

# CALIFORNIA STATE PARKS



Armstrong Redwoods State Reserve  
Austin Creek State Recreation Area

## Docent Manual

Developed by Stewards of the Coast & Redwoods  
Russian River District State Park Interpretive Association

# Armstrong Redwoods

*Preservation and Protection through Education*

## California State Parks/Russian River District

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## **Part I**

# **California State Parks System and Volunteers**



## THE CALIFORNIA STATE PARKS SYSTEM

### INTRODUCTION

The State Park concept is generally believed to have started in California in 1864 when President Abraham Lincoln signed an Act of Congress transferring the areas then known as the Yosemite Valley and Mariposa Grove of the Sierra Redwoods to California. In 1905, however, these lands were returned to the federal government.

Three years earlier, in 1902, the present California State Park System was begun with the establishment of the California Redwood Park at Big Basin in Santa Cruz County. It is only fitting that one of our state's proudest possessions – the magnificent coast redwood (*Sequoia sempervirens*) – should have provided the inspiration for the creation of California's first park.

Today, with nearly 300 units, California has one of the largest and most diversified park systems in the nation. Represented in those units are outstanding examples of the state's unique scenery, including redwoods, deserts, historical units, scenic reserves, recreation areas, and mountain parks for the public to enjoy.

The California Department of Parks and Recreation acquires, designs, develops, operates, and maintains units of the State Park System. The activities are directed toward the accomplishment of eight principal objectives:

1. Secure and preserve elements of the state's outstanding landscape, cultural, and historical features.
2. Provide the facilities and resources that are required to fulfill the recreational demands of the people of California.
3. Provide a meaningful environment in which the people of California are given the opportunity to understand and appreciate the state's cultural, historical, and natural heritage.
4. Maintain and improve the quality of California's environment.
5. Prepare and maintain a statewide recreational plan that includes an analysis of the continuing need for recreational areas and facilities and a determination of the levels of public and private responsibility required to meet those needs.
6. Encourage all levels of government and private enterprise throughout the state to participate in the planning, development, and operation of recreational facilities.
7. Meet the recreational demands of a highly accelerated, urban-centered population, through the acquisition, development, and operation of urban parks.
8. Encourage volunteer service in the State Park System.

## **OBJECTIVES OF THE VOLUNTEER PROGRAM**

Why should we have a volunteer program?

1. Parks are suffering from insufficient staffing.
2. Parks are suffering from insufficient funding.
3. To take advantage of talent available through volunteers.
4. Add life to our program/park.
5. Gives people a chance to participate.
6. Helps build community support for the park system.
7. Enables us to offer services we wouldn't otherwise be able to do.
8. Enriches the experience of park visitors.

Why do people volunteer?

1. Feeling of contributing
2. Try it, you'll like it
3. Positive use of leisure time
4. Self esteem, prestige
5. Gain skills
6. Form of recreation
7. School credit
8. Social interaction
9. Support for a cause
10. Input into a program
11. Chance to relax
12. It's fun!

What volunteers can do in the Russian River District State Parks.

1. Conduct historical tours.
2. Lead nature walks.
3. Answer visitors' questions.
4. Perform needed research.
5. Assist with special projects and events as needed.
6. Assist with maintenance and housekeeping tasks.
7. Catalog and audit artifacts.
8. Type reports, newsletters, fliers, etc.
9. Help with mailings.
10. Assist with publicity.
11. Staff the Visitors' Centers.
12. Photography.
13. Assist in making exhibits and displays.
14. Campground host.
15. Assist with preservation and restoration projects.
16. The list can continue as long as our imagination and energy can.

## **ROLE AND FUNCTION OF VOLUNTEERS IN THE STATE PARKS SYSTEM**

Volunteers are trained but unpaid staff members of the State Park System who perform a valuable function by augmenting park staff in providing increased services for the visiting public. Volunteers perform a variety of tasks and assignments throughout the State Park System, including giving tours, assisting with fundraising, working in visitor centers, and maintaining trails and resource management projects.

Many of our volunteers in this district are also members of Stewards of the Coast and Redwoods (Stewards), the cooperative association for the Russian River District. Membership in Stewards is a personal choice and is not required in order to volunteer; however, many volunteers find a great deal of satisfaction in their involvement with the group.

### **VOLUNTEERISM DEFINED**

1. You are an unpaid staff member of the state and will not receive pay or goods for work performed.
2. All of your service will be on a strictly voluntary basis, and you cannot be required by park staff or anyone else to do any work that you do not wish to do.
3. You will be covered by Workers' Compensation Insurance in the event you are injured while working in the park. For this condition to be valid, you must first complete and submit to your District Superintendent, the Volunteer Record and Service Agreement (DPR 208). You will be covered by the same policies as regular employees regarding liability.
4. A number of state and federal tax benefits are available for volunteers. You may be able to deduct some unreimbursed expenditures made while serving the department, such as automobile mileage, bus and cab fare, parking and toll fees, cost of meals and lodging if away overnight, travel expenses above per diem allowance, and expenditures for special uniforms or costumes.

## RESPONSIBILITIES OF VOLUNTEERS

1. We must know ourselves, our personalities, our strengths and our weaknesses. We must acknowledge the extent of our dedication to the subject matter, the park unit, and the community, and then make commitments that we can keep.
2. We should maintain a professional attitude, keeping a mature outlook that does not reveal personal opinion or personal problems. We must be sure to carry out, in a willing manner, the responsibilities that are assigned to us.
3. We must learn the educational philosophy of the state park system.
4. We should understand how different people learn, since conducting programs, is, in fact, teaching.
5. We should understand park visitors, their general intellectual abilities, their limitations, and their possible physical disabilities.
6. We should understand all facets of interpersonal communication skills, and adapt our bodies and minds to the task of getting our message across.
7. We must know our subject.
8. We must have detailed information about the specific subject or exhibit we are touring.
9. We should have interpretive strategies that will enable us to know exactly how to get a point across.
10. We should be ready to change direction or react to an unexpected situation whenever problems arise.
11. We should be gracious, friendly, and warm with all visitors.

Adapted from The Good Guide, by Alison L. Grinder and E. Sue McCoy, Ironwood Press, Scottsdale, AZ, 1985.

## VOLUNTEER STANDARDS

State Park Volunteers are members of the park staff within the Russian River District. As a volunteer, you are expected to conduct yourself in a manner that reflects pride in yourself and in the State Park System and adheres to a standard of conduct. In order to operate the interpretive program efficiently, all volunteer staff members must adhere to certain rules, procedures, and standards. The following information is intended to give you some guidance along these lines. Volunteers who display an unwillingness to conform to these standards will be asked to leave the program.

### 1. PUNCTUALITY

Plan to arrive at your committed shift location on time.

### 2. DEPENDABILITY

You will be asked to make a voluntary commitment of time so a reliable schedule can be followed. If an unforeseen emergency arises, notify the volunteer coordinator at once. Remember, promptness and reliability are crucial! Teamwork and cooperation keep our volunteer program alive!

### 3. APPEARANCE

You must be neat and clean in appearance when acting in a public function. Wear the approved volunteer badge when volunteering with the State Park System.

### 4. ATTITUDE

A pleasant and professional attitude is all important. All visitors are guests, and it is a primary responsibility to see that their visit is pleasant, enjoyable, and safe. Sincere concern and friendly interest should characterize staff dealings with all visitors. The public expects and deserves always to be treated in a courteous and professional manner. If a visitor comes to you with a complaint, explain to her/him what action you can or cannot take and report the matter promptly to a ranger. If a visitor asks you to identify yourself, do so.

Above all, never give false information or misleading information to the public. **If you do not know the answer, do not be afraid to say so**, but try to be well-informed and helpful. Avoid any public criticism of the State Parks Department, staff, or policies when performing volunteer duties. If there is something you disagree with, discuss it with the volunteer coordinator or the supervising ranger.

Your pleasant and professional attitude should also extend to your fellow volunteers. You must have a willingness to work as a team member

with other volunteers, as well as with park staff. Special privileges or separatism should not be expected and will not be tolerated.

## 5. BEHAVIOR

Immoral conduct, the illegal use of drugs, reporting to work with alcohol on the breath, being drunk or drinking alcohol on duty, or commission of a crime are all expressly prohibited and will result in your being asked to leave the program.

It is your responsibility to treat your co-workers and park staff with courtesy and respect; to obey all lawful orders; to report to the park on time and ready to work; and to remain alert while on duty. It is not proper to listen to music, play cards, or perform other such activities in view of the public. Keep private visiting to a minimum when the public is present. Do not use public contacts as a soap box for your private views.

## 6. AUTHORITY

It is important that all volunteers be familiar with park rules and regulations. **Never give false or misleading information to the public.** Diplomatically remind visitors of park regulations when appropriate, but leave enforcement to ranger staff. You are, of course, expected to personally comply with all park rules and regulations.

## 7. CONFIDENTIALITY

Certain information of which you may become aware is confidential and should not be discussed outside the organization. Confidential information includes such things as crime and incidents, rescue and accident reports, disciplinary actions, employee grievances, budget proposals, and proposed policy changes. If you are questioned on these matters, politely but firmly refer the questioner to park staff.

## 8. ABILITY

You are required to read this manual in order to become familiar with the basic information. It is important that all volunteers know and adhere to a certain "standardization of facts" for a consistent interpretive program. A fact stated as a fact must, in fact, be a fact!

A story, legend, or conjecture may be included in your presentation, but it must be clearly identified as such. **Admit, "I don't know," rather than relate misinformation!** Don't change from interpreting facts to personal showboating. Let your visitor be your guide to the direction of your interpreting.

A satisfactory speaking voice and the ability to communicate well are basic requirements for effective interpretation. Park staff will assist you in your interpretive efforts. It is important that you possess the ability to accept constructive criticism for reasons of self-improvement. All volunteers are encouraged to repeat training sessions as a refresher and to assist in sharing information and experiences as a volunteer.

Further, to enhance interpretation in the District, we would like to encourage all volunteers to become members of Stewards of The Coast and Redwoods. Membership is not required, but it is desirable in order to share information and keep updated about current activities in the Mendocino/Russian River District.

## THE PARK VISITOR

### Caring about Park Visitors implies that:

All park visitors are entitled to your help without discrimination or distinction as to race, color, creed, whether they are famous or humble, young or old, athletic or handicapped, male or female, thoughtful or thoughtless.

Even when you're tired and people seem demanding and exasperating, you'll be cheerful, patient, and courteous.

You care about your appearance whether you're in uniform or costume. Neatness and cleanliness are important criteria here. It would be unfortunate if the visitor's attention is drawn more to the way you smell than to what you're talking about.

You realize the appropriateness of courtesy. This is especially important when handling controversial matters such as the energy crisis, treatment of slaves, the importance of John Brown. Park visitors should not be "put down" when they ask what seems to you to be stupid questions. Starting and ending an event on time is one tangible way of showing courtesy as it indicates a respect of another's time.

It will be important for you to be available, approachable, sharing, and patient. You'll need to reach out to people, to start the communicative process.

It is also assumed that you are gifted with imagination, resourcefulness, originality; that you'll be sincere and enthusiastic; that you have a sense of humor that will help keep things light and in perspective; that you'll search out the facts and weave them together into a meaningful whole; that you'll understand the goals of interpretation and strive to accomplish them.

You're beginning to sound like quite a person. You are!! It's important for you to have self-confidence, but also to be aware of the dangers of conceit. You're expected to show leadership without being overbearing, authoritarian. Quiet, gentle, but firm leadership is generally most appropriate.

**Part II**

**Armstrong Redwoods State Reserve**

**and**

**Austin Creek State Recreation Area**



## **Armstrong Redwoods State Reserve Austin Creek State Recreation Area**

### QUALITY OF SERVICE TO THE VISITOR

About 1 million visitors from all over the world come to Armstrong Grove and the Austin Creek State Recreation Area each year to seek pleasure, inspiration and beauty in a natural setting. It is critically important that we, their hosts and custodians of the parklands provide them with accurate information. This information packet is not meant to be all-inclusive. You will be asked questions which you are not prepared to answer. Please remember this cardinal rule:

**IT IS ALWAYS BETTER TO SAY "I DON'T KNOW" THAN TO "GUESS" AND GIVE BAD INFORMATION WHICH COULD RESULT IN A VISITOR HAVING AN UNPLEASANT OR UNSAFE EXPERIENCE.**

Information is only useful when it is accurate and current. If you are in doubt, don't give the visitor advice which you are not absolutely sure of. Very unfortunately, we have had visitors injured, become lost and even be arrested because they received bad information and acted on it.

#### So what do you do when you are asked a question you cannot answer?

- Check the printed information we provide you and that which is kept in the Visitor Center.
- Call the ranger Station or Kiosk at 869-2015 and ask one of the paid staff.
- If no one is at the ranger Station or Kiosk, call 865-2391 between 8:00 AM and 4:30 PM, Monday through Friday to ask one of the District Headquarters staff.
- Take the name and phone number/ mailing address of the visitor and assure him/her that you will refer the question to paid staff when they become available.

## **What to do in case of the dreaded “What if ?!?!”**

### IN CASE OF ANY TYPE OF EMERGENCY, REPORT OF ACCIDENT, CRIME, FIRE, MISSING/LOST PERSONS OR REQUEST FOR FIRST AID/MEDICAL TREATMENT

Immediately contact paid staff. Do not take independent action. Keep the reporting party with you and wait for direction from paid staff. If no paid staff are immediately available for you to notify (not in the ranger Station or Kiosk) CALL 911 if you can access a land line.

#### **If calling from a cell phone call**

**1 916-358-1300**

This is the central dispatch phone number, they will contact a ranger by radio who will respond to whatever situation exists. This is the best and most effective way for you to help us to help others in case of emergencies.

YOU WILL NEVER BE FAULTED FOR REPORTING AN EMERGENCY OR OTHER CRITICAL INCIDENT WHICH DOES NOT IN THE END PROVE TO BE AN ACTUAL EMERGENCY. WE WILL HOWEVER BE VERY CONCERNED WITH ANY STAFF MEMBER WHO DOES NOT MAKE SUCH A REPORT TO THE RANGER STATION STAFF OR 911 AS SOON AS POSSIBLE.

We have tremendous responsibility for visitor safety and protection of the natural resources – it is always better to be safe than sorry. Don't hesitate to report your concerns!

# **911**



## STATE PARK RULES AND REGULATIONS

“THE BEST OF CALIFORNIA FOREVER” – with your help and cooperation. It is very important that the park visitor is given this message. Parks are for people to use and enjoy, not abuse and destroy. Without protection, the highly perishable values of these areas preserved in the California State Park System could soon be destroyed.

In many cases, park protection can be accomplished by interpretation of park philosophy, policies, and rules and regulations. Enforcement becomes necessary if and when other means prove insufficient. Many people who misuse or abuse a park area or facility do so only through thoughtlessness or ignorance. It is usually sufficient to bring to their attention the permanent nature of the damage resulting from improper use.

Though some may resist compliance because of lack of understanding, it isn't often that a simple explanation of the reasons behind the rules will fail to obtain willing cooperation. However, there is a small percentage of visitors who, once they understand the “why”, will continue to resent or resist the regulations. They will require special attention and probable enforcement action.

As a volunteer, you may encounter situations where you must decide whether a visitor's actions merit only an explanation of a rule or more formal action. If enforcement action is indicated, or a public relations problem seems imminent, remember that State Park rangers have peace officer authority. Do not threaten or try to bluff a visitor. Never hesitate to call upon a ranger for guidance or assistance in any situation that threatens to become a problem.

Every volunteer is charged with the responsibility of observing and recognizing any acts that may constitute potential hazards to the safety of people or property. Such acts should be reported promptly to a ranger or supervisor. This will permit effective action to eliminate the hazard. It will also help forestall or minimize any liability in case of an accident.

It is important that each volunteer read and become familiar with rules and regulations of the State Park System, especially those that apply to Armstrong Redwoods State Reserve and Austin Creek State Recreation Area. The following is a summary of some of the more commonly seen violations:

ANIMALS: No person is allowed to hunt, injure, or otherwise disturb any animal within the park's boundaries. Exception: Fishing in Bullfrog Pond is permitted per State Fish and Game regulations.

COLLECTING: Living and non-living things are protected within state parks, including all plant life and down-wood.

GEOLOGICAL & ARCHAEOLOGICAL FEATURES: Such features are protected from activities including removal, disturbance, injury, disfigurement, defacement, destruction, or mutilation.

PETS: Animals must be kept leashed and under control at all times within a State Park unit. All trails are closed to dogs in Armstrong Redwoods State Reserve and Austin Creek State Recreation Area. Dogs are allowed in the picnic area and Bullfrog Pond Campground, and must be on a leash at all times.

FIRES: Fires are allowed only in designated areas, such as the picnic area, fire pits and campgrounds. Campgrounds are subject to fire closures during periods of extreme fire danger.

FIREARMS & WEAPONS: Regardless of the intention of their possession, it is illegal to possess or carry any weapon capable of causing injury.

LITTER: Disposal of any item, other than in a proper trash receptacle, is prohibited.

CLOSED AREAS: Because of significant dangers to the public, or the fragile natural habitat, certain areas are closed to public access at the discretion of the District Superintendent. Please stay on designated trails and roadways.

OFF-HIGHWAY VEHICLES: No vehicles are allowed off-road in a State Park, and all vehicles must be registered through DMV for use on roads.

HORSES: Horses are not allowed on trails within the grove at Armstrong Redwoods State Reserve. Horses are allowed on the roads of Armstrong Redwoods and all trails and roads in Austin Creek State Recreation Area (weather permitting).

CAMPING: Camping is allowed only in designated campgrounds in Austin Creek State Recreation Area, which include the Bullfrog Pond Campground and the three backcountry sites: Tom King and Mannings Flat. Camping is prohibited in Armstrong Redwoods State Reserve.

JUVENILES: No campers under the age of 18 are permitted without a parent or guardian, or without written permission from a parent or guardian.

VEHICLE OPERATION: All rules of the road, as defined by the California Vehicle Code, apply in State Parks.

CRIMINAL ACTIVITIES: Any activity that is defined as criminal through the California Penal Code is illegal within a State Park unit. Other violations that also apply include all alcohol-related regulations.

PUBLIC RESOURCES CODE: The Department shall protect the State Park System from damage and preserve the peace within. Any person who violates the rules and regulations may be cited. Notify park staff of any violations you witness.

# PARK RULES

- Park closed from one hour after sunset to 8:00 a.m. daily.
- Payment required for all vehicles taken into the Reserve. Parking is free in the front lot or along Armstrong Woods Road south of the Park entrance.
- All Park features are protected. Do not disturb, damage or remove any plant, plant material, soil, mammal, reptile, insect, bird, other animal life or natural feature.
- Horses allowed on all trails except the Pioneer/Nature and Discovery trails.
- Bicycles allowed only on paved surfaces and service roads.
- Dogs must be kept leashed and remain on paved roads.
- Special permit required for events in Austin Creek State Recreation Area and to reserve the group picnic area in Armstrong Woods, contact District Office, 707-865-2391 to obtain permit.
- If in doubt about the lawfulness of any activity, please check with ranger staff first or call District Office, 865-2391

AUTHORITY: TITLE 14, CALIFORNIA CODE OF REGULATIONS

# DAY USE ACTIVITIES

- **HIKING:** Short, easy strolls through the redwoods or challenging day long hikes through rugged Austin Creek are available to suit every hiker's mood and level of conditioning. Suggested hikes and trail maps are available from the Visitor Center or ranger staff.
- **PICNICKING:** Armstrong Grove's coolly shaded picnic area is 3/4 miles from the park entrance. Tables, grills, water, restrooms and specially designed picnic sites for the handicapped are available. A large group picnic area, "Smokey's Den" is available by reservation.
- **OUTDOOR EDUCATION:** Armstrong Grove's volunteers provide guided walks and natural history talks for school groups and other organizations. Please contact Stewards of the Coast and Redwoods (707) 869-9177 for further information.
- **HORSEBACK RIDING:** Enjoy the 20+ miles of ridge and backcountry trails open to equestrian use. Privately operated Armstrong Woods Pack Station offers experienced and novice riders a carefree half-day ride. Knowledgeable owners Laura and Jonathan Ayers lead these rides. Call (707) 887-2939 for information and reservations.
- **FISHING:** All of Armstrong's and Austin Creek's streams are steelhead spawning habitat and so are closed to fishing, but Bullfrog Pond is a wonderful family fishing spot for campers and day users. All Fish & Game regulations apply. Campsites at Bullfrog Pond are for campers only - please park in the overflow area and picnic on the grass outside of campsites.
- **MOUNTAIN BIKING:** Armstrong's and Austin Creek's trails are closed to bicycles. All of the paved roadways and the service roads are open for mountain bicycling. Cross-country/off-road bicycling will damage habitat and is prohibited.
- **BIRDING:** Black Shouldered Kites, Wood Ducks, Great Blue Heron, Osprey, Golden Eagle, Spotted Owl and Red Tail Hawks are a few of the many avian species found in the various habitats of Armstrong and Austin Creek. As well as natives and migrators, exotics such as wild turkeys are also found here.

# Armstrong Redwoods State Reserve and Austin Creek State Recreation Area

## Suggestions for walks and hikes

1. **Round Trip under a mile:** Parking lot to Armstrong Tree and Forest Theater along Pioneer trail or road and back. A short, easy stroll through the redwoods.
2. **A Little Longer:** (1.7 miles) Parking lot to Armstrong Tree and then to Picnic Area along Icicle Tree and Pioneer Trails. Back along Pioneer Trail or road, redwoods all the way.
3. **A 2.2 mile loop with a 400 foot climb:** Parking lot to Picnic Area by way of the East Ridge Trail. Back along road or Pioneer Trail. A moderate hike along a ridge shaded by firs, oaks and madrones with a stroll back through redwoods.
4. **A 2.3 mile loop – A bit more strenuous than #3:** Parking lot to Armstrong Tree and then up Pool Ridge Trail. Loop back to Picnic Area and return along the Pioneer Trail or road. A 500 foot steady climb with lots of switchbacks.
5. **A 3.3 mile loop – Definitely a hike:** Combine #3 and #4. Parking Lot to Picnic Area by way of East Ridge Trail. Then loop back along Pool Ridge Trail to Armstrong Tree and back to Parking Lot. Up 400 feet, down, up 500 feet and down again.
6. **A 5.6 mile loop with a 1100 foot climb:** East Ridge Trail from parking lot to Gilliam Creek trailhead, return along Pool Ridge Trail.
7. **A 9.0 mile loop:** East Ridge Trail from parking lot to Bullfrog Pond, along road to Gilliam Creek trailhead and return along Pool Ridge Trail.
8. **A 5.0 mile Back Country loop:** Elevation change of 1000 feet. Start at East Austin trailhead (park at Vista Point) to Gilliam Creek. Loop back along Gilliam Creek Trail and East Ridge Trail to Vista Point. (along the paved road is shorter).
9. **A 10 mile Back Country loop:** As in #8 but continue on East Austin Trail to Gilliam Creek service road and then loop back to Gilliam Creek Trail and back to Vista Point (along the paved road is shorter).

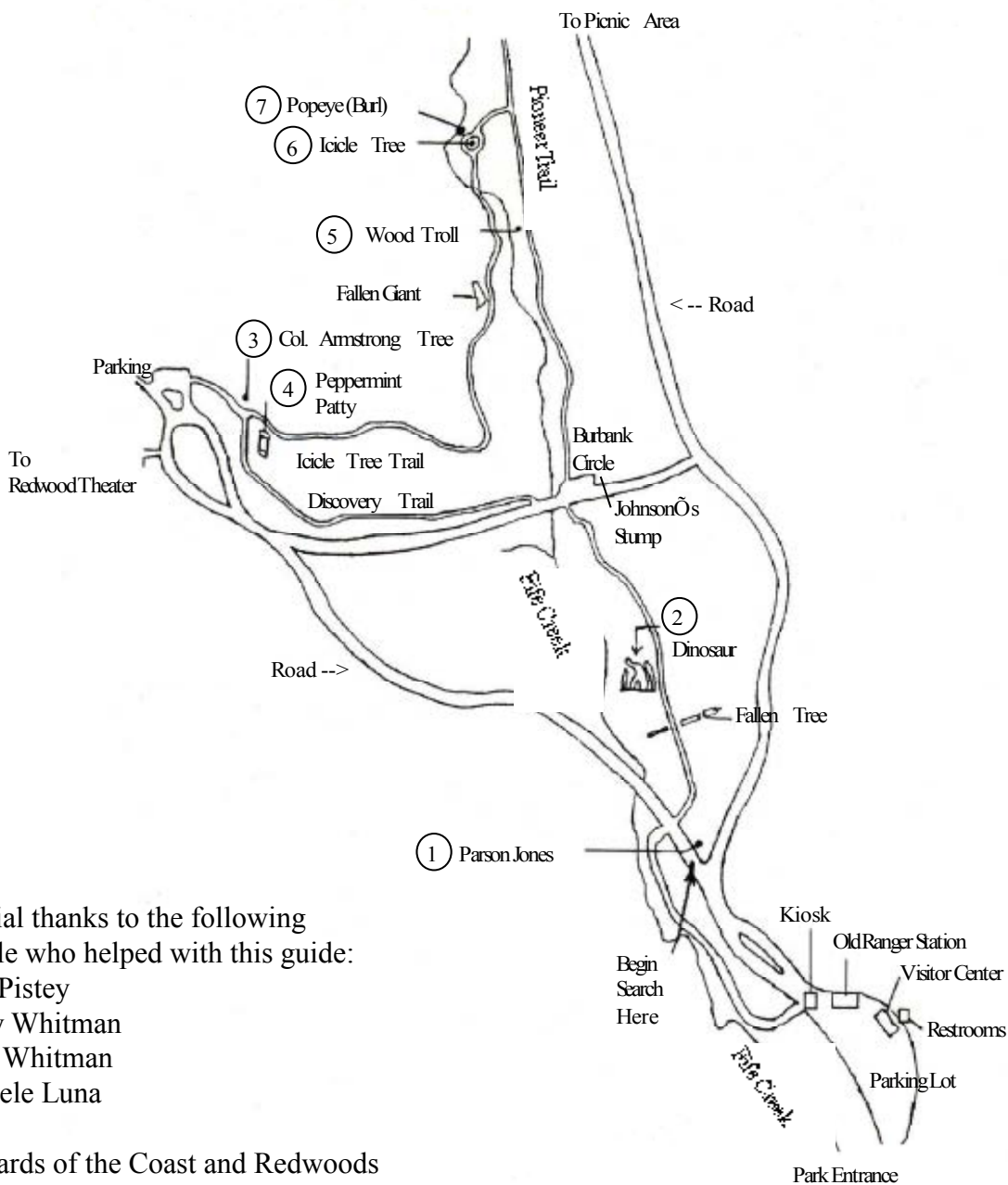
### Back Country Campsite Mileages:

Tom King Camp – 3.1 miles from Vista Point  
Manning Flat Camp – 4.1 miles from Vista Point

### Elevations:

Parking Lot	120'	Picnic Area	172'
Mannings Flat	293'	Gilliam Creek Trailhead	1200
Bullfrog Pond	1250'		
East Ridge Trail at Picnic Area Cutoff			500'

# Armstrong Redwoods State Reserve Children's Treasure Map



Special thanks to the following  
People who helped with this guide:

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[www.stewardsofthecoastandredwoods.org](http://www.stewardsofthecoastandredwoods.org)

Environmental Education Programs  
available for youth groups. Guided docent-  
led tours available for adult groups.

# Children's Treasure Hunt in Armstrong Reserve

## "Home of the Ancients"

Can you find us?

We will be looking for you!

1. I am the tallest tree in the Reserve (310 feet), longer than a football field. See me as you cross the road just before the tree slice on the nature trail. Can you find a place to see my top?
2. I am the Dinosaur. When you walk by me I look like tree roots standing up in the air. Because I am shy, you won't see me until you walk past me and turn around.
3. My name comes from a "Colonel" who used to own us, but wisely decided we were more important alive than dead. Besides, I am the oldest living thing in the Woods. (1400 years)
4. I am Peppermint Patty. If you walk too fast, you'll miss my smiling face at the end of a fallen log, right next to the trail. I am only 45 steps from the "Colonel."
5. I may look like an old tree stump, but I am the Wood Troll. I hang out just across the stream from the bend in the trail and guard the woods during the day. My eyes have a "rocky" look.
6. If you see my burls hanging down like fat icicles, you'll know that's me, the Icicle Tree, a friend of Popeye.
7. I am Popeye, hiding in a burl in a tree just behind the Icicle Tree. I live not far from the bridge where the Wood Troll sleeps at night.

How many did you find? See map on the other side.

**The Friends of Armstrong Redwoods hope that you had fun!** Please recycle this paper back to the Visitors' Center. Thank You.

Friends of Armstrong Redwoods (FAR) is a program of Stewards of the Coast and Redwoods, the nonprofit interpretive association working in cooperation with the California Department of Parks and Recreation in the Russian River Sector.

For information on memberships or volunteer opportunities with **Stewards of the Coast and Redwoods** please contact us at (707) 869-9177, [stewards@mcn.org](mailto:stewards@mcn.org), [www.stewardsofthecoastandredwoods.org](http://www.stewardsofthecoastandredwoods.org) or write, P. O. Box 2, Duncans Mills, CA 95430

ALL PARK FEES SUBJECT TO CHANGE

# CAMPING

Camping facilities are located in the Austin Creek State Recreation Area, and are accessible through Armstrong Woods State Reserve. Due to the nature of the road between the Grove and the campgrounds, traffic is limited to vehicles under 20 feet. Trailers of any kind are prohibited. Juveniles not accompanied by their parents must make arrangements with the ranger staff prior to camping. Seasonal fire closures may be in effect for either campground due to climatic conditions.

## **Bullfrog Pond Campground**

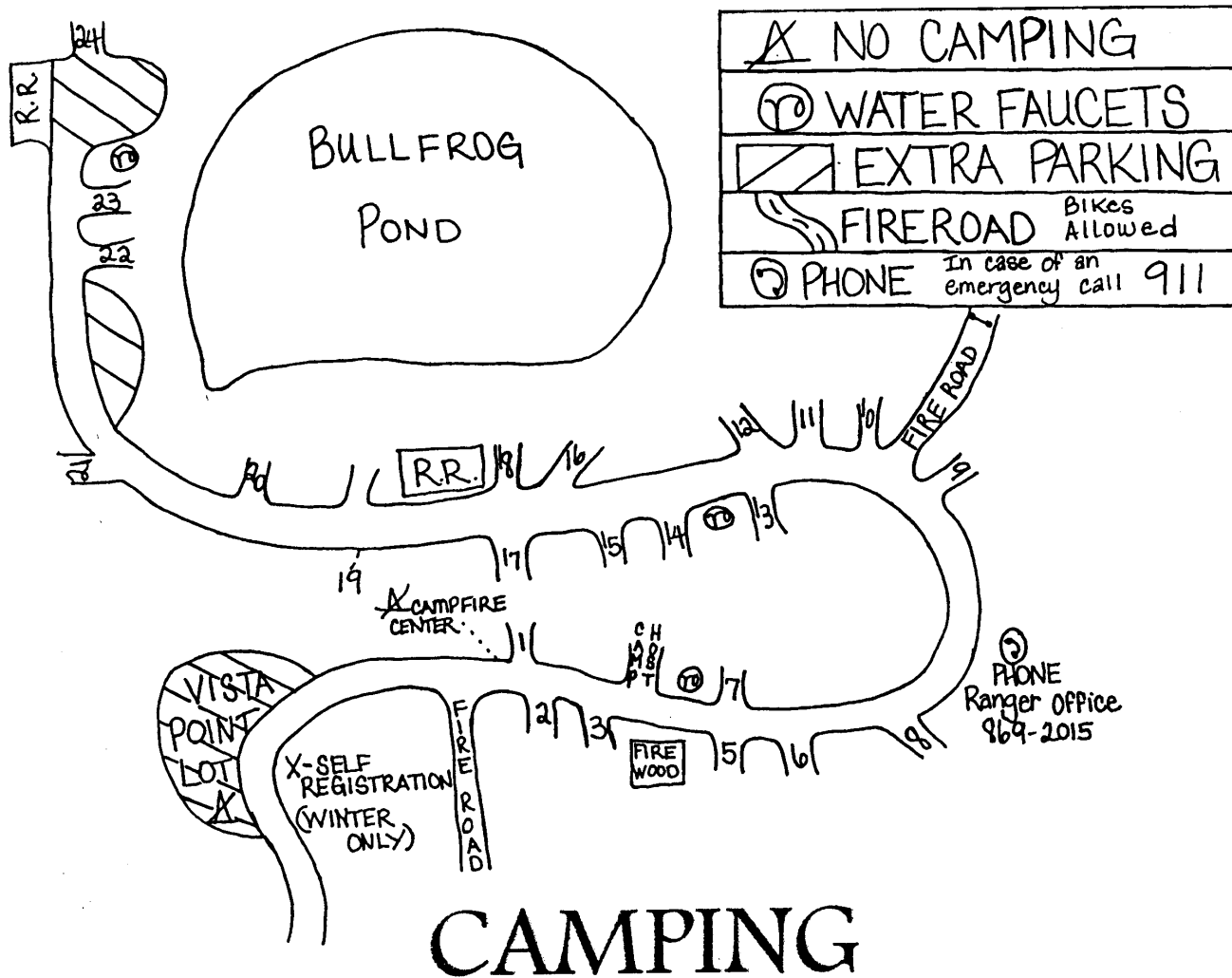
- Available year round on a first come, first served basis.
- Base camping fee is \$25.00 per night, Seniors \$20.00.  
2nd vehicles \$8.00, and dogs are free.
- Self-register at the campground.

## **Back Country Hike-In Camping**

Camping permitted only at the following designated sites:

Tom King Trailcamp (3.5 miles from trailhead)  
Mannings Flat #1 Trailcamp (4.5 miles from trailhead)  
Mannings Flat #2 Trailcamp (5.0 miles from trailhead)

- **Backcountry permit mandatory.** Contact Stewards staff to obtain permit.
- Subject to closure due to climatic conditions or fire danger.
- Base camping fee is \$25.00 per night. 2nd vehicle \$8.00 per night,
- Seniors \$20.00.
- No potable water supply. Must be prepared to purify stream water for consumption, or provide own water.
- No dogs, no motor vehicles, no hunting equipment, no fishing equipment and no firearms are allowed in the backcountry.



# CAMPING

In case of an emergency or campground disturbance call  
**911**

Camping is not permitted in Armstrong State Reserve  
Camping is permitted in Austin Creek SRA at the following location:

## Bullfrog Pond Campground

(accessible by passenger vehicle only)

- Σ No reservation- Available year round on a first come, first served basis.
- Σ Base camping fee is \$25.00 per night, Seniors, \$20.00, 2<sup>nd</sup> vehicle \$8.00 per night,
- Σ Juveniles not accompanied by their parent/guardian must make advanced arrangements with Ranger staff in order to camp overnight.
- Σ Access is via Armstrong Woods Rd., north from the picnic area. This road is very steep, narrow, and winding with two way traffic. For safety reasons the road between the picnic area and the campground is closed to vehicles over 20 feet long and to trailers of any type and size.
- Σ Self register at the campground from September 30<sup>th</sup>, through April 1<sup>st</sup>.
- Σ Campground is subject to fire closure during the summer months.

# You Can Help Save *Armstrong Grove*

Stay on designated trails and roads. “Volunteer Trails” compact the soil and destroy the understory plants of the forest. Redwood roots are shallow and the herbaceous plants are very delicate. The ecology of this precious forest may be irreparably damaged if traffic strays from the trailways.

Do not disturb the natural features. From the tiniest fallen leaf to the mightiest redwood, all parts of the Grove are interconnected within Nature’s plan and are dependent on one another for the well being of the whole. Take only memories, leave only footprints.

Make a contribution to the Habitat Restoration Project.

Restoration of damaged areas and prevention of further destruction is the goal of the Armstrong Grove Habitat Protection and Restoration Project. This vital project is entirely dependent on public donation. You can help make the project a success by becoming a “Friend of Armstrong Grove”, and making a tax deductible donation of any amount to:

Stewards of the Coast and Redwood’s  
**Help Save Armstrong Grove Fund**  
PO Box 2  
Duncans Mills, CA 95430  
(707) 869-9177  
stewards@mcn.org

*Please use this Grove and our Earth with Love and Wisdom,  
they are all that we have!*

## Special Events and School Group Visits

All special events within Armstrong Redwoods or Austin Creek require a special event permit. Anyone interested in a special event should contact the District Office, 707-865-2391.

A group picnic area (Smokey's Den) located in the Armstrong Redwoods picnic area is available for reservation by groups up to 150 persons. Call the District Office for current fee rates. Forms for reserving this area can be obtained from the District Office. No date will be held until all necessary paper work has been completed and required fees paid.

School groups interested in visiting the parks should submit a "School Group Reservation Request Form" to Stewards of the Coast and Redwoods. This allows the park to waive any fees for vehicle entry when the reservation is confirmed. The form also helps us to marginally protect the natural resources by limiting the number of groups on any given day and provides us with an opportunity to share critical park concerns with school staff. To assure staff/volunteer interpretive assistance (walks/talks), teachers must contact Stewards of the Coast and Redwoods in advance for preparation and scheduling. (707) 869-9177, email [stewards@mcn.org](mailto:stewards@mcn.org).

A special event permit is required for use of Austin Creek for events, (contact 865-2391). Listed below are possible alternative outdoor locations for such special events.

Northwood Lodge	869-2454
Salt Point State Park	847-3221
Sonoma Coast State Park	875-3483
Sugarloaf Ridge State Park	833-5712



Armstrong Redwoods State Reserve
17000 Armstrong Woods Road
Guerneville, CA 95446

ARMSTRONG REDWOODS STATE RESERVE
EDUCATION PROGRAM RESERVATION FORM

Docent Guides YES NO (Circle one)

School Information

Name: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_

Grade/Age: \_\_\_\_\_ # of Students: \_\_\_\_\_

Lead Teacher: \_\_\_\_\_

Email Address: \_\_\_\_\_

Visit Information

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Alternate Date: \_\_\_\_\_ Alternate Time: \_\_\_\_\_

Number of Buses: \_\_\_\_\_ Number of Cars: \_\_\_\_\_

No. Adults: \_\_\_\_\_

Educational Objectives: \_\_\_\_\_

Admission fees will not be charged for students (K-12), accompanying teachers, and adults when reservation has been received and confirmed. Group size is limited to 60 students when docents are requested. A limit of 10 autos and 2 buses per group is permitted. This request must be signed by the principal of the school where the students attend and must be in the possession of the leader on the day of visit (electronic signature acceptable for email). If more than one school is sending students to the proposed visit, the principal from each school must submit a request. The Department of Parks and Recreation reserves the right to combine tours when necessary and to limit the number of school groups per day to two.

CERTIFICATION

The above described visit is an official, educational, school outing or field trip and will be under the direction of the school personnel.

Signed: \_\_\_\_\_

Principal or Director of school

Submit forms to:

Stewards of the Coast and Redwoods

P. O. Box 2 • Duncans Mills • CA 95430

Fax form to: (707) 869-8252

Phone: (707) 869-9177 X03

Email: stewards@mcn.org

FOR STATE PARKS USE ONLY

[ ] We are pleased to confirm your participation for: Date: \_\_\_\_\_ With an arrival time of:
[ ] We regret that the date you requested for participation is not available. Please contact the office to set up an alternate date.

Approved/denied by: \_\_\_\_\_

Armstrong Redwoods State Reserve  
17000 Armstrong Woods Road  
Guerneville, CA 95446  
Phone: (707) 869-9177  
Fax: (707) 869-8252

School \_\_\_\_\_  
Attention \_\_\_\_\_  
Date \_\_\_\_\_  
Fax \_\_\_\_\_  
Number of pages \_\_\_\_\_

### RESERVATION AND FEE WAIVER INSTRUCTIONS

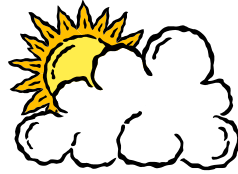
1. The group must be from a California licensed grade or high school (K-12).
2. Fee waivers are limited to 10 automobiles per school group and not available for weekends or holidays.
3. The group must have one adult for each 10 students.
4. Complete and submit the attached form to the above address at least 2 weeks in advance of your proposed visit. Forms may be downloaded from Stewards website: [www.stewardsofthecoastandredwoods.org](http://www.stewardsofthecoastandredwoods.org)
5. If you must cancel, please notify Stewards immediately so your time can be reassigned to another school.
6. Incomplete paperwork will delay the processing of your Reservation and Fee Waiver.
7. You may FAX your completed paperwork to the park instead of mailing it, if you prefer.

\*\*\*\*\*

In an effort to protect the fragile resources of Armstrong Redwoods State Reserve it is imperative that the school groups:

- *Stay on designated trails and roads.*
- *Do not disturb the natural features.*
- *For everyone's safety, keep children off the trail fencing.*

## *The Weather Page*



### What You Will Need To Bring:

- 1) Warm layered clothing including a windbreaker (maybe a raincoat).
- 2) Hiking shoes or boots for the trail.
- 3) Lunches in backpacks. There are no stores or restaurants in the park.
- 4) Name tags for each student.
- 5) Medical information for each student
- 6) Optional: Binoculars, camera & film

### Accessibility Considerations:

Please contact the park with any accessibility considerations

(707) 869-9177

Fax 869-8252

### On Site Tips:

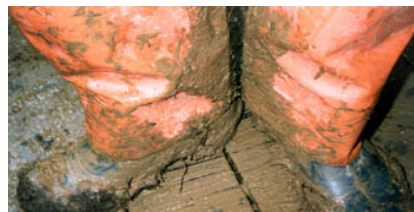
**Restrooms:** Are available at both the starting and ending points.

**Parking:** Free parking for school buses and cars is available in the front lot as long you have your reservation form signed by the park.

### Bad Weather Alternatives:

**The hike can be conducted in the rain. The final decision will be with the teacher and park interpreter. Students, teachers and parents need to provide their own rain gear. If the rain is not drenching, we will be able to conduct as much of the program as the students and teacher would like. There is no classroom space available indoors for the program or to eat lunch. If the weather is bad, the State Parks staff will be glad to reschedule the program if the teacher requests it. Call us at (707) 869-9177 after 8:30 am that day.**

**Remember: Please have the children dress in layers, so they are prepared for either cold or warm weather. It can be very chilly under the trees any day of the year at Armstrong Redwoods.**



**ARMSTRONG REDWOODS STATE RESERVE  
AUSTIN CREEK STATE RECREATION AREA  
PARK FEES**

Day Use:

Walk in / bicycle in	Free
Day Use (Drive In)	\$8.00 per vehicle
Drive in (persons 62 and over)	\$8.00 per vehicle
Drive in (with disabled discount pass)	\$3.50 per vehicle
Bus (10-24 passenger capacity)	\$50.00
Bus (25 or more passenger capacity)	\$100.00

Camping:

Bullfrog Pond Campground	\$25.00 per site
	\$8.00 per extra vehicle
Dog in vehicle	FREE
Back-country campsites	\$25.00 per site
NO DOGS ALLOWED	\$8.00 per extra vehicle

Note: For persons 62 and over there is one dollar discount for individual camping and a two dollar discount for family camping. The Disabled Discount Pass entitles the bearer to a 50% discount on camping fees and the Disabled Veterans Pass waives all camping fees as well as day use fees.

## **ANNUAL PASSES**

*The following passes are issued by the State of California, Department of Parks and Recreation or the California State Parks Foundation. Other agencies, i.e. Regional Parks, National Parks, etc. issue passes which are similar but which are not valid here or in other State Parks. If you have any question regarding the validity of any pass, refer it to the District Office..*

### **ANNUAL DAY USE PASS**

### **ANNUAL BOAT/DAY USE PASS**

- "PASS" is a misnomer. These two items are actually stickers which must be permanently affixed to the lower left hand side of the windshield of the vehicle. They are not transferable - they cannot be used for more than one vehicle.
- These passes cover vehicle entry fees only - they do not cover or reduce camping fees or other types of day use fees, i.e. dog entry.
- The ANNUAL DAY USE PASS is \$195.00. They are valid for 12 consecutive months from the date of purchase.

### **GOLDEN BEAR PASS**

- This is a true pass, i.e. a card issued to one person and that person's spouse, as opposed to one particular vehicle.
- This pass is available to persons 62 years of age or older provided they meet certain income limitations (see Ranger staff for GOLDEN BEAR PASS APPLICATION) or receiving aid to the aged, blind or disabled or to any person receiving Aid to Families with Dependent Children.
- The GB Pass covers day use fees for one vehicle but not other day use fees, i.e. dog entry, or camping.
- The GOLDEN BEAR PASS is \$5.00 per year. It is valid for 12 consecutive months from the date of purchase.
- The passholder must show picture identification when using the GOLDEN BEAR PASS.

### **LIMITED GOLDEN BEAR PASS**

- This is also a card issued to one person and that person's spouse. This card is available to anyone 62 years of age or older with proof of age, i.e. California Driver's License.
- This pass covers vehicle entry fees for one vehicle but not additional day use fees, i.e. dog entry, or camping fees.
- The LIMITED GOLDEN BEAR PASS is \$20.00 per year and is valid for one calendar year, EXCEPT DURING PEAK SEASON. Peak season is from the last Friday before Memorial Day through Labor Day.

**DISABLED DISCOUNT PASS**

This is also a card issued to a permanently disabled person by State Parks. The pass holder receives a 50% discount for the use of all basic facilities, i.e. day use and camping. The DISABLED DISCOUNT PASS Application and a \$3.50 one time payment are necessary for this pass to be issued.

**DISABLED VETERAN'S PASS**

Honorably discharged war veterans with a 70% or greater service-connected disability or a service-connected disability rated at 100% for reasons of unemployability are eligible for this pass. The pass holder may make use of all State Park facilities at no additional cost to the one-time \$3.50 payment. The payment and Disabled Veteran's Pass application should be mailed to the Disabled Veteran's Pass Program, P.O. Box 942895, Sacramento, CA 94296-0001. The Disabled Veteran's Pass Program will then issue the pass by mail.

**RUSSIAN RIVER/MENDOCINO DISTRICT DAY USE PASS**

This pass is issued by the Superintendent to persons who have made a significant contribution to our District. This pass typically covers only day use fees. If there is any question regarding the application of this pass, refer it to the Duty Ranger.

**CALIFORNIA STATE PARKS FOUNDATION PASSES**

The Foundation has two types of passes which we honor for day use only: a card which is issued to members and also individual use passes, about the size of a large postage stamp.

**AUTOMATIC SENIOR CITIZEN DISCOUNT**

For all persons 62 years of age or older, with age established by a Driver's License or other identification. This discount permits a \$1.00 discount on day use and a \$2.00 discount on family campsites year round.

**NOTE: THESE PASSES/DISCOUNTS APPLY SOLELY TO THE BASIC USE FEES. THEY DO NOT COVER FEES FOR DOGS, EXTRA VEHICLES, FIREWOOD, BROCHURES, ETC.**

IF YOU HAVE ANY QUESTIONS REGARDING THESE PASSES OR ANY OTHER PASS, PLEASE CONTACT THE DUTY RANGER.

## **Part III**

# **Interpretive Principles and Nature Guide Suggestions**



## WHY DO PEOPLE PARTICIPATE IN INTERPRETIVE ACTIVITIES?

While the reasons vary considerably, some would undoubtedly include the following:

- To learn something they otherwise wouldn't.
- To be with someone who will communicate with them – you.
- To make the unfamiliar, the familiar.
- To have an encore to a previous interpretive experience that was good.
- To satisfy one's curiosity.
- To experience bodily exercise while learning.
- To learn how to learn more.
- To meet other park visitors in a relatively intimate setting.
- To find new insights, relationships, relevancies.
- To relax.
- To have an aesthetically pleasing experience.
- To be touched, moved, inspired.
- To experience provocation as well as instruction.
- To appreciate the uniqueness of the park site.
- To find someone else to amuse the kids for awhile.
- To have their pictures taken with the interpreter to show folks back home how they spent their vacation.
- To be amused.

## HOW DO PEOPLE LEARN?

- People learn better when they're actively involved in the learning process.
- People learn better when they're using as many senses as appropriate. It is generally recognized that people retain about:
  - 10% of what they hear
  - 30% of what they read
  - 50% of what they see
  - 90% of what they do
- Each person has unique and valid ways of processing information and experience. New learning is built on a foundation of previous knowledge.
- People prefer to learn that which is of the most value to them at the present moment.
- That which people discover for themselves generates a special and vital excitement and satisfaction.
- Learning requires activity on the part of the listener.
- Friendly competition stimulates learning.
- Knowing the usefulness of the knowledge being acquired makes learning more effective.
- People learn best from first-hand experience.
- People learn best from an experience that is close to them in time and space.
- An organized presentation is more memorable than an unorganized one.
- Increasing the ways in which the same thing can be perceived helps people derive meanings.
- Questions can be effectively used to help visitors derive meanings.
- Giving visitors expectations at the beginning of an interpretive activity will focus attention and thus improve learning.
- Using a variety of approaches will enhance learning.
- The ways in which interpreters respond to people will affect their learning.

Interpreting for Park Visitors, by William J. Lewis

## **SIX PRINCIPLES OF INTERPRETATION**

**BY FREEMAN TILDEN**

1. Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile.
2. Information, as such, is not interpretation. Interpretation is revelation based on information. But they are entirely different things. However, all interpretation includes information.
3. Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is in some degree teachable.
4. The chief aim of interpretation is not instruction, but provocation.
5. Interpretation should aim to present a whole rather than a part, and must address itself to the whole rather than any phase.
6. Interpretation addressed to children (say, up to twelve years of age) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best, it will require a separate program.

## INTERPRETIVE PRINCIPLES

**Interdependence:** Emphasize the interdependence between people and nature, between any one bit of nature and all the other bits and pieces, and between historical facts and current interpretations thereof. John Muir said, “When we try to pick out anything by itself, we find it hitched to everything else in the universe.” This is called ecology. Historical events did not just happen in isolation but were linked to other events that the visitor may know about and relate to.

**Relate:** The interpreter must relate the subject (ecology, a particular plant, an historical event) to the personality or experience of the visitor. Therefore, the interpreter and audience must interrelate (connect their personalities and experiences) as soon as possible.

**Information:** Volunteers must have at least as good a command of the facts they are explaining as the average visitor. Knowing the facts does not in itself insure good interpretation.

**Values Awareness:** The values we hold influence how we treat the environment and each other. Why are trees important? Why are parks and recreation important? Searching for and discovering the answers promotes understanding.

**Sensory Awareness:** Having visitors describe what they see, hear, taste, smell, sense, and feel emotionally about an item interprets better than just asking them to see it, hear it, or feel it. We absorb information about the environment through our senses. Determine sensory awareness by eliciting responses and participation.

**Involvement:** A Chinese proverb, quoted in the DPR Interpreter’s Handbook, says, “What I hear, I forget; what I see, I remember; what I do, I understand.” Get the visitor to join you in doing things, not just listening and looking.

**Historical Perspective:** Everything in the environment, including us, has come from somewhere and has changed over time. How do these changes relate to the visitor?

**Stewardship:** When we begin to understand the environment and its relationship to us, we develop a sense of proprietary caring and desire to protect it. Stewardship is not for nature alone but is equally applicable to interpreting history, i.e., humans taking care or destroying humans.

**Enjoyment:** Having fun facilitates learning. This is scientifically established fact! Have fun and be sure the visitors do, too!

## **INTERPRETIVE PROGRAM OBJECTIVES**

1. To provide interest on the part of the listener. (To do this the interpreter must himself be interested and interesting to create an atmosphere that arouses curiosity).
2. To share your enthusiasm and pleasure. The desire to share with others something you think of value.
3. To present truth. To find and relate the basic truth behind the factual truth.
4. To make the tour meaningful by relating to the visitor's own experience.
5. To provide enjoyment. To probe and stimulate pleasurable responses for the visitors.
6. To become the vocal chord for the place.
7. To tie the visual experience with information.
8. To impart knowledge and elicit appreciation.
9. To point up the obvious that only becomes obvious when it is pointed out.
10. To help others understand not only the place but the things in it and the people who helped create it.

## SOME INTERPRETIVE OBJECTIVES

An interpretive program should contribute to a visitor's experience in three major ways: it should provide essential information and orientation services; facilitate the physical interaction of the visitor with the environment; and, foster an intellectual involvement of the visitor through a meaningful revelation of park values.

Major objectives of a program are to:

1. Provide essential recreation-related information necessary for the safe and enjoyable utilization of park resources and facilities.
2. Interpret the various elements of the story in a way which will emphasize the composite nature of environments and the importance of natural complexity and diversity.
3. Introduce visitors to the concept of nature as a dynamic process producing real and measurable by-products of importance to man, and that man's well-being is inexplicably tied to the health of the environment.
4. Develop imaginative approaches to interpretation that will encourage visitors to spend some time reflecting about meanings, values, and relationships.
5. Build "bridges of understanding" over which visitors – particularly young people – may freely move between the natural environment represented by the park and the synthetic environments represented by the school, the city and community, and the home.

Among the things that interpretive facilities and services should be designed to do are the following:

- Introduce visitors to the major ecosystems that comprise the park, and to communicate an understanding of their components and how they function.
- To begin to develop an appreciation for the natural complexity, diversity, and interrelationships that exist within those systems.
- Convey the idea that the real fascination of a park often lies concealed in its subtleties, and that it is outside, away from the insulation of the automobile and other human artifacts that a virtually endless array of interesting and meaningful discoveries can be made.
- Suggest that to more fully experience a park one should try to expand his awareness of the environment by being more openly receptive to the sensory impressions continually emanating from it – the sights, the sounds, the odors, the textures: to try to respond with the uninhibited and sharpened sensitivities of the child.

Ideally, interpretation of essentially intangible concepts should be approached through personal contacts with skilled field interpreters. Realistically, this cannot be expected to happen for the large majority of visitors. Interpretive facilities and services should at least begin a process of provocation and personal revelation.

Too often, interpretation of natural history relates to the rare and extraordinary, or involves the visitor with esoteric detail, not within his personal experience. The visitors' interest may be sparked by the display of things, which in spite of their prevalence, he may have little real opportunity of seeing. Indeed, the inference that he may see the same things "in-the-wild" may be quite strong. A certain animal or other subject of interest may well be common in the park; but by habit, choice of habitat, or location, it may be infrequently observed even by trained personnel. Interpretation ought to focus instead on the commonplace and unspectacular. Further, it should suggest that there are many other ways to "observe" things than by seeing them. It should do more than identify and instruct. It should encourage reasoned inquiry about fundamental concepts, and foster informed concern about environmental quality.

The effectiveness of an interpretive program will, in large numbers, be determined by the extent to which it is:

- **Intriguing** – does it excite interest and curiosity? Does it capture the visitor's attention?
- **Imaginative** – does it communicate in innovative ways, and does it stimulate new and different ideas or concepts? Does it cause the visitor to look at familiar things in different ways?
- **Involving** – does it invite or encourage visitor participation? Does it draw the visitor into intimate contact with things so that he is more than a spectator?
- **Informative** – does it convey meaningful information or new knowledge about the park and the kinds of places and things it represents?
- **Influential** – does it effect significant changes in visitor attitudes, and generate new ones?

While the magnitude and primitive character of the park may be formidable barriers to the passage of most visitors, it is always accessible at the expense of a little time and individual effort. An interpretive program should be designed to slow the pace of the visitor to encourage them to get away from roads and cars and into more intimate physical contact with the environment. It should cause the visitor to consider his inalienability from the rhythmic ebb and flow of nature – his relation to and dependence on the complex biogeochemical cycles which comprise his world. Finally, interpretation must establish obvious ties between the park and the contemporary life and times of the visitor. Lacking relevance, interpretation will be little more than an empty gesture.

## GUIDED WALKS AND TOURS

1. Always start on time! Don't penalize those who arrive on time by forcing them to wait for late arrivals. Arrive 5 minutes before.
2. Take Charge. Your voice and physical demeanor can effectively establish the proper relationship between you and your group. It can also lead to utter chaos. Don't be authoritative, but also avoid the appearance of timidity. Relax, but assume your rightful role as leader of the group.
3. During your warm-up, you met them individually. Now greet the group. Introduce yourself by name. Ask them to call you by your first name. Tell them what the walk will include and how long it will take.
4. Encourage introductions within the group. Try to get things on a first-name basis.
5. Invite everyone to join the trip.
6. Move out briskly to your first stop. This, again, helps to set your position as leader of the group. Try to make your first stop in sight of the starting point. In this way, late-comers may see you and still join you.
7. Then...set a moderate pace. An old rule of thumb says "adjust your pace to that of the slowest member of your group". However, don't permit someone to deliberately drag their feet to the dismay of your group.
8. Stay ahead of your group. This refers primarily to between stops. Obviously, there are times when you will want to walk back into the midst of your group in order to share discoveries with them.
9. Assemble your group before speaking. Allow everyone the benefit of your interpretation.
10. Be conversational...but, be heard. Try to establish an air of informality and sharing. Certain conditions may require you to shout. But, try to avoid these situations. It is difficult to shout and not sound authoritative.
11. Repeat questions, so all can hear. Nothing is so frustrating as trying to put an answer into context without the benefit of the question.
12. End your talk with a conclusion.

## Example: Developing a Walk (In Brief)

### Inventory

Mushrooms  
Shade  
Redwood Orchid  
Spider Hole  
Douglas-fir  
Fir Needles  
Banana Slug

### Facts

Mushroom	The decomposers, a parasite or saprophyte, doesn't manufacture chlorophyll, this is the fruiting body of the plant (that lives underground).
Shade	There are tall trees all around, a north-facing slope so not much sun reaches here, things staying cool and moist.
Redwood Orchid	One of the few wildflowers here, a perennial with bulblike rootstock, some orchids use scent to attract pollinating insects (to insure survival of their species).
Spider hole	The Turret Spider is a relative of the Trapdoor Spider, with a web-lined hole more than a foot deep, the "turret" keeps rain water from rushing inside the hole.
Douglas-fir	Named after the Scottish botanist David Douglas who explored in North America in the early 1800's. Note the 3-pronged bract on the cone or "mouse tail". Squirrels eat immature cones like we eat corn-on-the-cob.
Fir Needles	Known as forest litter or duff, like your cooling garden mulch in varying states of decay, a protective seed bed.
Banana Slugs	Are shell-less snails, eat veggies, including mushrooms, are eaten by snakes, raccoons, shrews and even some birds.

### Outline

1. Shady here, little sun, few plants growing on the forest floor.
2. The Douglas-fir, towering trees, providing the shade.
3. Mushrooms need little sunlight as they help to decompose the vegetation.
4. A Banana Slug has been chewing on this mushroom.
5. Fallen Fir Needles make up most of the forest floor.
6. Cool and moist, a perfect seedbed for Redwood Orchids to germinate.
7. And this Spider Hole, the "turret" is lined with fir needles.

## A FEW SUGGESTIONS FOR TEACHING CHILDREN

1. Teach less, share more.

Children respond more to observation than just textbook explanations. When we share our own ideas and feelings, it encourages a child to explore, respectfully, his own feelings and perceptions.

2. Be receptive

This means listening, and being aware. It is one of the most richly rewarding attitudes you can cultivate while working with children. The new surroundings bring out a spontaneous enthusiasm in the child that you can skillfully direct toward learning.

3. Focus the child's attention without delay.

Involve everyone as much as you can, by asking questions and pointing out interesting sights and sounds.

4. Look and experience first; talk later.

Children have a marvelous capacity for absorbing themselves in whatever they're looking at. Children seldom forget a direct experience. Look. Ask questions. Guess. Have fun!!

5. A sense of joy should permeate the experience.

Whether in the form of gaiety or calm attentiveness. Children are naturally drawn to learning if you can keep the spirit of the occasion happy and enthusiastic. Remember that your own enthusiasm is contagious, and that it is perhaps your greatest asset as an interpreter.

From Sharing Nature with Children, by Joseph Cornell.

## **SOME SUGGESTIONS FOR NATURE GUIDES TO MAKE A WALK AT ARMSTRONG RESERVE A SUCCESSFUL EXPERIENCE**

This information is a compilation of ideas and information supplied by present and past experienced nature guides at Armstrong State Redwoods Reserve.

### **Group management:**

Have a brief chat with your group before starting out. Introduce yourself and try to remember some names of children. Tell parents and teachers that they are in control of discipline (no running ahead, talking while the guide is speaking, eating while walking, etc.)

Keep the talk at the level of the students to keep them interested.

If you have a problem child, distract him (or her) with a small chore (looking for cones or green bay leaves sometimes works).

For small children, look for animals; have them identify trees vs. shrubs vs. sorrel vs. ferns; describe water and nutrients as food and drink; describe shade and sunshine as cold and warm; keep an eye out for the treasure hunt items; make the walk relatively short, with more information at the beginning before they get restless.

Have them look at leaves. Are they smooth or fuzzy? The same on both sides? Are different colors from the same tree?

Look for footprints. Look for gopher and mole work. Explain that the gopher and moles provide water and air penetration.

For older kids, try the more detailed concepts and see how they react—it's always better to challenge than to bore.

Explain that we stay on trails to keep out of poison oak and so we don't hurt the tree roots, animal homes in logs, or other plants (that's why the fences are where they are).

We leave the logs, branches, leaves, and other litter on the ground to decay naturally and send nutrients back into the soil to feed the live trees and undergrowth.

Don't litter .

## Helpful Information that Nature Guides at Armstrong Should Know Before Leading a Group through the Grove

1. Armstrong Grove is named after Colonel James B. Armstrong, who moved with his family to Sonoma County in 1874. After many obstacles, the 440 acres Col. Armstrong had set aside for a park, was purchased by the county in 1917. It became a State park in 1934, and a reserve in 1964.
2. A reserve is an area set aside to remain as natural as possible, without human intrusion.
3. Col. Armstrong's daughter, Lizzie, named the Parson Jones tree after her husband and the Col. Armstrong tree after her father<sup>2</sup>.
4. The three redwoods: Coast, Giant (or Sierra), Dawn.
5. Scientific names, *Sequoia sempervirens* (always living), *Sequoiadendron giganteum* (giant), *Metasequoia glyptostroboides* (akin to sequoia).
6. Show different trees on west side of old Ranger office.
7. Giant sequoia range is Sierra Nevada near Yosemite (lots of kids have been there). They like sunshine, but they also tolerate snow.
8. Giant sequoias grow older than coast redwood—some over 3000 years. They grow bigger, but not as tall as coast redwood. They are the biggest living thing on Earth<sup>3</sup>.
9. Dawn redwood is a native of China. Thought to be extinct until found in a remote area of China in 1941. Thousands of seeds and four small seedlings were brought to the U.S. in 1948<sup>4</sup>.
10. Twenty million years ago redwoods were widely distributed in the northern hemisphere. Due to weather pattern changes and geographical movement, the habitat has shrunk to what we have today.
11. Range of the coast redwood is from within the Oregon border, south to Big Sur, in a strip up to 30 miles wide.
12. Coast redwood is the tallest living thing on Earth.
13. Coast redwoods love lots of rain and fog.
14. Coast and giant redwoods are evergreen. Evergreen means they have green leaves all year.
15. Dawn redwoods are deciduous, turning beautiful fall colors. Deciduous means they lose all of their leaves in the fall.
16. If light is right, the log next to the pay booth shows growth rings, fat rings show more growth in wet years. Tight rings show less growth, possibly drought years.
17. The root system of the coast redwood is shallow and spreading, roots interlock for stability against wind and flooding. They have no tap root. Roots can spread out 100 feet or more<sup>8</sup>.
18. Know height of Parson Jones tree. Sign says 310 feet, probably taller now; measured early 1970s. As long as a football field. As long as the parking lot in front. Taller than the Statue of Liberty (301 ft.).
19. Col. Armstrong is the oldest tree in the park (1400 years). Coast redwoods sometimes live to 2000 years, or more.
20. At Fife Creek you can discuss the importance of a healthy stream. Creek is fed by local runoff. If creek bed is dry, water is running underground. Sometimes we see fish. Maybe steelhead or salmon spawning.
21. Show kids a nurse log. Good one next to litter display. Know the plants growing on it. Good for little ones to imagine snakes, spiders, mice, etc. What are they doing?
22. California bay trees (also known as laurel or Oregon myrtle) are an important part of the Grove. There are usually plenty of leaves on the ground for the children to smell. These can be used the same as the European bay in different recipes including soups and stews, and were also used by Native Americans for medicinal purposes, food, and as a flea repellent.<sup>5</sup>
23. On the stump near Parson Jones, the year "1924" is carved. You can discuss the damage to the tree and how many years people have been coming to Armstrong.
24. Parson Jones tree is an excellent spot to talk about poison oak. The large vine growing high into the tree (seeking sunshine) is poison oak. Different seasons bring different opportunities for discussions of leaf color, etc.
25. The History Tree will be your next stop. This should give the children a sense of the redwoods' endurance—from the year 948 until 1978 when man and the saw stepped in.
26. The fire cycle is very important to reproduction. Fire clears ground so seeds can have soil. It sends nutrients back into soil, and clears dead or dying trees. Show example of "goose pens."
27. Fibrousness, thickness, and tannic acid in the bark are key to fire resistance. Show bark samples.
28. Tannins and turpines are the key to insect and rot resistance. Tannin is also the agent which gives the bark and heartwood its color. Mosses and lichens do not favor the bark of redwoods.
29. Other conifers have high resin content in their pitchwood, which readily burns and attracts insects.

30. Cones of the coast redwood are the size of a large olive. Number of seeds per cone is a wide range (less than 30 to over 100). There are two types of cones: male, which are very small and produce pollen, and female which produce seeds. It's a good idea to carry samples with you. (You can't always find them on the ground.)
31. One tree can produce up to 1,000,000 seeds a year. Coast redwoods grow more often from sprouts than from seed. (Giant sequoias grow only from seed.)
32. Seeds need sun, water and mineral soil in order to germinate. It is difficult for seeds to pass through the thick, mattress-like duff to reach the mineral soil in the 30 days they are viable.
33. Show distinctive patterns around parent trees and hollows where trees sprout from root system. Some call these circles "fairy rings," others prefer "family circle." These sprouts are not daughters, but a continuation of the same life<sup>6</sup>.
34. Point out burls on trunks. Burls are not fully understood, but could be wound healing. Some authorities consider them benign tumors. Show the three mutually supporting trees with burl growth fusing them. The Icicle tree and Popeye are good examples of different forms.
35. Needles on lower branches are flat and wide, needles on upper branches small and awl shaped (like giant sequoia needles).
36. Explain burn scars where fire got through the bark. The upper portion of tree may be killed, but not all of it, so it can keep living and growing. In some you can see where the tree tries to heal over the scar.
37. Identify most abundant plants: Douglas-fir, hazelnut, tanbark oak, California bay, bigleaf maple, redwood sorrel, sword fern, bracken fern, wild rose.
38. Show them the difference between redwood and Douglas-fir. Also point out snags and explain their importance as habitat for birds and other critters.
39. Be able to briefly discuss lichen (light green, algae and fungus growing as one) and moss.
40. Don't forget the dinosaur, it's always fun to look for him.
41. Be on the lookout for a banana slug and enthusiastically explain how important they are as composters. Banana slugs also provide food for some other critters. (For interesting facts on their sex life, see book on slugs in VC.)
42. The Burbank Circle is an unusual phenomenon. Whether caused by nature or man is not known. You might discuss what could have caused the lack of growth in this circle (Native American campsite, etc.) Some guides like to have their children lie quietly on the logs and look up at the trees. A good space for activities, if time allows.
43. The Discovery Trail is an opportunity for quiet time. Holding on to the rope, have them follow the trail with their eyes closed. You can let the kids hold hands around the platformed tree and then determine how big around the tree is. Having a tape measure with you is fun.
44. Col. Armstrong lends himself to a little history. Brush up on some dates and names (Parson Jones, Lizzie Armstrong, Luther Burbank), plus some history of the logging industry.
45. A good time to talk about how lucky we are that these redwoods were saved for all of us to enjoy. And the importance of respecting all of nature's blessings.
46. It may be desirable to skip the Forest Theater if time is a factor, or the kids are too spunky. But if time allows and you venture there, do not let them run loose. Do not let them walk or stand on the benches, this is very dangerous. This is a good place to talk about the serenity of the forest, and the impact that many people and cars would have on the forest.
47. On your way back, take the Icicle Trail single file (the path is narrow and high). Kids are getting hungry by now, so move quickly.
48. The Happy Face log will smile as you head up the trail. Clintonias are abundant in this area. It's fun to look for the Troll across the creek and to see the large redwood that fell during the storm of 2005-2006. You will pass the awesome redwood which fell in 1984. Do not let the children climb on it. Some sprouts that were growing recently, are now broken off. **Restoration** is the key word.
49. Fire and the redwoods' survival would be appropriate at the burned out tree before the picnic grounds. The children will enjoy climbing inside. Do not let them go out the back side. This is also a place to tell them about "goose pens."
50. End your walk with a brief discussion of their favorite things. Then stand back—it's time for lunch!

## SOME QUESTIONS AND ANSWERS

**What animals will we see?** Banana slugs (the largest slug in North America), chickarees, chipmunks, squirrels, woodpeckers, ravens, blue jays, winter wrens, deer (if we're lucky!).

**Why is the bark broken and sometimes twisted?** Growing trees get wider and crack the bark; they can be twisted as the tree reaches for the light.

**Why is the creek dry?** Fife Creek is fed by runoff from the surrounding hills. It will start flowing when good rains have saturated the ground. Water continues to flow underground during the summer.

**When was the last fire?** In 1923.

**How many virgin coast redwood trees are left?** In 1976 it was estimated that about 85,000 acres was still in private ownership for commercial cutting<sup>1</sup>. In the 1800s, two million acres in an area 500 by 30 miles wide stretched down the coasts of Oregon and California. Approximately 80,000 acres is preserved within state and national parks<sup>8</sup>. Over 90% of the original coast redwood forest has been cut.

**Where is the tallest known coast redwood and how tall is it?** It is in Redwood National Park, and is approximately 368 feet tall.

**Where is the largest giant sequoia?** In Sequoia National Park. It is 275 feet tall, and over 35 feet in diameter at its base. Its crown spreads 107 feet.

**What is a widow maker?** Loggers call large fallen branches widow makers because they are so dangerous.

**What is the canopy?** An umbrella formed by uppermost trees. It takes a seedling in the redwood forest 200 years to reach canopy size<sup>8</sup>. Armstrong and other climax redwood forests could be compared to a layer cake. Under the litter on the forest floor there are, successively, duff, humus and finally soil; laced through with roots and fungi, which with bacteria slowly transform the litter into soil. Other fungi help the roots obtain nutrients, and a myriad of insects, centipedes, tiny worms and other critters eat the fungi and one another.

In the other direction there are successive layers of green: ground cover (sorrel, orchids, smaller ferns, etc.), understory (berries, roses, ferns, hazelnut), the lower canopy (hardwoods and young redwoods), the upper canopy (the dominant layer of large redwoods and Douglas-firs), and finally, the emergent layer of ancient giants, towering over even the upper canopy. The animals are also more-or-less stratified: birds that hawk insects on the wing prefer the top of the canopy, for example.

Finally, in the ancient forest horizontal diversity is created by snags, bald tops, and clearings from fallen giants. In clearings the understory and lower canopy get a chance to thrive and animal life congregates here also.

**Words and topics some older students might know. It would be helpful to you to learn as much about these as possible:**

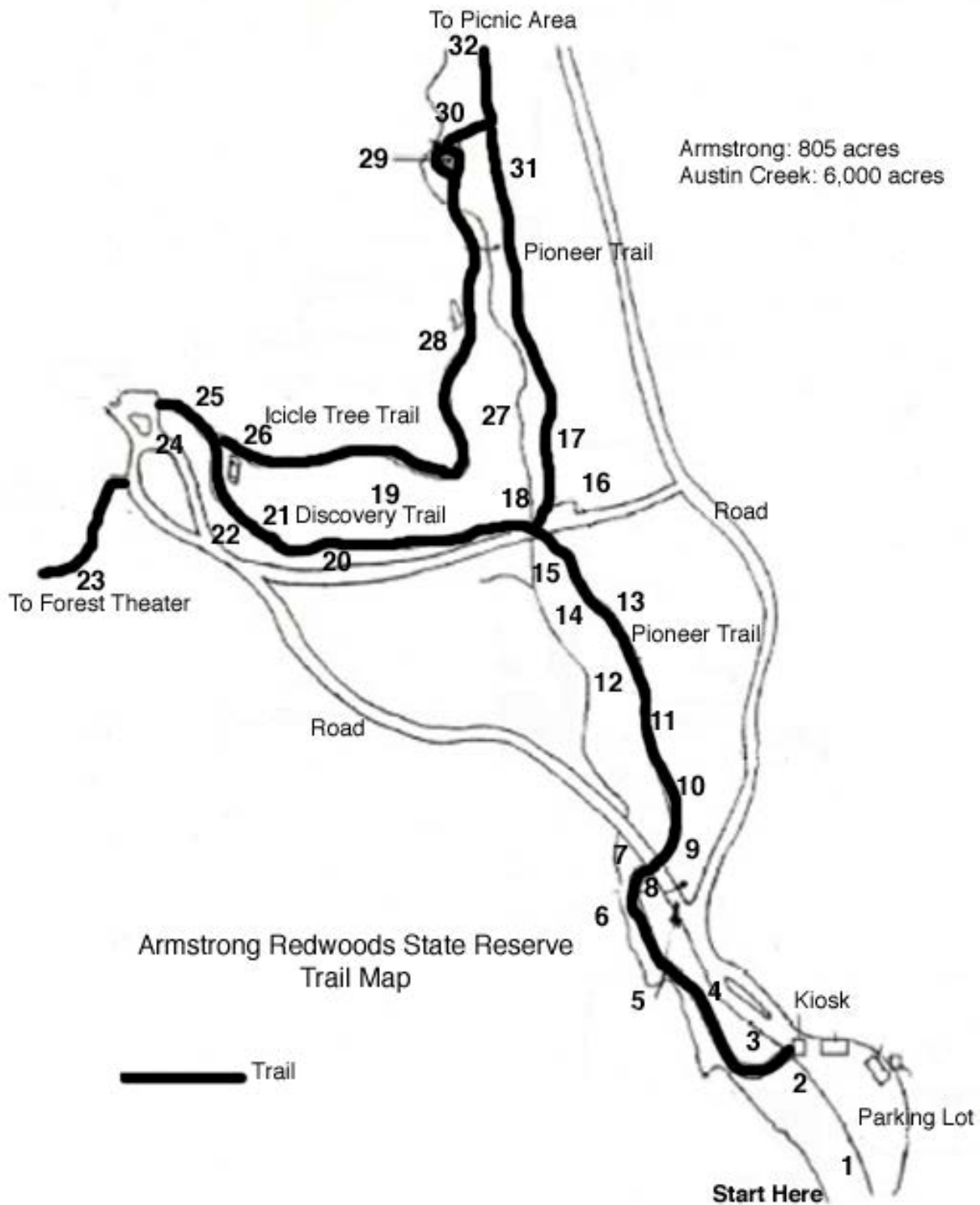
Canopy, understory, brush, ground cover, decaying  
Litter, duff, humus, soil  
Light-limited, shade tolerant  
Nutrient recycling, nutrient uptake, photosynthesis  
Heartwood, sapwood, bark, burl  
Branches (yearly growth can be seen between nodes)  
Polymorphic leaves (the two kinds on the coast redwood)  
Growth rings (thin with drought, thick with rain)  
Snags, cones (male and female), pollen  
Cambium, phloem, xylem  
Lightning causing natural fires, ecosystem, forest

**Add these plants to your list** (Also see list of plants for Armstrong and Austin Creek):

Clintonia lily *Clintonia andrewsiana*  
Trail Plant *Adenocaulon bicolor*  
Western Trillium *Trillium ovatum*  
Fairy Bells *Disporum hookeri*  
Deer Fern *Blechnum spicant* (one plant on trail to Forest Theater)  
Huckleberry *Vaccinium ovatum*  
Sugar Scoops *Tiarella unifoliata*  
Calypso Orchid *Calypso bulbosa* (Named for Greek goddess, Calypso<sup>5</sup>)  
Wild Ginger *Asarum caudatum*  
Five Finger Fern *Adiantum pedatum*  
Thimbleberry *Rubus parviflorus*  
Fetid Adder's Tongue *Scoliopus bigelovii*  
California Polypody *Polypodium californicum*  
Licorice Fern *Polypodium glycyrrhiza*  
Goldenback Fern *Pityrogramma triangularis*  
Black Oak *Quercus kelloggii* and Oregon Oak *Quercus lobata*  
Madrone *Arbutus menziesii* and Manzanita *Arctostaphylos* (higher elevations)

## References

1. *Redwoods, The World's Largest Trees*, Jeremy Joan Hewes, 1981
2. *Colonel James B. Armstrong and His Redwood Park*, John C. McKenzie, 1995
3. *The Giant Sequoia of the Sierra Nevada*, R. J. Hartesveldt, US Dept. of the Interior, National Park Service, 1975
4. *Reunion with a Chinese Redwood*, Wm. Gittlen, *California Wild Magazine*, Fall 1998, California Academy of Sciences
5. *Plants of the Coast Redwood Region*, Kathleen Lyons & Mary Beth Cooney Lazaneo, 1988
6. *A Natural History of Western Trees*, Donald Culross Peattie, 1953
7. *Redwood Empire*, Randy Collings, 1985
8. *Tall Trees*, FVN Corp., Fortuna, 1997



## TRAIL GUIDE KEY

1. **Stand of bigleaf maples**, common in the redwood forest.
2. **Planted examples** of Giant Sequoia, first in row, and Dawn redwood, which is deciduous, second; native Coast redwoods beyond.
3. **Entrance to Pioneer Trail**, main walking trail through park. Gorilla hair path.
4. **Nurse log** and California laurel (bay) tree that has produced sprouts.
5. **Viewing area** along Fife Creek. Seasonal creek. Check dams removed when sediment filled creek. Litter display. First example of redwood root system across path, more and larger ones farther on.
6. **Burned-out tree** and burls. Triple-tree tripod cemented with burl.
7. **Viewing spot for Parson Jones Tree** A rare view of a large redwood from top to bottom.
8. **Carved stump**, "1924." Discuss damage people do to park and that things go back to nature.
9. **Parson Jones Tree** Dedicated to her husband by Lizzie Armstrong Jones; 1,300 years old. One of the tallest recorded in park, 310 feet in 1970. Very old poison oak vine, cut near base a few years ago, self-grafted and continues to grow.
10. **History round** Not from park originally; dates to 1978; will be restored soon.
11. **Fallen tree** Decomposing log, snag beyond; importance of snags; fairy ring around old stump.
12. **"Dinosaur"** (Brontosaurus). To see it, walk a little farther on trail and then look back.
13. **Markers** New signs recently installed for self-guided nature walk.
14. **Mass of twisted roots** Chance to use imagination.
15. **Goose pen** being closed in with burl growth.
16. **Johnson Stump** washed up on Johnson's Beach, Guerneville, in winter of 2004-2005; donated to park by Harris family.
17. **Burbank Circle** Children lie on logs and look up at trees; not known if clearing caused by nature or man.
18. **Seedling Redwood** is growing in stump that has deteriorated to soil (at corner on bank of creek).
19. **Discovery Trail** for visually handicapped. Other ways to enjoy the forest, even if you can't see it (hear, smell, feel).
20. **Hug-a-tree** Usual children's activity. Wheelchair ramp.
21. **Understory trees** including bay, hazelnut, and tanoak.
22. **Native plants**, including trail plant, wood rose, sugar scoops, and clintonia.
23. **Forest Theater** Built in 1934; formerly site of concerts, weddings, plays, etc.; now closed to public events because of park reserve status.
24. **Park memorial** to Lizzie Armstrong Jones, who was responsible, along with the LeBaron family, for having county buy park land in 1917; bought by state in 1934.
25. **Colonel Armstrong Tree**, 308 feet in 1970, dedicated by Lizzie Armstrong to her father after his death.
26. **"Smiley Face"** replaced Peppermint Patty, which has disintegrated.
27. **View of "Wood Troll,"** across creek.
28. **Fallen Giant** Formerly stood on tripod base (fire-damaged legs), fell in 1984; bark beetles "hieroglyphics" on side; example of deteriorating layers of a dead tree.
29. **"Popeye"** Burl on trunk of tree across from #30.
30. **"Icicle Tree"** Burls used to reach almost to ground, but vandalized in past.
31. **Dead tree trunk** looks sawed off at top. Explanation???
32. **Tunnel goose pen**, a favorite with school groups.

## **Part IV**

# **Interpretive Materials and Cultural and Natural History**



## **Armstrong Redwoods State Reserve Austin Creek State Recreation Area**

Armstrong Redwoods State Reserve, located in the Russian River country about an hour and a half's drive north of San Francisco, this 805-acre reserve features a magnificent grove of ancient redwoods, several miles of nature trails and a variety of picnic facilities. This State Reserve offers a unique opportunity to explore an ancient redwood forest, you'll see some of the tallest and oldest trees remaining in this part of California. Armstrong Redwoods is the largest remaining "old-growth" redwood forest in Sonoma County, a living reminder of the magnificent primeval redwood forest that covered much of this area before logging operations began during the 19<sup>th</sup> century. Armstrong Redwoods is currently in the process of a multifaceted grove habitat protection and restoration project in an effort to mitigate the damage done to the grove by millions of visitors over the past 100 years. This interesting and vital restoration project helps to promote the importance of environmental conservation, protection and management.

Austin Creek State Recreation Area is located adjacent to Armstrong Redwoods State Reserve. This 6,000 acre park offers over twenty miles of hiking trails that help to facilitate exploration and enjoyment of this wild and scenic area. Elevations within the park range from 150 feet to 1,900 feet above sea level, it is this rugged topography that helps to give a sense of isolation from the hustle and bustle of civilization. Austin Creek's open forests and rolling hills offer a striking contrast to the cool, dark redwood grove in Armstrong Redwoods. The grasslands, chaparral, conifer, oak woodland and riparian habitats are home to a wide range of native flora and fauna. There are 23 family campsites located at Bullfrog Pond Campground that can accommodate up to 8 people per site. Austin Creek also offers 3 remote "back-packing" campsites (one is currently closed) that can accommodate up to 16 people per site.

## **Commonly Asked Questions About Armstrong Redwoods**

### **How big is the reserve?**

Armstrong Redwoods State Reserve encompasses 805 acres. Austin Creek State Recreation area is approximately 5683 acres.

### **When was the fire?**

Most of the fires were started by lightning strikes that hit the bases of trees during dry seasons. Fire travels through the root system to ignite the bases of other trees. The last big fire was in 1926. It swept through the forest and continued almost reaching the ocean. We know it was caused by human carelessness. One theory states that an accident at an illegal whiskey still may have caused the fire.

### **Why are some of the trees burned out on the inside?**

These are called "goosepens" (the early settlers kept their geese in them!). When fire sweeps through the forest the duff and slash around the bases of the trees burns hotter and longer, thereby finding a weak spot in the trunk and burning out the heartwood. The bark itself has "tannins" which insulates the redwood, especially further up the tree.

### **Why is it so quiet in the grove?**

Because the grove is so well shaded few plants can grow which would offer food and shelter for animals. Consequently there are very few birds and only a scolding squirrel may be heard now and then.

### **Why are there so many small trees growing around older redwood stumps?**

When a tree dies and leaves a decomposing stump, other trees sprout around its base, sometimes creating what is called a "fairy ring" – several mature trees growing in a nearly perfect circle.

### **What is the Burbank Circle?**

Located to the left of the main road, this circle of trees appears to be a fairy ring, but encompasses too large an area. Theories include the idea that this circle was created by successive generations of fairy rings, but all we really know is that it is a natural cleared area. It is a true mystery since no roots of a large tree can be found.

### **How and why do burls grow on the trees?**

The knobby growths or burls on the sides of some of the trees are places where, for some unknown reason, the tree has budded over and over again in the same location. Although on examination burls appear parallel to cancer in humans, they are not harmful to the tree.

### **How fast do redwoods grow?**

Where their tops are exposed to drying winds and full sun, redwoods grow only an inch or so per year. In partial shade where they are protected from moisture loss, redwoods may grow two or three feet in a year under ideal conditions. The stems of young trees may increase in diameter by an inch or more each year, but this rate diminishes with age.

### **Was the grove ever logged?**

Some parts of the grove had been logged at the time it was set aside particularly by Armstrong, particularly from the entrance to the Armstrong Tree. So we see a combination of second and old growth trees here.

### **How much rain does the reserve get a year?**

Rainfall averages 55 inches per year.

## HUMANS AND THE COAST REDWOOD

### ***How did the Indians use the coast redwood?***

Many Indian tribes lived near the borders of the redwood forests by a body of water or some other food source. Because the forests are so dark and dense, traveling within the woods is extremely difficult. The Indians felt a great fear and awe of these forests. Since game is not abundant here, the tribes could not depend on the forests to provide their livelihood. For these reasons the Indians settled on the outer fringes of the redwoods near meadows, streams, and the ocean. They used fallen logs and driftwood to build their dwellings and make many other useful tools and belongings.

The Yuroks, a tribe living on the Klamath River and the ocean in extreme northern California, are particularly well known for the canoes they built from driftwood. They used stone hammers, elkhorn wedges, blades from mussel shells, and stone-handled adzes to design their boats. First they split the log in half and hollowed it out by spreading pitch on it and then setting it on fire. When the log had burned enough, they smothered the flames with green bark. Two Yuroks would spend five to six months burning, smoothing, scraping, and polishing these canoes to sell or trade to other tribes. The average length of one of the canoes was 18 feet. One boat could carry five tons of fish in rough seas and was also maneuverable on rivers. Indian tribes also used redwood to build their shelters and sweathouses. Women used the shredded inner bark for skirts, and they constructed baskets with root fibers.

### **What did early Spanish explorers think of these big trees?**

When Portola was on a European expedition by land up the California coast in October, 1769, he marched from a camp on the Pajaro River close to a town we now call Watsonville. Fray Juan Crespi, a Franciscan missionary and the scribe for the trip, must have been impressed by the redwood tree. In his words, the group traveled, "over plains and low hills, well forested with very high trees of a red color not known to us. They have a very different leaf from cedars, and although the wood resembles cedar somewhat in color, it is very different, and has not the same odor; moreover, the wood of the trees that we have found is very brittle. In this region there is a great abundance of these trees and because none of the expedition recognizes them, they are named 'Palo Colorado' or Red Tree, from their color."

As the Spanish moved northward in California, they built adobe missions. The redwood tree, a prized resource among these people, was used for the doors, beams, framing, and supports of their buildings. Because the structures could only be as long as the timber used to build them, the Spaniards valued the long, straight redwood. These people also constructed aqueducts, coffins, and vats for tanning out of this durable wood. These few thousand colonists and the Indians barely touched the forests around them, but this was soon to change.

When the Russian people colonized a small area on the coast north of San Francisco Bay, they built a settlement called Fort Ross, earlier known as Colony Ross. The stockade and village (now reconstructed as a state historical park) were built of redwood. Here the Aleuts, brought by the Russians from Alaska, trapped sea otter until this animal dwindled in numbers. Then the Russians sold their fort, supplies, and lumber and moved on.

***What main event in California history triggered the demand for lumber?***

A few years later, with the discovery of gold in California, the edge of the western frontier became a new center of activity. Thousands of people traveled from all parts of the world to seek their fortunes. As more and more people settled in California, the demand for lumber soared, and the present redwood industry saw its beginnings.

The big question asked by all the lumbermen was this: How do we convert these huge trees into usable lumber and move them into the gold country with the least trouble? Faced with the difficulty, the lumberjacks managed to find a solution. They cut notches in the trunk of the tree and constructed scaffolds to stand on at a point where the tree's diameter was a reasonable size for cutting. Still, it sometimes took two men a week to fell a tree. Sometimes when trees crashed to the ground, others fell with them.

The men would use the best lumber and leave the remainder. Little thought was given to planning for the future. Land was inexpensive – \$1.25 to \$5 per acre – so the logging companies could afford to cut and then abandon. Ranchers would buy hundreds of acres, clear the forest, and try to graze stock. These men would spend much time and energy in cutting and burning the “obnoxious” stump sprouts.

As the loggers moved slowly inland, they logged first near the streams. Logs were floated down the rivers to the mills near the ocean. There they would be processed and then loaded onto steamers bound for San Francisco. As the logging operations progressed farther up into the hills and away from water, chutes had to be built to get the logs down to the streams. Eventually, oxen were used to drag the logs along “skid roads” made up of half-buried greased logs, down to the water. Later, railroads were constructed to make the work easier. At the ocean logs were stored in mill ponds until they were ready to become planks of lumber.

New machinery and more modern techniques were continuously being adopted – longer cross-cut hand saws, donkey engines, steam-powered locomotives – anything to make the work quicker and easier. Little thought was given to the care of the forests. Few loggers were concerned about the soil, problems of erosion, and regrowing the forest. In a very short time acres of magnificent forest were reduced to battlefields of stumps.

***Why do we have redwood state parks, and who is responsible for their existence?***

In 1900 a group of concerned citizens, who valued

The coast redwood forests, formed the Sempervirens Club in hope that their efforts would

Produce a park that would be protected and preserved for future generations to see and appreciate. In 1902 many dreams became reality when the California Redwood Park was established by the Legislature. These lands are the nucleus of a park now called Big Basin Redwoods State Park in the Santa Cruz mountains. Here, protected from a few of today's hazards, live a variety of birds, lizards, snakes, rodents, deer, and other forms of wildlife.

Today we are still battling to save remaining virgin groves. But this is a long and expensive fight because the costs of these lands are now so great. We have learned that forests aren't safe from destruction just because they are within park boundaries. Our park lands are not islands of peace in the midst of this disrupted earth. They are one part of a complete ecosystem. For example, each grove is closely related to the lands



surrounding it. Cutting the trees upstream from our parks will affect the groves that we are trying to save downstream. These lower lands aren't protected from the erosion and flooding that may occur upstream. This is why today many persons are still dedicated to raising money for the purchase of our few remaining virgin forests.

It is not enough for us to stand by and gaze at these magnificent trees in amazement.

Each of us can help maintain and protect the lives of our coast redwood forest by thinking about the trees and their needs while we are visiting the parks. Now that we understand more about the coast redwood and how it functions, we will be able to apply what we know to our activities within the forest. How will small feeder roots on the soil surface be affected by our footsteps, those of our classmates, and of the thousands of people who visit the area each year? How do we affect the Wildlife and its food supply when we pick a single berry? What if I eat 20 berries? What will happen to the forest creatures if every visitor picks one single berry? In what other ways might we affect the coast redwood community? How can we make a beneficial impact on the forest during our visit? If we keep in mind what we have begun to understand about this tree, and act accordingly, we will have the coast redwood to admire, enjoy and use for a much longer time.

## **COLONEL JAMES BOYDSTON ARMSTRONG**

Armstrong Redwoods State Reserve is named for Colonel James Boydston Armstrong, an early Sonoma County landowner. He was a conservationist with a dream of turning his grove of ancient redwoods into public property forever.

James Boydston Armstrong was born August 20, 1824, near Wooster, OH. His grandparents Robert and Isabella Armstrong immigrated to the United States from Ireland with their seven children. When James was a young boy, his father, George, who was a minister, moved his wife, Mary Boydston Armstrong, and their children to Urbana, OH, where James lived until he moved to California much later in his life.

James, educated as a civil engineer and surveyor, began his public life early. At 21 he was elected county surveyor of Champaign Co., OH, and then served two terms as county treasurer.

On Dec. 25, 1847, James Armstrong married Eleanor Wilson. Their eldest child, named Elizabeth, was born Oct. 9, 1850, in Urbana, however, throughout her life she was known as Lizzie. Their son, Walter, was born two years later.

James made the first official map of Champaign Co., OH, in the winter of 1850-51. He also wrote for an early Urbana newspaper as "Spectacles." In 1856, he went to California as a correspondent for the Cincinnati Gazette. The exact reason for the trip is unknown, but he wrote a letter home stating he was "hunting the trail of my man," so it might have been a pursuit of some sort.

His youngest child, Kate, was born Oct. 16, 1857. James purchased the Farmers' Bank of Urbana, which later merged with the Citizens' National Bank, where he was president until 1874, when he moved his family to California. In 1860, he was part of the Ohio Republican delegation that nominated Abraham Lincoln for president.

In 1862, a year after the Civil War began, James Armstrong was commissioned a Lt. Colonel in the 95<sup>th</sup> Ohio Volunteer Infantry, which was like a National Guard. His regiment took part in the Battle of Richmond, KY, and after two weeks of service, was captured by the enemy. The regiment was soon released, and Armstrong, who had been captured with his horse, received permission from the general to take it with him. However, when the time came to leave, a new general refused to release the horse. Armstrong took it upon himself to ride off with the horse, passing his walking regiment. A Rebel cavalry took off after him, but Armstrong escaped successfully with his horse. Five weeks later, after eight weeks of service, Lt. Col. Armstrong resigned.

In 1864, Armstrong again entered the service, this time as Colonel and commanding officer of the 2nd Brigade 134<sup>th</sup> Ohio Volunteer Infantry in Virginia. They were only required to serve 100 days, long enough for him to write President Lincoln to complain of excessive action and inadequate medical care. He was released from service after his 100 days, but continued using the title of Colonel for the rest of his life.

In 1874, James Armstrong moved his family to California. Both his wife, Eleanor, and daughter Kate were in poor health by then. Possibly, he hoped the California climate would be beneficial to them. He invested in orchard land in Cloverdale, where he made the family home. He also bought Santa Rosa fruit orchards and established nurseries to study crop plants.

This led to a lifelong friendship with Luther Burbank. Over the next two years, Armstrong purchased 600 acres in the dense, forested valley three miles north of Guerneville.

Three years later he built the Big Bottom Mill, a large capacity sawmill, but he began to realize that the redwood forest was not an inexhaustible supply of timber. He gift deeded 440 forest acres to his daughter Kate for “one dollar, love, and affection.” His intention was to preserve the old growth grove and eventually operate it as an arboretum and botanical garden. Common use of the grove by the public began and continued as a family courtesy. The family owned a house near the grove which was used as a summer home.

On Aug. 6, 1880, Eleanor died. James subsequently purchased a newspaper, the *Santa Rosa Republican*, and was editor until its sale two years later.

James Armstrong was called the “Father of the Cloverdale Citrus Fair.” His daughters, Lizzie and Kate, were active in the Cloverdale Missionary Gleaners of the local Congregational Church. They raised and displayed flowers at the annual Chrysanthemum Fair to raise money for the church. This gave James the idea of exhibitions of the local citrus crops, which grew into the annual Cloverdale Citrus Fair.

On New Year’s Day, 1891, James Armstrong, age 67, married Jesse V. Magee in Southern California. She was 37 years his junior. Her family was from Ohio, so possibly the family was

known from there. Kate and Lizzie were among the family who attended. After a brief honeymoon, the couple went to live in Cloverdale.

A plan for the Redwood Grove Arboretum and Botanic Garden, with a committee headed by Luther Burbank, along with Kate Armstrong and other citizens, was presented to the State Legislature. The plan was turned down when the governor pocket-vetoed it.

In November, 1891, Armstrong suffered his first paralytic stroke. A second one, two years later, left him in need of assistance for the rest of his life. His 1895 will included \$100,000 as an endowment for his proposed park, but the failure of the San Francisco Safe Deposit & Trust Co. later that year, in which he had invested heavily, nearly ruined him financially. He had to sell much of his real estate, and the Big Bottom Mill was sold by the sheriff. Adding to his misfortune, in 1899, his daughter Kate became seriously ill and died.

Colonel James Boydston Armstrong, age 76, died Oct. 15, 1900, at his home in Cloverdale. His daughter Lizzie and second wife Jessie were with him. He was buried in the Santa Rosa Rural Cemetery by the graves of Eleanor and Kate. Jessie Armstrong returned to the Los Angeles area to live.

When he died, James Armstrong's dream of saving his redwood grove for public use was unrealized. It was left for his daughter, Lizzie, and the family of his friend Harrison LeBaron to finally fulfill this dream.

In March, 1901. Lizzie Armstrong married the Rev. William Ladd Jones. He was 23 years her senior. In June, she chose "the most majestic monarch of the forest" in the redwood grove as a memorial to her father during an encampment of the Veterans' Association, to which he had belonged. Thus, we now have the Colonel Armstrong Tree in the reserve dedicated to the memory of Col. James Armstrong.

Doris Dickenson, October 2005

Abstracted from:

1. Archives of the Ohio Historical Society (on-line)
2. Wright, Karen Elise, Comp., *Armstrong Redwoods State Reserve, Resource Inventory*, Dept. Of Parks & Rec., Dec. 1975, Dist. 2
3. McKenzie, John C., *Colonel James B. Armstrong and his Redwood Park*, Annadel Press, Santa Rosa, CA, 1995
4. Potthast, Chazz, SPR1 Russian River Dist., *Armstrong Redwoods State Reserve Unit History*

5. U.S. Census: Urbana, OH 1860, 1870; Cloverdale, CA 1900, 1910, 1920; Analy Twp. Sonoma Co., CA 1900; Guerneville, CA 1920; Los Angeles, CA 1910, 1920.

## **ELIZABETH (LIZZIE) ARMSTRONG-JONES**

### **Fulfilling the Dream**

It was up to Lizzie Armstrong-Jones to help fulfill the dream of her father, Col. James B. Armstrong, to save his redwood parkland in Guerneville, CA, for public use. Col. Armstrong died before his dream was realized, but Lizzie and some family friends brought it to fulfillment.

Elizabeth, or Lizzie as she was known throughout her life, was the eldest child of James Boydston Armstrong and his wife, Eleanor (Wilson). She was born in Urbana, Ohio, Oct. 9, 1850. Her brother, Walter, was born in 1852, and her sister, Kate, was born Oct. 16, 1857.

In 1856, when Lizzie was six years old, her father made a trip to California, possibly as a reporter for the Cincinnati Gazette. The household at that time also consisted of her cousin James Chesney, age 10.

While Lizzie was growing up, her father, James, served as a Lt. Colonel in the 95<sup>th</sup> Ohio Infantry in Tennessee and Mississippi in 1862. He was captured by the enemy, was released, and returned home where he resigned after eight weeks service. Two years later he was commissioned a full colonel in the 134<sup>th</sup> Ohio Volunteer Infantry and served the required 100 days with his regiment.

Lizzie was 24 years old when her father moved the family to California in 1874, where he began buying land in Sonoma County.. The family made their permanent home in Cloverdale, north of Santa Rosa, where they grew citrus trees. Both Lizzie's mother, Eleanor, and her sister, Kate, had been in poor health for years, and the move may have been to improve the situation for them, but in 1880, Eleanor died of "dropsy of the heart" at age 52.

James Armstrong purchased redwood timber land north of Guerneville, a little town on the Russian River, and by 1877 his Black Bottom Mill in Guerneville was in operation cutting redwoods for lumber. In 1878, he deeded 440 acres of the land to Kate.

In Cloverdale, Lizzie and Kate joined the Congregational Church. The pastor was the Reverend William Ladd Jones, who had arrived there the previous year with his wife, Anne (Farrington) Jones. He was one of the first Congregational ministers to arrive on the Pacific Coast. He was also past-president of Punoho College in Honolulu.

In addition to participating in local social activities and assisting in social events, Lizzie and Kate were also leaders in a church society organized by the Rev. Jones, called "Cloverdale Missionary Gleaners," which primarily did missionary work, but also church work, and contributed to the pastor's salary. Money was raised largely by the annual Gleaner Chrysanthemum Fairs, where chrysanthemums were exhibited for prizes and a general bazaar was held. These Chrysanthemum Fairs were the forerunners of the annual Citrus Fair, whose establishment was instigated by Col. Armstrong in 1892. Thus, Lizzie and Kate were in close contact with Parson Jones until his retirement in 1897, when he and his wife moved to Pomona, California, where his wife died later that year. After her death, the Reverend Jones moved back to Cloverdale.

On New Year's Day, 1891, when James B. Armstrong married Jessie V. Magee in Arlington, Riverside Co., California, Lizzie and Kate were in attendance. In November of that year, 1891, James suffered a paralytic stroke, and a second stroke in June 1893 left him in need of assistance until his death in Oct. 15, 1900. He died with Lizzie and Jessie by his side. After James's death in 1900, Jessie returned to the Los Angeles to live.

In the deeds of June 23, 1891 and June 2, 1892, James Armstrong, Kate, and Lizzie gave \$100,000 in gold coin (or coin and real estate) toward a Botanic Gardens and Arboretum which was part of James Armstrong's dream to save his stand of old redwoods.

Kate, who had been in poor health much of her life, died in 1898, leaving all her property to Lizzie,

who was executrix of the 1895 will. It also stated she [Kate] had full confidence that if her father outlived her, "Lizzie will care for him with due filial affection and also look after Walter's interest."

On March 20, 1901, Lizzie, at age 50, married the Rev. William Ladd Jones, age 73, in Sebastopol, where her brother, Walter, resided. Lizzie and Parson Jones lived in Cloverdale until William died in 1910. Lizzie then spent about nine years in Guerneville, where the family had maintained a residence, used primarily as a summer home. She was involved in local real estate and had several Guerneville rentals. This area was where her father had purchased land, built the lumber mill, and hoped to protect the redwoods for public use.

In June 1901, Lizzie chose a tree, in the redwood grove, that she called the "monarch of the forest" and dedicated it to the memory of her father during the annual encampment of the Veterans' Association, to which her father had belonged. It is now called the Colonel Armstrong Tree and is one of the oldest in the forest. She later chose one of the tallest trees in the forest to dedicate to her husband and named it the Parson Jones Tree.

Some of the original 440 acres of redwood acreage had been sold, but they were later purchased by Harrison LeBaron, a family friend. In 1908, Lizzie gave LeBaron an option on her redwood acreage, which returned the total acreage to 440 acres. An effort in 1909 to have the grove purchased by the state failed when the state legislature passed the bill, but Governor Gillette killed it by pocket veto.

In Nov. 1916, the Santa Rosa Republican (formerly owned by Lizzie's father), published an Armstrong Woods Supplement to advocate the proposal to make Armstrong Woods a county park. Along with the LeBaron Estate, the other owner of the property involved, Lizzie agreed on the \$80,000 purchase price for acquisition and preservation of the woods, but she and the LeBarons each gave \$5,000 toward the purchase. Many prominent leaders of Sonoma County subscribed to the preservation fund, including Luther Burbank, a one-time trustee of the woods and a warm personal friend of the late Col. Armstrong. In 1916, the election passed the proposal for the purchase of the property by Sonoma County, and in 1917, the property became a county park.

Lizzie took great interest in women's club affairs. A bronze plaque was mounted on a granite boulder at the parking lot near the Colonel Armstrong tree. This is the only memorial to Lizzie Armstrong-Jones. It reads "Lizzie Armstrong Jones, dedicated by the Sonoma County Federation of Women's Clubs, May 29, 1923." A special seat of honor was reserved for her at a pageant in the redwoods at Guerneville in 1924, but illness prevented her presence.

On Sept. 5, 1924, Walter filed for appointment as his Lizzie's guardian because "by reason of old age, illness and physical infirmity, [she had] become mentally incompetent either to care for herself or to manage her property." At that time, Lizzie was at the Dr. W. C. Shipley Hospital of Cloverdale for treatment. She died there in her sleep Tues., Sept. 9, 1924, of a cerebral hemorrhage after a nine-day hospital stay. Not having a will, Walter petitioned to be her sole heir. When the estate was settled in 1925, Walter inherited about \$17,000.

Lizzie Armstrong-Jones was buried in the Santa Rosa Rural Cemetery Sept. 12, 1924, where a marker was placed the following April. Upon her death, Lizzie was described by the Press Democrat, the local newspaper, as being by nature "endowed with a quiet, kindly soul that was averse to ostentation of any kind. But she nevertheless made her influence for good felt in many ways."

Doris M. Dickenson, 2005

## A SHORT BIOGRAPHY OF 'PARSON JONES'

When Col. James B. Armstrong died in 1900, it was up to his surviving daughter, Lizzie Armstrong Jones, her husband 'Parson' William Jones, the LeBaron family, and family friends to continue the struggle for the colonel's dream of preserving the family's redwood grove.

'Parson Jones' was born William Ladd Jones in 1827, at Bangor, Maine. He was raised in Bangor and was educated there at Lewiston Falls Academy, Bowdoin College, and Bangor Theological Seminary.

William Jones married his first wife, Anne Louise Farrington, in 1854, the same year in which they set out for the California gold fields of Yuba County. He spent the years 1854 to 1878 ministering to the inhabitants of Camptonville and five nearby mining camps. After this distinguished career, William Jones and his wife moved to Eureka, California, where he established and built a church in 1878.

In that same year, 1878, the Reverend Jones and his wife sailed for Hawaii, and settled in Honolulu. He held the post of President of Punoho College from 1878 to 1883, when he and his wife returned to California.

Settling in Cloverdale, William Jones served as pastor of the city's Congregational Church from 1883 until his retirement in 1897. He and his wife moved to Pomona, California, in 1897, where Anne Jones died the same year.

After the death of his first wife, the Reverend Jones moved back to Cloverdale. He married Lizzie Armstrong, Col. Armstrong's surviving daughter on March 20, 1901, when she was 50 years old and he was 73. The couple spent their time between Cloverdale and Guerneville, California.

Lizzie Armstrong Jones convinced her husband to help save Col. Armstrong's redwood grove. They found a champion for the project in Harrison LeBaron. In 1908, LeBaron signed an agreement with the Reverend and Mrs. Jones, giving him an option on the entire redwood acreage, and in December 1908 the land was offered to the state as a public park. The governor killed the legislation by pocket veto.

'Parson Jones' died in 1910, at the age of 82, after a full and adventurous life. However, he did not live to see his wife's efforts to preserve the redwood property come to fulfillment. It was not until 1917 that Sonoma County purchased the redwood grove as a public park.

The redwood tree named in honor of 'Parson Jones' is recorded as the tallest in the park, 310 ft. high.

1. John C. McKenzie, *Col. James B. Armstrong and his Redwood Park*, Stewards of Slavianka, Duncans Mills, CA, 1995.
2. Abstracted by Ranger Chazz Potthast, January 31, 1997.
3. Additional information from a longer documented article on Armstrong history, which is in progress.  
Doris Dickenson, 2004

## THE LEGACY OF MARGUERITE WILDENHAIN

Marguerite Wildenhain, internationally known potter, born in November of 1897 at Lyons, France, left her mark in Armstrong Redwoods State Reserve and Austin Creek Recreation Area. She is, of course, best known for her wonderful pottery and exacting teaching. However, it is important to be reminded of her feelings about nature and life.

Marguerite trained at the Bauhaus in Germany, known for its demanding apprenticeship and as the wellspring of the Modernist Movement. She left Germany in 1937 because of Fascist anti-Semitism, going to Holland. Here she had her first brush with the U.S., as a result of a 1939 visit from Gordon and Jane Herr who told her of their dream to build an art colony in the U.S.

As a French citizen, she was allowed to emigrate to the U.S. just before World War II. However, she had to leave without her husband, Franz, a German citizen who shortly after was drafted into the German army.

Marguerite stayed briefly in New York before going to teach for a year at the California School of Fine Arts in Oakland. In 1939, before her arrival, the Herrs bought the Walker Ranch, now Pond Farm, which is part of the Austin Creek Recreation Area. Marguerite arrived to help Gordon and Jane realize their dream in 1942. She and Gordon rebuilt the Walker Barn into a studio and her house a few yards away.

Pond Farm, the Art School Colony, really got started with summer sessions in 1949 and flourished for three years until 1952. It was a mecca for all kinds of artists who have left a legacy of artistic energy that spread through California and the U.S.

In 1952, Jane Herr, the practical hands-on administrator, died, and Gordon gradually began to lose interest. The core of the artist group, including Franz, Marguerite's husband who came to join her after World War II, began to fall away after many spirited disputes about the direction of the school. Marguerite was one of those who felt your life must be given to your art.

By 1960, Marguerite was the only one who stayed to continue teaching summer courses. Students came from around the world to respond to Marguerite's challenge. They had to learn pottery by never keeping a pot. All were returned to nature as the learning was in the doing, not in the finished piece. She continued to teach until 1979 and threw her last pot in 1980. Six years later, at 88, she died.

We remember Marguerite as a woman who was outspoken and passionate in support of her beliefs. She was a woman who, by example, taught the importance of doing each piece of life with full heart and soul, a woman who was a "fierce protector" of the land and nature. She left her students and those who knew her a legacy of expectation and passion for human excellence in living.

**Armstrong Redwoods State Reserve  
Austin Creek State Recreation Area  
Bird Checklist**

<b><i>Blackbirds</i></b>	<b><i>Hummingbirds</i></b>	<b><i>Pigeons and Doves</i></b>
Redwinged Blackbird	Anna's Hummingbird	Band-tailed Pigeon
Brewers' Blackbird	Rufous Hummingbird	Mourning Dove
	Allen's Hummingbird	
<b><i>Buntings</i></b>	<b><i>Jays and Crows</i></b>	
Lazuli Bunting	Stellar's Jay	<b><i>Swallows</i></b>
	Western Scrub Jay	Violet-Green Swallow
	American Crow	
<b><i>Chicadees and Titmice</i></b>	Common Raven	<b><i>Swifts</i></b>
Chestnut-backed Chicadee		Vaux's Swift
Plain Titmouse	<b><i>Kinglets, Bluebirds and Thrushes</i></b>	<b><i>Tanager</i></b>
	Golden-crowned Kinglet	Western Tanager
<b><i>Creepers</i></b>	Western Bluebird	
Brown Creeper	Swainson's Thrush	<b><i>Towhees and Sparrows</i></b>
	Hermit Thrush	Spotted Towhee
<b><i>Ducks</i></b>	American Robin	California Towhee
Wood Duck	Varied Thrush	Golden-crowned Sparrow
Mallard	Townsend's Solitaire	White-crowned Sparrow
Cinnamon Teal	Ruby-crowned Kinglet	
Canvasback		
Common Goldeneye		
	<b><i>Kites, Hawks and Eagles</i></b>	<b><i>Vireos</i></b>
<b><i>Falcons</i></b>	Osprey	Solitary Vireo
American Kestrel	White tailed Kite	Hutton's Vireo
Merlin	Sharp shinned Hawk	Warbling Vireo
	Coopers's Hawk	
<b><i>Finches</i></b>	Red shouldered Hawk	<b><i>Vultures</i></b>
Pine Siskin	Red tail Hawk	Turkey Vulture
Lesser Goldfinch	Golden Eagle	
American Goldfinch		
		<b><i>Warblers</i></b>
		Orange-crowned Warbler
<b><i>Flycatchers</i></b>		Yellow-rumped Warbler
Olive-sided Flycatcher	<b><i>Mockingbirds and Thrashers</i></b>	Black-throated Gray Warbler
Pacific-slope Flycatcher	Northern Mockingbird	Townsend's Warbler
Black Phoebe		Wilson's Warbler
	<b><i>Nuthatches</i></b>	
<b><i>Grosbeaks</i></b>	White-breasted Nuthatch	<b><i>Woodpeckers</i></b>
Black-headed Grosbeak	Pygmy Nuthatch	Acorn Woodpecker
		Red-breasted Sapsucker
<b><i>Grouse, Turkeys, and Quail</i></b>	<b><i>Owls</i></b>	Downy woodpecker
Blue Grouse	Western screech Owl	Hairy Woodpecker
Wild Turkey	Great horned Owl	Northern Flicker
California Quail	Northern pygmy Owl	Pileated Woodpecker
Mountain Quail	Burrowing Owl	Nuttalls Woodpecker
	Spotted Owl	
<b><i>Hérons and Egrets</i></b>		<b><i>Wrens</i></b>
Great Blue Heron	<b><i>Plovers</i></b>	Bewick's Wren
Great Egret	Kildeer	Winter Wren

**ARMSTRONG REDWOODS STATE RESERVE  
AUSTIN CREEK STATE RECREATION AREA**

**MAMMAL CHECKLIST**

<b>Bat</b>	<b><u>Myotis sp</u></b>
<b>Black-Tailed Deer</b>	<b><u>Odocoileus hemionus</u></b>
<b>Black-Tailed Jackrabbit</b>	<b><u>Lepus californicus</u></b>
<b>Bobcat</b>	<b><u>Felis rutilus</u></b>
<b>Brush Rabbit</b>	<b><u>Sylvilagus bachmani</u></b>
<b>California Ground Squirrel</b>	<b><u>Sepermophilus beecheyi</u></b>
<b>Chickaree</b>	<b><u>Tamiasciurus douglasii</u></b>
<b>Deermouse</b>	<b><u>Peromyscus maniculatus</u></b>
<b>Feral Pig</b>	<b><u>Sus scrofa</u></b>
<b>Gray Fox</b>	<b><u>Urocyon cinereoargenteus</u></b>
<b>Mountain Lion</b>	<b><u>Felis concolor</u></b>
<b>Opossum</b>	<b><u>Didelphis marsupialis</u></b>
<b>Pacific Mole</b>	<b><u>Scrapanus orarius</u></b>
<b>Raccoon</b>	<b><u>Procyon lotor</u></b>
<b>Ring Tailed Cat</b>	<b><u>Bassariscus astutus</u></b>
<b>River Otter</b>	<b><u>Lutra canadensis</u></b>
<b>Shrew Mole</b>	<b><u>Neurotrichus gibbsi</u></b>
<b>Spotted Skunk</b>	<b><u>Spilogale gracilus</u></b>
<b>Striped Skunk</b>	<b><u>Mephitis mephitis</u></b>
<b>Townsend Chipmunk</b>	<b><u>Eutamias townsendi</u></b>
<b>Western Gray Squirrel</b>	<b><u>Sciurus griseus</u></b>

**ARMSTRONG REDWOODS STATE RESERVE  
AUSTIN CREEK STATE RECREATION AREA**

**REPTILE/AMPHIBIAN CHECKLIST**

Arboreal Salamander	<i>Aneides lugubris</i>
Bullfrog	<i>Rana catesbeiana</i>
California newt	<i>Taricha torosa</i>
California slender salamander	<i>Batrachoseps attenuatus</i>
Common garter snake	<i>Thamnophis sirtalis</i>
Common kingsnake	<i>Lampropectis getulus</i>
Ensatina	<i>Ensatina eschscholtzi</i>
Gilbert's skink	<i>Eumeces gilberti</i>
Gopher snake	<i>Pituophis catenifer</i>
Northern alligator lizard	<i>Gerrhonotus coeruleus</i>
Pacific ringneck snake	<i>Diadophis amabilis</i>
Pacific treefrog	<i>Hyla regilla</i>
Southern alligator lizard	<i>Gerrhonotus mullticarinatus</i>
Western fence lizard	<i>Sceloporus occidentalis</i>
Western pond turtle	<i>Clemmys marmorata</i>
Western rattlesnake	<i>Crotalus viridis</i>
Western skink	<i>Eumeces skiltonianus</i>
Western toad	<i>Bufo boreas</i>



# Stewards of the Coast and Redwoods

Russian River District  
State Park Cooperating Association  
Volunteers in Parks

## Armstrong Redwoods State Reserve/Austin Creek State Recreation Area

### PLANT CHECKLIST

#### TREES

Alder, Red *Alnus rubra*  
Ash, Oregon *Fraxinus latifolia*  
Bay or Laurel, California *Umbellularia californica*  
Buckeye, California *Aesculus californica*  
Chinkapin, Giant *Chrysophylla chrysolepis*  
Cypress, Sargent *Cupressus sargentii*  
Douglas-Fir *Pseudotsuga menziesii*  
Hazelnut *Corylus cornuta*  
Live Oak, Canyon/ Oak, Gold Cup *Quercus chrysolepis*  
Live Oak, Coast *Quercus agrifolia*  
Live Oak, Interior *Quercus wislizeni*  
Locust, Black *Robinia pseudoacacia*  
Madrone *Arbutus menziesii*  
Maple, Big-leaf *Acer macrophyllum*  
Mountain-mahogany *Cercocarpus betuloides*  
Nutmeg, California *Torreya californica*  
Black Oak, California *Quercus kelloggii*  
Oak, Leather *Quercus durata*  
Oak, Oregon (White) or Garry *Quercus garryana*  
Oak, Scrub *Quercus dumosa*  
Oak, Valley *Quercus lobata*  
Plum *Prunus domesticus*  
Redwood, Coast *Sequoia sempervirens*  
Tanbark Oak/Tanoak *Lithocarpus densiflorus*  
Toyon *Heteromeles arbutifolia*  
Walnut, Black or Hinds or Northern California  
*Juglans californica* var. *hindsii*  
Willow, Arroyo *Salix lasiolepis*  
Willow, Red and/or Pacific  
*Salix laevigata* or *S. lucida lasiandra*

#### PLANTED NEAR OLD RANGER STATION

Dawn Redwood *Metasequoia glytostroboides*  
Giant Sequoia *Sequoiadendron gigantea*

#### FERNS

Bracken Fern *Pteridium aquilinum*  
Chain Fern, Western or Giant *Woodwardia fimbriata*  
Coffee Fern *Pellaea andromedifolia*  
Deer Fern *Blechnum spicant*  
Five finger Fern *Adiantum pedatum* var. *aleuticum*  
Goldback Fern *Pentagramma triangularis*  
Indian Dream Fern *Aspidotis densa*  
Lady Fern, Western *Athyrium filix-femina*  
Licorice Fern *Polypodium glycyrrhiza*  
Maidenhair Fern, California *Adiantum jordanii*  
Polypody, California *Polypodium californicum*  
Shield Fern/Sword Fern, California  
*Polystichum californicum*  
Shield Fern/Sword Fern, Dudley's *Polystichum dudleyi*  
Sword Fern, Common *Polystichum munitum*  
Wood Fern, Coastal *Dryopteris arguta*

#### FLOWERING SHRUBS AND HERBS

Alumroot/Heuchera, Crevice *Heuchera micrantha*  
Angelica *Angelica tomentosa*  
Azalea, Western *Rhododendron occidentale*  
Baby Blue Eyes *Nemophila menziesii*  
Bedstraw, California *Galium californicum*  
Bedstraw, Nuttall's *Galium nuttallii*  
Bee Plant/Figwort, California *Scrophularia californica*  
Bitter-cress, Western *Cardamine oligosperma*  
Blackberry, California *Rubus ursinus*  
Blackberry, Himalayan *Rubus discolor*  
Blow-wives *Achyrachaena mollis*  
Blue Dicks *Dichelostemma capitatum*  
Blue-Eyed Grass *Sisyrinchium bellum*

Blue-Eyed Mary, Spinsters  
*Collinsia sparsiflor* var. *arvensis*  
 Brodiaea, Harvest or Elegant *Brodiaea elegans*  
 Broom, California/Deerweed *Lotus scoparius*  
 Broom, French *Genista monspessulanus*  
 Broom, Scotch *Cytisus scoparius*  
  
 Broom, Spanish *Cytisus junceum*  
 Buckbrush *Ceanothus cuneatus*  
 Buttercup, California *Ranunculus californicus*  
 Buttercup, Prickleseed *Ranunculus muricatus*  
 Buttercup, Western *Ranunculus occidentalis*  
 Catchfly, Pink *Silene sp.*  
 Cats Ear, Hairy/Dandelion, False *Hypochaeris radicata*  
 Cats Ear Smooth *Hypochaeris glabra*  
 Cattail, Narrowleaf *Typha angustifolia*  
 Centaury, Monterey *Centaureium muehlenbergii*  
 Chamise *Adenostoma fasciculatum*  
 Chinese Houses *Collinsia heterophylla*  
 Chinese Houses Sticky *Collinsia tinctoria*  
 Chickweed, Common *Stellaria media*  
 Clarkia, Slender *Clarkia gracilis sonomensis*  
 Clarkia, Winecup *Clarkia purpurea*  
 Claytonia, Common or Santa Lucia *Claytonia gypsophiloides*  
 Clematis Virgin's Bower *Clematis lasiantha*  
 Clintonia, Andrews or Red *Clintonia andrewsiana*  
 Clover, Bur- *Medicago polymorpha*  
 Clover, Cowbag or Bull *Trifolium fucatum*  
 Clover, Indian  
*Trifolium albopurpureum* var. *dichotomum*  
 Clover, Red *Trifolium pratense*  
 Clover, Shamrock *Trifolium dubium*  
 Clover, Spotted (Bur-) *Medicago arabica*  
 Clover, Tomcat *Trifolium willdenovii*  
 Clover, White-Tipped *Trifolium variegatum*  
 Coffee Berry *Rhamnus californica*  
 Coltsfoot *Petasites frigidus* var. *palmatus*  
 Columbine, Crimson *Aquilegia formosa*  
 Coral Root, Spotted *Corallorhiza maculata*  
 Cottonweed *Micropis californicus* and/or *amphibolus*  
 Coyote Brush *Baccharis pilularis*  
 Cream Bush/Ocean Spray *Holodiscus discolor*  
 Cream Cups *Platystemon californicus*  
 Dandelion, California *Agoseris grandiflora*  
 Dandelion, Common *Taraxacum officinale*  
 Delphinium, Foothill/Blue Larkspur  
*Delphinium hesperium*  
 Dock, Curly *Rumex crispus*  
 Dock, Whorled *Rumex conglomerates*  
  
 Dog Fennel *Anthemus cotula*  
 Dudleya, Canyon *Dudleya cymosa*  
 Elderberry, Blue *Sambucus mexicana*  
 Eriogonum, Naked *Eriogonum nudum*  
 Eriogonum, Wickerstem *Eriogonum luteolum*  
 Everlastings *Gnaphalium sp.*  
 and/or *Anaphalis margaritacea*  
 Fairy Lantern, Cedars *Calochortus raichei*  
 Fairybells, Hooker's *Disporum hookeri*  
 Farewell-to-Spring *Clarkia amoena*  
 Fennel/Anise *Foeniculum vulgare*  
 Fetid Adder's Tongue/Slink Pod *Scoliopus bigelovii*  
 Filaree or Storksbill, Foothill *Erodium brachycarpum*  
 Filaree or Storksbill, Giant *Erodium botrys*  
 Filaree or Storksbill, Red Stem/Clockweed  
*Erodium cicutarium*  
 Fireweed, Parched *Epilobium brachycarpum*  
 Fireweed, Slender or Threadstem *Epilobium minutum*  
 Flax, Blue *Linum bienne*  
 Forget-Me-Not *Myosotis latifolia*  
 Foxglove *Digitalis purpurea*  
 Fuchsia, California *Epilobium canum*  
 (formerly *Zauschneria californica*)  
 Geranium, Cut-Leaved *Geranium dissectum*  
 Geranium, Dove's Foot *Geranium molle*  
 Gilia, Birdseye *Gilia tricolor*  
 Gilia, Blue-headed *Gilia capitata*  
 Ginger, Long-Tailed or Wild *Asarum caudatum*  
 Globe Lily, Golden/Fairy Lantern, Golden/  
 Diogenes' Lantern *Calochortus amabilis*  
 Gold Fields *Lasthenia chrysotoma*  
 Goldenrod, Western *Euthamia occidentalis*  
 Goldwire *Hypericum concinnum*  
 Gooseberry, Canyon *Ribes menziesii*  
 Grape, California *Vitis californica*  
 Groundsel or Butterweed, Common *Senecio vulgaris*  
 Harebelle, California/Bluebell, California  
*Campanula prenanthoides*  
 Hawkweed, White *Hieracium albiflorum*  
 Hawkweed, Yellow *Hieracium sp.*  
 Hedge Nettle *Stachys ajugoides*  
 Heuchera, Crevice/Alum Root, small flowered  
*Heuchera micrantha*  
 Honeysuckle, Hairy *Lonicera hispidula*  
 Horsetail, Common *Equisetum arvense*  
 Hound's Tongue, Grand *Cynoglossum grande*  
 Huckleberry, California *Vaccinium ovatum*  
 Indian Warrior *Pedicularis densiflora*  
 Inside-Out Flower, Redwood *Vancouveria planipetala*  
 Iris, Bowl – Tubed *Iris macrosiphon*

Iris, Douglas *Iris douglasiana*  
 Ithuriel's Spear *Triteleia laxa*  
 Jewel Flower, Sonoma *Streptanthus glandulosus* var. *sonomensis*  
 Klamath Weed *Hypericum perforatum*  
 Lady's Slipper *Cypripedium sp.*  
 Larkspur, Red/Delphinium, Canyon *Delphinium nudicaule*  
 Lemon Balm *Melissa officinale*  
 Lettuce, Prickly *Lactuca serriola*  
 Lily, Checker / Mission Bells *Fritillaria affinis*  
 Lily, Leopard *Lilium pardalinum*  
 Linanthus, Flax-Flowered *Linanthus liniflorus*  
 Linanthus, Grand *Linanthus grandiflorus*  
 Linanthus, Small-Flowered or Common *Linanthus parviflorus*  
 Lomatium, Yellow (probably not Bladder Parsnip) *Lomatium sp.*  
 Lotus, Birdsfoot *Lotus tenuis*  
 Lotus, Hill *Lotus humistratus*  
 Lotus, Spanish *Lotus purshianus*  
 Lovage, Gray's *Ligusticum grayi*  
 Lupine, Miniature or Annual *Lupinus bicolor*  
 Lupine, White-Fronted *Lupinus albifrons*  
 Madia, Common *Madia elegans*  
 Madia, Woodland *Madia radioides*  
 Manzanita *Arctostaphylos sp.*  
 Mariposa Lily, Clay *Calochortus vestae*  
 Milkmaids/Toothwort, California *Cardamine californica* (formerly *Dentaria c.*)  
 Milkwort, California *Polygala californica*  
 Milkweed, Purple *Asclepias cordifolia*  
 Miner's Lettuce *Claytonia perfoliata*  
 Mint, Coyote *Monardella villosa*  
 Monkey Flower, Seep-spring or Common *Mimulus guttatus*  
 Monkey Flower, Sticky or Bush *Mimulus aurantiacus*  
 Morning Glory, Hill *Calystegia subacaulis*  
 Morning Glory, Western *Calystegia occidentalis*  
 Morning Glory, St. Helena *Calystegia cellina oxyphylla*  
 Mouse Ears, Large *Cerastium vulgatum*  
 Mugwort *Artemisia douglasiana*  
 Mule Ears *Wyethia glabra*  
 Mullein, Moth *Verbascum blattaria*  
 Mullein, Turkey *Eremocarpus setigerus*  
 Mullein, Woolly *Verbascum thapsus*  
 Mustard, Summer or Shortpod *Hirschfeldia incana* (formerly *Brassica geniculata*)  
 Navarretias *Navarretia sp.*  
 Nemophila, Small Flowered *Nemophila parviflora*  
 Nemophila, Vari-Leaf *Nemophila heterophylla*  
 Nightshade, Black *Solanum nigrum*  
 Ninebark *Physocarpus capitatus*  
 Ookow, Forktooth *Dichelostemma congestum*  
 Oregano, Wild *Origanum vulgare*  
 Orchid, Calypso or Redwood *Calypso bulbosa*  
 Owl's Clover *Castilleja sp.*  
 Paint Brush, Woolly or Felt *Castilleja foliolosa*  
 Parsnip, Bladder *Lomatium utriculatum*  
 Parsnip, Lace *Lomatium dasycarpum*  
 Pea, Chaparral *Pickeringia montana*  
 Pea, Pacific or Hillside *Lathyrus vestitus*  
 Pea, Tangier *Lathyrus tingitanus*  
 Pennyroyal *Mentha pulegium*  
 Phacelia, Imbricate *Phacelia imbricata*  
 Phlox, Slender *Phlox gracilis*  
 Pineapple Plant or Weed/Chamomile *Chamomilla suaveolens*  
 Pink, Indian *Silene californica*  
 Pink, Windmill/Catchfly, Common *Silene gallica*  
 Pipevine, Dutchman's *Aristolochia californica*  
 Poison Oak *Toxicodendron diversilobum*  
 Popcorn Flowers *Cryptantha sp.*, possibly *Plagiobothrys sp.*  
 Poppy, Bush or Tree *Dendromecon rigida*  
 Poppy, California *Eschscholzia californica*  
 Poppy, Tufted *Eschscholzia caespitosa*  
 Raspberry, Bluestem or Western, Blackcap *Rubus leucodermis*  
 Rattlesnake or Quaking Grass *Briza maxima*  
 Redberry, Spiny *Rhamnus crocea*  
 Red Ribbons/Lovely Clarkia *Clarkia concinna*  
 Rose, Wood *Rosa gymnocarpa*  
 Sand Spurry, Red *Spergularia sp.*  
 Sanicle, Coast *Sanicula laciniata*  
 Sanicle, Pacific/Snakeroot/Gamble weed *Sanicula crassicaulis*  
 Sanicle, Purple *Sanicula bipinnatifida*  
 Saxifrage, California *Saxifraga californica*  
 Scarlet Pimpernel *Anagallis arvensis*  
 Self Heal *Prunella vulgaris*  
 Service Berry *Amelanchier alnifolia*  
 Shinleaf, White-Veined, Non-green form *Pyrola picta*  
 Shooting Star, Henderson's *Dodecatheon hendersonii*  
 Sidalcea, Fringed *Sidalcea diploscypha*  
 Skullcap, Blue *Scutellaria sp.*  
 Skunkweed *Navarretia squarrosa*  
 Snowberry *Symphoricarpos albus*  
 Snowberry, Creeping *Symphoricarpos mollis*

Soap Plant, Wavy or Amole

*Chlorogolum pomeridianum*

Solomon's Seal, Slim *Smilacina stellata*

Solomon's Seal, False *Smilacina racemosa*

Sorrel, Bermuda *Oxalis pes-caprae*

Sorrel, Redwood *Oxalis oregana*

Sorrel, Sheep *Rumex acetosella*

Sorrel, Wood, Creeping *Oxalis corniculata*

Sourclover, Yellow *Melilotus indicus*

Spice Bush *Calycanthus occidentalis*

Spikeweed, Common *Hemizonia pungens*

Star Flower, Pacific *Trientalis latifolia*

Star Lily/Zygadene Star/Fremont's Camas

*Zygadenus fremontii*

Strawberry, Wood *Fragaria vesca*

Sugar-scoop, Single

*Tiarella trifoliata* var. *unifoliata*

Sweet Cicely *Osmorhiza chilensis*

Water Plantain, Common

*Alisma plantago-aquatica*

Wild Cucumber, California *Marah fabaceus*

Wintergreen, Red Flowered *Pyrola picta forma aphylla*

Wood Anemone/Windflower, Western

*Anemone oregana*

Woodland Star *Lithofragma affine*

Wooly Sunflower *Eriophyllum lanatum*

Wreath Plant, Twiggy *Stephanomeria virgata*

Yampah *Perideridea* sp.

Yarrow, Common *Achillea millefolium*

Yerba Buena *Satureja douglasii*

Yerba de Selva/Modesty *Whipplea modesta*

Yerba Santa *Eriodictyon californicu*

## **FLOWERING SHRUBS AND HERBS (cont.)**

Tarweed, Hayfield

*Hemizonia congesta leucocephala*

or *H. c. luzulifolia*

Tarweed, Springtime or Keck's

*Hemizonia multicaulis vernalis*

Tarweed, Yellow *Hemizonia congesta congesta*

Tea, California *Rupertia physodes*

Teasel, Fuller's *Dipsacus sativus*

Thimbleberry, Western *Rubus parviflorus*

Thistle, Bull *Cirsium vulgare*

Thistle, Italian *Carduus pycnocephalus*

Thistle, Milk *Silybum marianum*

Thistle, Red or Cobwebby

*Cirsium occidentale* var. *occidentale*

Thistle, Sow *Sonchus oleraceus*

Thistle, Star, Yellow *Centaurea solstitialis*

Trail Finder/Trail Plant/Silver Arrow

*Adenocaulon bicolor*

Trillium, Giant *Trillium chloropetalum*

Trillium, Western *Trillium ovatum*

Vetch, American *Vicia americana*

Vetch, Spring *Vicia sativa*

Vetch, Winter *Vicia villarosa varia*

Vinegar Weed/Wooly Blue Curls

*Trichostema lanceolatum*

Violet, Redwood *Viola sempervirens*

Violet, Stream or Smooth Yellow *Viola glabella*

Violet, Two-Eyed/Western Heartsease

*Viola ocellata*

# Meet a Tree

“A tree is a woody plant with a trunk.”

Such a simple definition hardly gives credit to this complex and beautiful creation. Suppose you read in the newspaper that someone had invented an amazing machine. It was run by the sun’s energy, manufactured its own food out of water and carbon dioxide. It also was powerful enough to split a rock or support tons of weight, produce oxygen, water, food and fuel and, rather than pollute the air, actually cleansed and beautified its surroundings. Incredible?

Hey, wait a minute this is the description of a **tree**!

From a tree’s tiny root hairs buried in the ground to highest leaves in the crown, each part of a tree plays a role in helping it to function. Here’s a rundown of the various parts of a tree and what each one does:

## Leaves

Leaves are the food factories of a tree. Using energy from the sun, which they capture with a pigment called **chlorophyll**, leaves convert carbon dioxide and water into oxygen and sugar (food!) through the process of **photosynthesis**. The gases needed for and generated by photosynthesis enter and exit through tiny holes called **stomata** on the under surface of the leaves. At night, a reverse process called **respiration** uses stored sugars and some oxygen to make carbon dioxide and water again. The process of **transpiration** occurs when the water vapor exits through the stomata in the leaves. Luckily for us, a plant makes more oxygen during the day than it uses up at night, otherwise there would not be any extra oxygen for us to breathe.

Leaves also can help to protect the tree against dryness and extreme cold. The greatest danger to trees in winter is drying out – ground water freezes into frost and is not readily available to the root hairs of the tree. **Deciduous** trees (those that lose their leaves at the end of the growing season) prevent this water loss by forming a waterproof, corky layer where each leaf is attached to the tree. When the leaf falls off, this thin layer serves as a waterproof and disease resistant patch. **Conifer** (cone-bearing evergreen trees) needles on the other hand, can remain attached year-round as they have less surface area through which to lose moisture and are covered with a waxy substance called **cuticle**, which greatly slows down moisture loss.

## WHAT ARE REDWOODS?

*What is a redwood tree?*

*What size are redwoods?*

*How large are they underground?*

*How are other trees like the redwoods?*

*How is the redwood different from other trees?*

*Are all redwoods exactly the same?*

Have you ever put yourself on the legs of an ant before? Did you ever wonder what a blade of grass might look like to such a small creature? Can you imagine lying on the ground, deep in the forest, looking up at the tallest living trees in the world? For a moment you might seem to be like an ant among blades of grass.

A coast redwood, like other trees, is built of many working parts. Beneath the soil grow many roots. They have several jobs. They are like your feet. They give the tree balance and stability. How great an expanse of roots do you think it would take to balance a single coast redwood?

Roots are also like our hands. They are the fingers on the tree that reach for all the nutrients and water they can absorb from the soil. Roots can store minerals for the tree until they are needed. Some plants have one large taproot to bring up water and nutrients from far into the soil. Others, like the coast redwood, grow in moist areas where much water is available near the soil surface. These trees, then, need only a shallow, spreading root system in order to obtain water.

Most coast redwood forests are very dense -- many of the trees grow side to side. Try to picture the root systems of these trees as a single network. How might this improve the balance of a single tree? Might this "close-knit" situation also affect the forest as a whole?

Above the ground the coast redwood, like other trees, is equipped with a trunk, branches, leaves, and a means of reproduction. High in the trees, leaves absorb and convert the sun's energy into sugars and starches that allow the tree to grow new roots and leaves, a taller trunk, and cones to produce new trees.

Although each of these parts has the same function in most plants, those of the coast redwood are distinct in appearance. Some trees very similar to the coast redwood in these characteristics are considered its relatives. Following are some pictures and a chart to help you see how the coast redwood and its relatives are similar yet different.



	<b>Coast Redwood</b>	<b>Big Tree</b>	<b>Dawn Redwood</b>
Location and distribution	500-mile range from Santa Lucia Mountains north to southern Oregon; elevation 0 to 3,000 feet	250-mile range in the Sierra Nevada Mountains from Tulare Co. north to Placer Co.; elevation 5,000 to 8,000 feet	Central China; elevation 2,400 to 4,000 feet
Size	Height: 300 to 360 feet Max. Height: 367 feet Diameter: 12 to 16 feet	Height: 250 to 300 feet Max. Height: 325 feet Diameter: 28 to 32 feet	Height: 80 feet Max. Height: 115 feet Diameter: 5 ½ to 6 feet
Age	Avg. 800 to 1,500 years Max. 2,000 years	Avg. 2,000 to 3,000 years Max. 3,300 years	Unknown
Root system	Spreads 40 to 50 feet; depth, 4 to 6 feet	Spreads 100 to 150 feet; depth, 6 to 8 feet	Unknown
Leaves	Two types: needle-like and awl-shaped Sessile Evergreen	Awl-shaped  Sessile Evergreen	Needle-like with small stalk  Deciduous
Long Branches	Bear short shoots in alternate array	Bear short shoots in alternate array	Bear short shoots in opposite pairs
Short Branches	Leaves in spirals Leaves in two rows except at tips	Leaves in spirals	Leaves opposite Leaves in two rows
Reproduction	Reproduces mostly by sprouts, sometimes by seed.	Reproduces only by seeds.	Reproduces by seed.
Seed Cones	.75 - 1.50 inches long Some persistent but open after first season Scales in spirals Seeds in one row on each scale Mature in one season	2 - 3 inches long Persistent but may remain green 20 years Scales in spirals Seeds in two rows on each scale Mature in two seasons	About 1 inch long Deciduous  Scales opposite Seeds in one row on each scale Mature in one season
Pollen Cones (staminate)	Scales spiral	Scales spiral	Scales opposite
Buds	Scaly	Naked	Scaly
Scientific name	<i>Sequoia sempervirens</i>	<i>Sequoiadendron giganteum</i>	<i>Metasequoia glyptostroboides</i>

## **DISTRIBUTION AND ANCESTRY; ADAPTATION AND EVOLUTION**

*What does a plant need to live?  
Do all plants have the same requirements?  
Where do redwoods grow?  
Have they always lived where they do now?  
Why don't they grow elsewhere?*

A plant's needs are a lot like a human's. In order to grow, a plant needs vitamins and minerals just as we do. In addition to nutrients from the soil, however, a plant requires sunlight for energy and growth. Another basic difference between plants and man is the inability of the plant to move from its rooted position. When we are too hot or cold, we can add or subtract clothing or change locations. If we are hungry, we can feed ourselves. But a plant must be able to survive in the limited environment in which it grows. If the soil is infertile, too wet or too dry, or if the leaves are getting too much or too little sun, then the plant may die. Survival only occurs when the plant can tolerate and adapt to the conditions in which it grows. No environment or organism is static.

Just as the earth has been changing for billions of years, so have the organisms that occupy the land, sea and air. In the severe seasons, only the most well-adapted individuals will survive and reproduce. In this way the most successful organisms pass on their characteristics to the next generation. In this slow process we call evolution are born the changes that allow organisms to change with the earth. And so it is that the three living redwood species have been subjected to different environmental conditions and each has responded uniquely and successfully. Many other species that could not make necessary changes have died out.

### ***What do we know about the ancient past of the coast redwood?***

At one time redwood trees grew in many parts of the northern hemisphere. The world was then a different place. Dinosaurs roamed the countryside, and huge swamps were common. The climate was much warmer because this was before the Ice Age and the formation of the northern glaciers. During this early, warm period, redwoods even lived in Alaska! How do we know this? Fossils of several different redwood species have been found in rocks in many parts of the northern hemisphere. Other plants, such as giant ferns, figs, avocados, and mahogany, are known to have occupied the same areas. Where do we find them today and in what kind of climate? To see these plants growing wild today, we would have to travel to the subtropical rainforests in Mexico or Central America. Why don't we find these plants in Alaska or California now?

Gradually, the earth and climate have been changing. Days and seasons have become much colder, the air and soil drier. Plants and animals have been forced to change their habits or bodies, to migrate, or to succumb. Today we find very few survivors of the past. What do you think happened to them? The dinosaurs disappeared long ago. So did most of the plants. However, the coast redwood, which once occupied many different areas throughout the United States, Canada, and Western Europe, is now living only along a 500-mile stretch of coast in northern California and southern Oregon.

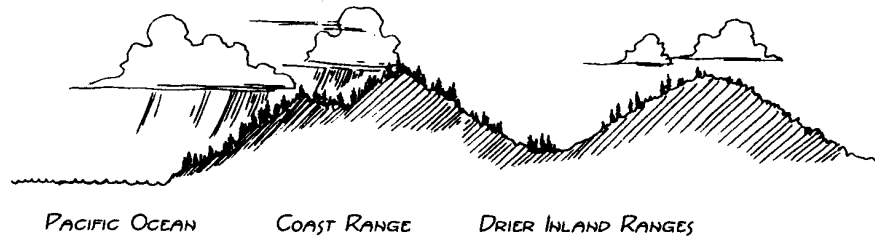
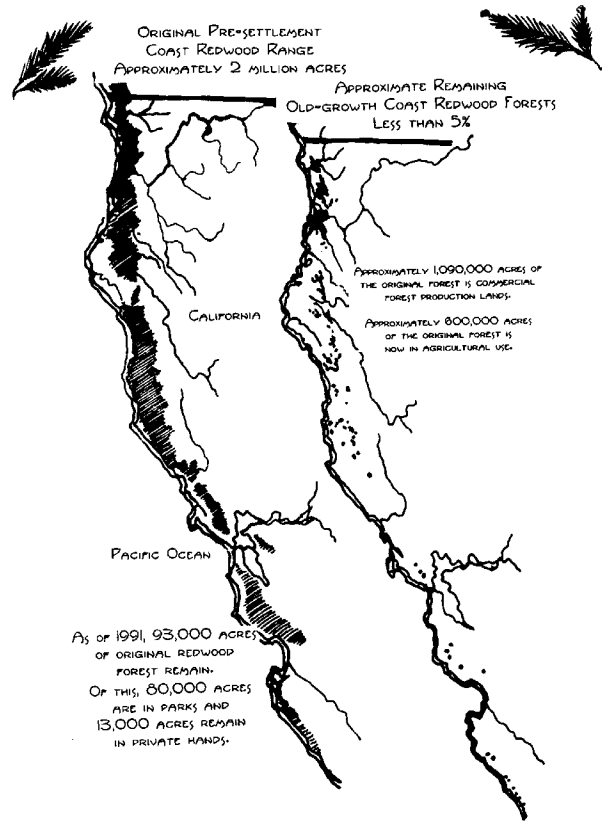
**Why is the coast redwood limited to such a small range and how is it suited to this particular natural habitat?**

The Pacific coast has a damp, mild climate all year round. Temperatures fluctuate very little from season to season, and fog covers the trees in a wet mist during much of the summer. Coast redwoods grow very straight and tall and close to other trees in the forest. The dense foliage collects the mist from the air. What does this do for the tree? Just beneath the soil surface grows a delicate system of feeder roots. As the water drips from the leaves to the earth, the roots take up the moisture. Because the trees are so tall and close together, sunlight rarely reaches the forest floor. This, too, helps to keep the roots moist and the tree supplied with the necessary water to live through the usually rain-free summers.

**What does “West-side weather” mean?**

Weather plays an important role in creating these forests. Warm, wet winds blow from the west across many thousands of miles of Pacific Ocean. When these winds finally hit the mountains of the Pacific Coast, they rise as they continue east. As the warm, water-laden air cools with changes in altitude, it condenses into the forms of rain or fog. The temperate, wet climate most closely represents the original Jurassic and Cretaceous periods when redwoods dominated the earth.

**The Range of Coast Redwoods**



***What else does a coast redwood need to survive and prosper?***

What other requirements does this tree have? The coast redwood grows the largest and healthiest and in pure stands where water, soil, and light are all abundant. The combination of these elements is at a peak in some coastal river valleys, where soils are continuously washed down the canyons or blown by eroding winds. These “new” soils are rich in minerals and the steady resupply allows redwood groves to grow and remain healthy.

***What are the other species of redwoods?***

***How have they adapted to their native habitat?***

Another California redwood, the big tree, grows naturally in a small range of about 250-miles on the western slopes of the Sierra Nevada. The climate here, with its seasonal fluctuations, is very different from that at the coast. Winters are much colder, and some snow is common. Summers are very hot and dry. What features of the big tree help it thrive in an area where its coastal relative cannot even survive? The deeper and farther-spreading root system of the Sierra Nevada species is useful in the dry climate. Let’s consider the leaves of the three living redwood species. How is each unique?



**Coast Redwood**



**Giant Sequoia**



**Dawn Redwood**

The Giant Sequoia has leaves that are much smaller than those of the coast redwood. This enables the tree to conserve water. Leaf surface exposed to the sun loses some water due to evaporation. Coast redwoods grow two distinct types of needles. Treetop needles, located where it is hot and dry, look like tight scale-like spikes (closely resembling the Giant Sequoia), creating less evaporative surfaces. Lower needles, growing within the shady forest canopy, are broader and flat so as to catch more of the available light. These are the needles we usually see, the upper needles come to our attention only when they are blown down from their high homes after a winter storm.

The Dawn redwood, thought to have been extinct for 20 million years, was recently discovered living in Central China. It has adapted to the seasonal freezing temperatures by losing its leaves during the cold season. Many plants, such as some oaks, maples, and elms, conserve water and energy by being deciduous.

## GROWTH AND REPRODUCTION

*Where does a coast redwood seed begin to grow?*

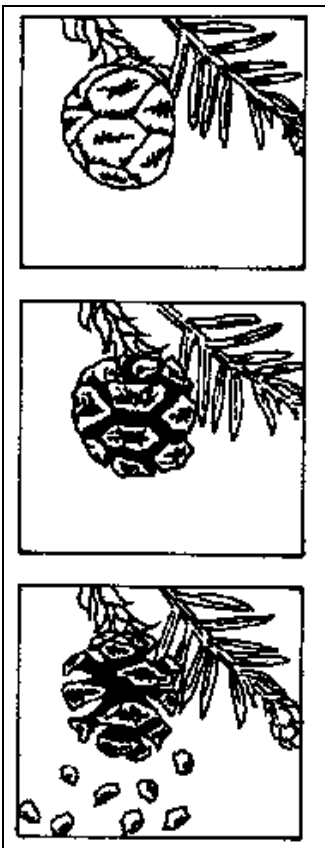
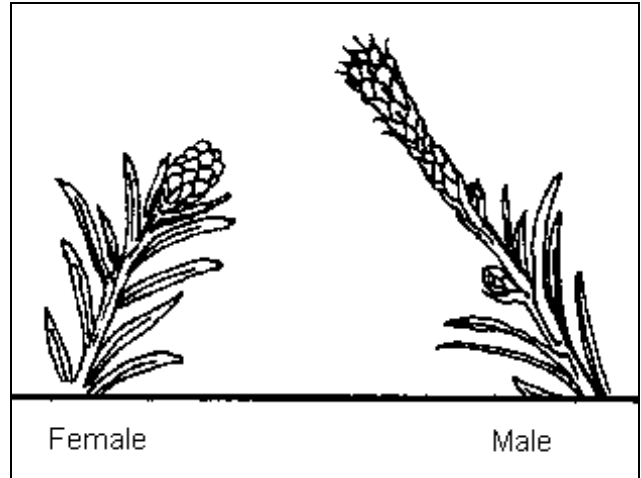
*Why don't all seedlings survive?*

*How fast do coast redwoods grow?*

***Did you know that coast redwoods, like other conifers, have both male and female cones?***

Both sexes can be found on separate branches of the same tree from March to November. The cones that you are probably familiar with are female cones. They contain the seeds that begin new trees. Do you think you've ever seen the tiny inconspicuous male cone? It is made up of pollen that must unite with a mother cell in the cone to become a seed. How does the pollen reach the female cone? The wind plays a large part in this event. Coast redwood trees produce millions

of seeds every year, but few survive. Still fewer will produce seedlings because of limited habitat conditions. During the late summer and fall most of the seeds drop from the cone to fall among the old trees of the forest floor.



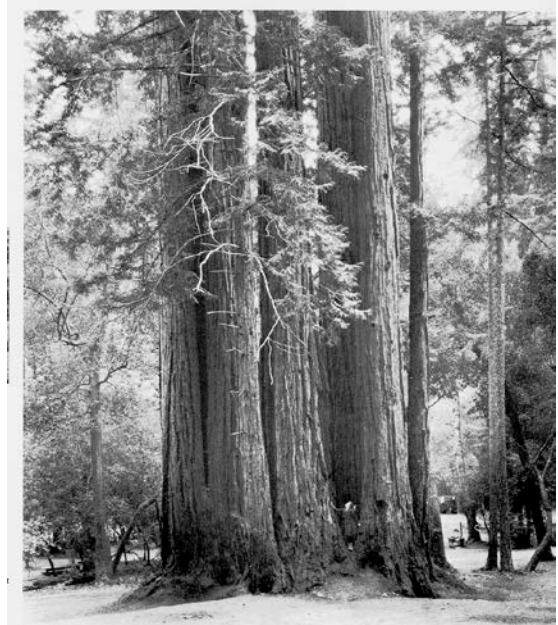
In order to germinate, a seed must get enough moisture to soak up its seedcoat and high enough temperatures to begin growth. Usually this means about five to eight inches of accumulated rainfall and days warmer than 58°F. If the young seedlings can survive longer than three months, they've made it through the roughest period. By this time a seedling is well established. Roots may have pushed three to four feet into the soil and begun to branch off in several directions. But before a seedling gets to this point, many events must have occurred. This is why few seedlings mature to the reproducing stage.

***How does the seed contact mineral soil, which lies six to eight inches below the litter layer?***

A disturbance, either natural or caused by man, may allow this to happen. A tree may fall, an area may be logged and the soil upturned, or a flood may bring in new soil. Burned areas are also the site of many young seedlings. The thick layer of dead plant materials on the soil surface is burned away, the bacteria are killed, the mineral soil is exposed, and the microorganisms that attack the roots and stems of tiny seedlings are dead. Under these conditions, when the soil has been naturally prepared, and the dense ceiling of the forest canopy has been thinned, light, moisture, and warmth work together to produce a healthy, thriving seedling.

***Why do coast redwoods regenerate themselves by sprouting?***

Sprouting is considered the major form of reproduction of the coast redwood. Buds on the roots form vigorous, fast-growing sprouts. Sprouting may also be a reaction to an injury inflicted on the tree. For example, when a tree is felled or burnt, it may sprout. In any case since the root systems are already developed and light is readily available, the sprouts shoot up and the forest is soon very green. Healthy trees produce a growth regulator that inhibits fast-growing sprouts. These trees concentrate all growth in the main trunk and branch system. Injured or declining trees don't produce these regulators, and the sprouts soon take over. Sprouts are very persistent, and young seedlings aren't able to compete with them for resources.



Oftentimes forests have a “fairy ring” of trees that are all sprouts from the same parent tree. The older center tree may or may not be living, and in some cases it will be completely decayed. Sometimes you will see sprouts that seem to appear out of nowhere. Often these are sprouting from burls beneath the soil on fallen logs or on the roots themselves. These gnarled masses of dormant buds are centers for sprouting and do not disrupt the functions of the tree. Wood craftsmen consider burls valuable building materials.

## SURVIVAL

*What enables a redwood tree to live so long?  
What are the enemies of the coast redwood?*

### **How long does a coast redwood live?**

Some of the oldest have been alive 2,000 years or more, but on the average they survive for 800 to 1,500 years. What events in history were occurring in the late 400s when some of these older trees were small seedlings. Columbus wasn't even to be born for another 1,000 years!

Redwoods have several natural enemies -- insects, disease, flood, fire, wind -- but they are also equipped with amazing abilities to combat these forces.

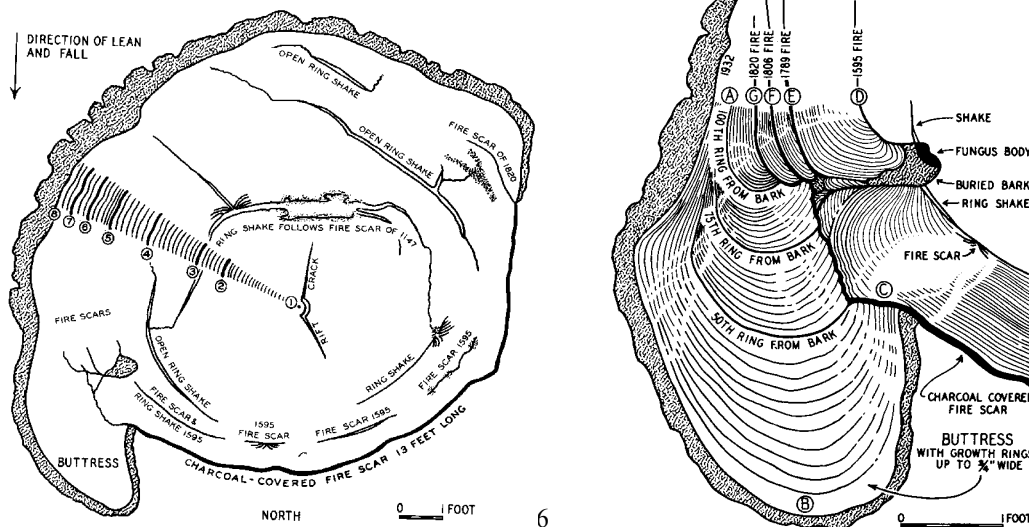
### **What protects the redwoods from penetrating insects?**

Most insects bore into trees through the bark, but in the redwood this is particularly difficult. Redwood bark is fibrous (dry and full of air pockets) and very thick. Tannins, produced by the tree, are found in the bark. The bitter taste of this substance, combined with the other factors, makes the bark a very unpleasant place for insects. The thick bark also protects the inside of the tree from fire.

### **What happens to a redwood forest in a fire?**

Very hot fires often burn the inner heart wood of the tree. Have you ever seen a redwood with a big cave-like hole ("goose-pens") in the base of its trunk? How can the tree continue to live with its interior burned away? Since the tree is still living, how important can the outermost layers of the tree be? This part of the tree, the cambium layer, is the most recent growth of the tree. It is alive and produces a new layer of bark and wood each year. The loss of the center support of the tree does definitely weaken the tree and make it more susceptible to damaging natural forces, but it doesn't kill the tree.

Redwoods heal their wounds, but only very slowly. Wounds in redwoods may be invaded by very slow-growing molds and fungi, but it is rare that these trees are killed by disease. In addition to healing the wounds of scarring, coast redwoods build a "buttress" that is used as support.

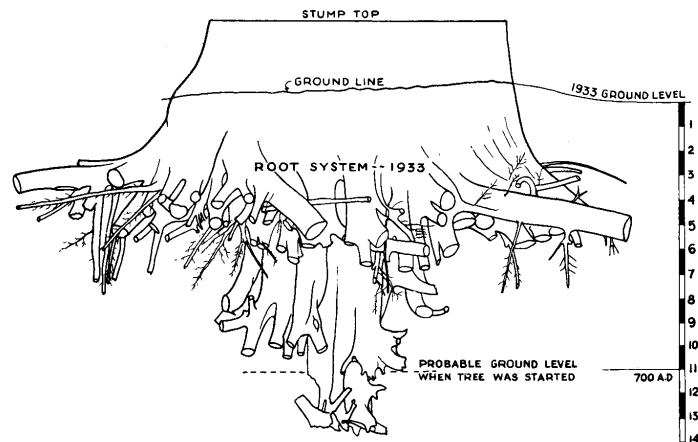


**How are these magnificent trees affected by flooding?**

The largest, most beautiful coast redwoods live in the river valleys, where the new mineral soils are regularly available through the seasonal processes of wind erosion and flooding. Have you ever watched a river during a storm? What color is it? When great amounts of water fall over a short period of time, the land cannot hold all the water. It drains into the rivers, which then swell and erode the banks.

Soil, branches, and other debris are absorbed and carried by the river. The river, swollen with these materials, leaves its normal course. Because it cannot travel so fast here, much of the dirt and debris settles out. If this happens year after year, the land on both sides of the river flattens. These areas contain some of the richest available soils and make superior homes for the coast redwoods.

But doesn't this regular flooding harm the redwood, whose roots need to be close to the soil surface? As we have already seen, this remarkable tree has developed the ability to combat many natural forces. When the roots are buried beneath a thick layer of topsoil, the tree quickly sends out new roots, first straight out from the old root system. Then, a completely new set of roots grows from the trunk at the point just beneath the new soil level, where minerals and moisture are most abundant.



So we see that the natural forces of the river have a tremendous effect on the coast redwood forest. New mineral soil is introduced fairly regularly, allowing young seedlings a good opportunity for survival. Maturing trees also benefit from the abundant nutrients. And the weaker, sickly trees are naturally harvested by the raging torrents. In some cases rivers rise too rapidly and race through canyons so quickly that an entire forest may be wiped out. These areas aren't so quick to recover, and erosion can be a major problem here.

## THE REDWOOD COMMUNITY

*What plants are the redwood's neighbors?*

*How do these organisms interact to make up the redwood community?*

*What happens when a member of the community dies?*

In falling by the natural forces of the earth, an old tree remains an intricate part of the forest's web of life. With the death of the redwood comes a surge of life to the forest floor. This single change brings a disturbance of the soil and more readily available nutrients, more space to grow, and a place where light can easily reach the floor. As the leaves, branches, and trunk of this mighty tree are attacked by bacteria, insects, and fungi, the woody material will be returned to the soil, where it can once again initiate new life and growth. This tree will decompose in time and bring nutrients to redwood seedlings, maturing adults, and the plant neighbors that will live in this community for many years to come.

A redwood community is many different things:

1. The foliage of many redwoods growing so close together blocks out much of the potential light source of many other plants.
2. The dense foliage captures fog, which drips to the forest floor beneath the tree.
3. The three-to-four year old sprays of leaves periodically fall from the redwood to the forest floor and accumulate there - a part of the long process of decay.

### ***How should we describe the forest floor?***

Think of this as a dark, wet environment. Though conditions seem pretty bleak for any kind of undergrowth, the redwood habitat is the home of a variety of plants that find the surroundings suitable for growth and survival. For example, some of the herbs found on this forest floor have been associated with the redwood for millions of years. Without the protection this environment provides, these fragile plants would have been forced to change or to succumb. Also at the floor level are several different ferns. The largest you'll see is the sword fern. Look at the back of the leaf. The moisture of the floor is very important for the growth of these spores, which are the reproductive cells of the ferns.

The California huckleberry, a shrub, is larger and taller than the herbs. It shares the second layer of growth with other plants that are also shrubs and require more light than the herbs.

***What other tree is commonly found in the upper layer of growth?***

The upper layer of growth is made up of a variety of trees, depending on the microclimate of the particular area. For example, the Douglas-fir, a conifer, can thrive in the subdued light of the redwood forest. For this reason it is a close associate of the coastal sequoia. On completely cleared slopes its seedlings are able to germinate and survive better than redwood seedlings. Later, under the protective branches of the “pioneer” Douglas-fir, the redwood seedling is able to get a good start. Other species do better with more light, and they are always fighting to grow closer to the sunlight. These types of plants do much better at the edge of the forest. Still other trees do best near streams. Where the redwood forest borders the ocean, we get a wholly different group of tree associates.

So we see that there is a great variety of plants that live near or among the coast redwoods. More important than knowing the names of these plants is acquiring a clear picture of the forest layers. Notice that the habitat is not uniform. Do you see that there are different plants at each level within the forest and that geographic location determines which plants will grow at a particular site? For instance, companion plants in the river valleys, the inland canyons, and the coastal mountain ridges are all different.

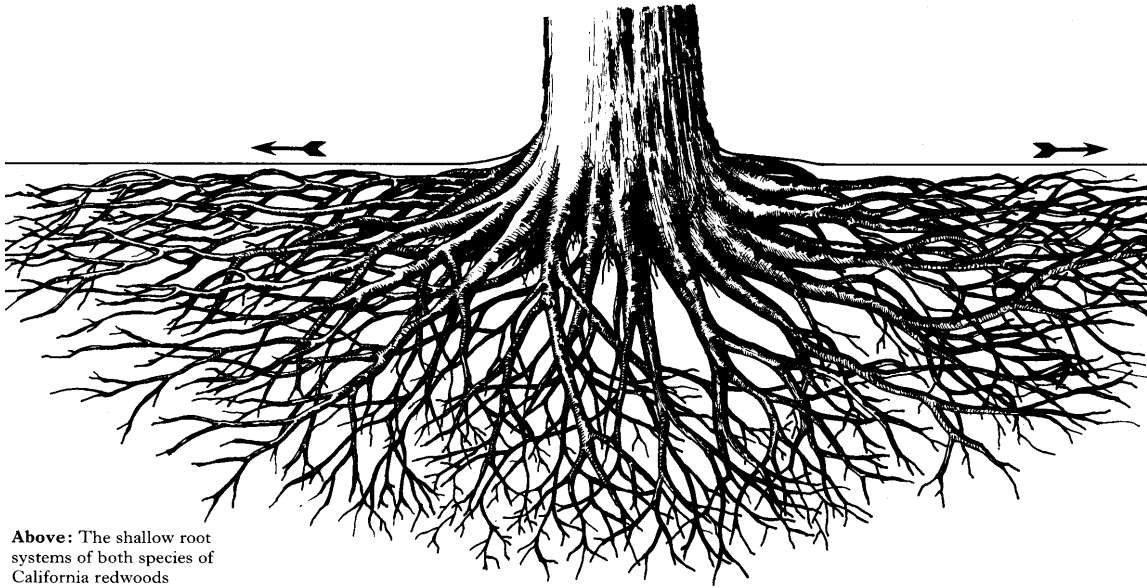
***What animals make their homes among the redwoods?***

The great diversity of plants within different layers creates a community of many different niches that can be filled by a variety of organisms. Moles, shrews, bats, squirrels, porcupines, birds and other animals inhabit the redwood forests, at least periodically. Since the forest isn’t very productive, these animals are not extremely abundant. Each creature must play a unique role in the community if it is to live and reproduce here. That is to say, each species has a different home and way of life from all others. However, the whole community is linked together in a loosely knit but intricate web; each plant and animal is dependent on others.

One of the most abundant food sources for animals of the redwood forest consists of insects. What kind of animals eat them? When you walk through a forest, listen for sounds. What do you hear? Different birds, each with a unique niche, inhabit the different layers of the forest. Some occupy the uppermost branches and search among the topmost leaves for food. Others climb the massive trunks of the redwoods, actively searching for sparse bark beetles. Still other species scrape in the floor litter for a morsel of food.

Notice the different feet and beaks of each type of bird you can get close enough to see. Try to decide what eating habits the bird has by looking at its body parts carefully and by watching it move. One bird you’ll be sure to see among the redwoods is the only blue-crested bird in California, the Steller’s jay. Oftentimes it will screech and squawk and warn all the forest animals that you are approaching. The banana slug probably won’t be quick enough to escape your eyes, but do watch your feet, or you’ll squish this well-camouflaged yellowish creature.

# THE ANATOMY & GROWTH OF TREES

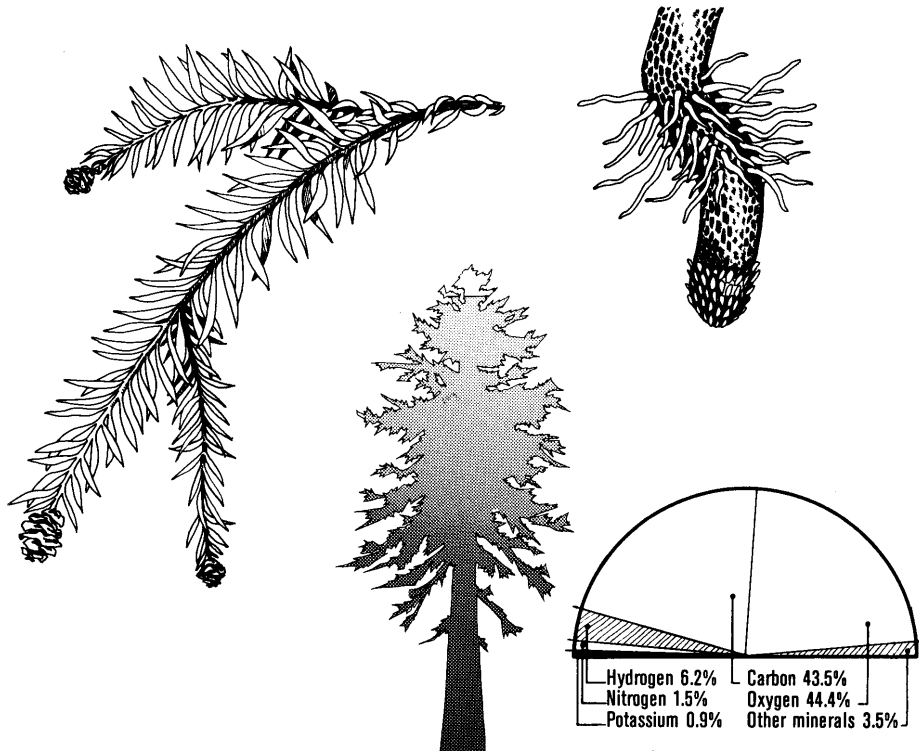


**Above:** The shallow root systems of both species of California redwoods rarely go deeper than six feet into the earth. They may spread for hundreds of feet in all directions around the tree, however. An undisturbed layer of thick, damp mulch on the forest floor is essential to the health of these trees.

**Far Right:** An enlargement of a minute root tip with the protective cap.

**Right:** A branchlet of the coastal redwood is made up of hard needle-like leaves covered with a thin layer of wax to inhibit transpiration and moisture loss. Like other sorts of leaves, those of the coastal redwoods breathe through spores on their undersides.

**Far Right:** From 80 to 90 percent of a living redwood's water is drawn up from the ground; the remaining 10 to 20 percent is taken from the atmosphere by its leaves. Carbon and oxygen are principally supplied by the atmospheric water; the roots supply, in addition, nitrogen, potassium, calcium, phosphorus, sulphur, iron and magnesium.

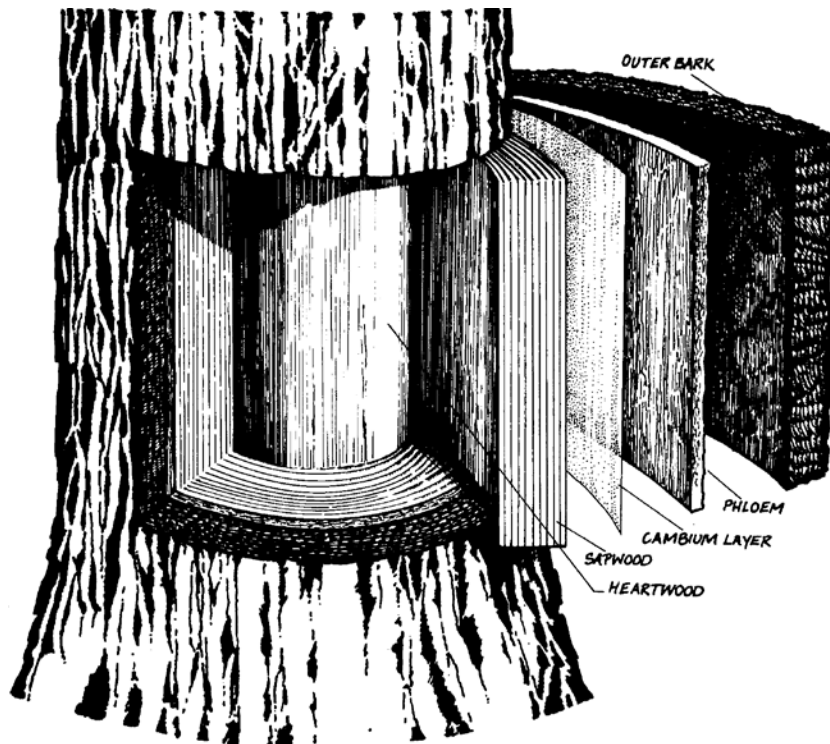


## TREE LIFE

Earth's forests contain thousands of species of trees, each of which is distinguished by the individual characteristics of its seeds, leaves and growth. Regardless of species, however, all trees have the same general structure and requirements for survival. They all utilize water, soil, air and light to manufacture food, increase in size and produce seeds.

The root system of a tree, which in redwoods is 4 to 6 feet deep and as much as 250 feet wide, collects water and minerals from the soil. Root tips are protected with a hard covering that enables them to probe the soil both vertically and laterally. Microscopic root hairs cover the root's surface and literally embrace grains of earth from which they absorb moisture and nutrients.

The root system sends the water and dissolved minerals to the leaves of the tree, where food production takes place. The leaves, in turn, send food back down to the roots, which cannot produce any nutrients on their own. All this transporting of substances takes place through the trunk and branches, where the wood is arranged in several layers that have specific functions in the process. The outermost layer of the tree, the bark, provides protection for the plant; this layer is made up of dead and aging cells that formerly served as conduits for food. The inner bark is the active food transport system, called the phloem, and this layer also stores food for the tree. Beneath the phloem is the cambium, the only part of the trunk that produces new cells. The cambium layer is microscopically thin, its cells continually dividing to add new growth to the layers on either side of it. The cambium does not add to the height of the tree, but adds to its diameter; all upward growth is accomplished by the tips of the branches.

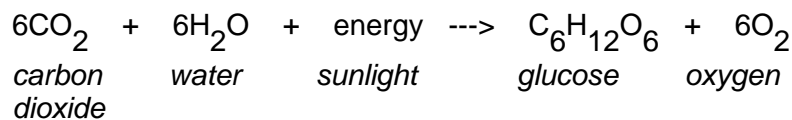


The xylem, or sapwood, of a tree carries water from the roots to the leaves. Like the phloem, this layer also stores food as a reserve supply for the tree, and it receives new cells from the neighboring cambium. As the xylem ages, its water-movement function ceases, and this woody layer becomes heartwood, which constitutes the real strength of the tree. The heartwood is no longer living, but it will stay intact so long as the layers of cells around it continue to be nourished.

It is the heartwood and sapwood layers that reveal a tree's record of growth. The rings that are visible in any cut log or stump show the annual growth of that tree; their dark outside edges represent the summer growth of small cells, and the wider, lighter-colored interior section of each ring record the spring growth, which is less dense and made up of larger cells than those produced in summer. In very old trees, particularly the giant sequoia, the number of growth rings can be misleading. In some instances an annual ring may not have reached the level of the stump, because the rings begin at the tree's crown. In other instances, the pattern of growth rings may be distorted owing to a fire scar or a buttress on one side of the trunk.

Water and dissolved minerals flow through the roots and trunk of the tree in a continuous process known as transpiration. For the most part, the leaves (or needles, which are a conifer's leaves) pull the water upward through the tree's body as they release water from their many pores through evaporation. This process of upward movement is aided by the surface tension of water molecules in the tree's circulatory system. Water moving upward through the sapwood could be likened to the column of mercury in a thermometer; its molecules cling together as they move up or down in the narrow chamber inside the instrument. The water in the long vertical cells of the sapwood behaves similarly, forming an unbroken column from roots to leaves.

At its destination, the water meets chlorophyll, stored in the leaves in millions of cell bodies called chloroplasts. When carbon dioxide from the air and sunlight also reach the chlorophyll, photosynthesis occurs. In this chemical reaction, the life-giving process for the tree, carbon dioxide and water combine to form glucose, the food for the tree. Oxygen, a by-product of photosynthesis, is released into the atmosphere to sustain all nonplant forms of life. The chemical formula for this process is as follows:



In addition to the products of photosynthesis, each leaf gives off excess water through its underside, adding moisture to the air and keeping the temperature of the leaf cool enough for photosynthesis to continue. Thus, through the combined actions of



transpiration and photosynthesis, trees actually increase the moisture in an area, by raising the water table through the action of their roots and by recycling water into the air through their leaves.

## **The REDWOOD “FOG DRIP” CONNECTION**

The coastal redwood rainforest grows naturally in the coastal summer fog belt allowing the trees to catch the moisture they require during the rainless summer months.

### **How fog drips occurs:**

- During warm coastal weather, fog forms over coastal waters and drifts inland as far as 25 miles.
- As the air temperature cools the fog condenses into droplets when it contacts the foliage of the tall trees.
- Most of the fog precipitation will occur between midnight and 4:00 am.
- A mature old growth redwood near the ocean can condense fog into as much as 80 inches of water during the months of July, August and September.

### **The entire ecosystem depends on fog drip:**

- Fog drip can account for over 40% of the water found in the forest.
- Tall redwoods capture more water than they need, which allows for the growth of understory species which themselves can't capture fog.
- Sword ferns, redwood sorrell, and rhododendrons are some of the plants that depend on the fog drip water for their summer growth.
- Amphibians such as frogs, toads, newts, and salamanders thrive in the fog drip moistened duff in the redwood forest. Their skin needs to be moist at all times.
- Fog drip water soaks into the soil and replenishes groundwater, springs, and rivers. Summer water temperatures and water levels are kept cool and adequate for salmon, eel, and steelhead.

### **Without tall trees to catch the fog, the entire ecosystem will and does change:**

- Young redwood seedlings cannot grow without summer moisture. They will shrivel and die.
- The microclimate becomes hotter and windier without the tall trees and the fog water they catch, which leads to drier soils and more obstacles for seedlings.
- Summer water levels in streams will be lower without fog drip, which leads to higher water temperatures, leading to very stressful conditions for salmon, steelhead, and eels.

EVENTUALLY THE FOG ITSELF WILL DIMINISH. Hot bare soil radiates heat which will burn off fog before it can roll east to cover the redwood forest region.

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## **Part V**

### **School Group Activities**



## ACTIVITY

### Before and After Your Visit

**OBJECTIVE:** To evaluate and summarize the students' knowledge

**GRADES:** K - 4

**MATERIALS:** 1-2 sheets of paper per student  
Markers, pens, colored pencils, or crayons

In this activity you will be able to compare the children's previous knowledge about the forest with the knowledge gained while at Armstrong Reserve. The children should be able to see a significant difference in their drawings as the second drawing usually contains more detail. If you have students who do not like to draw, have them use words for this project.

#### **Before your visit to the park.**

Give the students a blank page that is divided into two parts. Have the students draw a picture of what they think the forest will be like. Be sure their names are on their papers. Collect them for future use.

#### **After your visit to the park.**

Give the students back the same picture they drew before. Have them draw what they now know the forest looks like on the other half of the paper.

Have the students compare the two drawings. You can now have a discussion/review, about what kinds of things they learned. What did they see that was unexpected? What did they like best? Did they see any litter or defacement?

It is best to do this as soon after the field trip as possible, the same day would be great!



## ACTIVITY

### A READ-ALoud Story

#### THE STORY OF THE SOLOMON TREE

A very long time ago there was a redwood forest of really tall trees along a shiny river. There were many things in the forest: small furry animals with wide, bright eyes; lizards and worms; plants that flowered in the spring; birds who chattered in the trees; and silver fish in the stream that ran through the forest. Everything that lived in the forest loved being there.

In the winter, great white clouds sailed over the mountains and called down to the forest, "Rain tomorrow, rain tomorrow," and the birds listened and hid in their nests in the branches of the tall trees. The furry animals burrowed deep into the ground beneath the sweet smelling redwood needles, in a shelter from the coming storm. In summer, when the stream hid underground from the summer heat, gray, misty fog came from the nearby ocean and nestled in the treetops to give the redwoods a needed drink of water. When the wind blew through the trees, it brought news of the different seasons and of its travels around the earth and the animals listened. It warned the animals of fire, and the animals listened. The trees talked to each other through the wind in their branches; the raccoons and black bear and deer listened to each other's stories; the squirrels and caterpillars and mice listened to each other. They didn't talk in words and sentences the way most people do today, but they had secret codes that all of them understood. They all lived happily together in the forest.

In this redwood forest, lived something that was the wisest being around. He had lived for over two thousand years. He was the biggest, the strongest, and the most beautiful being in the forest. His name was Solomon, and he was a redwood tree. Solomon stood in the forest, listening to the wind in his branches, talking to the clouds overhead, drinking from the stream that flowed near his roots, and soaking up the summer fog. Small birds, and even animals, made their homes in his great branches. He was very old and very wise, and all the animals came to sit beneath his branches and talked with him in their own way. They loved him very much, and he loved them.

Because Solomon had lived so long, he had seen many changes take place in the forest. He saw the black bears move their homes farther and farther into the tallest mountains. He watched strange creatures move into the forest in the summertime, creatures who had copper-colored skin instead of fur, and who had dark, dancing eyes. These creatures walked on two legs and killed the raccoons and deer, and used their skins for clothes and shelter. They built fires with a stick and a stone, and roasted some of the animals over fire for food. Solomon

saw these creatures and was confused. But he saw that they were good creatures; they took no more than they needed, and they respected the forest and the animals and the stream. These men became like brothers to the forest, so Solomon did not fear them. They lived with the forest and respected everything there.



me, Solomon saw a different kind of man come. These men wore big boots and carried sharp axes, and big metal guns. They came alone on horseback, and they stayed all year long. They built dams up streams. They chased the Indians away. They hurt his friends the birds and raccoons and deer with these newcomers. The men took furs and sold them to the merchants and Solomon became afraid for his friends. He watched as the animals left to find other forests. He watched his brothers, the other trees, get cut down and chopped up for houses, or being burned who lived far away, or even being burned in the fields. The birds and animals called out their lonely, "bye, goodbye, Solomon. Goodbye, stream and forest. I cannot live here any more. Goodbye!" And Solomon became very sad.

One day, the men in big boots came into Solomon's forest and looked up at him. Solomon heard them and said, "That's a fine looking tree, the finest in the forest. I will chop it down and get a good price for it. We will get a lot of money." They stabbed their axes into the ground. They chopped away at his thick strong trunk as he sat there watching, but he was very proud. He did not care if the wounds hurt him very much, and soon he could not stand upright beneath his roots. He could not taste the water of the stream. The men chopped for a long time, chopping the very strong tree, and he did not give up easily. He was so strong, but under the weight of the axe he began to tremble. He lifted his great branches toward the clouds and the sun and the stars. He roared like a clap of thunder. All over the forest the sound could be heard, and the animals scampered far and fast in fright. Some of them never returned.

This story could end here. It is sad to remember the rest of what happened to the forest. All that was left of Solomon and his brothers were great redwood stumps. But Solomon left a message with the deer before he

fell; he left a message with the wind and with the stream. Nowadays, if you walk in the forest, or listen to the stream, you can hear Solomon's message. He said, "Be careful with all of us. We cannot fight. We can only grow if you leave us alone." This is the message he left for all of us. His last wish was that we would listen to his message.

But this was not the end of Solomon and his brothers. The great stumps that were left still had life in them, and new trees began to grow around the stumps. Now, when you walk in the redwood forest, you can look for the families that Solomon and his friends have left for you. Look at them, enjoy them, but do



## Armstrong Redwoods State Reserve Word Search

M	G	L	E	R	R	O	S	W	O	R	D	F	E	R	N
P	W	D	U	F	F	L	B	N	E	H	C	I	L	A	N
Q	O	Y	O	K	R	P	I	A	R	F	E	F	E	S	V
Z	O	I	B	O	H	I	Z	Z	D	P	S	E	S	E	G
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T	L	Z	S	Y	U	N	O	K	R	S	C	L	W	S	I
S	J	Y	E	I	R	C	B	V	L	Q	A	G	S	R	A
M	O	T	P	C	E	U	E	S	S	O	M	O	L	A	F
R	F	N	E	E	R	G	R	E	V	E	Z	U	C	P	D
A	U	V	N	L	K	G	U	L	S	A	N	A	N	A	B

<b>ARMSTRONG</b>	<i>Reserve named for Col. James B. Armstrong (Tree is 1400 years old)</i>
<b>BANANA SLUG</b>	<i>A PGM! Pulmonate (with lung) Gastropod (stomach foot) Mollusk</i>
<b>BURL</b>	<i>Knobby growth where, for unknown reason, tree buris over and over</i>
<b>CIYO'LE</b>	<i>Indian name for the forest meaning shady place; pronounced see-oh-lay</i>
<b>COAST REDWOOD</b>	<i>Sequoia Sempervirens; other redwoods are Giant Sequoia and Dawn</i>
<b>DUFF</b>	<i>The layer on the forest floor that becomes humus, then soil</i>
<b>ECOLOGY</b>	<i>The science of relationships between organisms and their environment</i>
<b>EVERGREEN</b>	<i>Having foliage (leaves, needles) that remains green through the year</i>
<b>FAIRY RING</b>	<i>Circle of trees sprout from parent tree that may or may not be living</i>
<b>FIFE CREEK</b>	<i>Flows through the grove and down to the Russian River</i>
<b>FOG DRIP</b>	<i>Can account for 40% of the water in the forest</i>
<b>GOOSE PEN</b>	<i>Where the bottom of trees have been burned out on the inside</i>
<b>HUMUS</b>	<i>Decomposed duff -- next stage is soil</i>
<b>LICHEN</b>	<i>Fungus and algae -- grows on rocks and trees</i>
<b>LIZZIE</b>	<i>With the LeBaron family, fulfilled father's dream of preserving this grove</i>
<b>MOSS</b>	<i>Grows in moist areas; important in soil formation, food for some animals</i>
<b>NATURE</b>	<i>The physical world, including all living things</i>
<b>PARSON JONES</b>	<i>Tallest tree in the grove (310 ft.), named for Col. Armstrong's son-in-law</i>
<b>POISON OAK</b>	<i>"Leaves of three, let it be!"</i>
<b>RESERVE</b>	<i>The level of protection California granted Armstrong Redwoods in 1964</i>
<b>SORREL</b>	<i>Grows on the floor of the grove; looks like clover</i>
<b>SWORD FERN</b>	<i>Fronds may be 2 - 4 feet in length</i>
<b>WOOD ROSE</b>	<i>Grows in shady areas of the grove; rose hips are rich in Vitamin C</i>
<b>WOOD TROLL</b>	<i>The protector of Fife Creek, it can be seen from the Icicle Tree Trail</i>

<b>Things to Look for in a Redwood Forest</b>	
<b>TREES</b>	
Coast Redwood ( <i>Sequoia sempervirens</i> , "ever living")	Soft, spongy bark; flat green needles on lower part of tree, to catch any moisture; closed up needles at top of tree, to prevent losing moisture; burls growing on trunk, growths only on some trees; grow to be the tallest trees in the world
Douglas-fir	Hard, rough bark; sharp, rounded needles
<b>UNDERSTORY PLANTS</b> (growing beneath redwoods)	
Tanoak	Slightly barbed chestnut-like leaves; acorns with bristly caps; evergreen
California Hazel	Soft, velvety leaves; deciduous; nuts later in year are eaten by animals (or humans)
Bay (or California Laurel)	Evergreen; leaves have strong smell when squashed
Redwood Sorrel ( <i>Oxalis</i> )	Most common groundcover; three leaves (resembles clover); small pink flower in center of plant in spring
Poison Oak	"Leaves of three, let it be;" touching leaves or stem can cause a rash
Blackberry	Low prickly bushes with edible berries
Sword Fern	Large leaves growing from a clump; each segment has a little "handle" near the stem
Bracken Fern	It grows 1 to 4 feet high with wide, triangular fronds that are highly divided.
Moss and Lichens	Grows on many old logs
Wood Rose	Small leaves on thin branches; spring flowers
<b>ANIMALS TO LOOK FOR</b>	
Gray Squirrel	Large, with bushy tail
Douglas Squirrel	Small, reddish brown underside; often called "chickaree"
Chipmunk	Brown grey in color with 3 strips on the back.
Banana Slug	May be yellow, or yellow with black spots; eats debris and fertilizes forest

## ACTIVITY

### Keying Out Trees Using Leaves

**TIME:**

Preparation: 30 minutes

Activities: 60 minutes

**Materials:**

1. Leaves (on the key)
2. Keying out trees- Leaf Key
3. Leaf Key Worksheet
4. Pencils

**Grade level:** 4th and up

**DIRECTIONS:**

1. **Prepare** by finding as many of the different leaves on the Leaf Key as possible. Set up a table of these for students to look at or take back to their desks. Number the leaves by marking on a piece of tape on the stem.
2. **Demonstrate** how to use the Leaf Key by selecting one of the leaves and working through the questions with the students.
3. **Record** the number of the leaf on the Leaf Key Worksheet. Start at the beginning of the Leaf Key, then go to the next number that most closely describes the leaves or needles. As they proceed, list the statements that apply to the leaf on the worksheet. This will allow students to track how they got to the ID. After a few choices, they should come to the name of the tree they are trying to identify.
4. **List** the name of the tree on the worksheet.
5. **Draw** a simple picture of the leaf in the box on the worksheet.
6. **Hand out** the Leaf Keys, worksheets, then have students select leaves or needles to identify. Determine if the students should work as groups or individually.
7. Share the results of the class at the end of the activity. Have students give the path they chose to come to the tree identity.

## KEYING OUT TREES - LEAF KEY

- |                                                         |          |                   |
|---------------------------------------------------------|----------|-------------------|
| 1. Leaves are shaped like needles                       | go to 2  |                   |
| Leaves are broad and flat                               | go to 7  |                   |
| 2. Needles are long                                     | go to 3  |                   |
| Needles are short                                       | go to 4  |                   |
| 3. Needles are in-groups of two                         |          | BISHOP PINE       |
| Needles are in-groups of three and dark green           |          | MONTEREY PINE     |
| 4. Needles are arranged around the stems                |          | D.FIRS OR SPRUCES |
| Needles are in two rows and flat                        | go to 5  |                   |
| 5. Needles have blunt tips                              |          | TRUE FIRS         |
| Needles have sharp tips                                 | go to 6  |                   |
| 6. Needles are usually less than one inch long          |          | COAST REDWOODS    |
| Needles are usually more than inch long and very sharp  |          | CA NUTMEG         |
| 7. Leaves are opposite                                  | go to 8  |                   |
| Leaf branches are alternate                             | go to 10 |                   |
| 8. Leaves are simple and palmate                        |          | BIG LEAF MAPLE    |
| Leaves are compound                                     | go to 9  |                   |
| 9. Leaves are pinnate                                   |          | OREGON ASH        |
| Leaves are palmate                                      |          | CA BUCKEYE        |
| 10. Narrow elliptical or lance-shaped with smooth edges |          | BAY-LAUREL        |
| Leaves are lobed or toothed                             | go to 11 |                   |
| 11. Leaves are lobed                                    | go to 12 |                   |
| Leaves are toothed                                      | go to 13 |                   |
| 12. Leaves have rounded lobes                           |          | WHITE OAKS        |
| Leaves have pointed lobes                               |          | BLACK OAK         |
| 13. Points are well separated                           |          | LIVE OAKS         |
| Teeth are close together                                | go to 14 |                   |
| 14. Main veins are branched, leaves stiff               |          | TOYON             |
| Main veins are parallel                                 | go to 15 |                   |
| 15. There are more teeth than main veins                |          | RED ALDER         |
| Veins go to ends of points                              | go to 16 |                   |
| 16. Leaf is oval and stiff                              |          | TAN OAK           |
| Leaf is broad, blunt-tipped, and soft                   |          | HAZELNUT          |

Name: \_\_\_\_\_

### Keying out Trees: Leaf Key Worksheet:

Leaf # \_\_\_\_\_ Tree ID: \_\_\_\_\_  
Key Choice:

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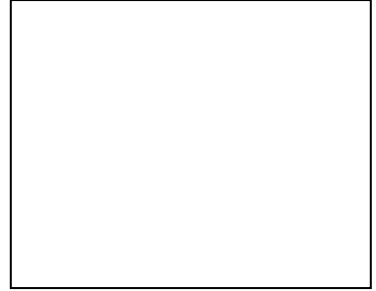
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Draw a picture



Leaf # \_\_\_\_\_ Tree ID: \_\_\_\_\_

Key Choice:

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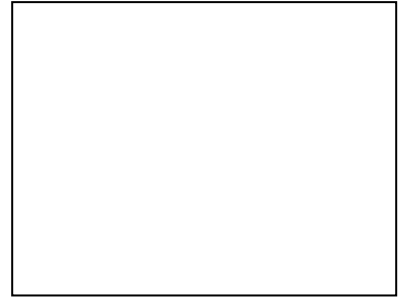
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Draw a picture



Leaf # \_\_\_\_\_ Tree ID: \_\_\_\_\_

Key Choice:

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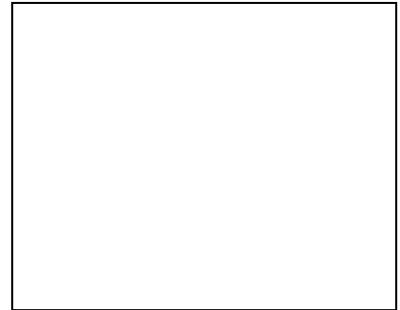
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Draw a picture



Leaf # \_\_\_\_\_ Tree ID: \_\_\_\_\_

Key Choice:

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Draw a picture



## ACTIVITY

### Find the Culprits

**TIME:**

Preparation: 30-45 min

Activity: 60-90 min

**MATERIALS:**

1. Field guides
2. Identification sheets
3. Pencils
4. Clipboards
5. Leaves

**Grade level:** 4th and up

**DIRECTIONS:**

Getting Ready

1. **Identify 7-10 trees** on your school property. If there are not that many different types of trees that are easy to tell apart, you can use shrubs instead. The field guides listed can be used to identify the trees or shrubs. You can also ask a groundskeeper, biologist, or other tree expert for help.
2. **Collect twigs or small branches** from 3 or 4 different trees. The twigs should be long enough to have several leaves. If possible, use twigs that have already fallen to the ground or have been pruned. Try to collect twigs from both needle and broad-leaf trees.
3. On a sheet titled "Tree Suspects" **copy drawings** of leaves from the different trees you identified. The field guides that use line drawings are a possible source for these drawings. Under each leaf, write the tree's name. See the Copy page provided.
4. On a second sheet titled "Tree Clues" **make a list of "clues"** about each tree: the shape of the tree, what the bark looks like, any flowers or fruit present during the time of the activity, etc. The clues should not include where the tree can be found on the school property. Under each set of clues draw a line for students to fill in the name of the tree after they have found the culprit. See the copy page provided.

## Find the Culprits - continued

### Doing the Activities

1. In class ask the students what characteristics or clues they might use to identify trees. As they give their ideas, ask how they could use these clues to identify trees. List their ideas on a chalkboard.
2. Hold up the branches you collected earlier, or pass them around the room. Have the students compare and contrast them. Can students suggest any other ways they might be able to tell trees apart? List any additional ideas on chalkboard.
3. Use the student's list and vocabulary terms from the previous activity to discuss ways people identify trees. Be sure to go over basic leaf characteristics such as shapes, tips, leaf edges, simple and compound, pinnate and palmate, and alternate and opposite branching patterns.
4. Divide the group into teams and give each student a copy of both sheets you made earlier (see Getting Ready).
5. Tell the teams that they will use trees on school property to match the leaf shapes and names on Tree Suspects with the Tree Clues. Explain that first the students should try to find a tree whose leaves match the drawings on Tree Suspects, then, by comparing their observations with the clues, they can make the match.
6. Some teams might find it easier to find a tree from the clues, and match its leaves to a drawing on Tree Suspects. This is also a valid method, so don't discourage it. Once the match is made, they should write the tree's name on the Culprit line below the clues.
7. Take the students outside and let them go to work. Don't forget to set limits on how far students can wander and how much time they have.
8. When back inside, go over the sheets as a group. Which team made the most correct identifications?





## Find the Culprits

**Tree Clues: (Examples: size and shape of the tree, bark, flowers, fruit)**

Clues	Clues
Tree Name:	Tree Name:
Clues	Clues
Tree Name:	Tree Name:
Clues	Clues
Tree Name:	Tree Name:

## ACTIVITY

### Leaf Hunt Relay

**Time:**

Preparation: 10 min

Activity: 60 min

**Materials:**

1. Leaves
2. Slips of paper
3. Small paper bags

**Grade level:** 4th and up

**Directions:**

1. Divide the class into teams and have each team collect three leaves from each of the trees identified in Find the Culprit. Encourage students to collect fallen leaves rather than taking live leaves off of trees. They could also cut the proper leaf shapes out of heavy paper or cardboard (make sure that tree names are not on the leaf shapes).
2. Take the students to an open area and explain that they will have a leaf hunt relay, in which their score will depend on the correct number of identifications made. Line them up in their teams and set each team's pile a set distance in front of each team. Tell the students that you are going to call out the name of the tree, and then you will tell them to "go."
3. At the signal "go" the first student in each team's line will go to his or her team's pile of leaves, find the leaf that comes from the tree you named, and hold it up. Be sure to give a time limit, and state that only the first leaf held up counts. Each team gets one point for each leaf correctly identified, and the team with the most points wins.
4. After each round, the contestants will put the leaves back in their piles, and then each contestant will go to the end of his or her team's line. Continue until you call out all of the tree names on the list.

## ACTIVITY

# The Water Cycle and Watersheds

**TIME:** Preparation: 10 minutes  
Activity: 45-60 minutes

**LEVELS:** Middle School to Adult

**OBJECTIVES:**

Students will be able to:

1. Describe what the water cycle is, and draw a picture or diagram of how the water cycle works, including rain, runoff (overland flow), stream, river, evaporation, and clouds.
2. Describe what a watershed is, and include in the drawing how the watershed and the water cycle interact (see the diagram included at the beginning of this chapter).

**MATERIALS:**

1. Previous page information on the water cycle and watersheds; Xerox enough copies for your class teams.
2. Art paper, magic markers, crayons, colored pencils, or pens.

**DIRECTIONS:**

1. Divide the class into groups of four each and distribute the reading and diagram of the water cycle and watershed.
2. Explain that each team of four has been given information describing the water cycle and what a watershed is. It is the task of each team to read, understand and explain the reading to each team member so they can draw an example of the water cycle and a watershed interacting.
3. Refer to the diagram in the reading material. It is an example of what we are asking them to have fun with.
4. Circulate around the teams listening for their understanding of the water cycle and what a watershed is. Offer assistance when clarification is needed.

## ACTIVITY

### The Web of Life

**OBJECTIVE:** To understand how all things are interdependent.

**GRADES:** Elementary grades

**SUBJECTS:** Science and Language Arts

**MATERIALS:**

Masking Tape

3 X 5 Cards (1 per person)

Ball of String

**DIRECTIONS:**

In this activity students will identify themselves as different parts of the life cycle and food chain. Then they will create a web of life.

Devise a web of life starting with the sun. For example: Sun, grass, mouse, snake, hawk, fly larvae, beetle, salamander, worm, frog, mosquito, human, deer, squirrel, owl, moth, bat, butterfly, skunk, opossum, raccoon, tree, mushroom, etc. You can include other elements such as soil and water. Be sure that you explain what an element is before starting the activity.

Explain that every student is a detective. Everyone will be a part of a food chain and they need to figure out who they are. Have the students stand in a line and tape a web card onto their backs. Instruct them to find out who or what they are by asking “yes” and “no” questions only. For example: “Am I green? Am I a plant? Do I have legs?” They should ask one question per student, and as the facilitator, you can give hints if necessary.

When each student figures out who or what they are, they should sit down, but still answer questions for others. Once everyone knows who they are have them stand in a circle. Re-emphasize that everyone is a part of a food chain. Now start with yourself as the sun and hold onto the ball of string and ask, “Who needs the sun to survive?” Toss the ball to everyone who answers “yes.” Whomever ends up with the ball of string should ask the group who needs them to survive. Continue until everyone is holding a segment of string. Direct the questioning as needed.

Point out the web that has been created and discuss interdependence. Describe some scenarios: If the mosquito dies, who feels the tug? If there is a drought, who will feel it? Now you can eliminate links by having students let go. What happens to the population, or the web in general? Discuss the cycle of life and death.

## ACTIVITY

### Oh, Deer!

**OBJECTIVE:** Students will:

- 1) Identify 3 components of habitat.
- 2) Define "limiting factors"
- 3) Recognize limiting factors in wildlife populations
- 4) Recognize the natural cycle of a population

**GRADES:** 4 and 5

**SUBJECTS:** Science, Math, Social Studies, Physical Education

**MATERIALS:**

- Large piece of paper (to draw a graph)
- Marker
- Hard surface to write on

**DIRECTIONS:**

You will need a large outdoor space to play this game. With class participation, you will be able to demonstrate a population of deer and some of its fluctuations over a period of 10-12 years.

Tell the students that they are going to participate in an experiment involving animal survival. Divide the students into two lines about 25-30 feet apart, facing each other. Describe the following three resources:

- 1) Food - Place hands on stomach
- 2) Shelter - Hold hands over the head to form a roof
- 3) Water - Cup hands to the mouth

Assign one line to be the deer that will be looking for the resources and the other line to be the resources. Have the students face away from each other. Huddle with each group and facilitate the following:

- 1) The deer will decide what resource they need
- 2) The resources will be divided between the students

As facilitator, you decide one situation at a time: drought, forest fire, etc.

On the count of three have the students face each other and show their resource symbol. The deer will need to run to match themselves with the resource they need to survive. Those that are successful take the resource back to their line to become deer. The deer who aren't matched up die and become a resource.

**DIRECTIONS for “Oh, Deer!” continued:**

As the facilitator you will keep track of the number of deer per round so they can be graphed at the end.

Continue providing different scenarios that require different resources.

Towards round seven you should introduce mountain lions into the activity. Explain the significance of predators. Discreetly choose a couple of students to be mountain lions. These students continue to show their resource symbol and only identify themselves as mountain lions with a roar when they are tagged. If a deer chooses a mountain lion, it dies. Gradually increase the number of mountain lions until all the resources are lions.

Regroup for the discussion. Graph out the results of how many deer there were in each round and discuss what the limiting factors were that affected their survival. What do the animals need to survive? Why do wildlife populations fluctuate? How and when is nature in balance?

## ACTIVITY

# Eat the Earth

**OBJECTIVE:** Demonstrate the relative percentage of the earth capable of supporting human needs.

**GRADES:** K-6

**SUBJECTS:** Science, Social Studies

**MATERIALS:**

Apple  
Knife

**DIRECTIONS:**

To illustrate for students the fragility of our life support systems, you can do the following using an apple to represent the earth.

Cut the apple into quarters and set three of them aside. They represent the part of the earth that is covered by water. The remaining quarter represents the part of the earth's surface that is not under salt water.

Next cut this quarter in half and set one piece aside. The piece in hand represents the part of the earth that is suitable for human habitation. The other part is too cold, too dry, too mountainous, or too hot.

Now cut the last one-eighth, which represents the part on which humans can live, into four slices. Rather thin, aren't they? Just one of these four slices represents the part of the earth that supplies most of our food and clothing, the small part that is presently tilled. It is not too wet, not too cold, not occupied by cities, factories, or highways.

Cut a very small piece from the last slice used above. This represents the  $\frac{3}{100}$  of 1% of the earth's surface which contains potable water. Not very much.

Our human presence on earth has been very short. In that time, we have done great damage and destruction to those systems that are capable of sustaining our lives. How will we treat the remaining healthy portion?

*Adapted from The Green Box, Humboldt Office of Education.*

## ACTIVITY

# Grow A Sprout!

**LEVELS:** Grades K-2

**SUBJECTS & SKILLS:**

1. Science Process: Observing, inferring, brainstorming, communicating, predicting, comparing, sorting, and classifying.
2. Integrated Curriculum: writing, language arts, comprehension.

**OBJECTIVES:**

The students will be able to:

1. Describe a tree seedling's roots and stem.
2. Discuss the things tree seeds and seedlings need in order to grow.

**TIME:**

Preparation: 30 minutes

Activity: To get started, 45-60 minutes

**MATERIALS:**

Citrus Seed Project:

1. Several citrus fruits- Grapefruit, lemons, limes, oranges with seeds.
2. Waxed paper cups or empty milk containers, one for each student.
3. Sand or half mixture of soil and perlite.  
(To avoid microorganisms that could damage the seed or young plants, get soil or sand from a store instead of digging it up.)
4. Several small spoons.
5. Felt-tip pen.

Avocado Project:

1. Several Avocado Seeds
2. Toothpicks. 3-4 per seed.
3. Glass jars. 1 per seed.

**DIRECTIONS: Citrus Plantings**

1. Explain to the students that they will be growing their own trees from seeds. This activity will help them get an idea of how trees sprout and what they need to stay alive. Grapefruit, lemons, limes, oranges, and other citrus trees are some of the easiest trees to grow indoors, and of these, grapefruit trees are the fastest growing.
2. Bring in or have the students bring in citrus fruits and avocado seeds. Most grapefruits sold in stores are “seedless,” but these usually have at least a few seeds. Use only the largest, plump seeds.
3. Set up two or three planting stations around the room each with the following materials.
  - Paper cups or containers with several holes punched in the bottoms.
  - Sand or soil mixture.
  - Small spoons for filling cups with soil mixture.
  - Fruit seeds from citrus fruits. To avoid damaging the seeds, peel the fruit and break apart the sections instead of cutting through them with a knife. Also, put the seeds in a container of water to keep them from drying out. If possible, use seeds that have already started to sprout inside the fruit.
4. Have the students go up to the planting stations in small groups of two or three.
5. Each student can plant his or her own seed in one of the cups by filling the cup most of the way with the sand, laying a seed on top, and then covering it with another 1/2 inch of soil. Tell the kids not to pack the soil down too hard.
6. Put the cups in a very warm spot (but not too sunny). Add enough water to the soil to make it moist, but not soaking wet, and make sure the soil never dries out completely.
7. Have the students observe changes in the seeds every several days. They can even keep a record in words or pictures of the changes. The seeds should sprout within a few weeks. (If some seeds don't sprout have the students replace them with fresh seeds. You can get a grapefruit seed to sprout within three to four days or so by gently peeling off the seed's covering with a razor blade before you plant it. Be sure to start peeling from the seed's rounded end and to be especially careful when you reach the seeds pointed end, where the embryo is.)
8. Review with the students how seeds develop and what the seedlings need in order to grow.

**DIRECTIONS:** Avocado Planting

1. Explain to the students that by suspending an avocado seed in water, they will be able to see how a seedling's stem and roots grow.
2. Peel the brown papery covering away from the seed.
3. Determine the smaller (top) and the larger (bottom) ends of the seed. Poke 3-4 toothpicks into it at equal distances from one another near the middle of the seed.
4. Let the seed rest in a glass of lukewarm water with its large end submerged. Make sure the water doesn't evaporate to the point where it no longer covers the bottom of the seed. Replace the water with fresh water once a week.
5. Have the students observe changes in the seed every several days. They can even keep a record in words or pictures of the changes. Avocados take about three weeks to sprout roots and stems.
6. Plant the sprouted seed in a pot when the avocado's stem and roots are several inches long. The pot should be at least one inch wider than the avocado.
7. Review with the kids how seeds develop and what the seedlings need in order to grow.

## **Part VI**

### **Ecology, Flora, and Fauna**



# Ecology

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## Getting the Big Picture

In the next chapters of this study guide, you'll be provided a lot of information on a variety of topics: birds, insects, plants, and reptiles. Each topic is neatly organized and presented separately. Of course, this isn't a reflection of real life! Instead, every living thing is interdependent with the other living things in its community and all the other components of its environment.

Ecology, derived from the Greek word for "house", is the scientific study of the relationships of living organisms with each other and their environments. It is the science of biological interactions between individuals, populations and communities. Ecology is also the science of ecosystems, the interrelations of biotic communities with their living and non-living environments. These definitions seem simple enough but their full ramifications for world (including human) health and welfare are infinitely complex and by no means fully understood.

The message of ecology is one of synthesis: to take the broader view and to put the pieces back together again. In an age of specialists, ecology strives for the broad outlook. Overlapping with other disciplines from chemistry to mathematics and anthropology to zoology, ecology violates traditional academic and scientific boundaries. It seeks to integrate knowledge about people and their environment from the viewpoints of history, current events and future prospects; it attempts to join biology and sociology, and to reunite the behavioral and environmental sciences.

The challenge for interpreters is to present this broader viewpoint to the general public, to put the subjects of this study guide together in a way they naturally fit, and to eliminate the artificial walls we sometimes build with our presentations. To help you with this challenge, let's start by looking at some basic ecological definitions and concepts.

## The Basics

The following are a few additional definitions, which will help ensure clarity; make sure your group understands these words when using them.

**Population** A group of interacting individuals, usually of the same species, and a definable space.

**Community** Consists of the populations of plants and animals living together in a given place.

**Environment** All the conditions, circumstances, and influences surrounding and affecting an organism or group of organisms.

<b>Habitat</b>	The natural abode or locality of an animal, plant, or person and includes all features of the environment in a given locality.  It's often characterized by a dominant plant form or physical characteristic (the stream habitat, the forest habitat).
<b>Ecosystem</b>	Includes populations, communities, habitats, and environments, and it specifically refers to the dynamic interaction of all parts of the environment, focusing particularly on the exchange of materials between the living and non-living parts.
<b>Substrate</b>	The physical soil type: sand, mud, rock, vegetative, and adobe. The substrate type dictates what types of animals can inhabit an area.
<b>Producer</b>	An organism (such as a green plant) which uses solar or chemical energy to convert inorganic substances into food (i.e. it does not have to eat), usually through photosynthesis.
<b>Consumer</b>	An organism that eats mostly flesh by catching other organisms or by eating particles of organic matter such as plants.
<b>Decomposer</b>	An organism (such as bacteria or fungi) that returns components of organic matter to ecological cycles by feeding on and breaking down dead plants and animals.
<b>Food Chain</b>	A sequence of living organisms in an ecological community in which members of one level feed on those in the level below it and in turn are eaten by those in the level above them.
<b>Food Web</b>	The totality of interacting food chains in an ecological community.

Along with definitions, it's beneficial to review some basic ecological concepts, which will enhance the group's understanding of what they'll see and do on the walk.

1. Everything has a home. During your walk you will be walking in, around and through other plant and animals' living rooms, dining rooms, kitchens, bedrooms and bathrooms. There are four basic necessities for life: food, water, shelter, and space. These necessities are found in the atmosphere (air), the hydrosphere (water), and the earth's crust (soil). The biosphere is the thin skin of the planet where these zones collectively support life on earth.
2. Everything is becoming something else. All plants and animals undergo evolutionary changes and adaptations. When things die, they are broken down, decomposed, recycled, and used by other living things.

3. Every living thing eats and is eaten by something else. Three categories of life forms are in the basic food cycle of life: producers, consumers, and decomposers.
4. Everything depends on something else. Interaction and interdependence occur among living and non-living things and their environment. A change in one strand of the food cycle of life affects the entire web. Nothing exists in isolation.
5. Diversity is essential for life. Many similarities and differences occur among living and non-living things. This variation is essential for maintaining a healthy community and ensuring that plants and animals survive and reproduce in spite of changing situations.
6. Humans are animals capable of consciously changing the balance of nature. We are rational, thinking beings, that have changed and continue to alter the environment of the entire earth in many profound ways. As such, we have a responsibility to all other living things.

Now let's examine each of these concepts in more depth.

### **Utilization of Resources: Everything has a home**

Every living thing (people, other animals, and plants) requires a special place to live that satisfies the organism's particular needs. This special place is its *habitat*. Ideally an organism's habitat includes all of the things it needs to survive (food, water, shelter, and space), and its suitability is determined by both living and physical factors. By understanding habitats and their four components, your audience will gain a better understanding of the conditions necessary to support life. Ask your group to point out similarities and differences among the animal and plant homes they discover and their own homes.

One way of exploring this concept with your group is to look closely at a single object. For example, a tree is one habitat that provides the things some animals and plants need to survive. A tree is the habitat of many tiny animals that spend their entire lives in the tree's leaves or bark. It can also be the habitat of plants that grow on tree trunks and branches, such as algae, moss, and lichen. Although larger animals like birds, squirrels, and raccoons collect nuts or fruit from trees for food or use branches for nesting or shelter, trees are only part of their habitat. They go elsewhere to gather food, hide from predators, and raise their young.

### **Adaptations: Everything is becoming something else**

An incredible diversity of living things shares our earth with us. Inhabiting the sea, the land, and the air are living things of many physical and behavioral types. All living things have evolved specific characteristics that help them survive in their habitat. These characteristics are called *adaptations*.

Adaptations enable organisms to obtain and store food, water, and air; to move about; to protect themselves; to survive in various temperatures; and to reproduce their own kind. When looking at a plant or animal, ask yourself “What adaptations allow this organism to be here?”

Birds are marvelous animals for studying adaptations because the ways that they are uniquely suited to their particular habitats and lifestyles are obvious to all ages.

For example, look at bird bills - the tools that help birds seize and eat their food. The variety of shapes and sizes of bills enables birds to consume many types of food. Birds that feed on similar types of foods have adapted similar bills that help them get their food. By utilizing different feeding strategies and techniques, many different types of birds can coexist in an area because they are not competing for the same food.

- Insect eaters** Generally have slender, pincer-like bills of varying length. Examples: swift, swallow, warbler.
- Fish eaters** Have long, sharp bills, often hooked at the tip, with serrated margins to help hold onto slippery fish. Examples: cormorant, merganser.
- Predators** Of other birds or rodents have powerful, hooked bills for tearing and cutting flesh and skin. Examples: peregrine falcon, golden eagle.
- Nut eaters** Usually have short, stout bills for cracking seeds open. Examples: finch, sparrow, and pigeon.
- Nectar eaters** Are characterized by long, slender bills ideal for reaching into flowers. Example: hummingbird.

Like animals, plants also exhibit a variety of adaptations. They have chlorophyll in their leaves that enables them to manufacture food using the energy from sunlight. Most plants have roots for obtaining water from the soil. Some plants, like cacti and other succulents, have fleshy leaves for storing water.

Some plants are protected by thorns. Some like milkweed have poisons (usually plants are poisonous to some but not all potential predators; for example, monarch butterflies feed on milkweed). Desert plants often have “hairs” which help shade the plants from hot desert sunlight. Some plants (like deciduous trees) “hibernate” during winter. They protect themselves from cold temperatures, and snow load by pulling their chlorophyll and other important components into the trunk and branches for storage, then drop their leaves.

Flowers often have adaptations to attract insects and birds because these animals move from flower to flower and help pollinate the plant’s eggs. Brightly colored petals, sweet smells, and nectar (which are food for pollinators) are flower adaptations that increase chances of reproduction.

Although plants are not able to move about, they have adapted other ways to help them survive. One important way that plants have compensated for their inability to move is in their adaptations for reproduction. Plants that produce seeds often employ some mechanism whereby the seeds are dispersed so that they will not compete directly with the parent plant.

## Food Cycles

### Every living thing eats and is eaten by something else.

A human community strives to meet all the needs of its members, including food needs. In a biotic community all the needs of plants and animals living there are met by the various elements of the community. For example, the animals in a particular biotic community must have their food needs met by other members of the community. This means that plant-eating animals depend on suitable plants for food, and animal-eaters (predators) depend on prey for survival.

A food chain is a simplified way of showing food relationships between plants and animals in a community. In the following chain, the arrow points in the direction that the food energy is flowing:

**Algae -> grasshopper -> small fish -> great blue heron -> bacteria**

In this example, food energy in the algae goes to the grasshopper, the food energy in the grasshopper passes on to the small fish that eats the grasshopper. Placing plants and animals into a visible food chain like this can help us understand what happens to members of a community.

Plants represent the primary *producers* in the food chain. Some plants are eaten directly by insects, microscopic animals, birds and other plants are first broken down by bacteria into detritus (small pieces of organic matter). Plant-eating animals are the primary *consumers* in the food chain. In the above example the algae is the producer and the grasshopper the primary consumer. The small fish and great blue heron are secondary consumers.

The cycle is completed at the tertiary level when an organism dies. As it is decomposed by bacteria, worms, insects, and buzzards, vital nutrients are returned to the system, where they are used by the plants and animals.

Rarely does an animal eat only one type of food, however, as a food chain might imply. To get a clearer picture of how animals in a community are related to one another, it is often helpful to look at food webs rather than food chains. A food web is the interconnection of the food chains in a community. It shows how members of the community are connected to other members by what they eat.

It is important to know and understand the pattern of energy flows in a system because the interference by people usually results in an upset in the balance of nature. Many ideas put forward for possible uses of our natural resources are excellent but one must always consider the impact of such actions. These same considerations must be made when people choose to affect a given population in a system, i.e. controlling “pests” and predators, increasing the feral population by letting dogs and cats roam freely.

## **Relationships: Everything depends on something else.**

All populations of living organisms exist in a network of interactions with other populations. Many of these interactions are more subtle and complex than direct food relationships. Some of them are cooperative and beneficial to one or more of the interacting populations. Others are competitive or limiting to the interacting populations. This continuum of interrelationships is such that it is often difficult or arbitrary to draw precise lines of distinction between some types of relationships, as for example, between commensalism and parasitism, or parasitism and predation. Borderline examples can be found which emphasize the dynamic nature of interspecific relationships.

Interspecific relations are often major selective forces in evolutionary change. In both cooperative and competitive relationships, specific adaptations to these relationships can be seen: behavior, coloration, adaptive morphology, and biochemistry. The following are some of the most common relationships.

**Commensalism** Is a relationship in which one population is enhanced or benefited and the other population is unaffected. An example is the remora-shark relationship where the remora fish attaches to the skin of the shark by means of a strong sucker disc and is transported widely and rapidly by the shark's motive power. The remora also consumes food remnants cast off from the jaws of the shark. Thus the remora benefits in two ways from this attachment, and the shark is relatively unaffected, although its swimming speed may be slightly impeded.

**Mutualism** That relationship where both interacting populations benefit or are positively stimulated by the association, is classically represented by the association of algae and fungi to form lichens. Fungi provide the framework, moisture and attachment sites in which algal cells grow, and the algae provide food production for both itself and the fungi.

**Predation** Is the capture of live animals for food. It is such a dramatic relationship between different animal populations, and natural selection has developed such elaborate adaptations around predation, that it has received considerable attention from naturalists and ecologists. Predation can exert both a qualitative and quantitative control on the interacting populations. The larger and more dramatic predators, such as wolves and lions, tend to cull out the young, old, and diseased individuals from the prey population. Predation has been considered a regulatory force on some prey populations (such as caribou and moose) but in other prey populations (such as quail and muskrats) it has been thought to eliminate only

surplus individuals which would succumb to some other mortality factor if predation were not present.

- Parasitism** Is a relationship in which one population derives its nutrition from another, usually without killing the host. It is a universal relationship in plants and animals, and it cannot be always sharply distinguished from some types of commensalism or predation. Parasites may cause substantial pathology in the host (i.e. disease producing as in the case of the malaria or schistosome parasites) or they may reside in the host with no noxious effect, as in the case of many intestinal amoebas.
- Competition** Is another powerful ecological force on populations. Two species cannot occupy precisely the same niche. Closely related species with very similar niche requirements often interact in such a way that one species displaces another.
- Amensalism** Is an interspecific relationship in which one population is inhibited while the other is unaffected. A simple example is the shading out of certain plants under tall trees. Only shade-tolerant plants with lower light requirements can survive as ground cover in the forest.
- Antibiosis** Occurs when one organism produces a substance which is toxic to other organisms. Algal blooms of some blue-green and red algae produce chemicals toxic to fish. The well known Red tide of southern coastal waters, produced by the flagellate *Gymnodinium brevis* can result in massive fish kills.

### **Avoiding Homogeneity: Diversity is essential for life.**

Why are there so many kinds of plants and animals? This topic has been a major question in ecology and evolutionary theory for many years. When the environment is viewed in very small units of space, it may be considered an infinitely variable mosaic of different conditions. The smaller a plant or animal is in size, the greater the ability to become specialized to the conditions offered by small diversified elements of the environmental mosaic. This is one reason, for example, there's a greater diversity (i.e. number of species) of insects than in groups of larger animals. Furthermore, the addition of each new plant or animal to the community increases its diversity, thus creating new conditions on which natural selection can operate. Diversity, then, becomes a self-stimulating phenomenon.

The limiting factors on diversity are the severity of the physical circumstances to which life forms can adjust. Those environments whose physical circumstances are harshest will have the least diversity (deserts, ocean depths, polar regions). Environments with conditions most nearly approaching the ideal for life processes (warm temperatures, ample light and plenty of moisture) have greatest diversity of plant and animal life. The tropical forests are far richer in

number of species of plants and animals than any other biotic community on earth.

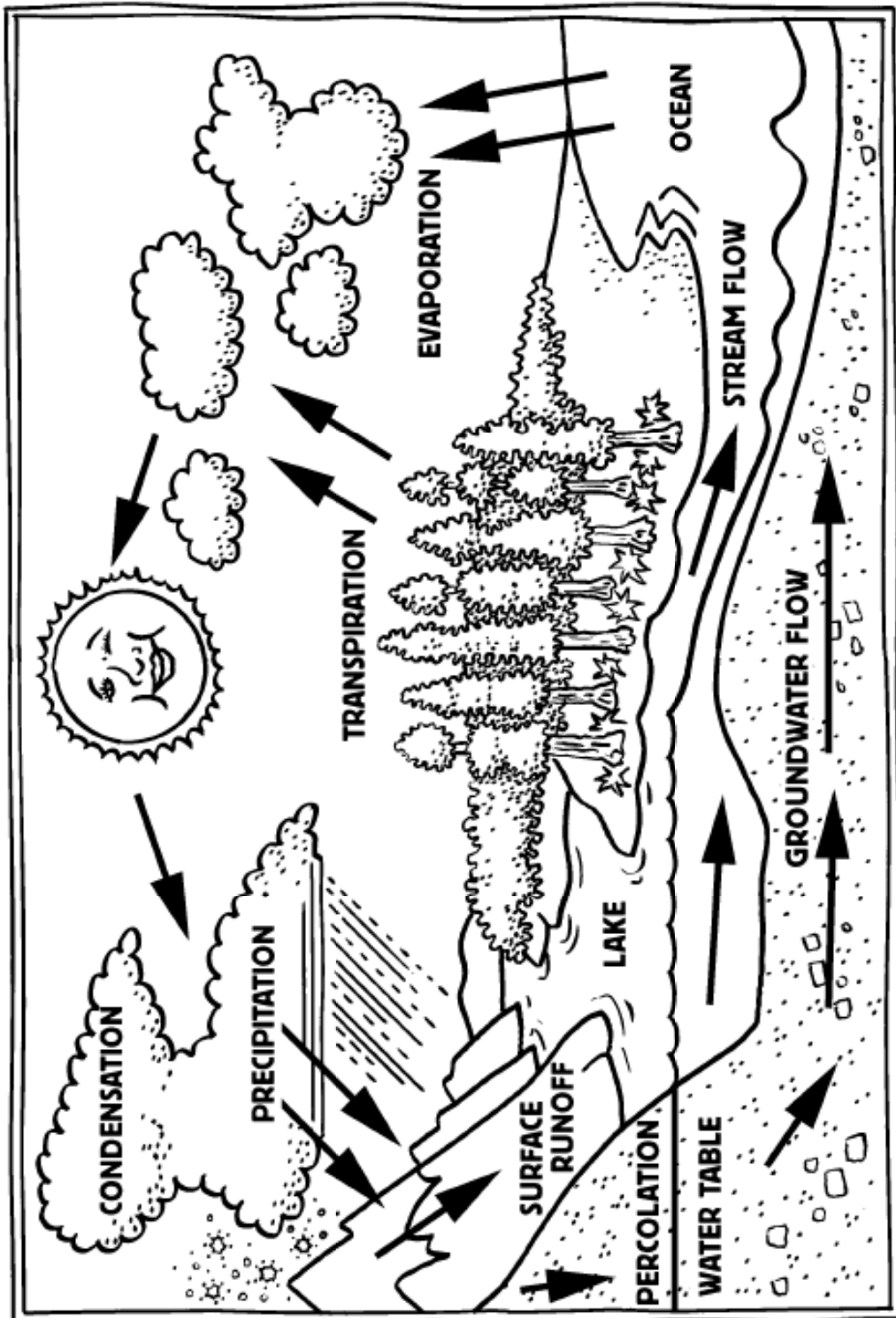
Another major factor which affects species diversity is pollution and environmental quality. Pollution usually reduces species diversity. By creating abnormal conditions which require new adaptations, both air and water pollution may reduce the number of species capable of tolerating these new conditions.

Why is diversity important? What does it matter if a few species become extinct? In general, the greater the species diversity, the greater the community stability. Communities with many species have a more complex web of food relationships, and each species has greater diversity in its food and cover resources. Thus each species has alternatives in meeting its life requirements. It has various ways of meeting new environmental shortages and contingencies. There is, in other words, a cushioning network of checks and balances. It must be remembered that we are speaking in broad terms and there are undoubtedly many exceptions to these generalities. Nonetheless, these generalizations are valid as overall principles of community ecology.

As a result, any major change in a single plant or animal population in a polar community is likely to have a far greater impact on the total community than a similar change in a tropical community. It thus becomes important to think of communities in terms of their vulnerability to ecological upset if change occurs in any one of their member populations. One of the major ecological influences of people has been to simplify the world's ecosystems.

Agriculture, which is the applied management of food chains, fosters simplified systems and reduces food chains to their simplest terms. People plow the prairies, eliminating a hundred species of native prairie herbs and grasses which are replaced with pure stands of wheat, corn or alfalfa. This increases efficiency and productivity but it also increases ecological vulnerability and instability. If we have a pure stand of wheat, then it amplifies the possibility of ecological catastrophe by having some pathogen (such as wheat rust) or herbivore (such as grasshoppers or locusts) sweep in suddenly to decimate the entire system.

With animal communities people also tend to oversimplify. The complex ungulate faunas of Africa and India (consisting of many species of wild antelope, wild buffalo and other ungulates) have been replaced with a single species of domestic cattle. This has often had a drastically damaging effect on the native grasslands and forests, and it has tended to produce exaggerated epidemics of diseases such as rinderpest and foot and mouth disease. We clearly pay a price for oversimplifying ecosystems and thereby reducing their natural stability.



**THE WATER CYCLE**

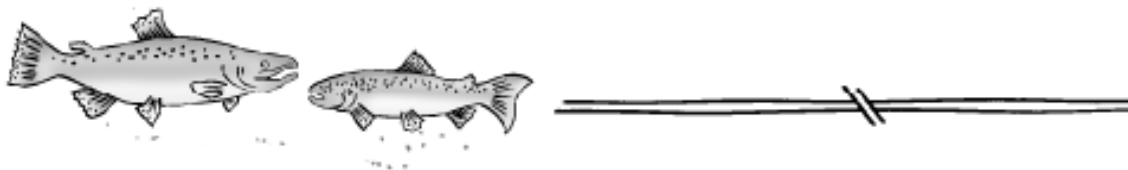
## The Water Cycle and Watersheds

The pathway water takes as it moves through air, soil, streams, rivers, oceans, and ice is called the **water cycle**.

1. Rain falls on the land and begins to puddle or run off.
2. Small streams join larger streams and then become big rivers.
3. Rivers flow into oceans.
4. Water evaporates and turns into water vapor, which forms clouds.
5. Plant roots also take up and release water through their leaves and stems, which then is released into the atmosphere.
6. Water also reaches rivers or streams when raindrops soak into the soil and become part of the groundwater (water which flows underground).
7. The groundwater sometimes comes to the surface as springs or seeps and flows into streams and rivers.

The first step in learning about a stream is to learn about its watershed. A **watershed** is an area of land that drains into a particular stream, river or lake. Water flows downhill, so when raindrops fall on the land, they flow down to the lowest elevation – usually a river or stream. A small stream that runs through your town might receive rainfall runoff from only a few acres of land, but it is still an important part of a larger watershed.

Knowing a stream's watershed area is very important. Everything that happens in a stream's watershed – good and bad- affects the stream no matter how far away. If someone pours a quart of oil onto the ground a mile from a stream in its watershed, eventually that pollution may reach the stream. Because of this, all people need to be careful and not cause pollution, even if they do not live on a stream or lake.



# Plants and Trees

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## Common Trees In and Near Armstrong Grove

### Conifers

Conifers usually have needle shaped or scale-like leaves. As the name implies, most conifers have seeds that develop inside cones. All Sonoma County conifers are evergreen.

#### **Coast Redwood** *Sequoia sempervirens*

The coast redwood is the tallest tree on the planet (up to 368 feet tall), and grows only near the coast of central and northern California, and of southernmost Oregon. It can have diameters of 10 to 15 feet, and live more than two thousand years.

Leaves on the lower branches are needle-like with sharp tips fairly short (mostly less than one inch long). Leaves near the top are much shorter, often scale-like. The thick fibrous bark is of an orange or cinnamon brown color and takes on a ribbon appearance. Because of the high tannin content in the bark and the asbestos-like fibers, the tree is insulated from periodic fires. The wood also contains tannins that give the tree resistance to fungus diseases and insects.

The cones are small (usually less than one inch long), oval, and hang from branch tips. Each cone contains 14 to 24 tiny seeds. One pound of redwood seeds would contain more than a hundred thousand seeds. Because so few of the seeds germinate, sprouting is the more common means of regeneration. Redwoods are unique conifers in that they have basal dormant buds on their large roots. When a tree dies or is cut down, the buds can sprout to form a circle of new stems around the parent tree, hence the species name “sempervirens” (always living). This circle of new trees around the parent stump is often referred to as a “fairy ring”.

Redwoods have shallow, wide-ranging root systems. Because of this they require a fairly constant source of surface moisture. The rains of winter months provide needed moisture, and in the dryer months, the needles on the lower branches collect water from the fog; called fog drip. This is why Coast Redwoods are found along the coast where fog is abundant. The leaves of the upper branches are more scale-like to reduce evaporation.

#### **Douglas-fir** *Pseudotsuga menziesii*

Douglas-fir is not a true fir, hence the hyphen in its common name. True firs have two rows of needles and upright cones, whereas the fairly short (about one inch) needles of Douglas-fir grow in whorls around drooping stems and the 3-4 inch long cones hang down from near the ends of the branches. One identifying characteristic of the cones is the 3-forked bracts, which with a good imagination can appear to be the hind legs and tails of tiny mice sticking out from under the

scales. This can be used in a story for young children about how mice will sometimes be pursued by owls or coyotes. The mice ran from tree to tree asking for help, with the Douglas-fir finally providing a hiding place. The bark of Douglas-fir is dark brown, thickly layered and rough, with irregular deep furrows. The Douglas-fir can be very large, with spreading branches and a pointed top. They can grow to several hundred feet and over 800 years old.

## **Oaks**

Several different species of live oaks can be found within Armstrong Redwoods SR and Austin Creek SRA. Some of the more common live oaks are the coast, canyon and interior. Oaks such as black oak, valley oak, and oregon oak, are deciduous, losing their leaves each fall. The average age for an oak is several hundred years.

Oaks produce acorns each fall starting at the age of around twenty years old. Some do not produce for the first fifty years. Acorns are relied upon by a variety of different species for sustenance. Woodpeckers, insects, squirrels and other rodents routinely use acorns for food.

Acorns usually drop in abundance during the fall. Native Americans relied on a plentiful supply of acorns as a food source during the winter. Acorns must be prepared before being consumed by leaching out the tannins that could otherwise result in indigestion and an unfavorable flavor.

Many areas are known where Native Americans would grind acorns into flour by pulverizing them with rocks. The acorns were placed on a flat rock surface then pounded with a hand held rock. This produced holes in the rocks from continual pounding. These areas are sometimes called grinding rocks. A prime example is within Chaw'se State Park near Pine Grove, California.

A person standing under an oak tree is 16 more times liable to be hit by lightning than if he had taken refuge beneath a beech tree. The oak tree has vertical roots which provide a more direct route to ground water.

### **Tanoak *Lithocarpus densiflorus***

Although it bears acorns, the tanoak is not a true oak. The only other place where *Lithocarpus* species are found is in Southeast Asia where there are over 100 species. This could account for its somewhat tropical appearance. Around the turn of the century, bark from the tanoak or tanbark oak was stripped from the trees to be used in the tanning industry. There are few large tan oaks today, because of the extensive destruction of these trees.

### **Sudden Oak Death**

The forests of California are threatened with exotic species of insects, plants and diseases, pests for which California's native organisms have little defense. One of the more recently introduced diseases that has done tremendous damage to State Park forests is Sudden Oak Death. Sudden Oak Death, or SOD, is caused

by a fungus-like pathogen which primarily affects oaks. It can also infect rhododendron, buckeye, madrone, manzanita, bigleaf maple, bay laurel, evergreen, huckleberry, coffeeberry, honeysuckle and toyon.

Trees infected with Sudden Oak Death are characterized by wilted, faded brown foliage. Older leaves become pale green and within weeks turn brown. On close inspection some varieties exude dark brown sap on the lower trunks. These dead trees pose a severe fire risk, especially in dense forests. More importantly is the loss of a valuable and treasured California resource. Since 1995, Sudden Oak Death has killed hundreds of thousands of tanoak, coast live oak, and black oak trees from Northern California to Big Sur.

One of the best methods in preventing the spread of SOD is awareness that the pathogen is transported to unaffected areas by introducing infected leaves, wood and soil. Plant material and soil should not be moved from coastal areas. Visitors and hikers traveling out of coastal forests should clean their tires, shoes and animals' feet before leaving the area. With the proper precautions the spread of SOD can be reduced.

### **Pacific Madrone** *Arbutus menziesii*

The cinnamon orange twisted branches and its contrasting large bright green leaves can easily identify a Madrone tree. This is an evergreen tree that drops leaves from the previous year in the summer. During hot, dry summers walking on a bed of Madrone leaves sounds as if you are walking on potato chips as they crunch under your feet.

The bark of this tree is shed, ridding it of insect pests while producing a smooth, light red color. Madrone is a hardwood sometimes called "The Refrigerator Tree". If you grab on to it on hot days the trunk will feel cooler than the surrounding air.

Madrone can reach 75 feet tall and live for around 200 years. They produce berries that are consumed by birds. Madrones are a host for many diverse insects, this in turn, attracts numerous insect-eating birds.

### **California Buckeye** *Aesculus californica*

If you see a hillside in late summer with what appear to be several small, dying trees with red-brown leaves, they may not be dying at all, but just the California buckeye. The California buckeye is closely related to the water loving horse chestnut from Europe and the Ohio buckeye. In the Mediterranean climate of California, water is not available year round, so the buckeye just shuts down when the water runs out, causing the leaves to turn brown. It is unique in other seasons as well. In spring large sprays of white to cream-colored flowers form.

The seed of the buckeye is poisonous. Native Californians tossed ground up buckeye seeds into streams to stun the fish, which would then float to the surface making them easy to harvest. Buckeyes are toxic if eaten unprepared. Native Americans leached the toxins out and used the seeds as food during lean times keeping entire populations alive when other food was scarce.

## **California Laurel** *Umbellularia californica*

The California Laurel or Bay has a distinctive aromatic odor to its crushed fresh leaves. The leaves are believed to repel insects and were used by Native Californians to repel fleas from their homes and beetles from their cribs of stored acorns. Similar to redwoods, the Bay Laurel can sprout new suckers when the parent tree dies. Small bays are often seen growing from nurse stumps or fallen larger bays.

The evergreen leaves of the Bay Laurel are shiny, dark green, lance-shaped, and about 3 1/2 inches long. Small cream-colored or yellowish flowers bloom in late winter or early spring. The fruit matures in late autumn, is elliptical, and with a thin pulp over a brown seed. The seeds of the Bay were roasted and eaten by the California Native Americans.

The bark is dark gray to brown, thin, with flat scales. Mature trees can grow as tall as 140 feet. Usually they fork into several large branches forming a broad, rounded, dense crown. In dense stands or in a redwood forest, there can be a single leader up to 100 or more feet high.

## **Bigleaf Maple** *Acer macrophyllum*

The Bigleaf maple has one of the largest leaves of native trees in our area, usually 6-12 inches in diameter, sometimes 15 inches. The leaves are shiny, dark green above, and paler and hairy beneath and give a bright green color in sunlight when viewed from below. The leaves turn yellow in the fall with brown and orange accents, pleasing the eye. In Spring, small yellow/cream colored flowers mature into typical double samaras (winged seeds). When the seeds fall from the tree, the seeds spin rapidly, slowing their descent and allowing them to be distributed more widely by wind.

The Bigleaf maple can be a small to large (up to 100-foot tall) with a broad, rounded crown of spreading or drooping branches. It requires a lot of water, so it is usually found near streams, or in moist, shady draws.

## **California Hazelnut** *Corylus cornuta*

The native hazelnut is not really a tree, but more of a large shrub, rarely exceeding 18 feet high. Although smaller, the native hazelnut, when roasted, has the same flavor as the commercial hazelnut. The fruit, often paired, mature in late summer and are covered by tubular, bristly husk, like a little vase. You should wear gloves if you try to husk more than a few of them.

The 2-inch long leaves are almost as wide as they are long with rounded bases and pointed tips. Young leaves feel very soft and take on a fuzzy appearance. In shady areas mature leaves can retain that softness. The tree has slender branches that are spread out and open, giving the tree an airy, delicate appearance. They're a beautiful addition to the understory of a redwood forest. In winter the male catkins elongate and hang down, making a beautiful complement to the horizontal groups of branches.

## **Red Alder** *Alnus rubra*

The Red alder has a straight trunk, a pointed or open, rounded crown, and grows to 100 feet tall. The alternate leaves are about 4 inches long, and shed in fall and winter while still green. Alders require an almost continuous source of water, and so are rarely found far from streams that flow year round or most of the year. Alder root nodules contain bacteria that have the ability to fix nitrogen, a process making the nitrogen useable, giving their leaves high nitrogen content.

The California Red Alder grows fairly close to the coast. Further inland is the White Alder. It is similar to the red alder, except that its leaves are more flattened, singly toothed and wavy edged. It's difficult to tell the difference, but the Red Alder leaf has its margin curled under.

## **Oregon Ash** *Fraxinus latifolia*

The ashes are unusual for native trees in that each tree has a single sex. The female trees can be distinguished in the fall by their great masses of green to light brown single samaras (one seeded winged fruit). Ash grow in wet soils along streams or close to intermittent ponds. The leaflets are arranged opposite, pinnately compound in groups of 5 or 7, sometimes 9, giving it an ornate look.

## **Toyon** *Heteromeles arbutifolia*

Toyon is also known as Christmas berry, as it forms clusters of red berries in November and December. The evergreen leaves are about 3 inches long, oblong lance-shaped, sharply saw-toothed, and shiny green. The berries are 1/4 to 3/8 inch in diameter, and have an astringent, sour taste. It is usually a large bush, but can grow up to 20 feet tall. It can withstand a variety of conditions from stream banks in wooded areas and seaside cliffs to chaparral environments.

When it is not flowering or bearing red berries, it can be confused with coffeeberry. Coffeeberry can be identified by having leaves that are less thick and more pliable, with less toothed edges. In the fall its berries mature to a black color. Native Californians sometimes ate the coffeeberries, but when ingested in large amounts they can cause a laxative effect. They both grow in similar environments, but are rarely found together. Coffeeberry tends to tolerate deep shade less than Toyon, and dry conditions a little better.

## **Poison Oak**

If you're not already familiar with poison oak, get to know it immediately! Introduce it to your friends, family, and every park visitor. Be able to recognize it in different forms. The shape, color, density of poison oak is incredibly variable, thus its scientific name *Toxicodendron diversilobum*. *Toxicodendron* clearly means "poison tree," and *diversilobum* explains the diversity of the lobes of the leaves. The leaves resemble those of several oaks, such as the roblar or valley oak. Poison oak, however, is found growing with many other trees: madrones,

eucalyptus, redwoods, and pines. It is also found along trails and surrounding hillsides.

Poison oak appears differently in different ecosystems. On the coast, poison oak tends to be hedge-like with small leaves. Under tanoak and madrone it tends to come up as singular stems with fair sized leaves. Growing near coyote brush it can obtain huge leaf size. In the redwoods, as well as other woodlands, it can grow aerial rootlets, which cling to trees, allowing poison oak to vine up trees. A good example of this is the magnificent Poison Oak vines on the Parson Jones Tree.

The common characteristics among poison oak are: "leaves of three," straight and smooth stems, usually a glossy finish on the leaf, and where the 3 leaves meet (when the plant has leaves), a red spot is visible. These characteristics help to separate poison oak from the surrounding plants it may blend in with.

When first looking at poison oak, look at the stem. If there are spines, then it is not poison oak but probably blackberry. If the stem is smooth and straight, look at the leaves. Are they lobed? The leaves can have from 2-6 lobes on each side. Sometimes the leaves are very rounded; other times they come to a slight point on the apex of the lobe. If the leaves are green, they are usually shiny on top and duller underneath (don't use your hands for this test!). Look next for the red dot.

And what if there are red, yellow, white, or even no leaves? In the fall or end of summer, poison oak stops producing chlorophyll, thus losing its green pigment. The color makes it now even more obvious. In the fall STAY AWAY from any red leaves. Madrones also will drop yellow and red leaves but they are much larger, lack the lobes, and have a serrated edge. Then, come November all of the leaves may be gone. What you have left is a stem which is still as strong an allergen as the green or red leaves. In the winter poison oak can sometimes be identified by tiny dark red dots or bumps on the lower stems. Poison oak also produces clusters of small white flowers that turn to white berries in summer.

## **Positive Aspects**

Poison oak covers a substantial amount of the uncleared local terrain of Northern California. It is a native that provides incredible ground control by protecting the soil from direct rain and holding the soil with its roots. Poison oak helps our parks directly by keeping wary people on the trails!

Humans seem to be the only creatures with an allergy to poison oak. Deer browse on the leaves, as do banana slugs. Birds eat the berries which pass through their digestive systems and grow where dropped. Many animals call the poison oak home and den, burrow, nest, and roost in poison oak shrubs. Poison oak also provides us with oxygen through photosynthesis.

Native Americans were very fond of poison oak. The black dye emitted from it was used in both basketry and tattooing. The stems were used for weaving and

needlework. Juice obtained from the stems and leaves was used for relief from ringworm and warts.

## **Negative Aspects**

People react to poison oak because it contains urushiol (you-ROO-she-all). Eighty percent of the population is allergic to this oil. Urushiol is converted in the body to a reactive chemical, quinine, which binds to white blood cells and starts an immune reaction leading to a rash. When the oil contacts the skin, it begins to react. Your skin has different thicknesses on different parts of your body, and the oil can be applied in small or large amounts. Combine those variables with the temperature of the air and your body, and the result is a rash that may develop between five hours and 15 days after contact.

The oil can come from the leaves, stems, flowers, and berries. The oil remains active for a very long time (some say years). The oil can be passed to clothing or animal fur, then to you and still cause a rash. You can have shoes with oil on them from last week's hike and get it this week when you put the shoes on.

Burning poison oak will disperse the oil with the smoke. Many fire fighters have suffered from internal poison oak, which can only be treated in a hospital. When making a campfire or choosing a stick for roasting marshmallows, make sure it is not poison oak.

You CANNOT get poison oak from the blisters that form. You can only get it from the oil. Many people get confused when they break out in different areas at different times and blame the oozing blisters for the spread, when in actuality it was the initial contact with the oil.

## **Prevention and Treatment**

If you think (or know) you have touched poison oak, WASH IMMEDIATELY or as soon as possible. Cold water and normal soap will remove the oils and the threat of the rash IF YOU GET IT IN TIME. Two remedies are on the market. People have used Fels Naptha soap for years as a post-exposure soap. TECNU and other similar products, work very well as an after exposure wash.

If you do develop a rash, cool compresses or soda baths (one cup of soda to a full tub of lukewarm water) will help to dry out the rash. Calamine lotion, cortisone cream, aspirin, and oral antihistamines may help relieve the itching. There are numerous "home remedies" as well, see what works for you! For severe reactions, see a doctor. Cortisone is the common treatment in such cases.

Scratching??? Well, it doesn't spread the poison oak but you can suffer infection. DO NOT use strong soaps, bleach, acids, ammonia, or vinegar. Remember, the oil that caused this is now gone and what you have is tender, inflamed skin. Harsh chemicals will only further your problems by possibly creating a serious infection. Prevention??? Long sleeves, long pants, and avoiding the plant.

## Common Ferns In and Near Armstrong Grove

Parts of a fern:

The full, compound leaf is a frond, which is subdivided into pinnae. If the pinnae are not further divided, as in sword ferns, the frond is once divided; if the pinnae are also divided, the frond is twice divided. Sori are clusters of small, spore containing sporangia, which are sometimes covered by a membrane called indusia.

### **Bracken Fern** *Pteridium aquilinum*

It is one of the most widespread plants in the world, growing in dry, open grasslands and in deep, moist forests, from sea level to high elevations. It is unusual in having branched stems. It grows 1 to 4 feet high with wide, triangular fronds that are highly divided. Conspicuous spores form in late spring and early summer, following the edges of the pinnae. Most turn yellow and brown, and die back in the winter. Some consider the young fronds a delicacy, but eating too much can be dangerous, and mature plant parts are poisonous.

### **California Polypody** *Polypodium californicum*

It likes to grow on steep places, usually in mixed shade, and will even grow on tree branches, mixed with moss. Its fronds are once divided with rounded segments. The sori are nearly circular. The closely related Licorice Fern (*P. glycyrrhiza*) is similar but has narrow, pointed pinnae.

### **Five-Finger Fern** *Adiantum pedatum* var. *aleuticum*

It also prefers slopes and shade, but also grows in more level spots in Armstrong Grove. It likes very wet places. Five to seven finger-like fronds spread out from the top of a long, slender, shiny black stem. The pinnae are long and uneven, and the curled over edges cover the spores. The stems were used to make black patterns in baskets, by local Native Americans.

### **Giant Chain Fern** *Woodwardia fimbriata*

Often found near streams and springs, it likes lots of water and shade. It is also the largest native fern, growing up to 6 feet tall. The fronds are twice divided with the deeply divided pinnae growing in orderly rows decreasing in size toward the tips. The worm-like sori form a "chainlike" double row on both sides and close to the vein. There are brown membranes (indusia) along one side of the sori. Two strands in the stems were used in making baskets.

### **Goldenback Fern** *Pentagramma triangularis*

It grows in shady areas on rocky slopes. It has small triangular fronds, twice divided near the base, on slender black stems 1 to 4 inches in length. The fronds curl up when dry. It gets its name from a waxy, yellow powder on the underside, which can be imprinted onto bare skin. The sori form a brown network along the veins. The stems were woven to form black patterns on baskets.

## **Lady Fern *Athyrium filix-femina***

It grows in moist, shady areas. The lacy light-green, twice divided fronds are tapered at the tips, and grow up to 4 feet long. Unlike the bracken fern, each frond grows on a stem coming up from the base. Crescent-shaped indusia cover the sori. They are annual, so they look less robust in fall and winter.

## **Sword Fern *Polystichum munitum***

Coastal redwoods and sword ferns go hand in hand. The sword fern receives its common name from the small perpendicular projection at the base of its pinnae, or leaflet, which resembles the hilt of a sword. The sword fern is also known as "Christmas Fern". While common to the redwood forest, sword ferns have been a part of the earth's plant community for millions of years, since the time of the dinosaur. The sword fern has adapted to a wide range of growing conditions. It thrives best in the damp environment and rich soil of the redwood forest. It is a striking evergreen plant with blades that grow up to five feet in length. Sword ferns reproduce the old fashioned way -- not by flowers and seeds but by spores that are located on the underside of their leaves.

Closely related California Shield Fern (*P. californicum*) and Dudley's Shield Fern (*P. dudleyi*) are similar but have twice divided fronds, with *P. dudleyi*'s divided all the way to the secondary stems; in fact, *P. californicum* may be a hybrid of *P. munitum* and *P. dudleyi*. Northwest natives used the sword fern for many purposes: to line pit ovens, on drying racks and as a base for flooring and bedding.

## **Edible, Medicinal, and Useful Plants**

**NOTE:** Although the following can provide interesting interpretive material, remind your visitors that:

1. All plants and plant parts are protected in the State Parks
2. Telling them of past or current use does not mean that we endorse or recommend that use.

## **Coffeeberry *Rhamnus californica***

Bark collected in spring or fall, dried for a year, ground into a powder, and mixed with hot water produces a laxative. Fresh bark can be used if boiled for a number of hours. Berries are edible either raw or cooked and are quite nutritious. At one time early settlers thought that due to the color, size, and shape of the berry, it was a substitute for coffee beans. When roasted, however, the coffeeberry has no similarity to the coffee we drink today.

## **Horsetail or Equisetum *Equisetum arvense***

Decoction in nervous cases and insomnia. The young tips were used for their diuretic properties in kidney and dropsical disorders. A decoction of the young

stems externally applied is said to stop bleeding of wounds and to contain effective antiseptic and disinfectant qualities. The soapy juice from the roots rubbed on the skin is claimed by many to relieve irritation from poison oak. The high concentration of silica in the stems accounts for its use as a pot cleaner and its name "scouring rush."

### **Lupine** *Lupinus bicolor and albifrons*

The seeds reportedly were boiled and used to treat urinary disorders but they often contain dangerous alkaloids.

### **Mugwort** *Artemesia douglasiana*

Infusion for obstructed menstruation: put flowers in a teapot, pour boiling water over them, and drink. Repeat twice or more daily. The fresh juice of mugwort is said to be effective in relieving itching of poison oak and has also been used as a bath additive for rheumatism and sore or tired legs. Sleeping on a pillow of Mugwort allows a person to see their future in their dreams.

### **Soap Plant** *Chlorogalum pomeridianum*

Bulb peeled, oiled to remove the soapy material, and eaten like potatoes. Lathering quality for soap and effective cure for dandruff. Raw bulb mashed and scattered into streams to stupefy fish. Antiseptic for sores and ulcers (roasted, beaten into a poultice and applied to afflicted region). Young green leaves may be eaten if boiled. During the Gold Rush the fibrous outer coats of the bulb were used for stuffing mattresses. The cooked bulbs contain a considerable amount of fiber which could be made into small brushes for sweeping the fine flour out of the baskethopper in the process of grinding acorn flour. Thick juice which oozes as bulbs bake was used as glue for attaching feathers to arrowhead shafts.

### **Sticky Monkey Flower** *Mimulus aurantiacus*

Young leaves and stems can be eaten in salads. Indians crushed the raw leaves and stems and applied them to wounds. In early spring the flowers contain a drop of sweet nectar at the base.

### **Stinging Nettle** *Urtica dioica*

The young, tender shoots of nettle provide a good spring or early summer vegetable. Cooking or drying the nettle leaves removes the irritable property of the hairs. Has high amounts of vitamins A and C. A decoction of one tsp. of dried leaves to a cup of boiling water for cases of diarrhea, hemorrhoids, and inflammation of the kidneys. Nettle tea has been used in reducing fever and expelling phlegm from the lungs. A decoction of the roots is used to bathe joints afflicted with rheumatic pains. The juice of the nettle acts as an antidote for its own sting. The dry stems of this plant were used for clothes, fiber, and fishing line.

A ranger working on the San Mateo coast tried eating stinging nettle as an experiment. He gathered the nettle and cooked it as directed. Not being a squeamish or cautious person, he tried a huge fork full. When he was able to

speak again he said it was like eating a mouthful of Novocain. His entire mouth grew numb. Upon checking the cooking instructions he neglected to notice that the young plants should be collected since they have a lower concentration of formic acid.

### **Willow** *Salix sp.*

The bark can alleviate aches and pains and promote sweating in cases of chills and fever; it contains salicylic acid which is related to aspirin. A decoction of dried bark is recommended for rheumatism. Astringent properties rendered useful in internal bleeding. Strong infusion prepared from inner bark was administered as an external wash in cases of venereal disease, and the dried powder from the pulverized roots applied to sores.

### **Yarrow** *Achillea millefolium*

Strong infusion prepared from the leaves and flowers for fevers and a general tonic. Local anesthetic, the root being inserted in the hollow of a tooth to relieve pain and a poultice from the pounded root applied to afflicted areas such as in cases of earaches and even deep bodily wounds. A teaspoon of yarrow leaves with equal parts of mint in a cup of boiling water has been used with much success in colds. Yarrow tea used for stomach cramps and lack of appetite. In Sweden yarrow is used as a substitute for hops in brewing beer. Care should be taken in its use because it contains some alkaloid poisons.

### **Redwood Sorrel** *Oxalis oregana*

Redwood sorrel can be called the "Clover of the Redwoods". Their shamrock shaped leaves are similar to clover. Sorrel is abundant in redwood and mixed evergreen forests. Sorrel is low growing, when left undisturbed, often covers the ground in thick green carpets. Flowers are produced on small stalks and vary from white to deep pink. Sorrel is extremely sun sensitive; the leaves fold down when in hot weather or direct sun.

*Oxalis* is a Greek term for sour. The leaves and stems have been eaten raw in salads or slightly fermented as dessert. Early pioneers used the sour stems to concoct a rhubarb type pie. Eating too much *Oxalis* can produce stomach upset including diarrhea. In large amounts oxalate poisoning may result. Leaf teas are brewed for fevers, urinary infections and to prevent scurvy.

# Miscellaneous

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## Yellow Jacket

**Habitat** – Commonly builds underground nests of chewed paper collected from a variety of wood sources. These nests can be found in trees, eaves, bushes, and bridges

**Oddities** – Yellow jackets and hornets can be aggressive. Their sting is painful; some individuals may be allergic. These insects have occasionally been cause for concern in the park by building nests near trails and inflicting stings on hikers. While they are an important part of our natural environment and should not be needlessly killed, sometimes due to their close proximity to humans, their nests must be removed.

**Facts** - Yellow jackets are considered extremely beneficial around home and commercial gardens. They feed on insects that are sometimes harmful to plants. They are also a major scavenger of small dead animals.

**Identification** - The yellow jacket worker is about one half inch long and has a pattern of alternating yellow and black bands all over its body. Yellow jackets that are foragers (a.k.a. foraging yellow jackets) are sometimes mistaken for honeybees because they look somewhat the same and may visit the same food sources. Honeybees are a bit larger and are kind of fuzzy. Yellow jackets have no hair on them. Foraging honeybees have pollen baskets which are sometimes loaded with lots of tiny yellow or green pollen. Yellow jackets have smooth stingers that make it possible for them to sting multiple times. Honeybees have barbed stingers, which hurt a bit more. Honeybees can only sting once. Their stingers remain in the wound and continue to pump venom. Once a honeybee stings, its stinger is pulled out and the honeybee dies.

**Food** - Yellow jackets eat foods that are rich in sugars and salts such as nectar and fruit. Foraging yellow jackets also search for meat that is high in protein such as other insects and fish, which they only chew and prepare to give to their larval members of the colony. In exchange for the pre-chewed protein, the larvae produce a sugary substance which the adults eat. The exchange between the larvae and adults is called trophallaxis (trah-fuhl-axe-iss).

**Life Cycle** - The queen builds a paper nest and lays several adult workers. This first generation of workers participate in nest expansion. Nests are constructed out of several layers of comb made by lots of little pieces of wood fiber chewed into a paper-like pulp. During the peak population period, the colony produces reproductive cells that mature into future queens and reproductive males that later leave the nest for mating flights. Queens that have mated drop to the ground and seek a protected place to stay, such as a brush pile, a hollow tree, or a building. Males that have successfully mated quickly die. During the fall, the adults and founders queen die because of the cold weather. The next spring, the life cycle begins again. Sometimes during the fall, when the adults in the colony

die, skunks and bears dig into the underground nests and feed on the little, not yet mature yellow jackets. Above ground nests sometimes persist in dry areas, but are not usually used again the next spring.

## **Banana Slugs (California's official state mollusk)**

**Habitat:** Banana slugs live on damp foggy forest floors on the West Coast of North America only. They like foggy summers and rainy winters. They hide in damp places.

**Morphology:** (Body parts.) Slugs are believed to have evolved from snails. They need conditions with plentiful moisture. They are invertebrates called Mollusks. They are gastropods (stomach foot) and pulmonates (with lung), without an external shell.

Banana slugs are hermaphrodites. Each slug possesses both male and female reproductive organs. Thirty eggs are laid that can be eaten by birds or shrews. They have a high mortality rate. If they reach adulthood, they live 3-5 years. The longer set of antennae are eyes and the short set is for smell. If the antennae are broken off they will regenerate within 48 hours. In the mouth is a tongue-like organ called a *radula*, composed of many tiny teeth. The small breathing holes are on the side of the head. The big muscle on the bottom of the body is the foot. This slug has been known to lift a lid of a container if they smell food inside. They do not like the salt in our skin, so try not to handle them.

**Predators:** Snakes, ducks, foxes and salamanders eat banana slugs. For protection they cover themselves with slime and contract to become shorter, fatter and thicker. This behavior makes the predators gag in a big way. They can dig, climb, swim, move upside down, and lower themselves on a cord of slime.

**Job:** Slugs clean the forest floor. They eat mushrooms, dandelions, wild flowers, ferns, scat, poison oak, mosses and leaves. They can smell a mushroom 10 yards away with their short set of antennae. Redwoods benefit from the nitrogen rich scat produced by the slugs. The slugs will not eat any part of a redwood tree.

### **Cool Slug Facts**

- Slugs have tongues with 30,000 teeth and rasp their food.
- Slugs go about .007 miles an hour.
- Slugs sometimes are both female and male, and if no one else is around will mate with themselves.
- Slug slime can take away the sting from nettles.
- Slugs can stretch out 11 times their normal length.
- Slugs mark their own trail so they can find their way home after dark.
- Banana slugs were a food source for the Yoruk Indians.

# Amphibians and Reptiles

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## Amphibians

The amphibians were the first vertebrates to face the rigors of life on land. They solved locomotion and air breathing problems but remained vulnerable to the dehydrating effects of terrestrial existence and were never able to divorce themselves completely from the aquatic environment. However, they gave rise to reptiles whose scaly skin and shelled eggs offered protection against excessive water loss, thus enabling them to advance into an unoccupied arid environment.

The frogs and toads, salamanders, and tropical caecilians are the major kinds of living amphibians. Caecilians are legless and worm-like. Salamanders resemble lizards but they lack claws and have a moist skin without scales. Frogs differ from salamanders in lacking a tail and in having enlarged hind legs fitted for jumping. A typical frog (*Rana*) differs from a toad (*Bufo*) in having longer hind legs, a smoother skin, and no large glands on the neck.

Like reptiles, the amphibians are “cold-blooded.” When on land, they are often cooler than their surroundings because of water evaporation from the skin. The skin is smooth or warty, without scales, and usually well supplied with mucous and poison glands.

The wet skin and, in most species, lungs function in breathing. Since these animals lack a watertight body covering, water passes freely in through the skin. An amphibian will soon dry up if it does not have access to water, and certain land-dwelling salamanders may become water-logged if forced to stay in water. Some species maintain the proper water content by moving in and out of water and from moist to dry places on land.

Most amphibians have an aquatic larval stage. The Western Spadefoot Toad illustrates the usual life cycle. Many jelly-coated eggs, sometimes more than 2,000 by a single female, are laid in fresh water. These eggs hatch into tadpoles that breathe by means of gills. They feed chiefly on plants, small animals, and decaying matter in the water. Later, the limbs appear, the gills are replaced by lungs, and the tadpole changes into a toad that, for a time, may retain the remnant of a tail. After a period of growth, the Spadefoot returns to water to breed. Not all amphibians go through this cycle. Some lay their eggs on land, and the young hatch fully formed, whereas other amphibians are completely aquatic.

## Salamanders

### Arboreal Salamander *Aneides lugubris*

Habitat: A lungless species that may spend its entire life cycle high in the redwoods, or other coastal tree cavities.

Food: Insects, sow bugs, and centipedes.

Oddities: Has pale yellow spots. Uses large finger tips and prehensile tail for climbing. Has been found 60 feet up a tree in a mouse nest.

### **Pacific Giant Salamander** *Dicamptodon ensatus*

Habitat: Streams and wet coniferous forests.

Food: A predator of banana slugs, rodents, and snakes.

Oddities: It barks like a dog!

### **Ensatina** *Ensatina eschscholtzii*

Habitat: Douglas-fir, redwoods, chaparral, coast live oak.

Food: Spiders, crickets, and beetles.

Oddities: May remain active after the fall rains until May or through June in high or northerly locales. Found under rocks and rotted logs in damp forest areas and shaded canyons. In cold to dry weather retreats into caves, animal burrows, and between roots and logs. If threatened they take a stiff-legged stance, with sway arched and elevated tail, which easily snaps off. May live 10-15 years. It is a lungless salamander. Lays eggs in damp places—but not in lakes or streams—which the female broods. Coloration varies with habitat.

### **California Slender Salamander** *Batrachoseps attenuatus*

Habitat: Redwoods, grasslands, mixed woodland, coastal mountains.

Food: Hunts at night for worms and small arthropods.

Oddities: Wormlike, very short legs; lungless, spawns in damp debris in late fall and winter. Likes to spend its days in damp forest debris or in rotted tree roots.

### **Rough-skinned Newt** *Taricha granulosa* and **California Newt**

*Taricha torosa*

Habitat: Slow-moving streams, lakes, ponds that have submerged vegetation and nearby damp forests and grassland.

Food: Invertebrates.

Oddities: Newts are salamanders. Orange to reddish belly; they return to ponds and streams in late winter to mate and lay eggs.

### **Red-bellied Newt** *Taricha rivularis*

Habitat: Redwood forest floors, streams

Food: small animal life

Oddities: Although they are around water most of the time, they feed on land in wet periods. They are seen more often during heavy rains. The coloration of the adult is dark above and red below.

## Toads

The 300 species of toads are found worldwide; however, they are absent from extremely cold or dry areas and remote oceanic islands. The only true toad in Australia, the Marine Toad, *Bufo marinus*, has been introduced. Many toads can live under adverse conditions. They range from below sea level in Death Valley to above 16,000 ft. in the Andes of South America and from the tropics nearly to the Arctic Circle. Thirteen species are found in the West. Our species (genus, *Bufo*), is chunky, short-legged and warty.

Parotoid glands distinguish toads from all other tail-less amphibians. The parotoids and warts secrete a sticky white poison, which in some species can paralyze or kill predators. Many animals, however, eat toads with no ill effect. The skin secretion may irritate the eyes or mouth, and if swallowed in quantity, can cause illness. However, ordinary handling poses no danger, and handling of toads does not cause warts.

Breeding often occurs in spring and summer, often after rains. All male toads develop brown nuptial pads on the thumb and inner fingers that help them cling to the slippery body of the female during amplexus.

### **Western Toad *Bufo boreas***

Food: Variety of insects, small aquatic animals.

Voice: A mellow chirruping, similar to the peeping of a baby chick. These toads have no vocal sack and are active from January to October, breeding in late January.

Oddities: The western seeks shelter by burying itself in loose soil or by retreating to burrows of gophers, ground squirrels, and other animals. They tend to walk rather than hop. They are diurnal at high elevations and nocturnal in low-lying areas. Prefers ponds, lakes, rivers, and streams.

## Frogs

Frogs are typically slim-waisted, long-legged, smooth-skinned jumpers with webbed feet and often with dorsolateral folds (glandular ridges) that extend from behind the eyes to the lower back. Any western tail-less amphibian with dorsolateral folds is a true frog. In males during the breeding season, forelimbs and thumb bases become enlarged and webbing increases; a dark nuptial pad appears on the thumb. Vocal sacs are paired or single and generally inconspicuous.

### **Bullfrog *Rana catesbeiana***

Food: Large specimens have been known to catch and swallow small birds and young snakes; its usual diet includes insects, crayfish, other frogs, minnows and small mammals.

Voice: A deep-pitched bellow suggesting *jug-o-rum*, or *br-wum*. Frightened individuals may give a squawk or catlike *miaow* when they leap into the water.

Oddities: Native to the East Coast, attempts to commercially harvest frogs' legs have prompted many introductions of the Bullfrog outside its natural range. Enters marshes, ponds, lakes, reservoirs, and streams, usually quiet water where there is thick growth of cattails or other aquatic vegetation. Wary by day but readily found at night by its eyeshine. Often easily caught when dazzled by light. When first seized, it may "play possum," hanging limp and motionless; be alert for sudden recovery! Reduces populations of red-legged and Pacific tree frogs, thereby reducing the food source of the Common or Western garter snake.

### **Red-legged Frog *Rana aurora***

Habitat: Chiefly a pond frog that inhabits humid forests, woodlands, grasslands, and streamsides, especially where cattails or other plants provide good cover. Most common in the lowlands and foothills. Frequents marshes, streams, lakes, reservoirs, ponds, and other usually permanent, sources of water. Generally found in or near water but disperses after rains and may appear in damp woods and meadows far from water. It is a threatened species.

Food: Insects, Pacific tree frogs

Oddities: Primarily diurnal. May be extinct in the southern Sierra Nevada, because of habitat disturbances and the introduction of the bullfrog. It was heavily marketed in central California and elsewhere as a source of frog legs in the late 1800's and early 1900's. The frog is a major food source for the San Francisco garter snake.

### **Pacific Tree Frog *Hyla regilla***

Habitat: Grasslands, chaparral, woodland, forest, desert oases, and farmland. From sea level to mountains, close to water.

Food: Leafhoppers, flies, ants, beetles, and spiders.

Voice: A high pitched, 2-part note: "kreck-ek!"

Oddities: Active both day and night. Used extensively in Hollywood movies for an authentic outdoor nighttime frog sound (normally where there are no tree frogs). Lacks dorsolateral folds.

## **Reptiles**

Living reptiles comprise five major groups, four of which occur in North America: the crocodiles, the turtles, the lizards, and the snakes. Derived from the ancient amphibians, the first reptiles appeared some 300 million year ago. The Age of Reptiles that ensued saw a proliferation of reptilian forms from small tree-dwellers to monstrous dinosaurs more than 100' long and perhaps weighing in excess of 50 tons. Except for the crocodylians and birds, all of the ruling reptiles are extinct; only 4 of 16 ancient orders are alive today.

The reptiles' protective dry scaly skin and tough-shelled eggs, as well as enlarged and improved lungs, enabled them to colonize area where amphibian

existence was impossible. The ancient reptiles, in turn, gave rise to birds and mammals whose subsequent proliferation coincided with the reptiles' decline.

Like fish, reptiles have a spinal column and scales but they breathe by means of lungs rather than gills. The skin is dry, in contrast to the moist, glandular, scale-less skin of the amphibian. As growth and wear take place, the outer layer of the skin is shed, usually in large pieces in most reptiles or in one piece in snakes and some lizards. In snakes the old skin loosens around the mouth and is turned back, inside out, as it catches on sticks, rocks, and other rough surfaces as the snake crawls. Even the watchglass-like covering of the eye is shed along with the head skin.

Like all animals, except birds and mammals, reptiles are "cold-blooded," which means that they derive their body temperature chiefly from their surroundings rather than from internal heat. When this temperature is well below our body temperature, they feel cold to us. Most of them, however, exercise some control over their temperature by moving from sunlight to shade, from land to water, or in and out of the ground. In this way, many species are able to keep their temperature at a nearly constant level during periods of activity. The Western Fence Lizard, for example, maintains its temperature at about that of people. Consequently, during most of the day, it may actually be "warm-blooded."

The major groups of reptiles in the Bay region are easily recognized. Turtles have a shell into which they can withdraw the head and limbs. Lizards differ from snakes in usually having limbs, and their toes have claws. No snake has movable eyelids, and thus the presence of eyelids will distinguish a legless lizard from a snake.

## **Turtles**

### **Western Pond Turtle *Clemmys marmorata***

Habitat: Quiet waters of ponds, small lakes, streams, marshes, or reservoirs, often where there are tules (bulrush).

Food: Aquatic plants (including pond lilies), beetles, and other insects and carrion.

Oddities: Seldom found more than a few feet from water. Individuals are often seen basking on logs, mats of dead tules, or on pond banks within easy reach of water. If even slightly disturbed by voices or loud footsteps, will quickly slip below water without being seen. It is best to approach their known areas quietly. Don't be afraid to tell your group to hush-up in order to see these turtles.

## **Lizards**

### **Western Fence Lizard (Blue Belly) *Sceloporus occidentalis***

Habitat: Grassland and open woodland, especially where there are rock outcrops, fallen trees, brush heaps, old lumber or buildings. Avoids dense, shaded woods.

Food: Beetles, ants, wasps, aphids, caterpillars and spiders.

Oddities: Male lizards establish territories and attempt to drive away other males. This is done by a threat or warning signal made by flattening the sides of the body, lowering the skin of the throat, and a bobbing movement resembling “push-ups.” The effect is to flash the blue markings. If the intruder does not turn away or is aggressive, a fight may occur. Males use much the same type of display when courting. A fighting male attempts to seize his opponent in his jaws. He may grasp any part that is handy but often takes hold of a leg or the skin of the sides or back. With a jerk of his head and body he may attempt to “throw” the other lizard. The threatening pose described reduces the chances for a skin hold and increases the apparent size of the lizard.

### **Western Skink** *Eumeces skiltonianus*

Habitat: Woodland, forests, and grassland, usually where there are rocks, rotting logs, or leaf litter.

Food: Beetles, grasshoppers, crickets, leafhoppers, moths, caterpillars, spiders, and sow bugs.

Oddities: Tail is easily lost to escape from predators; one of our more colorful and humorous looking lizards or skinks.

### **Northern Alligator Lizard** *Gerrhonotus coeruleus*

### **Southern Alligator Lizards** *Gerrhonotus multicarinatus*

Habitat: Open grassland, woodland, and chaparral.

Food: Sowbugs, scorpions, spiders (including the black widow) and their egg cases, snails, grasshoppers, crickets, beetles, and occasionally the eggs and young of birds.

Oddities: This lizard resembles an alligator in appearance and occasionally enters water to escape an enemy but only if no other retreat can be found. Sometimes seen in bushes or on the lower branches of trees. Once found in the jaws of a snake. The snake’s efforts to swallow it were foiled when the lizard seized its own tail in its mouth. If you suspend this lizard by the tip of its tail, it can draw itself up to your finger by tail movements alone, without help from its limbs. Caution—they do bite! Southern alligator lizards lay eggs; Northern bears live young.

## Snakes

In the presence of a reptile, especially a snake, most people show fear, disgust, curiosity, or delight - the kind of response depending on the individual and their background. Ignorance is responsible for most of our fear of snakes. Many people are interested in snakes but an "interest" based on the belief that all snakes are deadly is worse than indifference. The scientist has done much to dispel the fear and misunderstanding of these animals. We can begin our examination of snakes by pointing out some false beliefs concerning them:

- The fictitious "hoop snake" is supposed to take its tail in its mouth and roll like a hoop down a hill. After gaining momentum, it is said to straighten out and pierce its victim with a sharp spine at the tip of its tail.
- The so-called "glass snake" that may break into one or more pieces, when seized, is not a snake at all but a limbless lizard with a long, easily broken tail. These separated parts of the tail cannot grow together again but the lizard can grow a new tail.
- There is no evidence that snakes can charm people or other animals. An animal, such as a bird or squirrel, may watch a snake closely but the animal is not under the control of the snake.
- Snakes rarely chase people. There are a few reports of the eastern Racer attacking people. The Black Mamba of Africa, the Tiger Snake of Australia, and a few others may be aggressive (to be read: chase) but most snakes try to crawl away from people.
- On level ground, most snakes can strike a distance of about one-third their total length. An excited snake, especially a young one, may strike with such force as to leave the ground slightly, and certain South American vipers can actually leap a short distance. In general, however, snakes are unable to jump.
- Snakes have to coil to bite - another myth. They don't have to coil.

There are four poisonous snakes in the United States: the copperhead, water moccasin, rattlesnake (14 species), and the coral snake (2 species). The first three, called "pit vipers," give birth to their young, have a pit on each side of the face between the eye and nostril, a broad head set off from the slender neck, and movable hollow fangs for the injection of venom. The venom acts chiefly on the circulatory system of the victim, breaking down the blood cells and walls of the blood vessels. The coral snake is a relative of the cobras and has erect, non-movable, hollow fangs in the front of the upper jaw. The venom acts chiefly on the nervous system, causing paralysis. Except for possibly a few coral snakes near the Arizona border, the only poisonous snakes in California are rattlesnakes.

### **Ringneck Snake** *Diadophis punctatus*

Habitat: Under logs, boards, rocks, and other objects in or near woods, grassland, salt marshes.

Food: Treefrogs, slender salamanders (and the young of other species), skinks, and small snakes.

Oddities: If threatened this snake will curl its tail and flash the bright red underside as a warning to predators. Bright colors in nature frequently indicate a warning and is appropriate in this case since a bird that eats a ringneck will become violently ill. The bird will remember the bright red flash and supposedly leave other ringnecks alone. The ringneck is a small snake about as thick as an earthworm.

### **Gopher Snake** *Pituophis melanoleucus*

Habitat: Lives in a variety of habitats, from the lowlands high into the mountains and from coast to coast.

Food: Other snakes, mice, kangaroo rats, gophers, ground squirrels, rabbits, occasionally birds and their eggs.

Oddities: Gopher snakes have been confused for rattlesnakes due to their response to danger: they will hiss loudly and sometimes flatten their head and vibrate their tail. This along with similar coloration to a rattlesnake will sometimes get them mistaken and, as a result, squashed with a shovel.

### **Western Terrestrial Garter** *Thamnophis elegans*

Habitat: Lives in a variety of habitats, from lowlands into the mountains and from coast to coast.

Food: Slugs, snails, leeches, earthworms, fish, small mammals, occasionally birds, insects, and carrion. Adults eat mostly mice.

Oddities: When frightened, will seek shelter under brush rather than water.

### **Western Aquatic Garter** *Thamnophis couchi*

Habitat: Inhabits mostly ponds, rivers, and streams, also brackish and fresh marshes.

Food: Fish, tadpoles, mice, gophers.

Oddities: This garter is primarily diurnal and will retreat to water if threatened.

Food: Red-legged and Pacific tree frogs, tadpoles, and mice.

### **Western Rattlesnake (Northern Pacific subspecies)** *Crotalis viridis*

Habitat: Although the Western rattlesnake frequents a great variety of habitats, from shrub-covered coastal sand dunes to timberline, prairies, mountain forests, and desert-edge stream courses, it is not likely to be encountered during guided walks. It may be encountered at higher altitudes in the watershed areas of both parks.

Food: Eats mammals (mice, ground squirrels, and rabbits), nestling birds, lizards, snakes, and amphibians, swallowing their prey entirely (gulp!).

Oddities: Rattlesnakes can be distinguished by their triangular head, heat-sensing pits between eyes and nostril, and tail rattles. A new rattle segment is added each time the snake sheds its skin, normally 2-4 times a year. Effect of the venom varies depending on size of the snake, when it last injected venom, age and condition of victim/prey. Venom is not always injected if the snake is biting as a result of a defense mechanism rather than for the purpose of capturing prey.

## **Miscellaneous Information**

The following information is a collection of additional facts about amphibians and reptiles that you can add to your storehouse of fascinating tidbits!

### **Amphibians**

- Unlike fish, most amphibian larvae have external gills, though in frog tadpoles, a gill cover forms shortly after the gills develop.
- Adult amphibians may breathe through lungs, gills, lining of the mouth, or skin, depending on the species.
- The rough-skinned newt disperses 80% of carbon dioxide through its skin.
- Amphibians have a 3-chambered heart, like reptiles. Birds and mammals have 4; fish have 2.
- Amphibian teeth are polyphyodont (may be replaced an infinite number of times) and homodont (all teeth along the jaw are similar, no specialization).
- Ribs are poorly developed in amphibians and absent in toads and frogs.
- Frogs have vocal chords; salamanders do not, although some can make sounds.
- Amphibians hear low-frequency environmental vibrations through their forelimbs and pectoral girdle, transmitted to the inner ear by an opercular bone. Frogs also possess an eardrum with which they can hear high-frequency sounds, i.e., courtship and territorial calls.
- Many amphibians continue to grow throughout their lives.
- Many salamanders can lose their tails, like lizards.
- All salamanders in the northwestern U.S. have internal fertilization.
- All frogs in the northwestern U.S. have external fertilization (except the tailed frog).
- Many species of salamanders retain larval structures, such as gills, into adulthood. This can be environmentally induced or genetically fixed.

- All frogs and salamanders possess toxic skin glands. The toxicity of different species ranges from deadly to no more than an irritant. The skin of the Poison Arrow Frog of South America is used by Indians to poison their arrow points.
- The toxic skin secretions of some newts have been found to be effective local anesthetics.
- The California Newt, Tailed Frog, Bull Frog, and Map Turtle have been shown experimentally to use celestial cues for directional guidance.
- Frogs sing by passing air back and forth over their vocal chords from their lungs to their vocal sack. They sing with their mouths closed and can even sing under water.
- Many salamanders live more than 20 years.
- Many frogs live more than 10 years.

## Reptiles

- The reptile egg is amniotic (contains amniotic fluid, a self contained aquatic environment). The shell is not totally waterproof so eggs are usually laid buried in the soil or under rocks or logs where they are protected from drying out.
- Reptiles have no larval stage.
- Reptiles have tougher, less permeable skin than amphibians, which prevents them from drying out and requires that they all have lungs.
- Reptiles have true claws; amphibians do not.
- Reptiles have 3-chambered hearts (except crocodilians which have 4).
- Lizards use their hind tongue for swallowing, fore tongue in food gathering, and the tip of tongue in carrying odor particles to Jacobson's organ in the roof of mouth. Not all lizards have all of these tongue parts. The most advanced lizards have long forked tongues, like snakes.
- Reptile teeth are commonly heterodont (teeth in different parts of mouth specialized for different purposes).
- Turtles have no teeth but have a sharp beak.
- Many lizards (and a few snakes) can lose their tails at will. The replacement tail (which takes up to a year to grow) is cartilaginous and cannot be lost unless broken off above the point where it broke off before.
- Turtles and lizards have eardrums. Snakes ear bones are connected to their lower jaw bone to allow snakes to hear low-frequency vibrations through the ground.
- Many female reptiles (and some salamanders) can store sperm in their bodies for several years after mating.

- Many lizard species common on islands are parthenogenetic (females can reproduce without mating). If a female rafts to an island on a piece of driftwood she can start an entire population of lizards.
- Reticulated pythons are excellent swimmers and also colonize islands. They were the first reptiles to colonize Krakatoa after the famous eruption.
- Snakes and lizards that live at high altitudes and latitudes typically bear live young. (Warm season too short for eggs to develop.)
- Most reptiles abandon their eggs. Exceptions: Female skinks stay with their eggs and protect them, turn them, and bring them back together if they are scattered. Female pythons incubate their eggs for about 6 weeks. Female alligators stay with their young a year or more.
- There are only two species of poisonous lizards in the world, the Gila Monster and the Mexican Beaded Lizard. They are closely related to each other and both live in northwestern Mexico. Gila monsters are occasionally found in Arizona.
- Lizards are usually territorial but when they become over-crowded, they shift to a dominance hierarchy. Since only the dominant is able to reproduce, over-crowding is eventually alleviated.
- Many snake species are gregarious. Forty ringneck snakes were placed in a laboratory arena with 10 identical flat discs for cover. Seven days later, 24 of them were congregated under one disc. Only one was alone under a disc. Rattlesnakes den up in winter to hibernate.
- All snakes are carnivorous.
- Snakes are considered by some to be the most evolutionarily advanced of the reptiles. Their ancestors had legs but developed a more efficient means of locomotion so that legs eventually were lost.
- Many turtle species live more than 30 years.
- Many snake species live more than 20 years.
- Many lizard species live more than 10 years.

# Birds

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## Introduction

“More than 800 species of birds breed in North America, or visit the continent regularly, or drop in occasionally” is how National Geographic Society’s Birds of North America begins. Please, do not let this intimidate you. The reason for reading this chapter is for your own education, not intimidation! Therefore, a condensation of the most pertinent information will follow. While your attention is undivided, let’s begin with the 3 most important things used by a beginning birder (a “birder” is someone who observes birds):

1. Go out with birders to gather the most useful information. Befriend them and drag them to the area in which you have an interest. LEARN THE VOCALIZATIONS of the most common birds in that area. You may NEVER see the birds that are the most commonly asked about by visitors, only hear them. Learn one at a time. Don’t let the first attempts at mentally organizing the birds’ characteristics baffle you. Everything takes time.
2. Keep a notebook and write down clues the bird gives you. There are many people who can help you after you have seen or heard the bird but you must provide them with good information. Write down everything that you notice and then look up in your field guides and consult established birders.
3. Someone on your Nature Walk is a birder. Sometimes it is obvious: binoculars around the neck and a “life-list” hanging out of their pocket. Most of the time it isn’t. Birding is a hobby (or to some an obsession) that can be a life-long interest. Birders take it seriously but usually love to share knowledge with you. Remember, if you don’t know the bird, just admit it and ask if anyone else does.

## Classification

*Now the nitty-gritty...*

**Families** - Family groups share certain structural characteristics. They have Latin names that translated refer to some characteristic common to that family. The field guides use the families for organization. It helps to bring down the inconceivable 800 birds to a manageable 21 families.

**Scientific Names** - Each kind of bird, or species, has a two-part Latin name. The first part, always capitalized, indicated the genus, a group of closely related species. The second part of the name, not capitalized, indicates the species. No two species share the same two-part scientific name. If a third name exists, it is a subspecies. This helps when populations in different geographical regions show recognizable differences.

**Common Names** - Luckily, birds are not like plants in that birds’ common names are (for the most part) regulated and widely used. Birding has been a pastime

globally for many years, and as the birds migrate, birders will follow, therefore creating a regulated system. Plants don't normally migrate seasonally and tend to receive different common names in different areas with scientific names and/or families changing every 20 years. Birders converse at the common name level, as opposed to a botanist who must depend on scientific names. This enables us to look at a Red-tailed Hawk, to notice its size, coloration, and habits, to decide it is a Red-tailed Hawk, and we don't have to call it a *Buteo jamaicensis*.

**Field Guide Division** - Field Guides tend to place birds in taxonomic orders with water birds first, followed by land birds, with few exceptions. The sequence is seabirds, waterfowl, hawks, upland game birds, wading birds, gull-like birds, miscellaneous land birds, and songbirds.

## Identification

There are many factors and characteristics used by birders to identify birds. Usually, no one single factor is sufficient for identification; a combination of factors is often used, including:

**Body size, shape, posture, habits, length and shape of bills and tails, and length of legs** - These characteristics will differentiate between families or even smaller groups. Look through your field guide when you are not birding and acquaint yourself with the basic differences families have.

**Plumage** - Within each species the norm is for the male and female to differ, the plumage in the spring and winter to differ, juveniles to differ, and the period of change (molting) to differ. From the bird's point of view, all of these changes are for a reason: mating, camouflage, rejuvenation. From a birder's point of view, this requires more time in the field becoming familiar with the changes. A good field guide representation for this is National Geographic's Birds of North America. "In general, nestlings wear fluffy down. The first coat of true feathers, acquired before the bird leaves the nest, is worn by the juvenile and may show some traces of down. In many species, juvenile plumage is replaced in late summer or early fall by a first-fall or first-winter plumage that usually more closely resembles the adult. First-fall and any subsequent plumages that do not resemble the adult are termed immature plumages and may continue in a series that includes first-spring (when the bird is almost a year old), first-summer, and so on until it attains adult plumage. When birds take more than 1.5 years to reach adult plumage, they are termed as subadult.

"Some species wear colorful plumage in the breeding season and molt to duller colors for fall and winter. In some songbirds, the bright plumage of spring appears with the gradual wearing away of dull tips on the feathers of their winter plumage, with very little actual molting involved. By late summer, feathers become worn and faded; fresh fall plumage can be brighter than the colors of August.

"In some species, breeding plumage looks much like winter plumage. Some changes are evident only during the brief period of courtship. In herons, for

example, the colors of bill, lores, legs and feet may change or deepen. When these colors are at their height, the birds are said to be in high breeding plumage.

“Male ducks, after courtship, molt into an eclipse plumage that resembles the dull colors of the female. In most species, eclipse plumage is held only for a few weeks, when another molt begins. All the flight feathers are lost simultaneously during eclipse; the ducks are unable to fly until new flight feathers grow in.”

**Field Marks** - Field marks remain constant as the plumage changes. Field marks are used in the narrative description of each bird. Examples are: wing bars, rump patches, eye rings, tail spots... It will help to know the parts of a bird so you know exactly where these field marks will be. Successful birding requires that you recall and recognize quickly what field marks identify which species, and this ability comes with experience.

**Distinctive Actions/Behavior** - Each bird has adapted to its size and environment. These adaptations become quite clear as you watch how a bird flies, walks, hops, feeds, and flits. There are specific characteristics for each family and species. An American Dipper will sit on a rock in a stream and quickly squat (or bob) a few times. No other sooty gray bird does this. (YOU can mimic the dipper on a nature walk to help visitors remember what a Dipper is.) Watching a bird fly with a few flaps, then glide with wings against the body, tells you that it is a woodpecker. Then you see a distinct white rump patch, white patches on the wings, and a flash of red on the head, and you are in the Redwoods. You will probably be right if you say Acorn Woodpecker.

**Measurements** - The length and wingspan of a bird help you to identify the family and species. Length in field guides is taken from tip of bill to tip of tail. Wingspan is given for birds in flight from wing tip to wing tip. It helps to remember if, for example, the bird is bigger than a Robin (9"). That may help you quickly differentiate between a Western Meadowlark (10") and a Goldfinch (5"). Measurements help when relative size is an important factor in distinguishing a larger species from a smaller (Hairy Woodpecker from a Downy Woodpecker).

**Songs and Calls** - Many times you will not be able to see birds, only hear them. Their vocalizations can be roughly divided into two categories: songs and calls. Songs are usually given by adult males on territory during the nesting season but may also be heard during migration and, in some species, during the winter as well. In certain species, females as well as males may produce songs. Many songs are rather complex, like those of the Winter Wren and most wood warblers but some are very simple. Calls, or call notes, are generally more simple and are often given throughout the year under a variety of situations to express alarm, to maintain contact with other members of a flock, or to interact with a mate or young. You can use a bird's song when other factors limit you: darkness, fog, thick vegetation, and a distant location.

**Habitat** - Most people know that ducks are water birds and woodpeckers are birds of the forest but few beginning birders are aware of how specific most species are in their habitat requirements. Although these requirements may vary

somewhat according to region and season, they are still quite rigid: certain birds are in certain habitats. Knowing habitat preferences greatly increases the chances of finding particular birds; it can also limit what we expect to find. In many cases, habitat by itself helps us to identify species.

**Range** - The range of most birds is determined in large part by the availability of a specific habitat. A range boundary is drawn where the species ceases to be regularly seen. Birds are not, of course, bound by maps. Ranges continually expand and contract, making any map a tool rather than a rule.

The more time spent with your field guide, binoculars, notebook, ears, and eyes, the more you will learn. Sign up for other people's walks to share their knowledge. Identify a bird and continue watching it. The goal is to learn about the bird beyond just its name. If you can memorize a bird's song or characteristic by a tricky phrase, story, or comparison, remember it and share it with others.

### **Great Blue Heron** *Ardea herodias*

Most wading birds, such as Herons, have long legs, neck, and bill for stalking food in shallow water. Graceful crests and plumes adorn some species in breeding season. The Great Blue Heron is common year round as long as there is sufficient water to support its food supply of fish, amphibians, reptiles, small snakes, and rodents. They have the widest food base of any heron and can eat almost anything. Great Blues use their height (up to 4') to gain a view of surrounding food by standing perfectly still until a good morsel passes by, then striking out with their long beaks to catch it, usually between the mandibles. One Great Blue was observed becoming stuck on a large fish, after spearing it and being taken for a wild ride through the water before it could break loose. The bird then made it to shore, where it appeared to be slightly ruffled and dazed by the encounter but still maintained its majestic composure. If the Great Blue catches a particularly large fish it will bring it ashore and beat it on the ground to kill it. If it catches a small fish, it is normally swallowed head first and whole.

### **Snowy Egret** *Egretta thula*

Light, airy, and graceful, once hunted to near extinction in Europe and North America for its plumes. They are now protected, and populations have been expanding. Picture a smallish sized heron with a dark beak, dark legs, and yellow socks. Snowys move briskly in water, stirring up prey with their feet, stabbing repeatedly to catch it. Known to occasionally nest alongside the Great Blue Heron.

### **Belted Kingfisher** *Ceryle alcyon*

Stocky, short-legged body; large head, with oversize bill; and in two species a ragged crest. They hover over water or watch from low perches, then plunge headfirst to catch a fish. Heavy bill and stubby feet also serve for digging long nest burrows in stream banks.

They will nest in the holes to the east of a bridge on the south bank, digging three to seven feet in soft soil to create safe nests that they line with grass. Very territorial. They feed on fish, aquatic invertebrates, amphibians, reptiles, young birds, and rarely berries.

### **Mallard** *Anas platyrhynchos*

Very common in freshwater along our coast. The female cares for and rears the eggs and young alone, while the males spend the summer in small groups by themselves (smoking cigars and playing poker no doubt). Females are courageous in protecting their young. They will commonly try to lay their eggs in another duck's nest to avoid the work of caring for the young. To avoid predators, mallards will often cling to the weeds beneath the surface, and when finally forced to come to the top for air, they will expose only the top of the bill. They try to escape by simply diving and clinging motionless to weeds more often than they attempt to swim long distances underwater. Mallards are basically fresh-water ducks. In Alaska and on the Pacific coast they feed largely on dead salmon and salmon eggs, which they obtain in the pools in the rivers. On or near breeding grounds, they feed largely on wheat, rice, barley, and corn. They will also eat bechnuts, acorns, slugs, snails, frogs, or lizards.

### **Turkey Vulture** *Cathartes aura*

A small unfeathered head and hooked bill aid these scavengers in consuming carrion. Weak talons are ill-suited for grasping live prey. Vultures do not build nests but lay their eggs in a sheltered spot: cliff ledge or cave, hollow log, abandoned building. These relatively unglamorous birds are commonly seen soaring gracefully, usually in small groups. Flocks often roost together at night.

Feeding practice: As soon as an animal can no longer move, the meal is ready, and if a vulture finds a dead body, although still warm, the bird will begin to feed at once. A large animal cannot be finished, even by a company of voracious vultures, while the body is fresh. Putrefaction works fast, and the end of the meal becomes far advanced in decomposition. Occasionally due to the position of the body, or because it is submerged, or because the hide is too tough for the vulture's beak to tear, little or none of it is accessible to the birds. Then the vultures gather about the carcass, in large numbers if the carcass is large, and wait patiently nearby until time and decay make it soft and ripe and fit for their needs. Vultures fulfill a required niche in the food web by scavenging dead organic matter which could produce disease in other mammals.

### **White-tailed Kite** *Elanus leucurus*

Seen frequently throughout the year. Often seen "kiting" for small rodents, birds, snakes, lizards, frogs, and insects over fields and marsh lowlands. Population of kites has strongly declined, and in the early 1900's they were thought to be near extinction. However, due to protection by law and exemption of collecting permits, their numbers are on the increase and their range expanding rapidly.

Kites have been known to reuse nests from year to year and will lay a second brood of eggs if the first brood is destroyed. They are erratic nest builders, some being so loose that the eggs practically fall through. Others are constructed so tightly as to submerge eggs in water after a rain. The term "To fly a kite" is derived from the way a kite hunts. They begin up high, moving their wings to stay in the same place. They will drop in height at a glide to a lower position and repeat the process until they find prey. These birds have colonized all over the world, except the Arctic and Antarctic.

### **American Kestrel** *Falco sparverius*

This is one of our smaller hawks. A year-round resident of our coast, seen frequently on power lines. Feeds predominantly on insects, small rodents and mice, and small birds in winter. Kestrels do not make nests but lay eggs in protected areas, such as: recesses in a ledge of a cliff, among rocks, or in the nests of other birds, occupied or not. In the former case, kestrels have been known to evict current tenants of nests before they have laid eggs.

### **Northern Harrier** *Circus cyaneus*

Often observed in open country skimming at a low altitude for prey; they normally do not soar at high altitude. The Harriers have a facial disk similar to owls and normally use a well developed sense of hearing for hunting. They can hear a mouse before they can see it and only use sight in the last 4-5' while catching dinner. Harriers have a great differential survival rate. There is only one adult male to every 10-12 females.

### **Red Tailed Hawk** *Buteo jamaicensis*

One of the best-known, and widely distributed hawks in northern America. It has a broader ecological tolerance of habitats than any other northern hawk. It nests throughout most of northern America, from Canada and interior of Alaska, and south to Panama and West Indies; some northern birds winter to Gulf Coast and northern Nicaragua.

Up to 2 feet long and a wingspan of 46-58 in. Adults are dark brown with white below intermixed with brown streaks. It can be distinguished by the red on upper side of tail, and its soaring flight. It is also known for its piercing scream, like a *Kree-e-e-e* sound.

The Red Tailed Hawk is known for its keen eyesight. It may hunt while soaring in the sky as it catches small birds or bats, or hover over an area and then dive. Young redtails may hover about 100ft. above fields while hunting for mice. They often watch for prey from a perch and then glide, and snatch prey from ground with talons.

In nesting habits, the same pair cling to territories year after year and are thought to mate for life or until the death of one of the pair. The pair in courtship, soar and scream as they turn over in the air in mock combat. Pairs defend the nest by screaming and diving.

Habitat: See above

Food: Its main prey is rodents, but also hunts other small mammals such as squirrels and rabbits. Also eats small birds, snakes, lizards, some insects and even catfish at the edge of the water. All hawks need to regularly have some kind of prey with fur or feathers.

### **Osprey** *Pandion haliaetus*

Also called fish eagle, fish hawk and sea hawk. Its species name is Latin for sea eagle. The Osprey is almost eagle-like in size. It's up to 2 feet long and its wingspan is 54-72 inches. Nesting is in colonies or singly, and the nest is often found near water, perched on a snag or on rocks, where the Osprey flies out over fresh or salt water to hunt. Nests are built up of sticks by the pair each year and may be occupied for decades. They can live to 20 or more years.

When it sees a fish, it hovers with wings beating. It sometimes plunges into water in a dive, with wings held back and rises in air with the fish held in both feet. It then pauses in midair to shake water from its plumage and to arrange the fish with head facing forward to reduce its resistance to air. Then it flies with its catch to its usual perch or nest to feed its young. Sometimes an eagle seeing the Osprey with its catch, will dive upon the Osprey forcing it to drop its catch. The eagle often catches the fish in its talons before the fish hits the water.

Habitat: In summer it can be found along lakes, rivers and seacoasts of U.S., Canada, and Alaska. Its winter range is in South America, Mexico and the southern U.S.

Food: Almost exclusively fish. Occasionally catches small rodents and small birds.

### **Spotted Owl** *Strix occidentalis*

This large, dark-brown owl has a spotted chest and a barred belly. It has a puffy head and large dark eyes. Spotted owls are rare, as they are an endangered species, but do reside here. Their range is in old forests from southwest British Columbia to central Mexico.

Habitat: Mature old-growth forests, conifers, and wooded canyons.

Food: Rodents, birds, reptiles, fish, and large insects.

Oddities: High pitched hoots that sound like the barking of a small dog. Usually in groups of three (hoo, hoo-hoo), or four (hoo, who-who-who).

### **Common Raven** *Corvus corax*

Some of the habitats of the Common Raven are North America, Eurasia, Central America and northern Africa in forests, grasslands, shorelines, deserts, and even cities. Ravens are commonly seen in Armstrong Grove! Visitors to the park often ask if they are crows. Common Ravens are large, black birds, with strong, heavy bills. Its all black feathers often take on a metallic luster of purple and blue, with green gloss on its wings. They look like American Crows but are larger. When size isn't enough to distinguish the two species, look for the heavier bill and shaggy feathers around the throat area.

In flight, the raven shows a wedge-shaped tail from below, unlike the crow, which has a slightly rounded tail. Its wings are longer and less rounded. Ravens typically soar and glide in flight, while crows tend to flap continuously and fly in a direct path. Ravens are magnificent flyers and can hold position in a gale, hover like an American Kestrel, or rise and circle like a hawk. Ravens are usually seen in pairs or small family groups rather than in large flocks like crows often form. However, Ravens roost together in large groups in winter.

Common Ravens usually breed when they are 2-4 years old. They are monogamous and form long-term bonds. Pairs typically stay together year round, roosting close to one-another at night. Nest sites are often re-used, consisting of sticks and mud woven into a bulky basket. The male feeds the female on the nest and helps her brood the young.

Ravens are very acrobatic fliers. It is common to see individual ravens performing feats of acrobatic exhibitions for an audience of other ravens. Ravens seem to take turns trying to out perform one another. They are known to fly upside down for extended periods.

Ravens are omnivorous. They eat just about anything including insects, grain, fruit, garbage and carrion. Increasing raven populations can have negative effects on the populations of some vulnerable prey species, such as desert tortoises and Least Terns. Raven populations have increased partly due to an increase in food source from un-secured human garbage.

### **Anna's Hummingbird *Calypte anna***

Hummingbirds are tiny, colorful birds that hover at flowers to sip nectar with needle-like bills. Often identified by twittery calls or chattering "chase notes" given when driving intruders away. Their wings also make distinctive whistles. Males have iridescent throat feathers, called a gorget. A hummingbird's wings beat more than 20 times per second.

Anna's Hummingbirds are most frequently here in spring and summer, but resident here in winter. They feed on nectar of all types. Extremely high metabolism requires frequent feeding, making 14-18 foraging trips per hour, each taking less than one minute. For the rest of the hour the bird usually sits quietly. Nectar takes about one hour to be digested and excreted, removing 97% of the sugar contained in the nectar. Will also eat spiders and small insects to supply fat to their diet.

### **Allen's Hummingbird *Selasphorus sasin***

Also seen in spring and summer in the same areas as the Anna's. Similar foraging characteristics as the Anna's. Allen's will migrate to Baja for the winter and frequently take a small passenger with them as a hitchhiker. Allen's feeding includes Indian Paintbrush wherein lives a small mite. At the start of migration, when feeding, this mite will jump onto the bill of the hummingbird, travel up to its nostril, and remain there until the bird reaches its wintering grounds. The mite will hop off into another flower in Baja and hopefully will return with a hummingbird to its summer grounds.

## **Brown Creeper** *Certhia americana*

Creepers are one of the smaller birds frequenting redwood groves. They are commonly seen spiraling up tree trunks in search of food. They typically do not move down or sideways as nuthatches are likely to do. Sometimes they take short hops backwards to investigate promising areas for food. Creepers work their way to the top of a tree then flutter down to the base and start over again. They are normally solitary.

Habitat: Coniferous and mixed coniferous-deciduous forests.

Food: Small insects, invertebrates and seeds.

## **Woodpeckers**

There are about 200 species of woodpeckers worldwide except in the polar regions. Woodpeckers are known for searching just about anywhere for insects, typically found on trees or wood products. They are known for drilling into the sides of wooden houses resulting in numerous holes in siding.

Woodpeckers are well suited for collecting insects from holes, tree bark, acorns and just about any other small space that might contain food. They have long, hard pointed bills for drilling into wood; their nostrils are covered with short bristle like feathers that presumably protect the nostrils from wood particles.

Woodpeckers have specialized tongues that wrap around the back of their skull to the top of their skull providing extra length to probe the nooks and crannies of tree bark. The tip of the tongue can be hard and pointed for spearing insects, sometimes having barbs similar to a fishhook for larger insects or sticky parts coated with saliva for catching smaller prey. Woodpeckers seem to depend on hearing to locate prey, listening for insects gnawing or moving within the bark.

## **Acorn Woodpecker** *Melanerpes formicivorus*

The Acorn Woodpecker is found in California Woodlands. They bore acorn-sized holes into tree trunks, fence posts, and even wooden buildings. They then fit nuts into these holes for later use. They are quite social, living in small colonies whose members share nesting as well as food-gathering.

Acorn Woodpeckers have a black, white, and red head. In flight, they display patches of white on wings and rump. They have a raspy “laughing” call that sounds like, “whack-up,” “whack-up,” or “ja-cob.”

Habitat: oak woods, groves, mixed forest, oak-pine canyons, foothills.

Food: insects, acorns, and other nuts, berries

## **Downy Woodpecker** *Picoides pubescens*

Named from the soft, downy appearance of its plumage, the Downy Woodpecker is the smallest woodpecker in the U.S. and Canada. It's 6-7 in. long and its wingspread is 11-12 in. The coloring is black and white, with a plain white back. It and the hairy woodpecker are the only ones in the U.S. with a plain white back without bars.

Its call reminds one of the whinnying of a small horse. Both sexes drum, a long, unbroken roll, which is territorial and also to bring males and females together in courtship. On trees or poles, it moves in quick, jerky hops, or descends a little way in downward hitches on trunk, and may flit to outer twigs in search for food. Entrance to nests is a round hole 1¼ inches. Nests are usually 5-50 ft above ground.

Habitat: southern Alaska, across Canada, and in most of the U.S. to Florida

Food: mostly insects, some berries and nuts

### **Hairy Woodpecker** *Picoides villosus*

The Hairy Woodpecker has a hairy, shaggy, rough appearance to its plumage. It's 8-10 inches long and its wingspan is 15-17 inches. Broad white stripe down its back similar to the Downy Woodpecker, but larger in size, also shyer but more active. It taps on wood more loudly and more often than the Downy Woodpecker.

The Hairy Woodpecker is an expert climber on trunks of trees and underside of branches. It often strikes its bill into wood and then holds it there to detect the vibrations and locations of insects. The male is the one who selects the nesting site and does most of the digging for it.

Habitat: Resides in all types of forests throughout Canada and the U.S.

Food: Mostly insects, also some berries and nuts

### **Pileated Woodpecker** *Dryocopus pileatus*

Large, black, and crow sized, the Pileated Woodpecker can be distinguished in flight by white patches on front half of wings. Both sexes have a red crest. Both sexes drum, and interesting fact is that it drums when it is about to go to roost. Pileated Woodpeckers are vigorous defenders of their young and have been known to attack snakes that enter their nests, and to even carry their eggs to a new location if needed.

Habitat: Forests from western Canada and northwestern U.S., through eastern U.S. to eastern Texas and Florida

Food: Mostly insects, some berries and nuts

### **Northern Flicker** *Colaptes auratus*

Called red-shafted from the brilliant salmon-red color on the underside of its wings and tail. It also has numerous black spots on its sides and lower breast. It is known as a flicker because it flicks, or strikes with a quick jerk of its bill, also to flicker: to flutter or flap wings without flying. This bird is an interesting flyer and was timed at a flight speed of 43-44 miles per hour. Another good identifier of this bird is that it will beat its wings a few times, then glide. Red-shafted Flickers sometimes interbreed with yellow-shafted flickers where their ranges meet.

Habitat: Alaska, south through western Canada and western U.S. and Baja California

Food: Feeds much on the ground. Ants consist of about half of its intake of insects. Also berries and nuts.

### **Winter Wren** *Troglodytes troglodytes*

Possibly given its name because some of the few hardy ones winter in northern U.S. and in southern Canada. Most, however, migrate southward in the fall like other wrens. It is smaller and darker than a house wren. It has a habit of almost continually bobbing its head, spends most of its time out of sight, or about in dense brush or among fallen trees. It's very common on the forest floor of Armstrong Grove, foraging like a mouse. Look for its cocked tail.

The Winter Wren has a call that is a sharp repeated *tick*, and a sharp *chirr*. The male sings a mostly loud, yet sometimes whispered, rich song, with rising and falling high-pitched notes. Its song can last 7 seconds, and contain up to 108-113 notes.

Habitat: Nests from southern Alaska, through Canada and the northern U.S. It is also widespread in Eurasia, where there are no other wrens, and is simply known as the wren.

Food: Eats almost entirely insects. Also reported to eat berries from the red cedar.

# Mammals

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## Land Mammals

Mammals share certain characteristics:

1. Mammals have a backbone
2. Mammals bear live young which nurse from the mother's mammary glands
3. Mammals are covered with fur or hair.
4. Mammals have adapted to their living conditions which is evident in their means of locomotion. Mammals that live on the ground are ambulatory (walking) or cursorial (running). They may walk with their heel on the surface (humans or bears) or they may run on their toes (rabbits, bobcats, and coyotes). If they live in the trees (arboreal) they usually have long toes ending in sharp claws, as in squirrels. Bats are the only mammals that are truly able to fly. Burrowing mammals (fossorial) have modified forefeet for digging (broad-footed mole).
5. Except for the whales, mammals' digits (fingers or toes) end in claws, nails or hoofs.
6. Teeth indicate the diet of mammals. Except for baleen whales and anteaters, all mammals have teeth.

Like most wild animals, mammals avoid human contact. Come in the early morning or visit at dusk and you will have the best chance of seeing some of these elusive creatures. Many of them are nocturnal or are starting to feed and move around just before sunrise and sunset. Your chances are enhanced by being alert, moving slowly, wearing clothing which blends with the surroundings, and being still.

Although it's difficult to see mammals, it's easy to see the signs of their presence: tracks, scat, fur caught on twigs, burrows, bones, paths, grazed areas, beds, and dens. Look for these clues when walking, and encourage visitors to do so as well. Mammal tracks, for example, are often found near burrows, in mud, in the dust along trails, or under sheltering boulders or logs.

### **Shrew-mole** *Neurotrichus gibbsii*

The little shrew-mole, smallest of North American moles, spends much of its time above ground in a network of trails and tunnels beneath the leaves and tangled vegetation. It's found along the moist ground litter at forest edges, around wet meadows, and along streams.

Feeding on earthworms, sow bugs, and insects, the shrew-mole is active day and night and eats up to 1.5 times its body weight daily. It has several litters a year with 1-4 young per litter.

### **Broad-footed Mole** *Scapanus latimanus*

The broad-footed mole is one of the strangest looking mammals. Its eyes and ears are hidden by fur, and the palms of its front feet face outward and cannot be placed flat on the ground. The velvety fur doesn't allow dirt to cling, and the mole has little need for good eyesight, as its life is spent underground, finding food by smell.

With its powerful front feet, the broad-footed mole "breaststrokes" through porous soil (meadows, pastures, stream banks) at about a foot per minute. Because its fur will lie in either direction, the mole can run unhindered backward as well as forward in its narrow tunnels.

Moles and other earth diggers prevent the earth's topsoil from becoming too compacted.

### **Dusky-footed Wood Rat** *Neotoma fuscipes*

Found throughout the area. One house may have successive owners, each adding new sticks until the pile may be more than six feet high. These old houses are quite complex inside, containing many hallways and several abandoned nests in addition to those occupied at the moment. The nest, usually a cup-shaped mass of shredded bark, is the wood rat's sleeping quarters. Many wood rat houses have mice living in the abandoned hallways. Other animals utilizing the chinks and crevices of the nest may include lizards, salamanders, slugs, snails, and insects.

Wood rats are also called pack rats because of their inclination to collect all sorts of apparently useless objects, which they carry away to their houses.

### **Long-tailed Weasel** *Mustela frenata*

Long-tailed weasels are fierce little predators of small mammals and occasional birds. Slender bodies and short legs permit weasels to enter burrow systems and narrow crevices where rodents take refuge. The weasel grapples with its victim and kills it with a bite at the back of the skull. In this manner, fairly large prey animals, such as rabbits, squirrels, and rats, can be subdued by a small but active and determined weasel.

With its high metabolism, the weasel eats 40% of its body weight everyday. The weasel is commonly observed hunting in the daytime and is known to also be

active at night. When attacked, it discharges a foul musk.

As with many mustelids, the weasel's fertilized egg can undergo delayed implantation after copulation. This means there is a period in which the embryos do not develop. Long-tailed weasels, after a summer mating and delayed implantation of the embryos during the winter, bear a single, annual litter in spring. This is advantageous for the young because there is more food available and conditions are more optimal.

### **California Ground Squirrel** *Spermophilus beecheyi*

Heading the list of agricultural pests in California is the California (Beechey) ground squirrel. Not only do these squirrels do damage to grain fields, they're particularly troublesome in the Sacramento Valley where they eat the green almond nuts.

The plump, grayish squirrel is a familiar sight, perched on a fence post or standing erect beside its burrow. The ground squirrel's diet consists largely of seeds, nuts, and fruits. Food is transported to its burrow in its inside cheek pockets.

### **Western Gray Squirrel** *Sciurus griseus*

The arboreal Western gray squirrel is most active in morning and evening. They can often be seen on the ground collecting and storing acorns in shallow holes in the forest floor. They later find these caches by scent. Since not every acorn is recovered, the squirrels help in reforestation. They also strip the seeds out of Douglas-fir cones, and dig for truffle-like fungi.

Gray squirrels make their homes in redwood forests and oak woodlands, where their bulky nests, somewhat resembling arboreal nests of wood rats, are often seen in the treetops.

### **Bat** *Vespertilionid* Bat Family

There are at least 14 species of bats known to occur in the vicinity. Bats are the nocturnal counterparts of the day-flying swifts and swallows. As they swoop about, they are capturing flying insects such as moths, mosquitoes, and beetles

Bats are the only true flying mammals. The bat's "hand" has developed into a leathery wing, with the finger bones extended into long, thin supports for the wing membrane. Although they can see, bats usually fly in almost total darkness, relying on an echolocation system similar to sonar.

As it flies, the bat gives high-pitched "squeaks" which are usually keyed too high to be heard by our ears. These squeaks echo from objects in the bat's line of flight, and the returning sound warns it of obstacles. Echolocation is also used by bats to hunt insects. Bats eat around 3000 insects per night including mosquitoes.

During the day bats roost upside-down in caves, hollow trees, building attics, and other dark niches. Except for man, bats have few enemies. Owls and snakes eat a few, and large trout catch some as bats drink from lakes or pools while

skimming over the water. Bats may live 20 years or more. They can carry rabies virus.

Bats are among the world's most fascinating animals. Your grocery stores would not be the same without bats. Fruit eating bats are nature's most important seed-dispersing mammals. Nectar-eating bats, along with some fruit bats that visit flowers, pollinate thousands of bat-dependent tropical and subtropical trees and shrubs.

The nearly endless list of valuable fruits, nuts and spices from bat-dependent plants includes peaches, bananas, mangos, guavas, avocados, dates, figs, cashews, carob and cloves. Other commodities include plant fibers for surgical bandages, life preservers and rope, lumber for furniture and crafts and even tequila.

In the southwestern U.S. 100,000 tons of bat guano was mined from a single cave. Guano continues to be a major source of fertilizer in developing countries, where it is used to fertilize a number of crops, including nearly a third of the world supply of black and white peppers.

Millions of bats have been killed by people who explore caves. Although some people intentionally kill bats, many others are unaware of the damage they do. Each human entry into a winter hibernating cave causes bats to arouse and waste 10 to 30 days of stored fat reserve. Hibernating bats must conserve their limited fat supplies until spring or face starvation. In summer, flightless young may be dropped or abandoned when humans disturb their nursery roosts.

The relatively few caves that shelter bats seldom are used year-round. Warm summer nursery caves should not be explored from April through September. Colder hibernation caves should be avoided from late August through mid-May. Many important caves have signs explaining when they can be visited without harm to bats.

In the early 1960's, an estimated 150 million Free-tailed bats fed over farms of the southwestern U.S. and Mexico. They caught approximately a quarter million metric tons of insects annually. Since then, populations of these bats have declined drastically, some by as much as 99%. Most apparently died from eating insects contaminated by overuse of agricultural pesticides. Voracious appetites and slow reproduction (usually only one young per year) make bats everywhere extremely vulnerable.

### **Brush Rabbit *Sylvilagus bachmani***

The Brush Rabbit has unicolored ears and a small white tail. It lives in chaparral and thick brush of coast and foothill areas. The Brush Rabbit stays close to thickets and stays clear of forested areas with less dense understory. Oftentimes there is a maze of cleared runways connecting close-cropped feeding areas. Its range is  $\frac{1}{4}$  to one acre, one to three rabbits per acre. It is least active in the midday, but feeds on vegetation all day. The Brush Rabbit has the same enemies as other rabbits. It has two to six per litter, and can have three to four litters per year.

## **Black-tailed Jackrabbit** *Lepus californicus*

The black-tailed hare is more commonly known as the jack rabbit. With its long ears, long legs, and loping gait, this hare is easily recognized. It is one of the fastest animals in North America, and its great speed is its best protection. In addition to speed, the jack rabbit utilizes other tactics, such as jumping straight up in the air or quickly changing directions, to escape pursuers. It prefers open grassy areas and less-dense chaparral, but will venture into the forest.

Unlike the blind and helpless baby rabbits, baby jack rabbits are able to hop when they are only a few hours old. Jackrabbits multiply rapidly and can become serious pests unless their population is kept in check. Their natural enemies are coyotes, bobcats, and large birds of prey.

Like certain other mammals, jackrabbits are *coprophagous*. Two kinds of pellets are formed in the digestive tract: the hard, normal waste products of digestion are formed in the intestine; the soft pellets are formed in the cecum and are taken directly from the anus and eaten again during the daytime while the animal is resting. The benefit of this practice may be vitamin nutrition. Don't kiss a jackrabbit!

## **Raccoon** *Procyon lotor*

With its black mask across its eyes and ringed tail, the nocturnal raccoon may be familiar to you as your late night garbage can marauder. These omnivores will eat just about anything, including fruit, eggs, fish, small mammals, and insects. They live with equal facility along wild rivers or in densely settled residential areas. Dens for the young are situated in tree hollows, rock dens, or caves.

Raccoons are very curious animals. They like to handle everything, especially food, with their sensitive hands. They are also fond of water, and although they may wander far from it while hunting, most of their life is spent near streams, lakes, or marshes. Adult raccoons frequently wash their food before eating it.

When walking, these animals look ungainly and clumsy. Like a bear, a raccoon walks with its heel on the ground. Their agility, however, is demonstrated in climbing as they use their sharp claws.

## **Striped Skunk** *Mephitis mephitis*

## **Spotted Skunk** *Spilogale gracilis*

Two types of skunks have been observed here, the Western spotted skunk and the striped skunk. The spotted skunk (about the size of a half-grown kitten) is smaller than the striped skunk, has a broken pattern of stripes that makes the animal look spotted, and is more nocturnal.

An even more distinguishable characteristic, however, between the two skunks is the manner in which the animals defend themselves. The striped skunk will give a warning signal by raising its tail and stamping its feet. The spotted skunk not only raises its tail, it does a sort of war dance with its whole back end in the air!

If foolish intruders ignore either of these warnings, they are likely to be sprayed

with a nauseating oil. This offensive-smelling secretion is stored in two large glands opening near the base of the skunk's tail. The oil can be accurately squirted for a distance of ten feet and up to thirty or more feet. One should also be wary of skunks because they are the primary carriers of rabies.

Skunks are most frequently seen in late afternoon or evening as they start on their night's foraging. Since 50% of their diet consists of insects, they are doing a service as they unconcernedly grub and dig for their favorite prey.

Besides man, few animals other than large owls prey on skunks. With their biological artillery available, skunks have developed a sense of invincibility that is rare in wild animals. They go about their business without sign of fear and seem to defy the world around them.

### **Common Gray Fox** *Urocyon cinereoargenteus*

A member of the dog family, the gray fox resembles a small shepherd dog. It is the most abundant and widespread fox in North America. Gray foxes are afflicted with many diseases and parasitic worms, which also affect dogs. Its chief enemies are eagles, dogs, and people. Although of fairly large size, gray foxes are timid creatures and readily retire even when smaller animals threaten them. Large raccoons have been seen to drive gray foxes from their food.

Small mammals, birds, and carrion are primary items of diet but fruits of many plants are taken when available. The number of harmful rodents destroyed by gray foxes every year make them an important and beneficial part of this region's wildlife.

Home ranges are several square kilometers in size. There is no direct evidence of territorial defense but gray foxes generally avoid each other and mark their home ranges with urine and feces, as do most other carnivores.

### **Coyote** *Canis latrans*

The wily coyote... source of myth and legend, the coyote is an integral part of American culture. Despite being one of the most persecuted carnivores in North America, it has proven so flexible in its habits, so adroit in escaping the trap and gun, and so prolific, that it persists in good numbers even today. It is one of the few animals in America whose range has actually expanded from its original distribution. It prefers open country, but signs of it have been seen on forested slopes.

Coyotes are heard more often than seen. The setting sun or the first daylight may be greeted by a chorus of yapping howls; often the entire choral effect comes from a single animal.

Generally coyotes make their dens in natural crevices and caves but they sometimes enlarge a burrow dug by a ground squirrel or a badger. Coyotes mate in February or March and may pair for several consecutive breeding seasons, although they do not usually associate outside of the reproductive season. After a 7-week gestation, the pups are born, averaging 5 per litter. They are cared for by both parents. The young disperse in the autumn, and those that survive the

heavy toll of poison, traps, predation, and starvation, reach sexual maturity at one year of age if food is plentiful.

### **Opossum** *Didelphis virginiana*

The opossum, a marsupial (pouched mammal), is not native to California but was introduced from the eastern United States around 1900. Since then they have become well established over most of the state. They eat almost anything and can hunt food equally well on the ground or in trees.

When discovered, opossums usually feign ferocity with gaping jaws and threatening hisses but often they merely topple over on their sides. With eyes half closed, tongues lolling out, and jaws drooling, they seem to be dead. If undisturbed, most opossums soon revive and go about their business.

“Playing possum” may be a method of defense or possibly a state of fainting. Probably the opossum’s chief protection is its habit of freezing if danger is near, then retreating so slowly and silently that it remains unnoticed. Unfortunately, this tactic does not work as well with automobiles, and opossums are often seen as road kills.

Adults are solitary, denning in ground holes or hollow trees. The young are born only 13 days after mating, when they are one cm. long. The newborn opossums crawl into the marsupium (pouch) where each takes a nipple in its mouth and remains so attached for two months. Although there are thirteen nipples, usually seven or fewer young survive to weaning at three months of age.

The mother abandons her offspring at weaning and may mate a second time that year. Many of the newly independent young starve or fall to predators but a good proportion grow to maturity and breed when less than one year old.

The opossum holds two distinctions: it is the only North American marsupial, and it has the most teeth (50) of any land mammal in the U.S.

### **Mountain Lion** *Felis concolor*

The fearsome mountain lion, ranging from six to eight feet in length, is California’s native big cat. Other names for it include puma, panther, cougar, and catamount. Shy and rarely observed, the mountain lion may be found wherever there are deer. They are not necessarily dangerous to the deer population as a whole, for the deer they kill are frequently diseased or crippled. In addition to deer, the mountain lion preys on smaller animals such as skunks, porcupines, rabbits and large rodents.

Individual mountain lions each have their own ranges. The home areas of males are larger than those of females and overlap very little. Female home areas overlap substantially with those of other females and with home areas of males. Fighting over range jurisdiction is minimized by mutual avoidance but males do fight occasionally.

Breeding occurs mostly in winter. The cubs, 2-3 per litter, most frequently arrive in April, although they may be born in any month. The den is generally in a cave

or crevice of a big rockslide at the base of a rocky cliff and is often quite accessible.

There are a few authentic cases of mountain lions attacking humans. Two incidents of attacks on small children, however, sparked much publicity. With an increasing mountain lion population in the state, there is pressure to resume a hunting season on the animal.

Normally, mountain lions are very elusive, and people rarely get a glimpse of them. They **very rarely** attack humans. To reduce an attack if you do encounter a mountain lion: give them a way to escape and do not approach them, stay calm and face the lion. **Do not run** as this may trigger their instincts to attack. Pick up small children, as they may panic and run. Try to appear large by raising your arms and opening your jacket. If the mountain lion does approach or acts aggressive, shout and throw branches, or what you can **without turning your back or bending over** (this is because they tend to bite the head or neck when attacking prey).

### **Bobcat** *Lynx rufus*

The large catlike animal lying in a clearing or sunning itself on a rock on chaparral-covered slopes is probably a bobcat, or wildcat, especially if it has long legs, a short tail, and sharp-pointed ears. They are seldom seen, however, because their mottled coats blend so well with their surroundings. Although usually more active at night, bobcats can hunt by day or night, for the vertical pupils of their eyes close to narrow slits in glaring sunlight or open wide to take full advantage of even dim starlight. Bobcats have a reputation for being killers of game birds and poultry. However, investigations have shown that most of their prey consists of rodents and rabbits, making them beneficial pest eradicators.

The bobcat prefers rocks, brushy country for hunting and raising its young. But signs are often found in forested areas. The den may be a protected cavity or cave among rocks. The young (average 3 per litter) are born any time in the spring and summer months but probably in April.

### **Black-tailed Deer** *Odocoileus hemionus*

The black-tailed deer are the smallest deer in California. They are distinguished from other deer by their broad black tail and restricted white markings. They are so distinct that until recently they were classed as a separate species. Now that it's been proven they hybridize freely with other populations, they are recognized as a sub-species of mule deer.

The mating season, or "rut," occurs in October. Bucks are in their prime and are ready to battle over mates. Rivals lunge and spar but usually the fights are brief, with one of the bucks retreating to seek another doe. Fawns appear 7 months later, in May, when the spring foliage is at peak growth. The fawns are difficult to see due to the camouflage effect of their spotted coat.

By fall the fawns usually lose their spots. A young buck begins to grow antlers the first winter but his first pair is usually single spikes. The antlers are shed each

year in late winter, and new antlers start to grow in the spring. By early summer the new antlers are well grown but covered with short hair, or “velvet.” As they mature and harden, the velvet dies and is scraped off against shrubs or saplings. Each successive pair of antlers is larger, until the animal is approximately five or six years old. The number of points on the antlers does not indicate the age of the buck, although up to a certain age older bucks usually have more points.

Black-tailed deer prefer open woodland where they can find acorns, grasses, clover, berries, and truffle-like fungi. They are frequently seen on the higher parts of the East Ridge Trail.

## References

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