodity used to turn animal hides into supple leather.

With a few exceptions, Tanbark Oak is now an understory tree in the Santa Cruz Mountains. However, they're quite common in dappled shade areas.

Leathery leaves, 2-5" long, have many parallel veins.

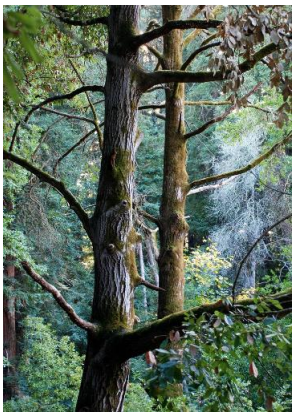
Stiff male spikes release millions of pollen grains each spring.

Fuzz on young leaves reflects sunlight.

The underside is often pale fuzzy. Leaf edges curl under.

Acorns develop slowly, taking 2 years to mature.

Acorns caps are woody and are decorated with slender, curly scales.



Here's an unusual, fully-grown tree.

Bark is pale and relatively smooth until old age.

Tanbark Oak

Notholithocarpus densiflorus

Tanbark Oak leaves are leathery and stiff, with about 10 pairs of indented veins branching out from a midrib. Each vein ends in a serration, giving the leaf a distinctive look.

Photo by Keir Morse

Here's a view from the back. Veins stick out. Leaf edges curl under.

Pale, woolly hair covers the underside of the leaf until it eventually falls away. I often turn the leaf over to see its woolly underside to confirm that it's a Tanbark Oak.

Photo by Keir Morse

Leaves are evergreen, staying on the tree for about four years.

New leaves grow on shoots from existing branches. They're pale yellow and covered in fine hair. The non-green color and hair make them less interesting to deer and other herbivores.

Once they mature, leaves become tough and full of tannin, making them doubly uninteresting to herbivores.

Photo by Bruce Homer-Smith

Tanbark Oak

Notholithocarpus densiflorus

Light reflects from these new leaves and from the woolly, pale backsides of others, creating bright spots that stand out. You can identify a Tanbark Oak from far away, using this feature.

Photo by Zoya Akulova-Barlow

Tanbark Oak

Notholithocarpus densiflorus

Tanbark Oak grows grains of male pollen on stiff, spreading spikes.

Notice the spherical yellow-green female flower connected directly to the branch at the base of the spikes. It will receive pollen in the air from other trees, starting the growth of a new acorn.

Photo by William Follette

Pollen grows in minute flowers, each with 5 sepals and about a dozen stamens. The flowers crowd each other along each spike. Massive numbers of pollen grains are needed to fill the air to ensure that some reach female flowers on other Tanbark trees.

You can tell that the female fruit here has already been pollinated because it is growing in size.

Photo by Keir Morse

Tanbark Oak

Notholithocarpus densiflorus

This closeup shows individual stamens and spherical, yellow anthers in the background. Each anther holds large numbers of pollen grains until they're ready to fly on the wind.

The female fruit in the foreground is maturing into an acorn. Acorns take two years to mature before they drop from the tree.

Photo by Keir Morse

Tanbark Oak

Notholithocarpus densiflorus

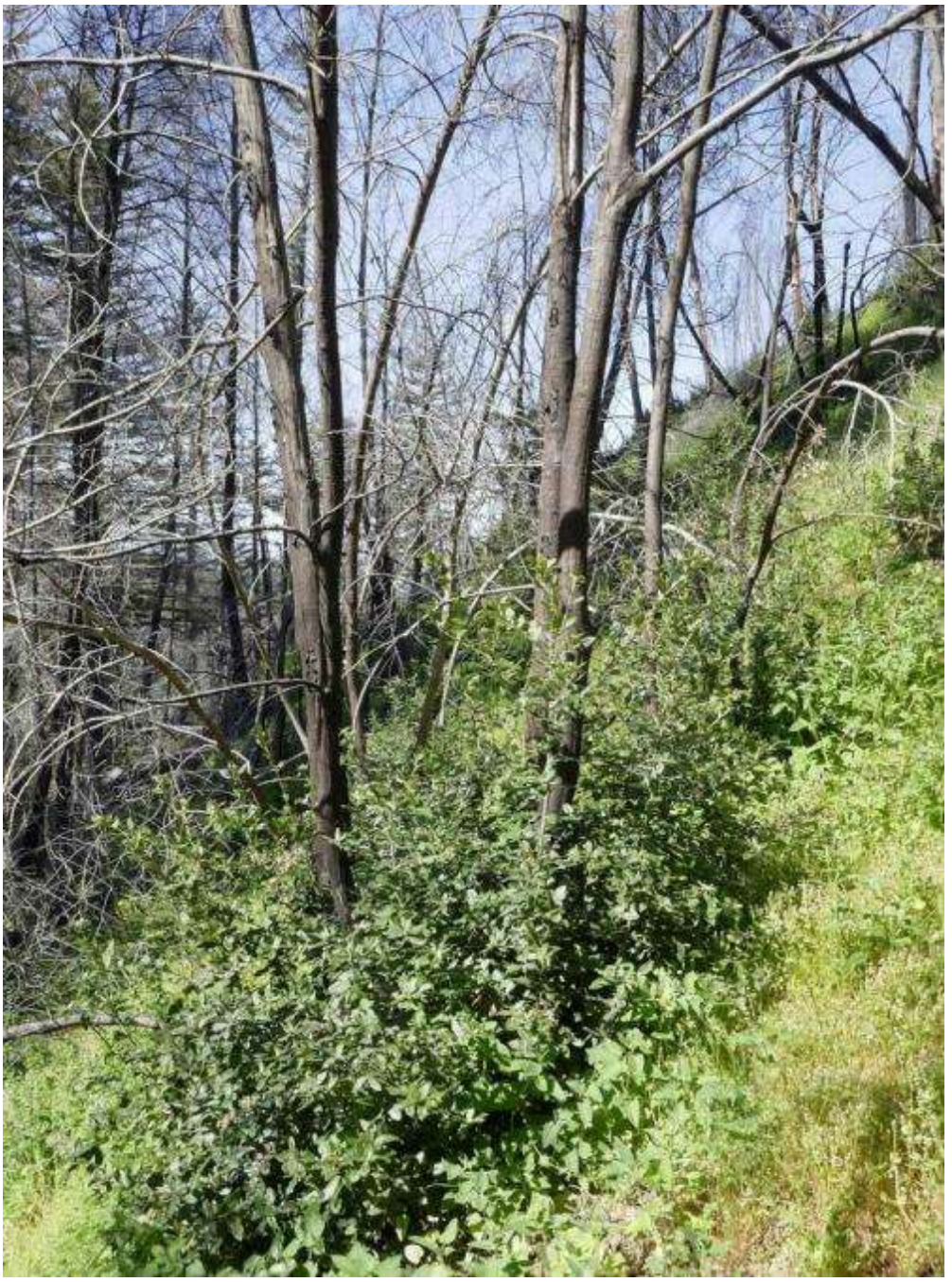
Though similar, Tanbark Oak is not a true oak. Its acorn cap is woody and harder than those of true oaks. Also, hundreds of slender, curling scales stick out from its cap - a wilder look than on traditional oak acorns.

Photo by Zoya Akulova-Barlow

Tanbark Oak

Notholithocarpus densiflorus

Like other trees native to California, Tanbark Oak grows a burl near its base. When a fire sweeps through, which is not uncommon in the California landscape, vigorous new growth quickly emerges from the burl.



Tanbark Oak

Notholithocarpus densiflorus

The bark is pale and relatively smooth until old age, when vertical fissures emerge. Mature trees can have trunks that are many feet across.

Photo by Zoya Akulova-Barlow

Tanbark Oak

Notholithocarpus densiflorus

A few large Tanbark Oak trees remain, but most are far short of the 6-foot diameter 130-foot giants that used to grow in California. Settlers discovered that the bark could be stripped and used to produce tannin to turn animal hides into leather. It took about 4 large trees to cure a hide. By one estimate, seven million large trees were harvested in 60 years, supplying tanning companies up and down the California coast.

Photo by Zoya Akulova-Barlow

Tanbark Oak

Notholithocarpus densiflorus

You can pick out the Tanbark Oaks in this picture by their lighter young leaves. Behind them are young Maples and mature Douglas Firs.

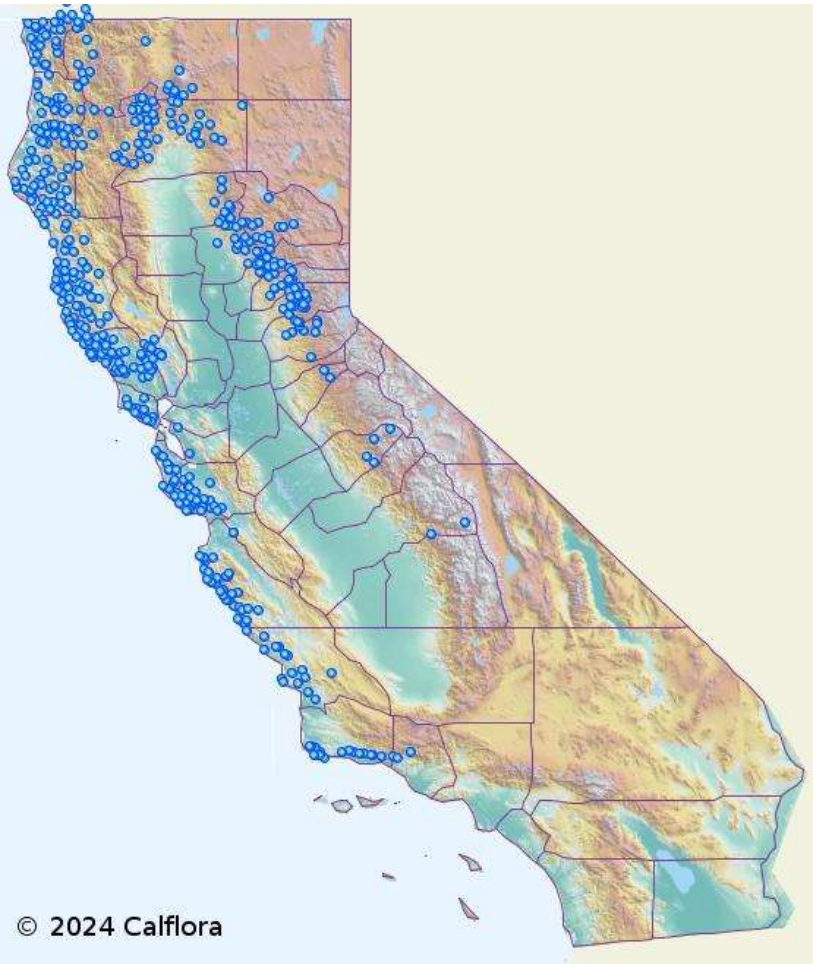
In 1846, Fremont described Tanbark Oaks as "handsome and lofty." But after heavy logging and current depredations by Sudden Oak Death, most of today's Tanbark Oaks are understory trees, dwarfed by the large trees around them.

Photo by Bruce Homer-Smith

Tanbark Oak

Notholithocarpus densiflorus

California Distribution



Calflora Taxon Report:
http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=11880

Resources

Jepson eFlora: http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=89061

Calphotos: https://calphotos.berkeley.edu/cgi/img_query?where-taxon=Notholithocarpus+densiflorus

Wikipedia: https://en.wikipedia.org/wiki/Notholithocarpus_densiflorus

California Bay Laurel

Umbellularia californica

In the Santa Cruz Mountains, California Bay Laurel can be shaded out by redwoods and firs, but grows luxuriantly where there is plenty of water and sunlight.

Leaves are distinctive –long, narrow and smooth-edged. Rub them and you'll smell the bay leaf fragrance from your kitchen.

Leaves make a flat cluster near the ends of twigs.

Clusters of small yellow flowers appear in the spring.

Pollinated flowers grow into small avocado-like fruits.

Bark is a blond to brown color, developing plates in old age.

A ring of daughter trees often grows around an original tree, making a very wide base.

Trunks often grow spectacular burls. They do well in damp places and are often covered in moss.

California Bay Laurel

Umbellularia californica

Leaves are stiff, flat, oblong, up to 4" long, and pointed. They have smooth edges, different from similar Toyon leaves which have toothed edges.

The upper surface is shiny green, sometimes with a yellow tinge. The underside is much paler and sometimes slightly hairy.

They have a strong spicy smell when crushed.

Photo by Julie Kierstead Nelson

California Bay Laurel

Umbellularia californica

Leaves are shiny green on top and turn yellow in the fall.

Fruits start out green with yellow and purple spots, grow to about 1" across, and turn purple when mature.

California Bay Laurel

Umbellularia californica

6-10 tiny flowers form in a half sphere, radiating from a central point like an umbrella. Umbellularia comes from the Latin for umbrella.

Notice the pale green underside of the leaf.

Photo by Keir Morse

California Bay Laurel

Umbellularia californica

Each flower has 6 petal-like sepals surrounding about a dozen stamens. Notice the orange nectaries at the base of the flower which provide a reward to pollinators.

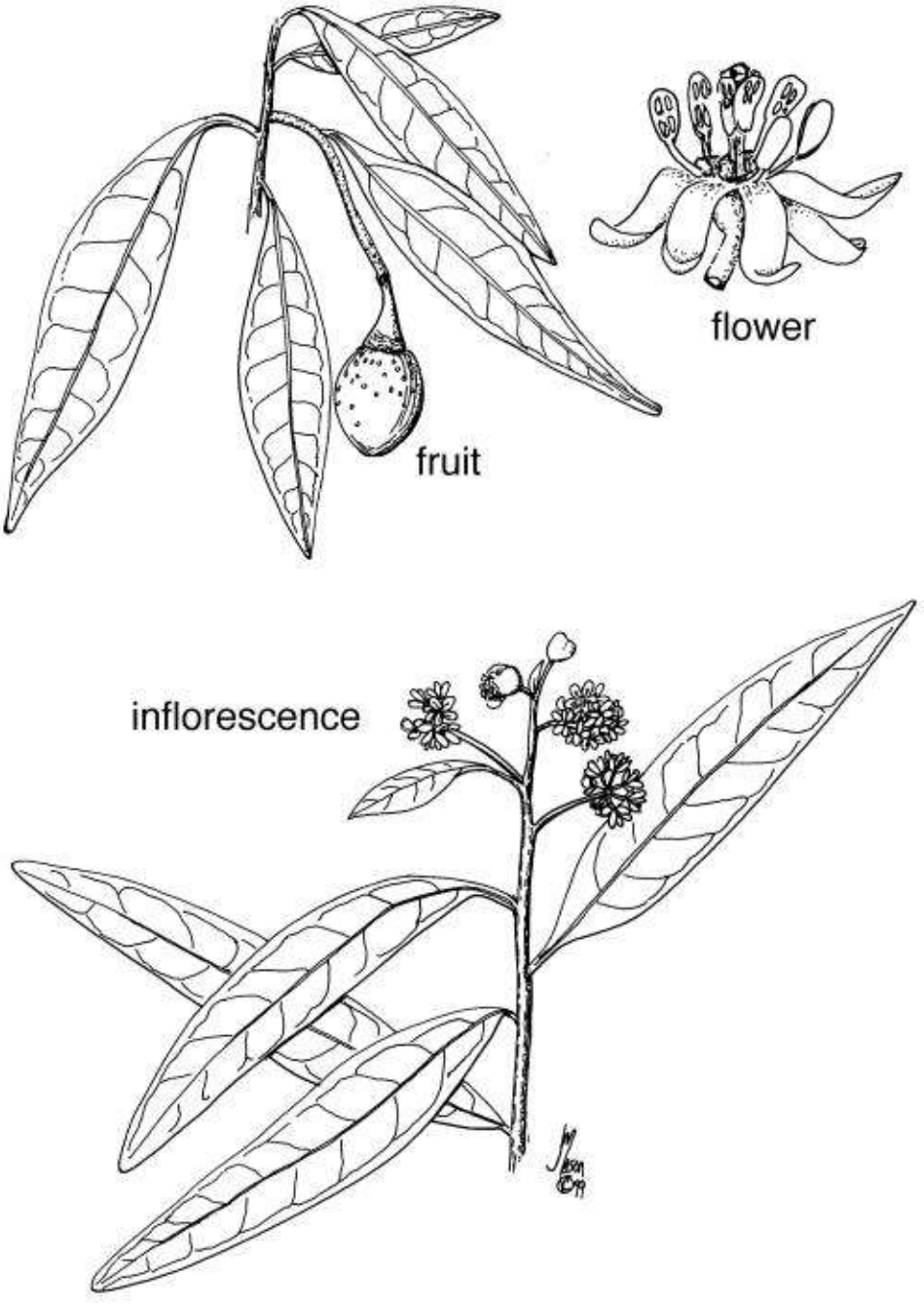
Photo by Steve Matson

California Bay Laurel

Umbellularia californica

Flower clusters grow at the end of stalks. Generally one fruit will mature from a cluster.

Illustration by Judy Mason



The bark starts smooth but adds vertical ridges with age.

Bay Laurel bark and leaves release terpenes which get into the soil, suppressing growth in nearby plants that might compete with the tree.

Terpenes also repel fleas. Both animals and humans have been known to spread Bay Laurel leaves on their floor to get rid of fleas and other troublesome insects.

Photo by Zoya Akulova-Barlow

California Bay Laurel

Umbellularia californica

Bay Laurels can be shaped by the prevailing wind, especially in windy spots on the coast.

Photo by Zoya Akulova-Barlow

California Bay Laurel

Umbellularia californica

This Bay Laurel has been eaten by deer, creating a topiary effect. The top is left alone because the deer can't reach that high.

Photo by William Follette

California Bay Laurel

Umbellularia californica

Trees sometimes grow in large clusters - the result of daughter trees sprouting from a parent.

Bay Laurels are widespread and common in many plant communities in California, including redwood, oak, and yellow pine forests. They also thrive in shady somewhat damp areas in chaparral.

Photo by Zoya Akulova-Barlow

California Bay Laurel

Umbellularia californica

Bay Laurels can grow to 60 feet tall. They're found only in California and its immediate surroundings, in what is called the California Floristic Province.

Photo by Barry Breckling

California Bay Laurel

Umbellularia californica

California Distribution

Calflora Taxon Report:
http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=8183

Resources

Jepson Video: https://www.youtube.com/watch?v=DiEmBnjj1OU&feature=youtu.be

Friends of Edgewood Guide: http://friendsofedgewood.org/california-bay-laurel

Jepson eFlora: http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=47489

Calphotos: https://calphotos.berkeley.edu/cgi/img_query?where-taxon=Umbellularia+californica

Wikipedia: https://en.wikipedia.org/wiki/Umbellularia_californica

California Buckeye

Aesculus californica

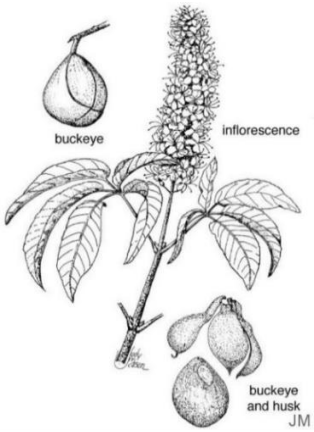
California Buckeye is shorter than neighboring firs and redwoods, but often grows in colonies that dominate a part of the canopy. It is an ancient member of the California ecosystem. For instance, local native bees have figured out how to sip its pollen, which is poisonous to non-native bees.

Compound, radiating leaves join at one point.

Sweet-smelling flower clusters stand up from the tree.

A few pollinated flowers form heavy, leathery covered fruit.

Lots of early spring leaves emerge from a single, big bud.



Trunks are pale and smooth.

Inside the covering is a lovely, mahogany fruit.

Buckeyes are the first to drop their leaves and are often bare by July.

California Buckeye

Aesculus californica

California Buckeye is endemic to the California Floristic Province. It is well adapted to our Mediterranean climate.

It does most of its growing in the winter wet season. Its seeds germinate with the first rains. Its leaves bud early and fall by early summer.

Buckeyes drive a taproot deep in the ground, helping them thrive in areas that dry out in the summer.

California Buckeye

Aesculus californica

In early February, branch-tip bud covers curl back and produce large numbers of bright green leaves.

These leaves spread and help the tree grow during the wet spring.

Photo by Wilde Legard

California Buckeye

Aesculus californica

Leaves are compound and palmate.

Each leaflet is several inches long and joins at a common point at the base of the leaf.

They're slightly fuzzy in the spring, but lose their hair as they mature.

This is the only California plant with opposite compound leaves.

Photo by Julie Kierstead Nelson

California Buckeye

Aesculus californica

Leaf edges are finely toothed.

An intricate network of veins stands out on the bottom.

Photo by Zoya Akulova-Barlow

California Buckeye

Aesculus californica

Flowers bloom in May.

Sweet-smelling flowers bunch together in cylinder a couple inches across and 5 to 8 inches long.

Stamens are long and orange-tipped.

Photo by William Follette

California Buckeye

Aesculus californica

California Buckeye is poisonous to humans and reportedly to non-native bees as well.

This gives an advantage to native bees who eagerly collect pollen and nectar from the flowers. Late-spring migrating butterflies also seek it.

Most flowers are male only - with long stamens and no functional female parts.

A few flowers near the end of the inflorescence have both male and female parts. In the picture, notice the flowers in the upper right that have narrow "columns" emerging from the petals. These are the only flowers that can produce fruit. That's a good thing since the fruits are so heavy.

Photo by Wilde Legard

Here's a "perfect" flower, with both male stamens and a central female pistil.

Notice the swollen ovary - a buckeye fruit in the making.

Photo by Kathy Korbholz

Fruits are heavy, covered with a leathery coating.

The fruits are larger than any plant outside the tropics.

Photo by Wilde Legard

The leathery coating splits off the fruit, leaving a lovely mahogony-colored seed.

The seed comes to life with the rains, sending a shoot down into the ground where it splits - one branch reaching upward to become the stem of a new buckeye, and the other continuing down to form a root system.

Photo by Kathy Korbholz

The trunk is pale and fairly smooth.

This tree is summer deciduous, dropping its leaves as soon as they begin to dry out and not sprouting new ones until the following February.

If you see a pale-barked leafless tree in the fall and early winter, before other trees lose their leaves, it's probably a California Buckeye.

Photo by Zoya Akulova-Barlow

California Buckeye

Aesculus californica

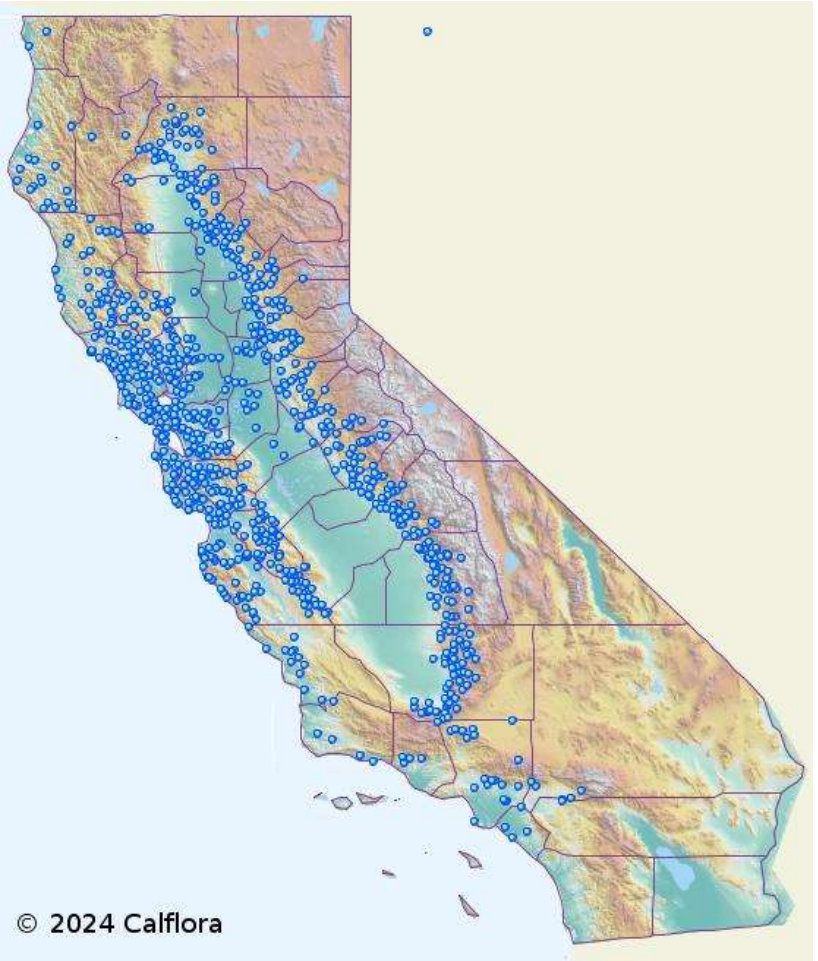
Twice a year, Buckeye is easy to pick out from a distance - first when its dome-shaped green trees are covered in prodigious pink floral displays, and second when all the leaves fall off, leaving a white skeleton.

Photo by William Follette

California Buckeye

Aesculus californica

California Distribution



Calflora Taxon Report:
http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=111

Resources

Jepson Video: https://www.youtube.com/watch?v=uvYzsuUOaWc

Friends of Edgewood Guide: http://friendsofedgewood.org/california-buckeye

Jepson eFlora: http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=12026

Calphotos: https://calphotos.berkeley.edu/cgi/img_query?where-taxon=Aesculus+californica

Wikipedia: https://en.wikipedia.org/wiki/Aesculus_californica

Madrone

Aesculus californica

A member of the Heath Family, Madrone shares similar flower shapes and branch colors with Manzanitas and Huckleberries.

Madrone gets shaded out by dense stands of firs and redwoods but recovers territory if there is fire. Hundreds of vigorous Madrones are sprouting along route 236 at the north end of Big Basin Park, after fire opened the area up in 2020.

Similar to buckeye, leaves radiate. However, each connects separately the stem.

Clusters of small flowers decorate erect stalks.

Thousands of berries cover some trees, persisting until after Christmas.

Outer bark is thin and brittle, peeling to reveal beautiful inner bark.

Flowers are urn shaped.

Pollinated flowers turn into orange-red berries.

Less than 4 years after the Big Basin fire, this Madrone has grown to 25 feet tall.

Madrone

Arbutus menziesii

Madrones, with their brown trunks, long limbs, and dark green leaves, are magnificent.

They grow for hundreds of years and reach over 100 feet tall.

Photo by William Follette

Leaves join the branch in separate spots, but very close to each other.

They grow to about 5" long and are evergreen, thick and leathery.

Photo by Keir Morse

The top of the leaf is dark green, waxy and shiny.

The under side of the leaf is paler and less shiny.

Although often smooth edged, Madrone leaves can have small serrations as shown here. The similar Toyon leaf has much larger teeth.

The leaves are eaten by deer and small mammals.

Photo by Zoya Akulova-Barlow

Madrone

Arbutus menziesii

Madrone bark is quite brittle so when the inner trunk grows, the outer bark breaks and curls up.

Photo by William Follette

Bark color varies from green to orange and brown, changing with age.

The brown tints come from tannins and other compounds. These chemicals, plus the peeling bark, deter insects from eating the tree.

Photo by Susan Mayne

Flowers are small, white, and urn-shaped. They're less than 1/2" long and 1/4" wide.

They grow at the end of stems, hanging down from branched stalks.

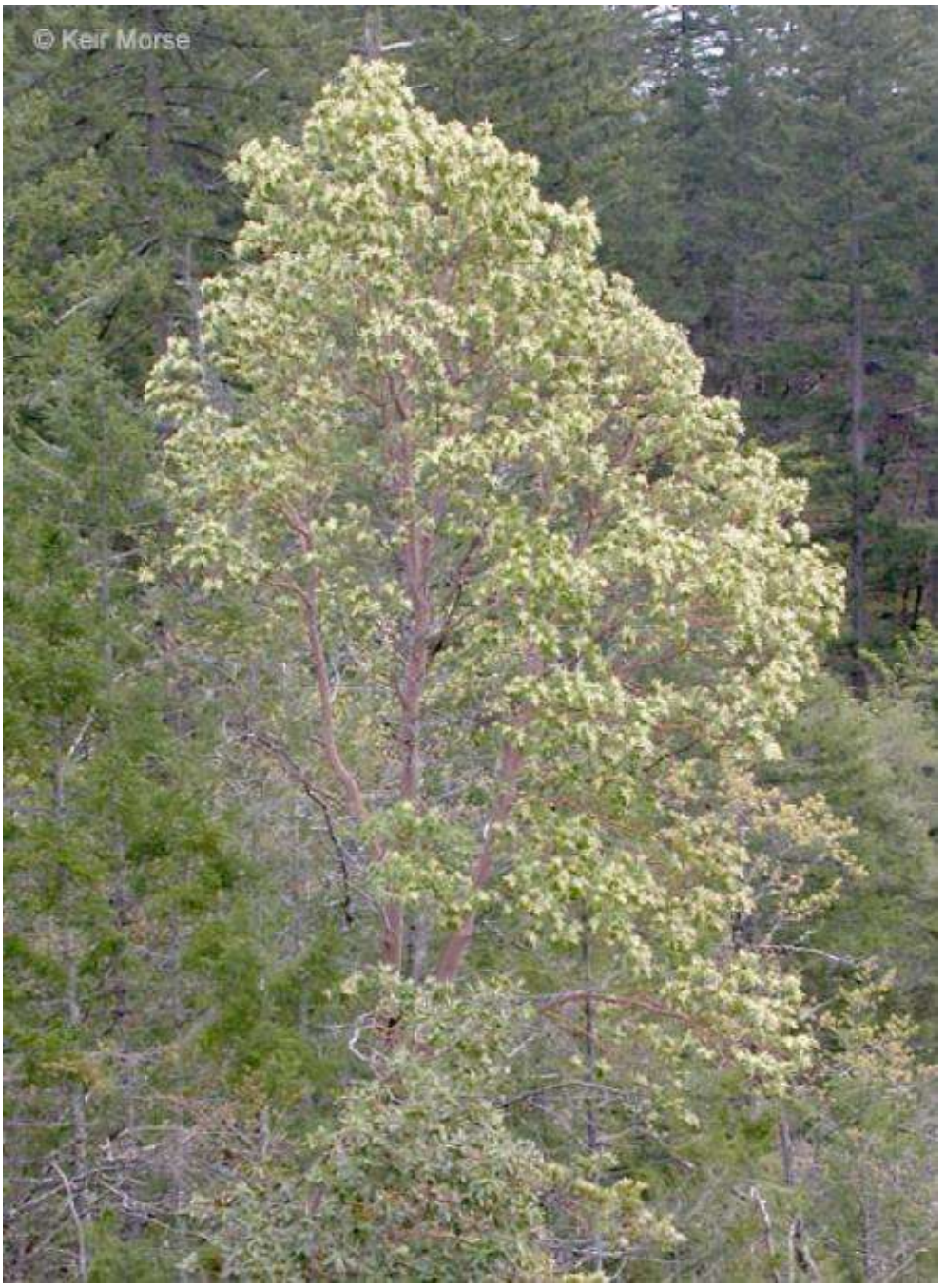
Photo by Wilde Legard

Madrone

Arbutus menziesii

Mature trees can generate over 10,000 flowers - quite a sight and quite a bonanza for local wildlife.

Photo by Keir Morse



Madrone

Arbutus menziesii

Bees pollinate Madrone flowers.

Butterflies also pollinate the flowers.

Madrone

Arbutus menziesii

Madrone berries start orange and mature to a bright red. These berries are still maturing and haven't lost the floral parts from the withering flower yet. They're less than 1/2" across.

Berries have a warty, bumpy skin and many seeds.

Toyon berries are similar, but smoother and heavier.

Mature trees can generate over 10,000 berries in the fall.

The berries stay on the tree well into winter and are an important food source for birds, deer, and small mammals. Almost every berry will be eaten before it drops to the ground.

Photo by Tony Corelli

Madrone

Arbutus menziesii

Madrones show so much red in the fall that whole patches of forest look red from afar.

Photo by Doreen L Smith

Berries have many seeds.

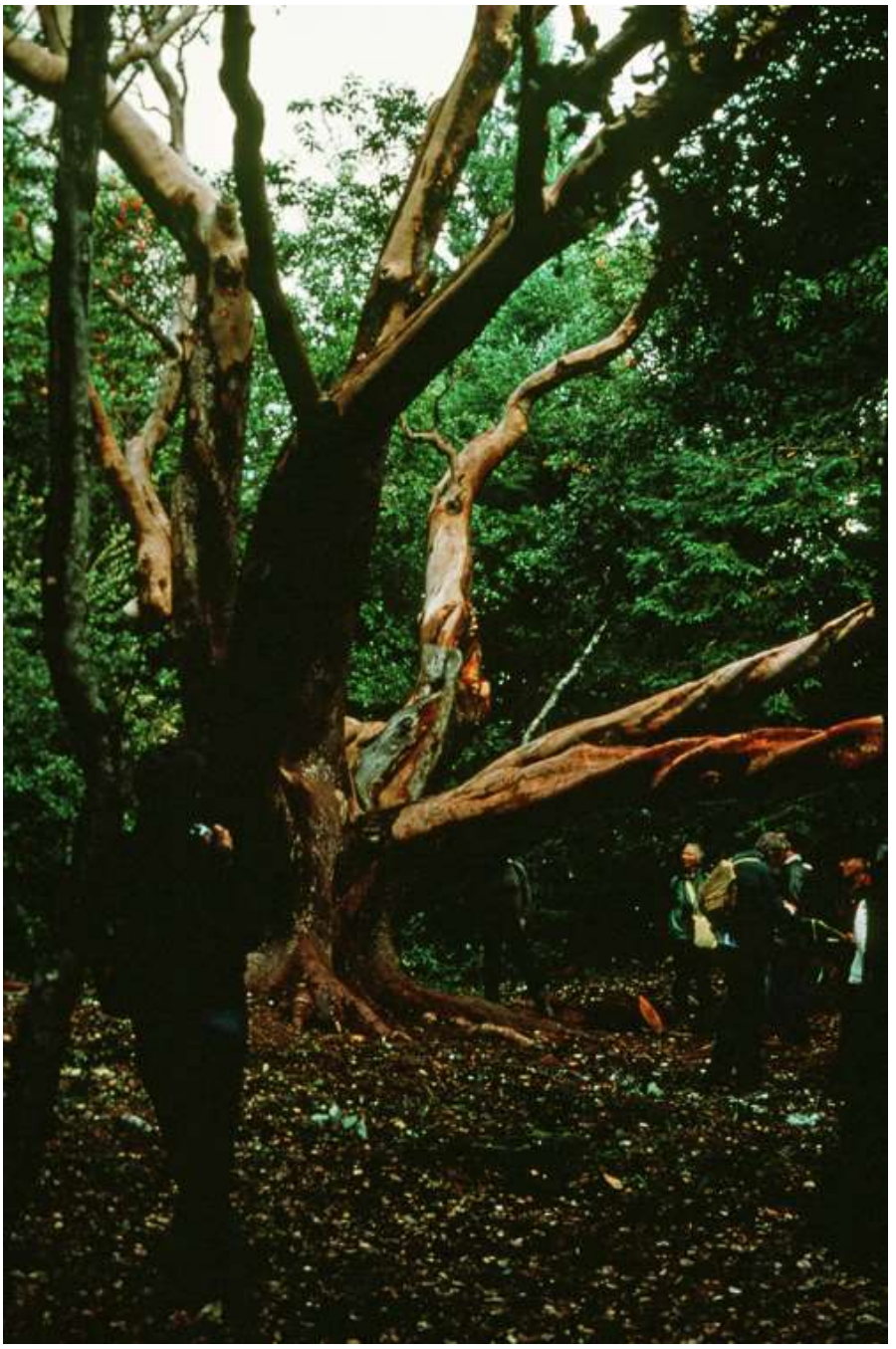
After they reach the ground seeds can lie dormant for dozens of years. They'll germinate when there is enough water and light.

Madrone

Arbutus menziesii

Madrones need a lot of light. In the absence of fire they can be shaded out by surrounding trees. In forests where humans limit fire, Madrone populations are declining.

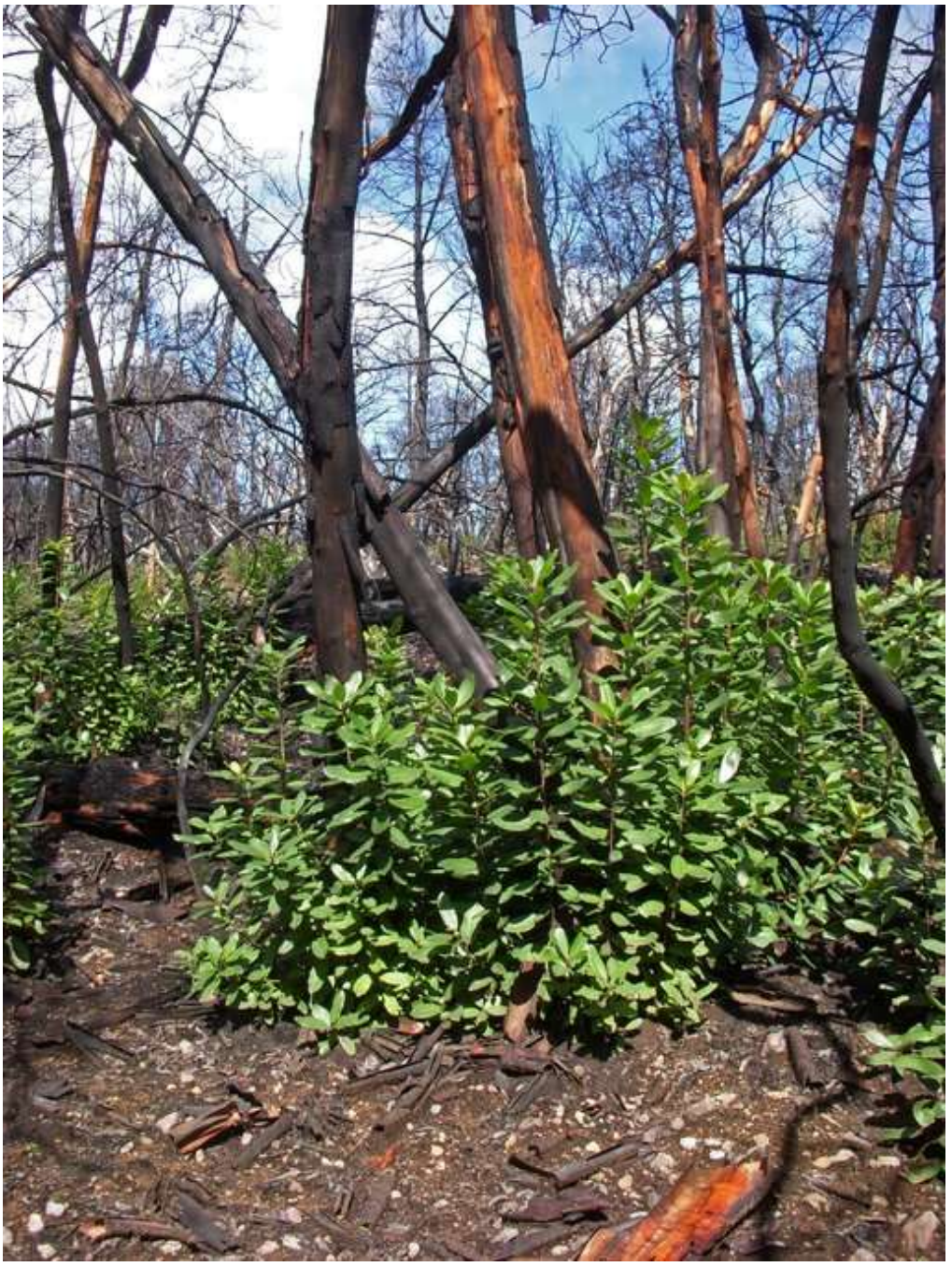
Photo by William Follette



On the other hand, Madrones do well in areas that are burned.

As you can see here, the trees above ground are generally killed because they have little insulating bark.

However, the burls at the top of the root ball generally survive. The burl is full of buds and food, leading to rapid new growth. This new growth is only a couple of years old.

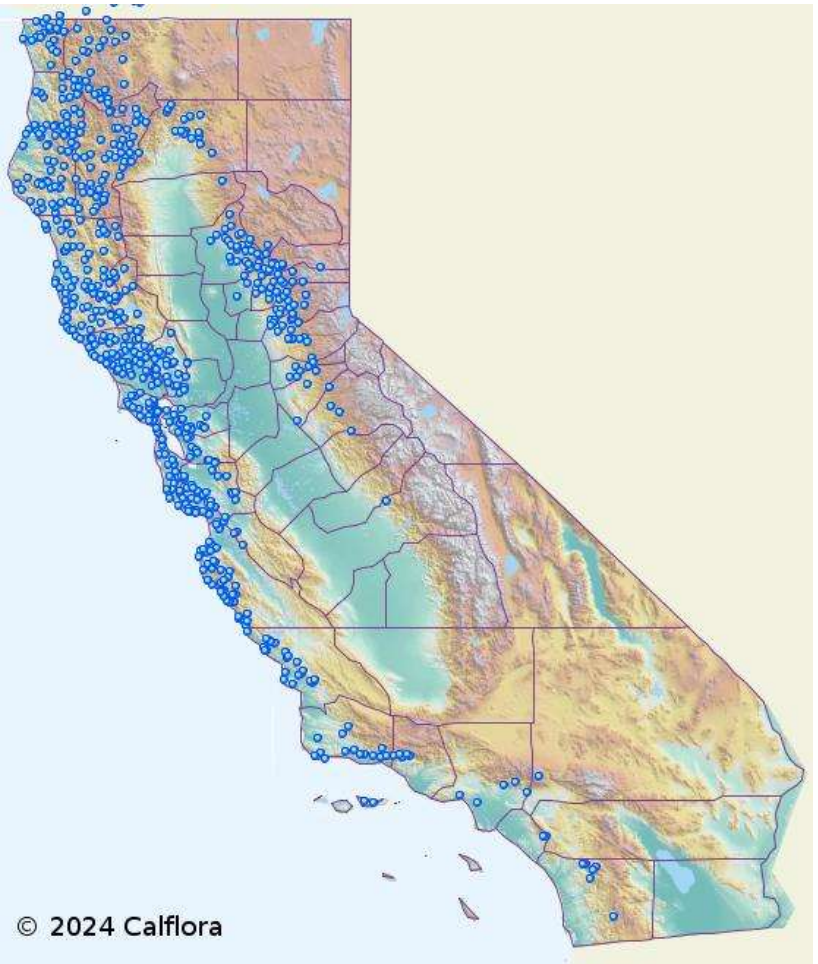


Older Madrone trunks often have rotten spots that are hollowed out - ideal for nests.

What a great tree!

Photo by Zoya Akulova-Barlow

California Distribution



Calflora Taxon Report:
http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=506

Resources

Friends of Edgewood Guide: https://friendsofedgewood.org/pacific-madrone

Jepson eFlora: http://ucjeps.berkeley.edu/eflora/eflora_display.php?tid=13872

Calphotos: https://calphotos.berkeley.edu/cgi/img_query?where-taxon=Arbutus+menziesii

Wikipedia: https://en.wikipedia.org/wiki/Arbutus_menziesii

Tree Sex Glossary

When it comes to pollination, trees parts and processes differ radically. Here are some terms that will help you follow the descriptions in the book.

When male **pollen** reaches a female **ovule**, you get **pollination**, the start of a new life. The pollinated ovule becomes an embryo in a covering (an acorn, pine cone, winged seed or fruit).

Each tree accomplishes this essential communication in processes that have been repeatedly successful over vast amounts of time.

Male flower parts:

- Each **pollen** grains holds unique DNA that is ready to merge with the DNA of a female **ovule** to create a new individual.
- Large numbers of pollen grains are held in **anther** sacs or **pollen cones** while they mature.
    - On maples, laurels, buckeyes and madrone, anthers are bumps at the end of **stamen** filaments, held out where pollinators can rub against them.
    - On oaks and conifers, anther sacs are held on dangling **catkins**, erect **spikes**, or in spherical **pollen cones** until they're ready to be released to the air.

Female flower parts:

- The **Stigma** is a receptive surface on which pollen grains from another tree stick.
- Once stuck to the stigma, approved pollen grains are passed to an **ovule**, the female egg. When pollen joins the ovule, you have pollination.
- Some species have sets ovules, grouped together in a **carpel.** For instance, maples have two ovules grouped in a carpel. When they're fertilized, each seed grows a wing to create the 2-winged maple fruits you see on trees.

In addition to tree sex, many new tree trunks grow directly from their mother; **clones** with identical DNA to their parent. Most large Bay Laurels and Coast Redwoods are clones, with their unique DNA reaching back many generations.

Notes

The dominance of just nine tree species in the Santa Cruz Mountains is most apparent in the forests above 1,000 feet. Below that level, other trees join the mix due to a riffraff of planted trees and a change in conditions:

> Ocean-side foothills feature Monterey Pines and streamside trees such as alders and willows.
>
> Valley-side foothills feature Valley Oaks and other trees adapted to the warmer parts of our Mediterranean climate.

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I love looking at the tree canopy shifting as I ride my bike in the Santa Cruz Mountains. I made this video of the shifting canopy as I rode my bike on the southern end of Skyline (route 35). I think you'll find it beautiful and peaceful to contemplate: https://www.youtube.com/watch?v=1f8jgAkuJLk

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This book relies heavily on photographs, drawings, illustrations and paintings donated to PlantID.net. Thank you!

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