

## **BASIC Organism Information for A.R. Docents** rev. 6.1.23

This document provides background information about many organisms found at Armstrong Redwoods and Pomo Canyon. As a docent, do not feel that you need to know all of this information in order to successfully help visitors learn about and appreciate our wonderful redwood forest. Start with the basics and build your knowledge over time.

The Organism Cards are divided into two major groups. Docents should become familiar with these **BASIC** Organisms first. They are the most common organisms that visitors will notice at Armstrong Redwoods.

The **ADVANCED** Organism Cards provide information about other organisms, including some found in Armstrong Redwoods SNR on the hillsides around the canyon, in Austin Creek SRA, in the Willow Creek/Pomo Canyon area, and along the coast. The Advanced Organism Cards are in a different document.

**A caution:** It is good for a docent to have lots of knowledge. We must, however, not yield to the temptation to be just a lecturer...a “sage on the stage.” Our purpose is not just to inform. More importantly, our purpose is to help people come to love and understand the habitat and to care for it so that they want to become stewards... caretakers. Your job is not to be a font of knowledge. It is to be someone who helps people develop an appreciation and understanding...a “guide on the side”.

And...rather than just telling facts and names, we should be encouraging people to think and wonder. One way to do that is to ask them questions and encourage them to try to figure out answers.

The following pages include photographs and information about many of the organisms that one might find in Armstrong Redwoods or the Willow Creek/Pomo Canyon area. The images and information are laid out in such a way that you can print a page and then cut it into two 5” x 7” sections, glue them back-to-back and then laminate them so that you can easily carry them with you as you learn about the organisms.

This is a “living document.” It will periodically be updated and revised.

### **Credits:**

This document was prepared by Mike Roa, Stewards docent, with help from:

- Leslie Carrow, Rachel Hallaway, and Scott Lawyer, Stewards staff
- Hollis Bewley, Greg Corby, Karen Gebbia, Beth Lamb, and Nina Lowrey, Stewards docents
- Sources of images are indicated on the “cards.”



## Organism Information for Docents

rev. 6.30.21

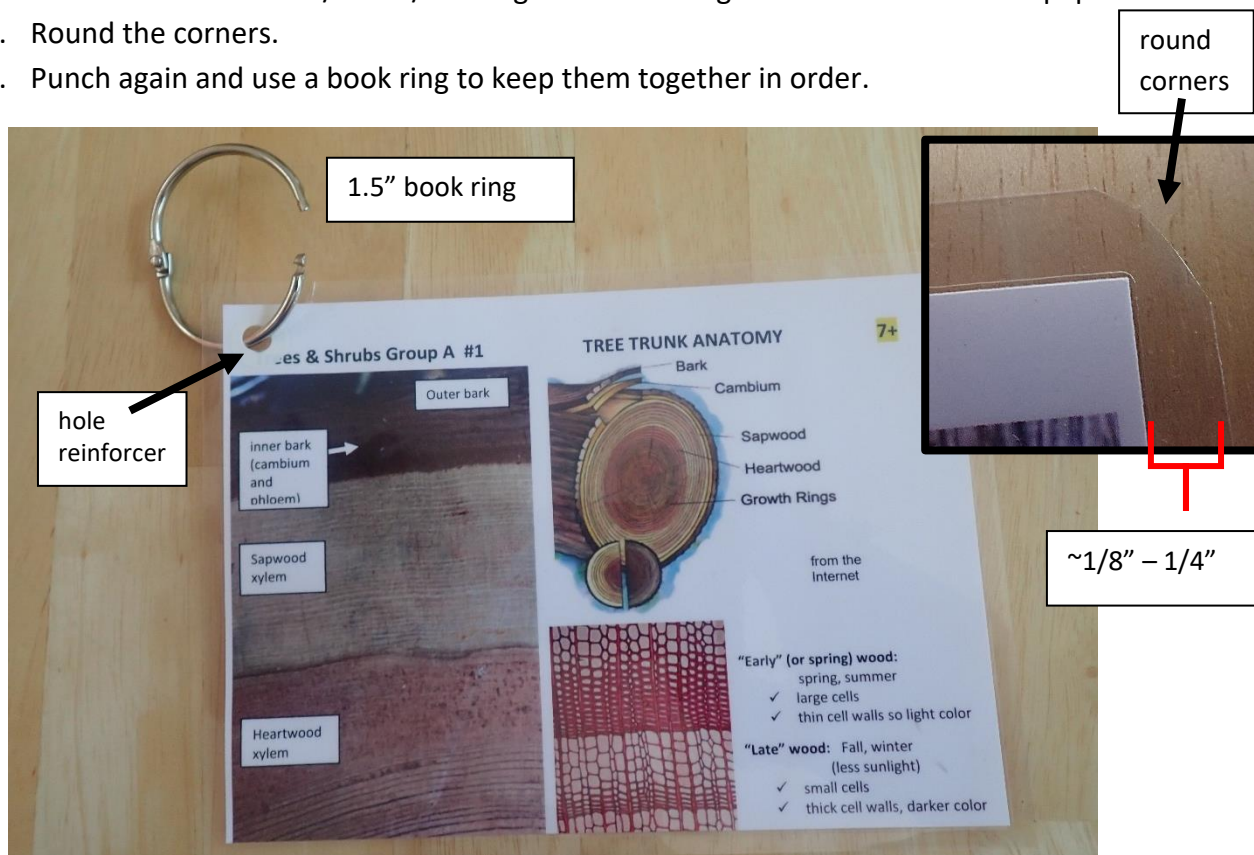
The following pages contain photographs and information about many plants and animals found in and around Armstrong Redwoods and the Willow Creek/Pomo Canyon area. Don't worry about trying to learn all of them.

If you're interested, you can do that over several years. The **most common** ones are in the Basic Organism set. The Advanced Organism Card set includes many others that you can learn about over time.

Each page has one or more photographs on the top half and some information and possibly more photographs on the lower half. This is so that you can make them into 5" x 7" laminated cards that you can carry with you if you want to.

### Laminating and Binding Cards:

1. Print the cards; cut to size (5"x7").
2. Glue the information to the back of the photo.
3. Punch a hole in the upper left corner. Leave at least 1/4" of paper around the hole.
4. Add a hole reinforcer. (Clear reinforcers look better but are harder to attach than white.)
5. Laminate.
6. Cut so that there is a 1/8" – 1/4" margin of laminating material all around the paper.
7. Round the corners.
8. Punch again and use a book ring to keep them together in order.



# **BASIC ORGANISM (BO) CARDS (This document)**

Docents should become familiar with these organisms first.

After you are familiar with these, another document has some “Advanced” Organism Cards. You can learn those at your own pace (or not!).

**Key to numbering:** The “BO” indicates that it is a “Basic” Organism Card. The next letter(s) indicate which group of organisms the organism/card belongs with. Within the group, the organisms are in alphabetical order. (The organisms are broken into groups so that if we add or delete organisms, we only have to change the subsequent numbers in that group rather than the numbers on all of the organism cards.

## **Trees and Shrubs**

- BO-T&S-1. Tree Trunk Anatomy
- BO-T&S-2. Redwood Leaves and Cones
- BO-T&S-3. Douglas-fir
- BO-T&S-4. Coast Redwood or Douglas-fir?
- BO-T&S-5. Bay
- BO-T&S-6a. Big Leaf Maple
- BO-T&S-6b. Green Island Fungus
- BO-T&S-7. California Hazelnut
- BO-T&S-8a. Poison Oak
- BO-T&S- 8b. Poison Oak at Entrance to A.R.
- BO-T&S-8c. Poison Oak Leaves
- BO-T&S-8d. Poison Oak Reproduction
- BO-T&S-9a. Tanoak
- BO-T&S-9b. Tanoak Acorns
- BO-T&S-9c. Tanoak Uses
- BO-T&S-9d. Sudden Oak Death

## **Flowers**

- BO-F-1a. Redwood Sorrel (*Oxalis*)
- BO-F-1b. Redwood Sorrel and Shamrock

## **Flowers, Continued**

- BO-F-2. Western Trillium

## **Moss** BO-M-1

## **Ferns**

- BO-Fe-1. Sword fern
- BO-Fe-2. Bracken Fern

## **Animals**

- BO-A-1. Banana Slugs
- BO-A-2. Millipedes
- BO-A-3. Crows and Ravens
- BO-A-4. Woodpeckers
- BO-A-5. Jays, Junco, Pacific Wren
- BO-A-6. Columbian Black Tailed Deer

## **Fungi and Lichens**

- BO-F&L-1. Some Fungi
- BO-F&L-2. Crustose Lichens
- BO-F&L-3. Foliose Lichens
- BO-F&L-4. Fruticose Lichens

## A Few Words About Names

Is it important for docents to know the names of organisms found in our area?

The answer is yes – and no.

To paraphrase Juliet: “A wood rose by any other name would smell as sweet.”

So, we could call the flower at the right a wood rose, a bald hip rose, *Rosa gymnocarpa*, or that plant with the small thorns and pretty pink flower, or Bob. It would still be the same plant.



But there are a couple of reasons to know the names of organisms.

- 1) Knowing the name facilitates communication. If I want to talk about the plant, it is easier to say “wood rose”, or “*Rosa gymnocarpa*” than “that plant with the small thorns and pretty pink flower.” Also, there are several plants with small thorns and pink flowers.
- 2) Knowing the name of something helps establish a connection. Visitors to any environment often ask the name of a plant, animal, kind of rock, or something else in the environment. Wanting to know the names of things seems to be a natural desire.

Many people are content to just know the name of an organism. But that is probably the least important thing to know. It is far more interesting, and important, to know something about the organism. What does it eat? What eats it? Why does it live here and not there? Do people use it for something? What other organisms live in the same environment? To what is it related?

As docents, it is useful to know the names of organisms, but it is at least as useful to know something about the organisms.

The “scientific,” or binomial name of an organism has two parts: the genus name and the species name. A genus is a group of closely related organisms. The species is the particular kind of organism. Members of the same species can mate and reproduce fertile offspring with each other, but not with other species.

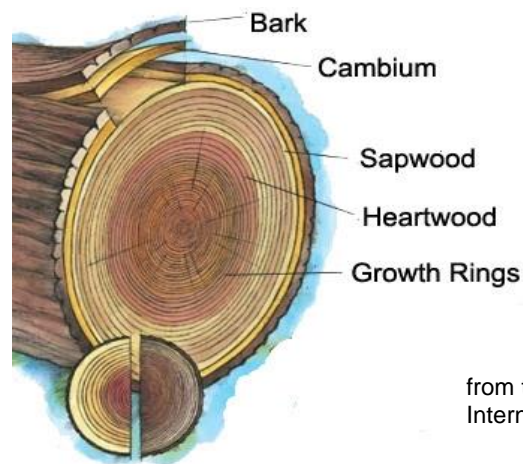
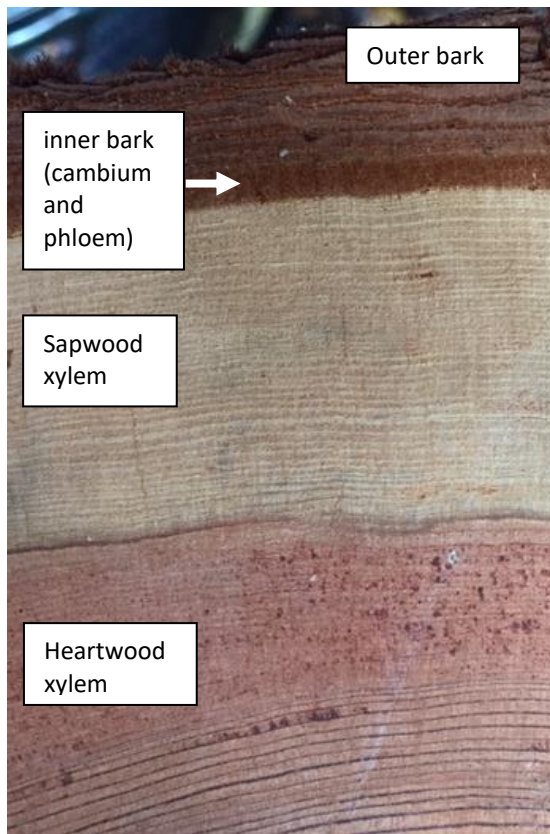
When written, the genus name is capitalized and the species name isn’t. To identify the name as a scientific name, it is italicized or underlined. So, for the wood rose, the scientific name is *Rosa gymnocarpa*. It is a different species than *Rosa californica*, the California wild rose, or *Rosa nutkana*, the Nootka rose. The genus name, *Rosa*, tells us that it is closely related to other roses. The species name, “*gymnocarpa*,” tells us something about it. In this case, the fruiting body or rose hip, quickly loses its sepals, leaving it “naked.” “*gymno*” means naked, and “*carpa*” refers to fruit. Another common name for the plant is “bald hip” rose.

When a visitor asks the name of a plant, it can be interesting to ask them to look at it and think of a name that would help them remember what it looks like. You can even use that name the next couple of times that you encounter the plant before telling them the “real” name.

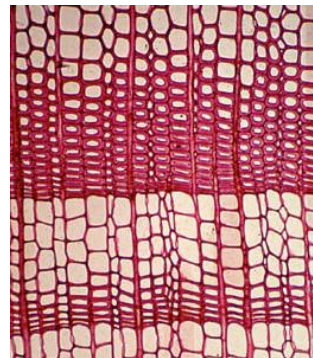
### **Citations**

The vast majority of the photographs were taken by Stewards docents or staff. The photographers’ names are indicated. Some were taken by other people; their names are also indicated. Many were taken from the iNaturalist or Flickr web sites. In those cases, we used only images for which use is allowed.

A few images were taken from the internet without permission, but we feel that “Fair Use” allows for that, as we are not benefitting financially, and the images are being used for educational purposes. Those images are indicated with an “I” notation.



from the  
Internet



**“Early” (or spring) wood:**

- spring, summer
- ✓ large cells
- ✓ thin cell walls so light color

**“Late” wood:** Fall, winter  
(less sunlight)

- ✓ small cells
- ✓ thick cell walls, darker color

**OUTER BARK:** The outer bark serves to protect the tree, especially from insects, disease, and, in the case of coast redwoods, fire. Redwood bark is commonly 4”-8” thick, and may be over a foot thick! Redwood bark is high in tannins, which deters insects, and is very fibrous, not providing much nutrition for insects.

The outer bark’s structure makes it sponge-like, allowing it to absorb moisture. Most naturally occurring fires would be lightning-caused, which usually happens during rain storms, so wet spongy bark would provide some protection. **(Have visitors press their hands on the bark to sense its sponginess.)**

**INNER BARK:** The inner bark includes the cork cambium (which produces the outer bark), and **PHLOEM**. Phloem brings nutrients such as sugars down from the leaves to the rest of the plant. (**Phloem flows down**)

**VASCULAR CAMBIUM:** **Vascular cambium** is the tissue that produces the plant’s vascular tissues, **phloem** and **xylem**. (Vascular tissues transport materials...our vascular system is our blood system.)

**XYLEM** (The **xylem** is the wood.)

**Sapwood** is light colored living tissue through which water and minerals move upward. (**xy** to the **sky**)

Dead xylem cells accumulate **tannins**, which are brought inward by groups of cells that form **rays**.

Tannins accumulate in the darker colored **heartwood**, which provides structural strength to the tree.

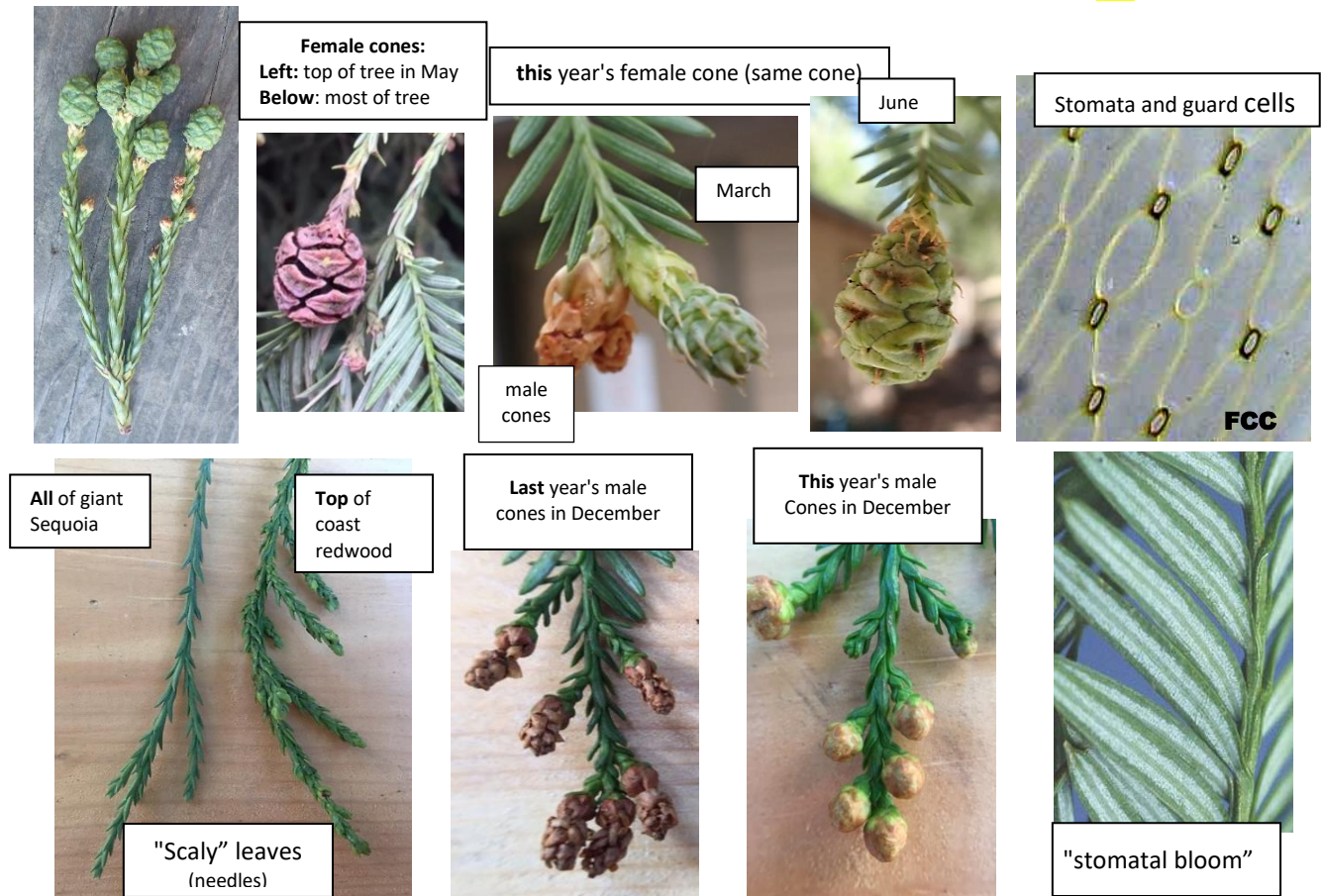
Redwoods have a reputation for being resistant to insects and rot. This reputation was well earned when old-growth forests were being logged. A 1000-year-old tree had 1000 years to accumulate tannins. A 50-year-old second growth tree wouldn’t have nearly as much tannin, so it isn’t very insect and rot resistant.

A year’s growth is indicated by a light AND a dark ring. The light rings (“early” or “spring” wood) are made of large cells with thin cell walls as the tree grows rapidly in the spring and summer. Dark rings (“late wood”) are formed of small, thick-walled cells formed during the slow growth period in the late fall and winter.

**Credits:** diagram of “layers” (upper right): U.S. Forest Service left photo of layers by Mike Roa

Microphoto of early and late wood/rings: <https://www.geo.uzh.ch/microsite/alpecole/static/course/lessons/12/12d.htm>





**1. UPPER LEFT:** Most female (ovulate) cones are borne in the upper part of the tree; some are borne lower. Male (pollinate) cones form throughout the tree

**2. UPPER MIDDLE:** It is difficult to distinguish male from female cones until January or February.

**3. LOWER LEFT:** Leaves/needles pressing against the branchlet helps the tree conserve water because the stomata are shielded from the drying effect of wind and sun. Coast redwood leaves in the upper canopy of mature trees have such scale-like leaves.

The Giant Sequoia (*Sequoiadendron giganteum*) grows in the gravelly soil of the Sierra Mtns. That soil doesn't hold water well, so when rain falls, it percolates into the soil and becomes unavailable to the tree. In the winter, the water is frozen and is unavailable. Thus, giant Sequoia needles press against the twig.

**4. LOWER MID.:** After releasing pollen, pollinate comes dry up. They may remain on the tree for a long time.

**5. BOTTOM RIGHT:** Like the leaves of many plants, redwood needles have a waxy coating (cuticle). There is an especially thick layer on the ventral (under) side, surrounding the stomata. This is called "stomatal bloom."

**6. TOP RIGHT:** **Stomata** (singular: stoma or stomate) are tiny openings in the under side of a leaf. Gases can pass in and out through the opening. Photosynthesis produces oxygen gas, which exits through the stomata. Water vapor can also exit through the stomata; this is called **transpiration**.

When plants are stressed due to dry conditions, they have several methods of reducing transpiration.

- The stomata are surrounded by "guard cells". Guard cells close the opening when there is not enough water.
- The ventral (under) sides of many plants are "furry." California hazelnut is a good example. That "fur" traps air that is moistened by transpiration, thus reducing water loss.
- Redwood sorrel leaves droop downward when the plant is in warm sunlight for long. This helps shield the stomata, trapping moist air and reducing moisture loss.

**photos:** Stomata image from Flickr, by Yersinie Pastis all others by Mike Roa





young Douglas-fir

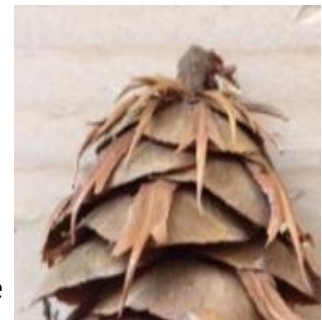
pollinate  
cones in  
March

young, "middle aged", and mature bark

photos: by Mike Roa

Douglas-fir is not a true fir, hence the genus name "*Pseudotsuga*." Among other differences, true firs have cones that stand upright on the twigs and fall apart when mature, while Douglas-fir cones hang down and fall from the tree intact.

The cones are easily identified by the bracts that extend out beyond the edges of the scales. A Native American tale says that this represents a mouse given shelter by the tree, allowing the mouse to hide from Coyote, or from a fire in another version. In exchange, the mouse helped spread the tree's seeds. The mouse's legs and tail extend beyond the edge of the scale.



Douglas-fir needles grow all around the twig; redwood needles extend out in one plane, feather-like.

Douglas-fir bark is light colored and smooth when young and brown-gray, hard, and deeply furrowed when mature, while redwood bark is fibrous and rust colored throughout its life.

Douglas-fir is one of the most widely distributed conifers in western N. America. It is the major lumber-producing tree in N. America. The lumber in visitors' homes is probably mostly Douglas-fir. It is also used for particle board, plywood, and pulp.

It is moderately shade-tolerant and in redwood forests grows mostly in openings. It requires less water than redwoods, so it often grows upslope from the redwoods.

At both Pomo and Armstrong woods, the trees often have a lot of lichen, especially "old man's beard" growing on them. Animals, probably squirrels or porcupines, have fed on the tops of many Douglas-firs at Pomo, resulting in trunks that split.





**BO-T&S-4**  
**Coast Redwood**



**COAST REDWOOD or DOUGLAS-FIR?**

**LEAVES/NEEDLES**

**Coast Redwood** needles grow out from opposite sides of the twig, and often stay attached to the twig when they fall.

**Douglas-fir** needles grow all around the twig, like a bottle brush., and usually break from the twig when it falls.

**7+**  
**Douglas-Fir**



**CONES**

**Coast Redwood** cones are woody, olive-sized, and tend to stay attached to the twig when it falls.

**Douglas-fir** cones are soft, about 3" long, with bracts sticking out from the scales. They tend to fall from the tree without remaining attached to the twig.

**photos:** by Mike Roa



**HABITAT**

**Coast Redwoods** tend to grow in valley where there is shade, moisture, and fog.

**Douglas-firs** tend to grow higher on hillsides, where it is drier, but they may also grow among redwoods.



**COAST REDWOOD BARK**

Coast redwood bark is red-brown, fibrous and relatively soft .

**DOUGLAS-FIR BARK**

bark is gray and fairly smooth when it is young. As it ages, it becomes harder, scaly, and dark brown.

**WHAT'S IN A NAME?**

**Douglas-fir** is hyphenated because it is not a true fir, hence the species name *pseudotsuga*.

The species name for the **coast redwood**, *sempervirens*, means always green, a nod not only to its leaves but its longevity. *Sequoia* may be in honor of the Native American, or because a botanist was studying its scale sequence.



BO-T&S-5

BAY *Umbellularia californica*

4+



Bay flowers in February



Bay seeds in July

***Look for green or yellow leaves on the ground. Pick one up and smell it.***

***Does it remind you of any spices that you might have at home?***

(There is an interpretive sign for the bay tree near the Parson Jones Tree. Consider having visitors pick up bay leaves from the ground along the trail as you approach the tree/sign because other groups may have depleted the leaves at the sign itself. Also have them feel the bark, comparing it to that of the redwoods.)

This tree has many names, including **Bay, Ca. Bay, Laurel, Bay-Laurel, Oregon Myrtle, and Pepperwood.**

Bay trees will readily sprout from root crowns after fire or cutting, or even from a healthy tree (right).

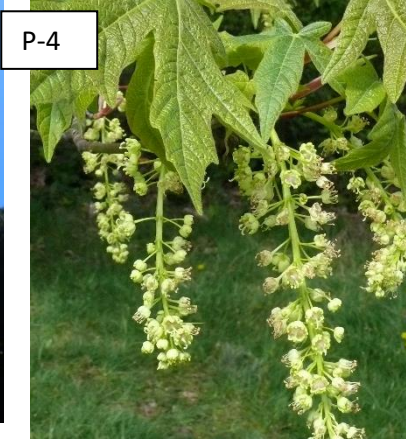
It is not the same species as the plant whose leaves we use in spaghetti sauce and soups, but it is closely related.

Fleas and some other insects don't like the smell of the leaves, so Native Americans used them as an insect repellent in their homes. They would also wipe crushed leaves on their bodies to disguise their scent when hunting. They also ate the nuts after roasting them.

The wood is used to make beautiful bowls.



Photo by Mike Day



***Do you know what kind of leaf is on the Canadian flag?  
It is the maple leaf, because many maple trees grow in Canada.***

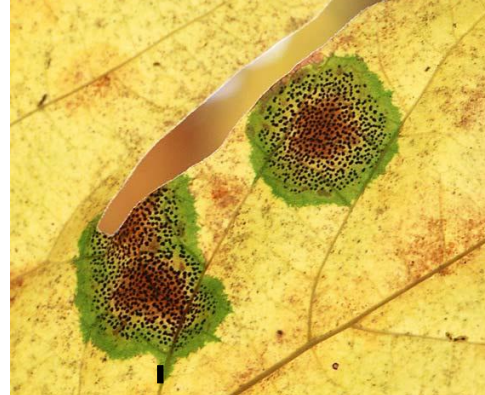
The **Big Leaf Maple** tree is common in redwood forests.

The seeds have wings that help them float to the ground by spinning like a helicopter blade. If you can find a seed on the ground, toss it up into the air and watch it slowly fall to the ground. If you can find several, have the visitors pick them up and toss them.

***Why would it help the species survive to have the seeds take a long time to reach the ground? (A longer time in the air allows the seed to be blown farther from the parent tree. That way the seedling won't be competing with its parent for sunlight and water.)***

photos: by Mike Roa





### Green Island Fungus

Big Leaf Maple leaves are sometimes infected with a disease called “**Green Island Fungus.**” This disease also affects other maples and some other plants, including thimbleberry and hazelnut, but it doesn’t seem to cause much harm other than early leaf drop in the fall. The fungus itself is called “speckled tar spot fungus.”

The same effect can be caused by some bacteria and insects, notably leaf miners.

The black spots of the fungus give rise to its name *Rhytosoma punctatum*, because the spots look like punctuation points (periods).

The fungus (or insect or bacterium) produces hormones (cytokinins) that promote the retention of chlorophyll (delaying senescence) in the surrounding tissue, hence the “green island.” (or maybe green atoll, or “chloratic halos”). In the case of insects, this active chlorophyll extends the availability of food. A good article can be found at:

<https://simonleather.wordpress.com/2019/09/10/green-islands-mining-cytokinins/>

The fungus overwinters in decaying fallen leaves on the forest floor. In the spring it produces “aerospores” that are carried by the wind to the new crop of leaves.

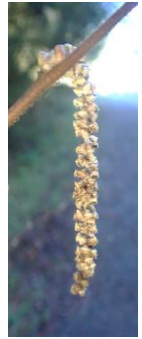
photos: upper left and lower left by Mike Roa

others from the Internet





Catkins left:  
in January  
Catkin at right:  
in February



seeds in early May and early June

photos: seed in May by Karen Gebbia all others by Mike Roa

**Don't pick the leaf, but gently feel it. How would you describe it? (Shake hands with Hazel.)**

**Have you ever had Nutella? Nutella is like peanut butter, but it is made from hazelnuts.**

The **California (or Beaked) Hazelnut**. It is a different species from the one used for Nutella, but it is similar. Ca. Hazelnuts are smaller than the ones used in Nutella. Hazelnuts are also called filberts.

Native Americans prized the thin, pliable young hazelnut stems that sprouted after a fire because they were very useful for making baskets. (The photo of the basket was taken in the Jesse Peter Multicultural Museum at SRJC. It shows a cradle basket made partly from hazel stems. The basket was made by Elsie Allen, after whom a local high school was named.)



Ca. or Beaked Hazelnut  
*Corylus cornuta*

Common Hazelnut  
*Corylus avellana*  
(used commercially)



California or Beaked  
Hazelnut seeds in July



The vine growing on the tree is **poison oak**, which can grow as a shrub or vine.

***What do you know about poison oak?***

Notice that the leaves are in groups of three. There is a saying:

***"Leaves of three, leave it be."***

***Do you see any other plants with "leaves in threes?"***

The main photo is the Parson Jones tree, taken from the "back" side (opposite from the sign). The cut vine on the front side is poison oak. Notice/point out the black sap that oozed from the cut. Native Americans used poison oak sap for coloring baskets. They used poison oak ash for tattoos.

photos: by Mike Roa



**BO-T&S-8b**  
spring and summer

**POISON OAK (near base of Giant Sequoia)** **ALL**  
fall winter



CA blackberry



photos: by Mike Roa

### Poison oak near base of Giant Sequoia at entrance

Poison oak looks different at different times of year.

New leaves are red in the spring, turning to green. They may be shiny or dull. They turn red in fall.

In the winter, the leaves fall off, leaving a stem that tapers very little until the very end.

The winter stems contain the oils that cause dermatitis (itchy skin) so it is good to recognize and point out the stems in the winter in addition to the leaves at other times of year.

Notice the 3 leaves: "leaves of 3, leave it be." (But of course, **we let everything be in Armstrong!**) (Many redwood region plants have leaves in groups of three, though. Native Ca. blackberries, have leaves in groups of 3.) (The Himalayan blackberries growing near the entrance usually have 5 leaves and are not native. Those are very invasive and most of the blackberries in Armstrong are Himalayan.) Both CA. and Himalayan blackberries have thorns.

Leaves have serrated(saw-toothed) edges.

The edges of poison oak leaves can be deeply lobed (left photo), barely lobed (right photo), or in-between.

The species name is

*Toxicodendron diversilobum*:

*Toxico* (toxic/poisonous) *dendron* (tree)

*diversi* (diverse) *lobum* (lobes)





**BO-T&S-8c**  
spring and summer



**POISON OAK Leaves**  
summer and fall



**ALL**  
winter



### **Poison Oak Leaves in Different Seasons**

**Poison oak** looks different at different times of year.

In early spring, the leaves are red and turn to green in late spring and summer. They may be shiny or dull.

In the fall, the leaves turn red.

In the winter, the leaves fall off, leaving a stem that tapers very little until the very end. There are often short branches jutting out alternately to the side, sort of like arms. Poison oak stems or vines are usually only about the diameter of a pencil, even when 6 or more feet tall.

Notice the 3 leaves: “Leaves of 3, leave it be.”

In the winter: “Stubby arms can still do harm.” “If it don’t taper, it ain’t safer.”

The winter stems also contain the oils that cause dermatitis (itchy skin), so it is a good idea to learn to recognize poison oak without its leaves!

photos: by Mike Roa

BO-T&S-8d

## POISON OAK reproduction

7+



flowers in April



seeds in May



seeds in July



seeds in July



seeds in September

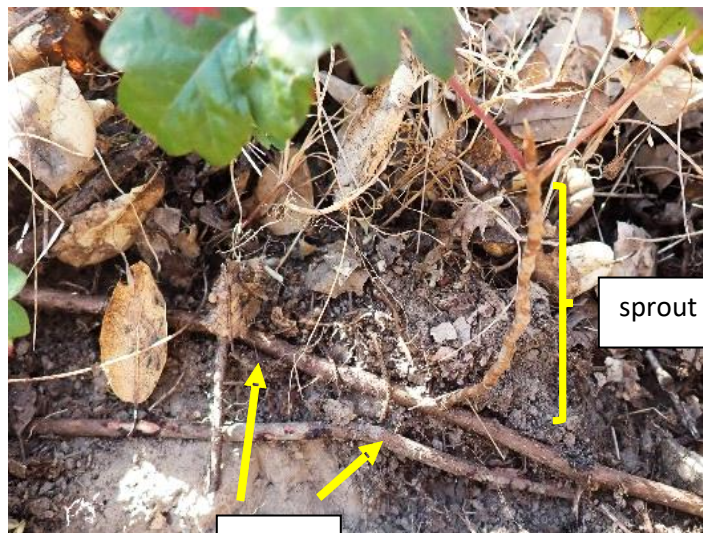


seeds in December

Poison Oak reproduces by both seeds and sprouts from the roots. I (Mike) think that it might also sprout from a vine taking root while lying on the ground.

**photos:**

Seeds in Dec.: from iNaturalist by Paloma  
all others by Mike Roa



sprout

Roots





Acorn in July

This tree was called the "Beautiful Tree" by Kashaya Pomo because its seeds, or acorns, were so large and plentiful. (\*The Pomo word for the tanoak is "*she-chik kele*" or "*she chil le*", depending on the group.)

In a good year, a single tree could produce 200 pounds of acorns.

### ***For what did the Native Americans use the acorns?***

The **Tanoak**, or Tanbark Oak, has lots of chemicals called tannins in its bark. Tannins were used to tan leather, which means to preserve it so that it was soft and easy to use for things like saddles, belts, and other important items.

Even though it produces acorns, the tanoak is not a true oak. It is more closely related to chestnuts than to oaks.

### ***Do you see any dead tanoaks?***

A fungus is killing many tan oaks. The disease is called "Sudden Oak Death Syndrome" or SOD.

Even if some (or most) of the tanoaks survive, the dead ones will provide a fuel source. As a result fires will be larger and more likely to kill even redwoods.

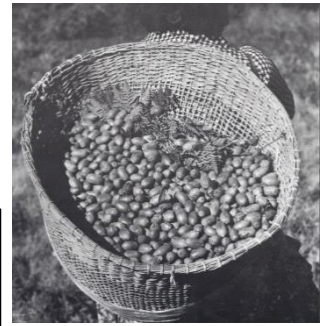
\*Source: C. Hart Merriam: *Indian Names for Plants and Animals Among Californian and Other Western North American Tribes* (in SRJC library)

photos: by Mike Roa





## BO-T&S-9b Tanoak acorns (and chestnuts)



**Tanoak** acorns were an important food crop for Native Americans



**Tanoak**  
seeds (acorns),  
flowers, leaves



**American chestnut**  
seeds, flowers, leaves



Acorns were an important food resource for California Indigenous peoples. Tanoak acorns were especially prized because they are large and plentiful. A single tree might give over 200 pounds of acorns! The name of the tanoak in the Kashaya Pomo language is *chishkale*, which means “The Beautiful Tree.”

Native Americans managed their environment by setting fires, which helped keep grasslands open, providing a suitable environment for blackberries, deer, rabbits, and other desired resources, including tanoaks. Frequent fires also resulted in smaller fires that were less destructive than large ones. Tree ring data shows that, in the past, fires burned most redwood areas every 5-10 years, keeping the fuel load down.

The tanoak is more closely related to chestnuts than to true oaks. Note the similarity not only of the leaves and seeds but also the flowers

Chestnut trees were once a common sight in the eastern U.S., but a fungus practically wiped them out. Recently a fungus has attacked oaks in California, causing a disease called Sudden Oak Death. Will California's oaks go the way of the chestnut?

### photos:

Mortar and pestle: from Flickr by John Rusk

Pomo acorn basket: West Sonoma County Historical Museum

Tanoak acorn and flowers (middle left): from iNaturalist by Todd Plummer

Tanoak acorns and leaves (middle right): from iNaturalist by Tri Do

Chestnut flowers and leaves: (lower left): from Flickr by Bob MacInnes

Chestnuts (lower right): from iNaturalist by Mario Vega



The bark of the tanoak is rich in tannins, the red colored chemicals that give red wines and redwood their red color.

Tanoaks were stripped of their bark to provide tannins for the **hide tanning** industry. Bark was shipped from the forests of Mendocino and Sonoma Counties to San Francisco and San Jose. In the 1800's, a cow's "tanned" hide was often worth at least as much as its meat.

Today tanoak wood is used for **furniture** and **flooring**, primarily in northern California and Oregon.

**photos:**

Top left: from *Redwood Ed*, image from the Humboldt Room collection at Humboldt State U.

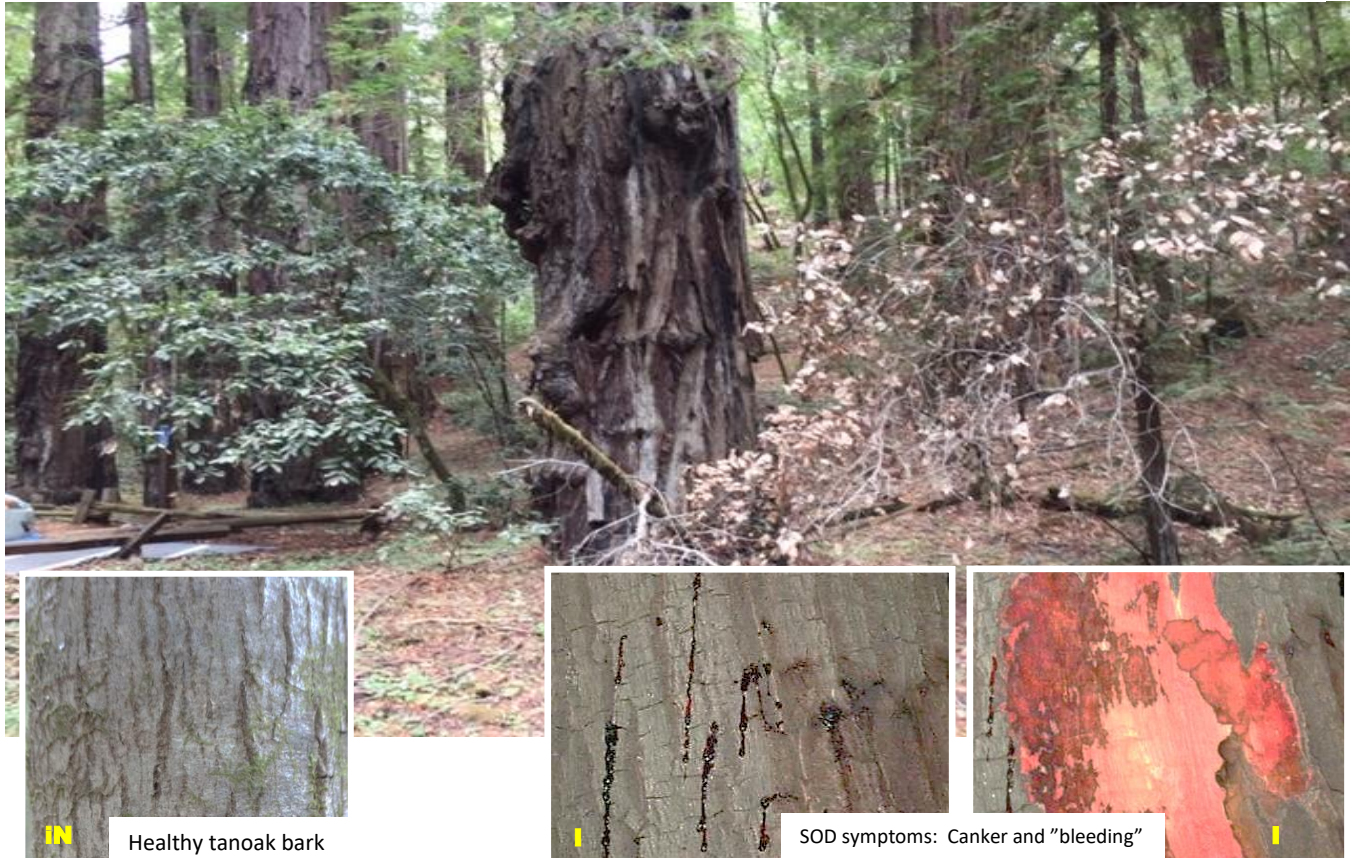
Top middle: Flickr, photo by Karen Cox

Top right: image from Whitethorn Hardwoods, used with permission (californiahardwoods.net)

Bottom left: internet archive book image, from U.S.D.A. National Agricultural Library

Bottom right: stool made by Brendan Gaffney, student at the Krenov School of Fine Furniture Making





Healthy tanoak bark

SOD symptoms: Canker and "bleeding"

A fungus-like plant pathogen named *Phytophthora ramorum* is killing many tanoaks. The disease is called "Sudden Oak Death Syndrome" or SOD.

***Do you see any dead or dying tanoaks?***

**Some** tanoaks may be naturally resistant to SOD. The photo was taken near the parking area by the Armstrong Tree. The tanoak oak at the left appears healthy, while the nearby one at the right is dead. (These trees were burned in the 2020 Walbridge fire. Look for similar pairs along the trails.)

Even if not all of the tanoaks are killed, if many of them die they will present a great fire danger.

Also, there is concern that SOD may mutate and attack other species, including redwood.

The photo at the left bottom shows healthy tanoak bark. The photos at the right bottom show "bleeding" from a SOD canker infection.

**photos:**

Main background photo by Mike Roa, Armstrong docent

Left (healthy bark): from iNaturalist by terrydad2

Infected bark: both from California Oak Mortality Task Force, by Karl Buermeyer



The plants that look like clover are called **Redwood Sorrel**.

When it is cool and shady, the leaves stick straight out, but when the plants are in the warm sunlight, the leaves often droop down.

Plants have openings called **stomata** on the bottom of their leaves. Air (with carbon dioxide, needed for photosynthesis) enters through the stomata, and water vapor and oxygen are given off to the atmosphere through the stomata.

***How would drooping leaves reduce water loss from the leaves? (The stomata are shielded from the sun and wind.)***

**Right:** Several species of *Oxalis* have yellow flowers and are called “wood sorrel”. They are common along Sonoma Co. roads.

*Oxalis* stems have oxalic acid in them. Oxalic acid has a sour taste that some people like, but some are allergic to it, so **do not** invite students to taste the stems.

Point out that Redwood Sorrel often covers the ground and protects the leaf litter from drying out, helping to protect whatever animals live there. But when people walk through the Sorrel, they break the stems, killing the plants. Look for places where paths show no Sorrel.





**BO-F-1b**

**Is Redwood Sorrel a type of Shamrock?**

While redwood sorrel (*Oxalis oregana*) leaves look like many illustrations of the classic Irish Shamrock (*Trifolium dubium*), it belongs to a different genus and species. However, there are several other plants that are also called "shamrock," including some species of *Oxalis*. (See other side.) To further confuse things, even Irish paintings of "shamrocks" often show indented heart-shaped leaves like *Oxalis* rather than the oval/rounded leaves of the Irish Shamrock plant.

Flowering plants are generally classified by their flowers. The images below show that the Redwood Sorrel flower is very different from that of the Irish shamrock.



**Above and right:**  
Irish Shamrock  
(*Trifolium dubium*)



**Left: Redwood Sorrel (*Oxalis oregana*)**  
Compare its flower to the Irish Shamrock, which is a type of clover. Clovers usually have leaves with rounded edges, while Redwood Sorrel leaves are more heart-shaped.



**Credits:** From iNaturalist: large photo: Mefisher; flower: Andra Waagmeester  
*Oxalis*: Mike Roa

Here are some examples of plants that are sometimes called "shamrocks." This shows why scientists prefer using "scientific" names rather than common names. (The word *shamrock* derives from an Irish term for young clover.



Black Medick  
(*Medicago lupulina*)



False shamrock  
(*Oxalis triangularis*)



Pink shamrock  
(*Oxalis debilis*)



Rose shamrock  
(*Oxalis articulata*)



Red Clover (*Trifolium pratense*) is used as a ground cover. It is in the same genus as the Irish Shamrock.



The leaves of the common bur clover (*Medicago polymorpha*) (above) look like the Irish Shamrock, but the flowers are very different.





As the flowers get older and are fertilized, they tend to turn reddish.

*Trillium* or Wake Robin after bloom.

***Trillium*** is the genus name for several plants, including the **Western Trillium** or **Wake Robin**, which has a flower on a stalk and is the most common in our area.

**How many wheels does a tricycle have? The word root "tri" means 3.**

**Why do you think these plants are called *Trillium*?**



Giant White (a.k.a. Sweet) Trillium  
(*Trillium albidum*)  
(note lack of flower stem)



Western Trillium (*Trillium ovatum*)  
(note the presence of the flower stem)



seed pod  
late May

photos: by Mike Roa





December

September

photos: by Mike Roa

***This plant is moss. What do you know about moss?***

Mosses are classified as Bryophytes...non-vascular land plants that reproduce by spores.

The picture at the right was taken in October. The picture on the left was taken in December. What differences do you notice?

Moss sometimes reproduces by producing spores, which are similar to seeds but don't need to be fertilized. Spores are produced in capsules when the moss is in the **sporophyte** stage. When it is in the **gametophyte** stage, moss produces sperm and eggs (gametes), which need water to travel.

***Moss requires a moist environment in order to grow well. Is the redwood forest a moist environment?***

***It is sometimes said that one can find the north side of a tree by looking for moss, because many storms come from the north and the north side of trees tend to be moister and shaded. Would that work here?***

***(No, because the redwood forest is moist everywhere much of the year!)***

photos: by Mike Roa

BO-Fe-1

**SWORD FERN** *Polystichum californicum*

4+



Fiddlehead  
in March



Sori in June

The big structure that looks like a big feather is called a frond. The leaflets projecting out from the side are called pinnae.\*

The frond has many pinnae projecting out from each side

This is called a **Sword Fern** because at the base of each pinna has a projection that looks sort of like the hilt of a sword.

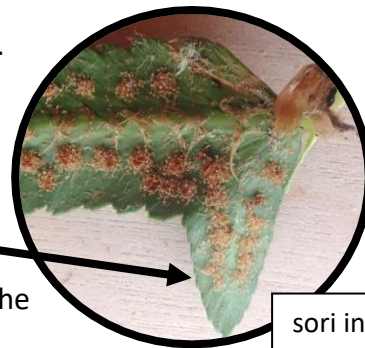
Sori (singular sorus) can sometimes be found on the back of the pinnae. When they develop depends on the species of fern.

These dark brown structures contain sporangia (singular: sporangium), which produce spores, which are sort of like seeds, but they don't need to be pollinated.

When a new frond grows, the tip is curled over. This is called a "fiddlehead." (see other side)

The fiddleheads of some ferns are edible **when prepared properly (and toxic if not) and eaten in moderation**, but **not all are**. Some ferns also have edible tubers. Of course, we don't pick any plants in Armstrong.

\*The word root "pinna" (plural: pinnae) means feather or feather-like. If you use that term with students, ask them why it was chosen to describe ferns.



sori in July





Sori along rounded/smooth edges of pinnae



Fronds emerge from ground separately.



Fiddlehead in February

The big structure that looks like a feather is called a **frond**. The leaflets projecting out from the side are called **Pinnae**, which means “feather-like”. The frond has many pinnae projecting out from each side.

As the frond grows, the tip forms a “fiddlehead.” The fiddleheads of **SOME** ferns are edible **when prepared properly** and eaten in **moderation**. (and toxic if not). Some ferns also have edible tubers. Of course, **we don't pick any** plants in Armstrong.

Bracken fiddleheads are often eaten, but only in moderation, and they are toxic to livestock.

**Most reproduction** in bracken ferns is from sprouts from the underground **rhizomes**.

**Sori** (singular sorus) are structures that contain **sporangia** (singular sporangium).

The sporangia produce **spores**, which are sort of like seeds that don't need to be fertilized to grow.

Brackens that have grown in the sun for several years tend to produce sori more than younger plants growing in the shade. The upper photo at the right shows the ventral (lower) side of two ferns taken on the same day in July. The lower one grew in a sunny area on Guerneville Rd. near Hwy 116. The upper one grew in a shady area in Sebastopol.



sori with sporangia

- **Bracken** ferns turn **yellow and die back** above ground in the fall. **Wood** ferns stay **green** all year.
- **Bracken** fern fronds emerge from the ground **individually**. **Several wood** fern fronds emerge from the ground **in one place**.
- When present, **bracken sori** are found along the **edges** of the pinnae. **Wood fern sori** are found in **rows along the center** of the sori.
- The edges of **bracken** fern pinnae are either smooth or rounded (like the right side of a “**B**”) But this is quite variable. The edges of **wood** fern pinnae are toothed (like a series of **WWW**s)



wood



bracken



BO-A-1

**BANANA SLUGS (Ariolimax spp.)**

ALL

The banana slug most commonly found at Armstrong Woods and Pomo Canyon is the **Button's Banana Slug (*A. buttoni*) (right)**. It can grow to be almost 10 inches in length!

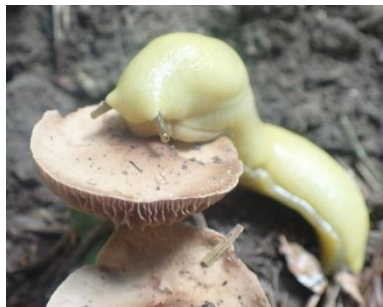


Banana slugs can be pure yellow, have dark spots, or be yellow-brown, or even black.

The **California Banana Slug (*A. californicus*) (below)** is bright yellow throughout and grows to about 7" long. It is the mascot for U. C. Santa Cruz!



(In 1988, the banana slug was proposed as the Ca. State Mollusk, but the governor vetoed it. ☹ )



Pacific banana slugs (*A. columbiana*) feeding on:  
(clockwise from aboveleft):  
plants (W. Sweet Coltsfoot)  
mushroom dead frog fox scat



Banana slugs obtain moisture through "gills" on the lower sides of their body. The gills must be moist to function, so in dry weather banana slugs crawl into holes in the ground. They have been found 9' below ground in holes dug by other animals.

Photo credits:

California Banana Slug credit: from iNaturalist, by Paul P

Pacific Banana Slugs feeding on frog: by Jesse Bunkley, Wildlands Conservancy, Trinidad, Ca.

others by Mike Roa



BO-A-2

MILLIPEDES

ALL

below: Yellow-spotted millipede  
right: snake millipede



Millipedes have two pairs of legs per body segment; centipedes have one pair per body segment.

Millipedes are herbivores, feeding on plants, while centipedes are carnivores and have a stinging organ with which they kill their prey.

In general, centipedes are very flattened and millipedes are more rounded, but the yellow-spotted millipede is in-between.

The **yellow-spotted millipede** (to about 2 inches in length) glows under ultraviolet ("black") light.

Like many millipedes, it can give off odiferous hydrogen cyanide when threatened.

(Millipedes are sometimes called "thousand-leggers."  
(A millennium is a thousand years and a millimeter is a thousandth of a meter). ~~But they do not have a thousand legs.~~

**News flash!** A new species of millipede, *Eumillipes persephone*, was discovered in 2020. It has over 1000 legs!

Similarly, centipedes don't have a hundred legs, even though there are 100 cents in a dollar and 100 centimeters in a meter.)

**photos:**

Yellow-spotted on sword fern from iNaturalist, by Franco Folini  
snake millipede on hand by Mike Roa  
Millipede in u.v. light from iNaturalist, by "Caenvsci"  
Centipede: from iNaturalist, by Suzie Rose



Centipede. Note one leg per segment.

BO-A-3

## CROWS and RAVENS

7+



Murder of crows harassing a raptor



American Crow



Ravens



Subadult raven.  
Note pink throat patch.

A bird that one is likely to see (and hear) at Armstrong is the **Common Raven**, although **American Crows** may also be present.

They are closely related and look much alike, but people sometimes want to know the difference.

Their beaks are shaped a little differently... the raven's is more stout, and it has more feathers on top.

Both birds have a wide variety of calls. The raven's calls, especially its "rattle," has a deeper sound, often mistaken for a woodpecker.

Both crows and ravens are often seen in pairs of a male and a female. A flock of crows is called a "murder." Crows and ravens often will chase or harass raptors such as hawks.

There are a variety of online sites where one can listen to bird calls. The best site for all things avian is Cornell University's Ornithology site:

<https://www.birds.cornell.edu/home/>

photos: Ravens: Leslie Carrow

from iNaturalist: crows and raptor by Elizabeth Praetz

individual crow and head by Robert Webster





The **acorn woodpecker** grows to between 7.5 and 9 inches in length.

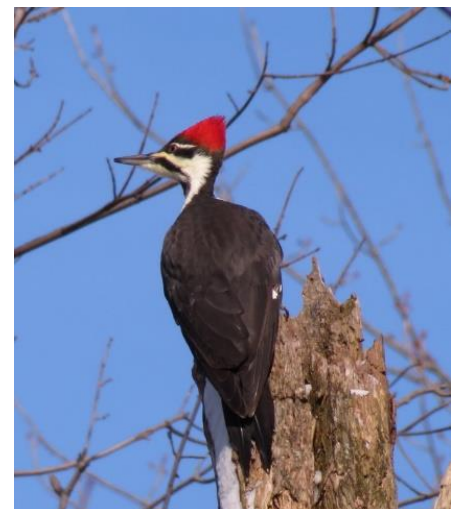
The acorn woodpecker makes holes in trees and stores acorns in them. This is called a granary.

As the acorns dry out and shrink, the birds will sometimes switch them to another hole where they will not fall out.

They use both the acorn “meat” and insects that feed on the acorns for food.

The granary log is beside the Discovery Trail.

The **pileated** woodpecker (right) is also found in Armstrong woods, but is more often heard than seen.



**photos:** Acorn Woodpecker picture is from Flickr by Mark Gunn  
Pileated Woodpecker from iNaturalist, by reuvenmarten  
Log by Mike Roa

BO-A-5

STELLER'S JAY and SCRUB JAY

7+



**Steller's Jay** (*Cyanocitta stelleri*) to 13" long  
People will sometimes call this a "Blue Jay," but true blue jays are found east of the Mississippi.

Quickly becomes accustomed to people in campgrounds and may hang around looking for food.

**Ca. Scrub Jay** (*Aphelocoma californica*) to 12"  
More common in Armstrong than the Steller's Jay. The blue coloring is often muted.

Often feed on acorns, which they may bury for future use, thus helping to spread oak trees.

**Credits:** both photos from iNaturalist. Steller's Jay by Stephen Matthews Scrub Jay by Dario Taraborelli

BO-A-5

OREGON JUNCO and PACIFIC WREN

7+



**Oregon (Dark Eyed) Junco** (*Junco hyemalis*) 5.5"  
aka Pink-Sided Junco. The female doesn't have the contrasting black head and gray chest.

Generally a ground-dweller and ground-feeder. Flocks often move through the forest feeding on insects and seeds on the ground.

**Pacific Wren** (*Troglodytes pacificus*) 4"  
Look for the short tail, often sticking up. Until recently (2010), this common bird was considered to be the same species as the Winter Wren.

Male may build several nests. The female may "inspect" them and finally select one to use.

**Credits:** both photos from iNaturalist. Oregon (Dark Eyed) Junco by Megan Ralph Pacific Wren by Craig Martin



BO-A-6

COLUMBIAN BLACK-TAILED (MULE) DEER

ALL



There are several subspecies of mule deer in California. The one found in Armstrong is the **Columbian Black-tailed Deer**.

Deer generally spend their time in the prairies (grassy openings) on the hillsides, but sometimes come into the forest. They may be looking for water or feeding on tender vegetation.

Females (does) and fawns are commonly seen in Armstrong Woods; males (bucks) are rarely seen.

The antlers of the bucks in the photo are covered in “velvet,” which forms on the new antlers that grow in late Spring. (The photo was taken in June near Lake Tahoe.) By late summer or early fall the velvet has been shed by rubbing on bushes and trees.

The antlers themselves are shed in January or February.

Since hunting is not allowed in Armstrong, the deer are wary but not terribly skittish.

People should never feed deer because our food is not good for them and we don't want them to become too used to humans.

Also, deer can seriously hurt people with their sharp hooves.

The Columbian Black-tailed deer grow to a little over 3 feet tall and 4-5 feet in length.



**photos:** Bucks from iNaturalist, by Donna Pomeroy (photo taken in the Lake Tahoe area)

Doe in the redwoods by Greg Corby

Doe on hillside near Stewards Volunteer Office by Leslie Carrow

## BO-F&L-1



## Some FUNGI



7+



### Turkey Tail

The scientific name of the Turkey Tail is *Trametes versicolor*. It is so-named because the color is quite variable. It is **not considered edible**, but it some medicinal properties. Most of the Turkey Tail mushrooms that you will see at A.R. are the "real" ones.

**Credits: top two:** Mike Roa Lower left: Nina Lowrey  
Lower right: from iNat. By Rambryum

### Above: False Turkey Tail

There are several species of "False Turkey Tail." Some have smooth ventral surfaces; others have gills. Some are white and some are orange. Some curl upward to form "cups."

**Credits:** Top two: from iNat. By pynklynx  
Bottom: from iNat. By Austin Pursley



### White Coral Fungus

Considered mycorrhizal. (provides nutrients to trees). Some are **toxic**.  
**photo:** by Mike Roa



### Felt-ringed Agaric Fungus

**Toxic**

When it emerges from the ground, the cap is convex. It flattens as the mushroom matures. The color changes from a pinkish brown to a reddish gray when mature.

**photo:** Mike Roa



BO-F&L-2

## CRUSTOSE LICHENS

7+



As the name implies, crustose lichens form a low mass or crust, often on rocks and sometimes on trees.

“Dust Lichens” often give redwood bark a gray-green coloration that appears dust-like from a distance.

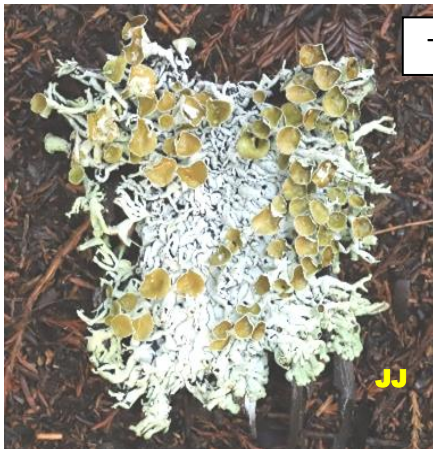
And speaking of crusty jokes, don’t forget that ***Freddy Fungus and Annie Algae took a lichen to each other!***

Photos by Mike Roa

BO-F&L-3

## FOLIOSE LICHENS

7+



Tube Lichens



Lichens are made up of fungi and algae (and sometimes certain bacteria). The fungus provides shelter for the alga and the alga provides nutrients for the fungus. Foliose lichens have broader, less stringy forms than Fruticose lichens. (Think "foliage"... leaves.)

Tube lichens form tubes.

**Photo Credits:** from iNaturalist, by Julene (JJ) Johnson

**BO-F&L-4**



above:  
**Old Man's  
Beard**

**FRUTICOSE LICHENS**



**Beard Lichen**

**7+**



**Methusela's Beard**  
(a rare lichen found in  
Armstrong Redwoods)

Photos: by Mike Roa

Lichens are made up of fungi and algae (and sometimes certain bacteria). The fungus provides shelter for the alga and the alga provides nutrients for the fungus.

Fruticose lichens grown in stringy masses.

As the name implies, beard lichens often hang from branches in beard-like masses. The lichen in the upper left picture is called "old man's beard." It is more commonly found on Douglas-fir and oak trees than on redwoods.

Beard lichens have a core made of the fungus' mycelia that can be stretched a bit, like a rubber band (if they aren't too dry).

Methuselah's Beard is a beard lichen that grows as a single strand. It is rare, but it is found in Armstrong Redwoods on some trees by the front parking lot and on some oak trees along the road above the picnic area.