



# ARBORETUM

## *Nature Trail*

COLUMBIA COLLEGE

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please return it to the box  
when you have completed your walk**

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# Arboretum Nature Trail

## **Do you know the mode of origin of this large depression in the landscape?**

What native shrub of the Mother Lode has a common name which in Spanish means "little apple?" What hardwood tree in this area provides sustenance for bees and has a poisonous fruit? Do you know the native shrub in this locale that produces an edible fruit containing 60 times more vitamin C than a lemon? What are witch's brooms doing in the Sierra foothills? Why are the soils in this area red in color? Answers to these and other intriguing questions are provided along the one-quarter mile loop nature trail circling a portion of the large depression located below you.

## **When Columbia College was initially developed in 1968,**

a decision was made by the Science and Natural Resources staff to preserve this large depression in an undisturbed state as an outdoor laboratory for environmental studies and as a sanctuary for native flora and fauna. This depression, or Arboretum, as it is now called, encompasses 20 acres of the north campus boundary and includes a diverse cross-section of flora common to the foothill woodland and mixed-coniferous forest plant communities of the Sierra Nevada. A major portion of the Arboretum was donated to the college through the generosity of the Segerstrom family in 1980, thus assuring its preservation. An interesting mixture of native flora, geology, and Mother Lode history awaits the trail hiker, and a labyrinth of towering limestone formations and passageways attract the energetic off-trail hiker.



**NEVER  
HIKE  
OFF-TRAIL  
ALONE!**

## **The loop nature trail was constructed by volunteer student help in 1969**

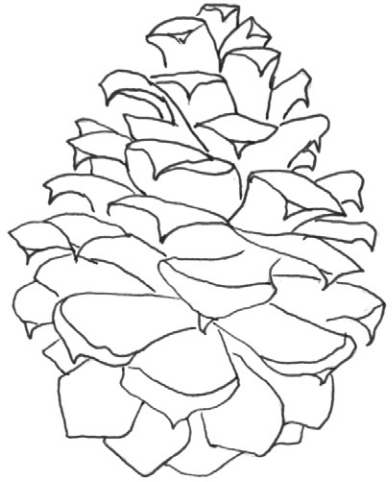
**and 1970,** and through financial contributions from Tuolumne County and Modesto Garden Clubs for purchase of materials and tools. An important intent of the nature trail is to provide foot travel access to and from the Arboretum at one point only, in order to minimize plant disturbance and soil erosion around the fragile basin edge.

## **The one-quarter mile loop trail begins from the Toyon building**

and provides you with the opportunity to become familiar with the natural history of this portion of the Mother Lode. Points of botanical, geological, and historical interest along the nature trail are numbered 1-20 and are described for your information.

1. **The most common conifer on the Columbia campus is the ponderosa or yellow pine *Pinus ponderosa*.**

This stately tree is found in every state west of the Great Plains and parts of Canada and Mexico, from near sea level to 10,000 feet elevation in Arizona. Commercially, it is second only to Douglas-fir in the United States in terms of total annual production of lumber by species. The tree can be recognized by its dark green needles in clusters of three which are approximately seven inches long. The cones are approximately four inches long and have sharp prickles turning outward from the end of each scale. It might help you to remember this tree by "prickly ponderosa" as you handle the cone. This large specimen is approximately 100 years old.



**Ponderosa Pine**

2. **All of these rocks are tailings from mining that took place in the Arboretum during the last 100 years.**

Overlying soil and rock layers were removed by pick and shovel and then sluiced by flume-borne water to obtain placer gold deposits. You will note the presence of large chunks of white quartz in this pile of tailings.

**A young black willow *Salix goodingii* has established itself in a low spot**

in the tailings where water accumulates by gravity flow and allows this water-demanding shrub to survive. Willow bark contains a compound (salicylic acid) that is the main chemical ingredient of aspirin, and was often steeped by Indians and consumed as a tea to relieve pain and fever.



**Black Willow**

3. The saying “Leaves of three, let it be” warns the hiker of the presence of poison oak *Toxicodendron diversilobum*.

Poison oak is the most widely distributed shrub in California. In fall its brilliant red foliage colors the trailside and walls of the Arboretum. The plant’s juice produces an irritating rash, sometimes severe, on the skin of many persons. Contact with the berries, pollen, leaves, clothing touched

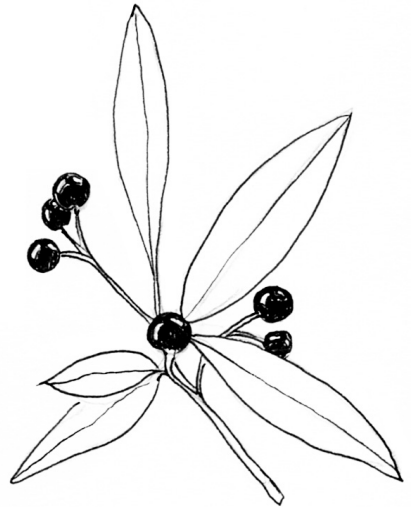


**Poison Oak**

by the foliage, or smoke from burning plants serves to carry the oily substance. The shrub produces tiny, white berries that persist into winter after the leaves have fallen. “Berries white, poisonous site” serves as a fall and winter warning.

4. **Sierra coffeeberry *Rhamnus rubra* produces globular black berries containing two seeds in the late summer.**

The plant acquired its name by the resemblance of the seeds to coffee beans. The fruit is extremely bitter and possesses too puckery a taste for human consumption. The bitter bark has laxative qualities when chewed.



**Sierra Coffeeberry**

**At this point,  
the trail forks  
and you should  
keep to your left  
in order to continue  
using this booklet  
while you walk.**



5. **A young bull or gray pine *Pinus sabiniana* is located in front of you, its long gray-green needles (7-12") in clumps of three.** With age, the bull pine transforms into a multiple-stemmed, scraggly conifer thirsting skyward in defiance of gravity. Because of its grotesque appearance, the 49ers often referred to it as a "clown of a tree," or "the tree that casts no shade," in reference to its sparse needles. However, the tree provided a main food staple for Indian tribes throughout the Sierra foothills, and the large, sweet seeds were regarded nearly as important as the acorns of the oaks.



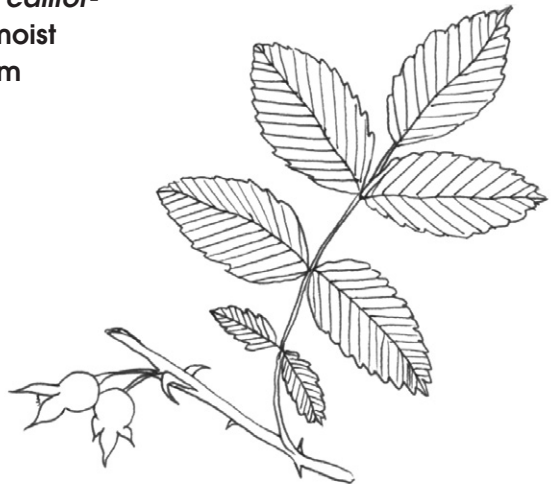
**Gray Pine**

**A large mariposa manzanita *Arctostaphylos viscada* is located in the tailings behind you with strong, crooked branches and smooth, red bark.**

Manzanita in Spanish means "little apple" and the immature fruit resembles a tiny apple. The dried berries are edible and can be used to make cider, and the blossoms can be used to make jams, jellies, and teas. Notice how the individual leaves are oriented vertically on the stem instead of horizontally in order to reduce leaf surface temperature during the heat of summer and thereby conserve the water needs of this shrub.

6. **California wild rose *Rosa californica* are common in the moist regions of the Arboretum and produce attractive pink blossoms in spring.**

Note the sharp, recurved thorns on the stem! The hard fruits, or rose hips, are orange-red and can be used to make jam, jelly, syrup and tea. Rose hips contain 60 times more vitamin C than lemons on a unit weight



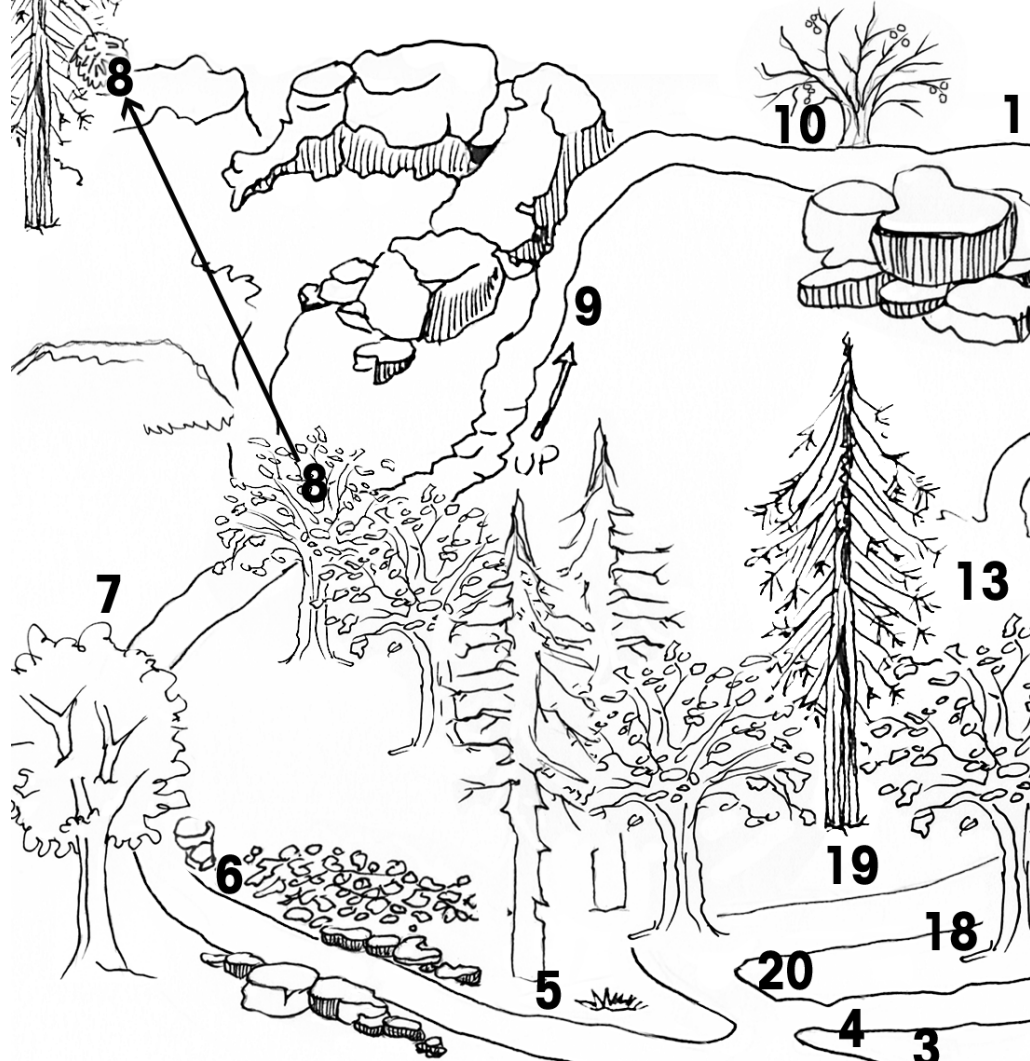
**California Wild Rose**

basis. Beneath this wild rose is a small redberry shrub *Rhamnus crocea* which produces bright red berries in late summer eagerly sought by numerous birds. The nutritious berries may be eaten raw and are excellent cooked with meat. However, it is reported they will turn the skin red temporarily if eaten in quantity. The variety of this plant common to the Sierra foothills is called hollyleaf redberry because of the shiny holly-shaped leaves.

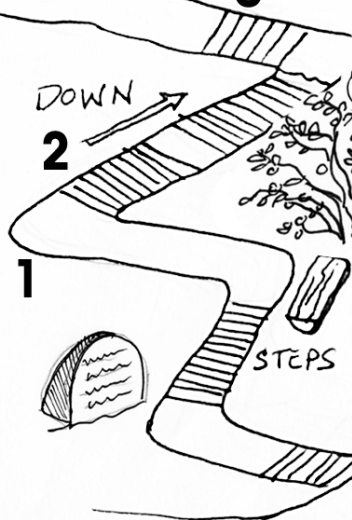
- 7. An exposed and weathered limestone-marble outcrop projects upward** as a remnant of the Jurassic geologic period of 200 million years ago when the Sierra were uplifted and marine sea beds were upwarped and metamorphosed to create the foothill limestone and marble beds in the Columbia area. The more metamorphosed limestones formed marble, and two abandoned low grade quarries are located near Columbia. Notice how the limestone has been stained a rust color by the presence of weathered iron oxide compounds in the clay soil.

**Notice to your left how poison oak *Toxicodendron diversilobum* has become a vine on the ponderosa pine and is using the tree to climb upward for light.** Such a plant, which uses another for physical support, is called an epiphyte. Many westerners mistakenly call poison oak "poison ivy" because of its climbing capability.

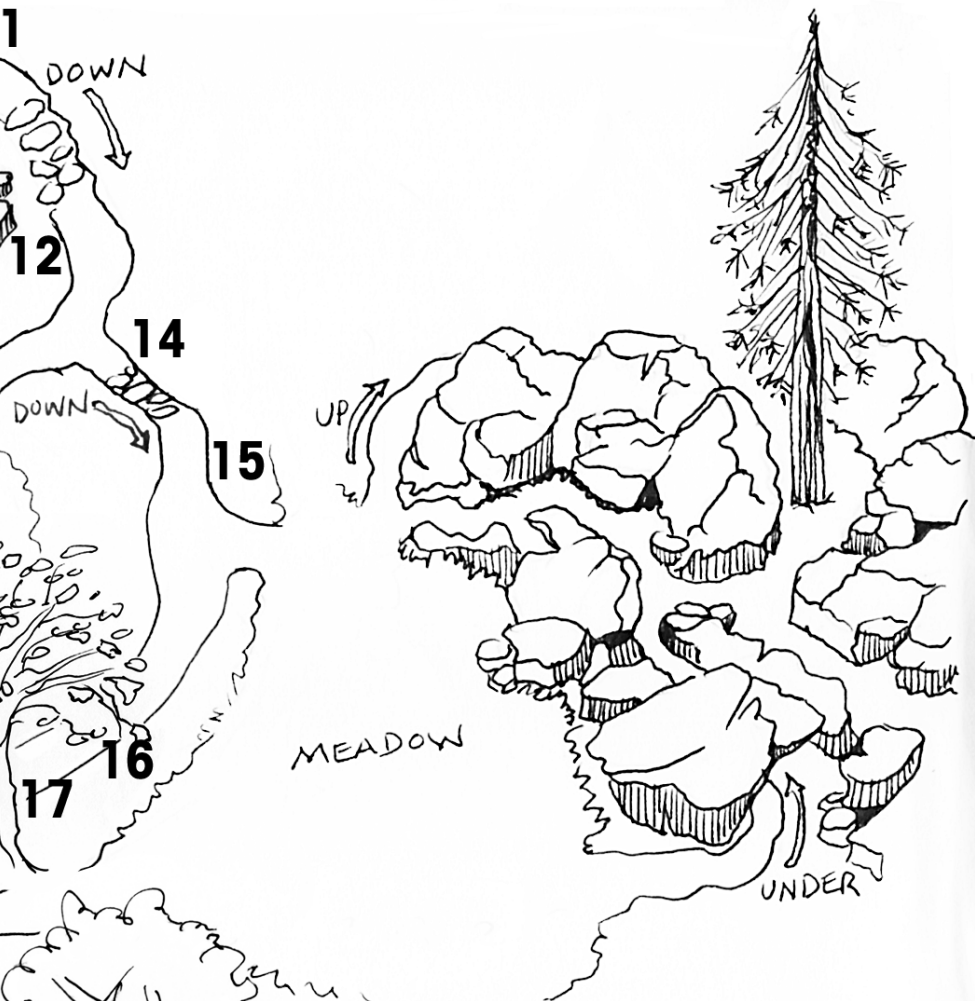
- 8. The large ponderosa pine *Pinus ponderosa* located to the left of the limestone-marble outcrop in the distance** has significant clumps of needles on the lower right side. These needle clumps are called "witch's brooms" and result from dwarf mistletoe *Arceuthobium campylopodum* infections that appear to elicit the profusion of needle growth as a tree's response to hold the mechanical ejection of mistletoe seeds in check.



1. Ponderosa pine *Pinus ponderosa*
2. mine tailings and willow *Salix* sp.
3. poison oak *Toxicodendron diversilobum*
4. Sierra coffeeberry *Rhamnus californica* and Himalayan blackberry *Rubus armeniacus*
5. bull pine *Pinus sabiniana* and mariposa manzanita *Arctostaphylos viscada*
6. California wild rose *Rosa californica* and redberry *Rhamnus illicifolia*
7. limestone-marble outcrop and poison oak *Toxicodendron diversilobum*
8. witch's broom and dwarf mistletoe *Arceuthobium campylopodum*
9. toyon *Heteromeles arbutifolia*



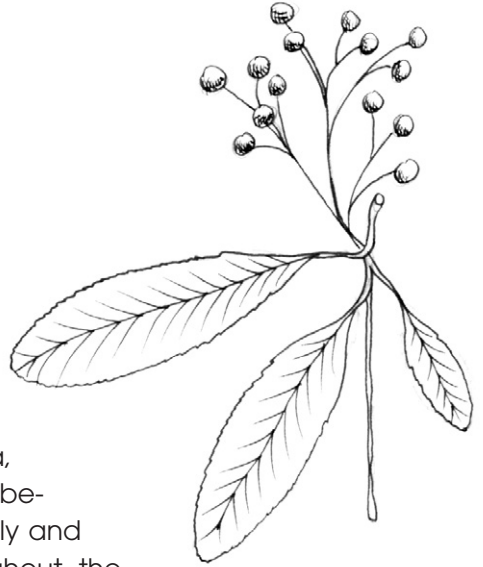




10. California buckeye *Aesculus californica*
11. Weathering process of limestone-marble formations
12. mountain mahogany *Cercocarpus betuloides*
13. Hilltop overlook of Arboretum
14. buck brush *Ceanothus cuneatus*
15. Mining flum walls, access to limestone-marble formations
16. Arboretum mining history
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18. interior live oak *Quercus wislizenii*
19. California black oak *Quercus kelloggii*
20. Arboretum soils and lichen in trees

\* Areas 6 and 7 had fuel reductions done in late 2013.

9. From November to January, the clusters of bright red “Christmas berries” contrast with the dark green foliage to make toyon *Heteromeles arbutifolia* a most handsome shrub. The berries serve as an important food for robins, cedar wax-wings, and other birds during winter. These berries are bitter if eaten raw, but do provide a tasty cider in much the same way as the manzanita berries. Hollywood, California, was named after the toyon because of its resemblance to holly and its common distribution throughout the Los Angeles basin.



**Toyon**

10. Below the trail is California buckeye, or horse chestnut *Aesculus californica*. This hardwood tree puts forth a showy display of white flower clusters to attract bees in April or May, then sheds its leaves in mid-summer to leave the pear-like seed pods hanging from the tips of bare branches. The early shed of leaves is the manner this succulent hardwood uses to adapt to the summer drought of the Mother Lode. It simply completes its reproductive cycle beginning in late winter and ending in spring when conditions are favorable and then goes dormant throughout the driest portion of summer. No other local deciduous tree has the same habit of “closing shop” during the heat of summer. The fruits of this tree are a deadly poison and were used by local Indian tribes to stupify fish for ease of catching.



**California Buckeye**

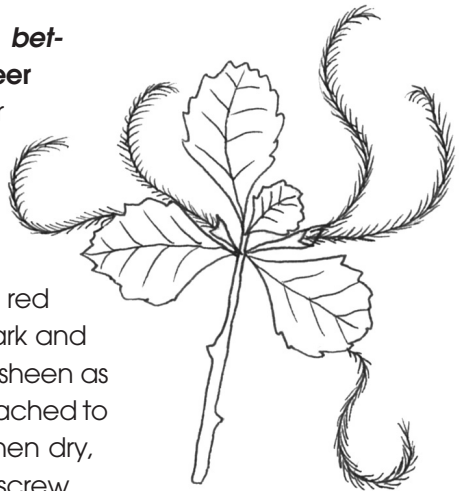
**11. You can now see the rugged inner reaches of the Arboretum with towering limestone-marble monoliths and narrow passageways.** Natural erosion of limestone-marble rock is responsible to a large degree for the present formation of the Arboretum. The process occurs by carbon dioxide (CO<sub>2</sub>) in the atmosphere dissolving in rainwater and groundwater to form a weak solution of carbonic acid (H<sub>2</sub>CO<sub>3</sub>) which disintegrates the limestone-marble and renders it soluble in water. These naturally occurring formations are slowly being dissolved and carried off by rainwater & snowmelt. Centuries ago this area was relatively level until percolating groundwaters eroded the underlying limestone and marble beds causing the area to collapse and form a large sinkhole. Landscape features formed by subterranean limestone erosion creates what geologists refer to as “Karst topography.”

To a significant degree the rate of erosion of limestone-marble has been accelerated by mining in the area during the last hundred years. The mode of origin of the Arboretum basin therefore consists of a combination of limestone-marble erosion followed by extensive gold mining in the basin since the 1870s.

If you look to your left, you can see the original soil level located thirty feet above you, and in the foreground the tops of the monoliths representing the original soil level before mining and Karst solutioning. It is easy to speculate on the thousands of cubic yards of soil removed from the area by miners in the late 1800s.

**12. Mountain mahogany *Cercocarpus betuloides* is the “ice cream” of all deer feed.**

That is, the Sierra mule deer *Odocoileus hemionus* prefer this shrub for food to any other in the Sierra foothills. Native Americans used the durable wood for fish spears, arrow shafts, and bows. A red dye was obtained from the inner bark and roots. In fall, the shrub casts a silvery sheen as the long, feathery plumes (awns) attached to each seed disperse the sunlight. When dry, these plumes are twisted like a corkscrew, and when moistened they untwist, and in doing so, literally bore the seed right into the tough mountain soil.



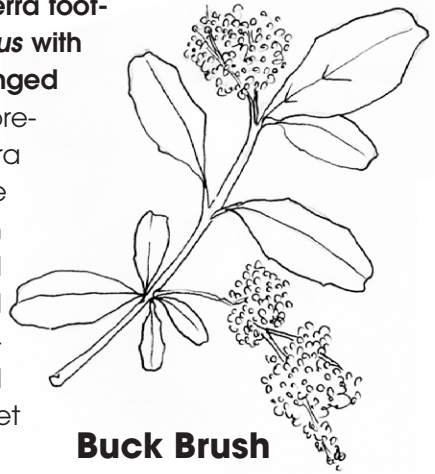
**Mountain Mahogany**

**13. Take the trail to your right to the hilltop for an impressive view of the Arboretum.** From this outlook you can observe more of the eroded, tilted masses of limestone-marble and clearly see that natural erosional processes and gold mining activity have lowered the floor of the Arboretum nearly 60 feet from its original level. Once again you are standing upon a large pile of mine tailings which at one time were located in the depression below you.

This vantage point often provides the opportunity to observe spring flocks of band-tail pigeons *Columba fasciata* roosting in the bull pines, and coveys of California valley quail *Lophortyx californica* foraging for berries and seeds in the thick brush. California gray squirrels *Sciurus griseus* are commonly observed in summer and fall collecting seeds from the cones of ponderosa and bull pine and acorns from the Arboretum oaks. An occasional red-tailed hawk *Buteo jamaicensis* may swoop into the Arboretum in search of an unwary rodent for a meal.

**14. A common chaparral shrub in the Sierra foothills is buck brush *Ceanothus cuneatus* with its stiff, wedge-shaped leaves arranged in opposite clusters.**

Buck brush is a preferred browse species of the Sierra mule deer *Odocoileus hemionus*. The fragrant white blossoms lather when crushed in water and can be used as a soap to make the skin soft and fragrant or as a shampoo. The capsule fruits shrink when dry and expel the seeds mechanically up to 40 feet during summer.



**Buck Brush**

**15. Note the old rock wall erected by miners during the 1870s to support the flumes or “races” that carried water into the Arboretum to sluice gold-bearing soil deposits overlying the limestone and marble.**

On March 2, 1983, water filled the Arboretum to the ground level of this post due to an extremely heavy precipitation year. Rugged and interesting access into the limestone and marble formations is provided from this area. Please do not trample the fragile moss-covered rocks and delicate ferns located in the shady recesses of the formations.

# THIS AREA IS DENSE WITH POISON OAK!

16. Notice the willow *Salix sp.* once again and the open meadowland which represents the lowest spot in the Arboretum. In the 1870s, when water was first transported into this area from flumes and ditches originating miles away on the Stanislaus River, a tunnel was dug in the lowest spot of the Arboretum to carry off the water that was used to sluice the mined deposits for gold. The tunnel ran south for approximately 1,000 feet and surfaced near the present location of the now-defunct sewage treatment pond below the Fine Arts (Willow) Building. Gold was extracted at both ends by sluicing and yielded up to \$2,000 per week in the late 1800s. All of the mined material to be sluiced was extracted by pick and shovel and carted by hand labor to the tunnel entrance. The larger rocks were sorted out at the entrance and piled up in various locations throughout the Arboretum as you have already observed.

The tunnel has since collapsed and sealed off any means of drainage from the Arboretum. In wet winters, this portion of the Arboretum accumulates water up to four feet in depth and maintains the semi-marshy meadow environment of rush *Juncus sp.* and willow *Salix sp.*

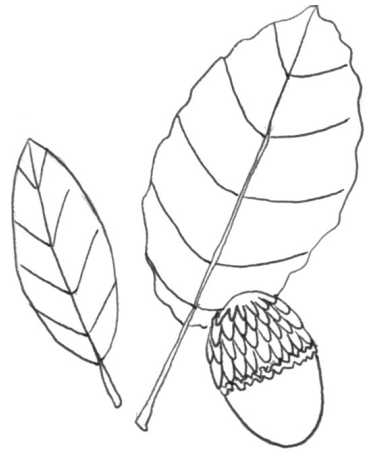
17. In the lower portions of the Arboretum where water is more plentiful, the valley oak *Quercus lobata* is commonly found with its deeply-lobed leaves with veins that do not extend the leaf margins. The leaves are very late to leaf out in spring, and the acorns are the longest of any oaks in the area (1.5" to 2.25"). Valley oak more commonly grows on the lowlands of the Great Valley of California where it boasts sizes of up to eight feet in diameter and heights up to 100 feet, relegating this tree to the level of "mon-arch" of all the deciduous oaks of the west.



**Valley Oak**



18. The interior live oak *Quercus wislizenii* is a rugged evergreen oak common to the campus and Mother Lode. The tree can be recognized by dense, dark green leaves which usually have small prickles, and the acorn deeply set within the scaled acorn cup. The tree provides protected roosting places for California valley quail *Lophortyx californica* and other birds.



**Interior Live Oak**

19. California black oak *Quercus kelloggii* is also common to the campus and to the Sierra from elevations of 2,000 to 7,000 feet. The leaves are deeply lobed as similar to the leaves of valley oak, *Quercus lobata*, but the veins extend beyond the leaf margins and the margins are more pointed than those of valley oak. The Sierra Miwok preferred the acorns of this species as a food source to any other oak in the area.



**California Black Oak**

Notice the depression in the rock located approximately 25 feet to the right of the post. Although this depression has some characteristics of a bedrock mortar as used by the Miwok Indians to prepare acorn meal, it was more likely formed by drip from a flume or overhanging rock in the area and is solutioning related rather than formed by Native American Indian activity.

**20. The Toyon Building** can be seen on the south edge of the Arboretum with its glass front that brings the outdoors “inside” to the laboratory. Facilities in this building are used to instruct courses in natural resources and forestry at both the state college transfer and two-year vocational levels.

Feel free to examine the cross-section of a large sugar pine *Pinus lambertiana* located next to this building that was cut from a giant tree in the Pinecrest Lake area of the Stanislaus National Forest, and was nearly 600 years old.

The red soils surrounding the Arboretum are heavy in clay and iron compounds, and have been chemically weathered to yield colorful red and yellow iron oxide compounds. Notice the pinnacle soil formation near the right edge of the Toyon Building where a cemented and durable soil cap has protected the underlying clay soil from eroding into the Arboretum.

It is hoped that this outdoor experience has made you more aware of the beauty, complexity, and organization of nature, and that because of this experience you may become more aware and interested in the natural environment, wherever you may be.

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### **Acknowledgements**

This nature trail booklet was compiled by Ross A. Carkeet, Jr., Instructor of Forestry, Natural Resources and Biology, Columbia College.

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This nature trail is dedicated to the following Columbia College students who cared enough to help build it during 1969-70 on donated time: Barbara Balen, Bob Belt, Brian Burger, Terry Deatsch, Don Dutra, Penny Erienbusch, Tim Fitzpatrick, Jeff Gibbons, John Gordon, Steve Griggers, Hal Hushbeck, Candra Manthey, Ken Maraccini, Dave Owings, Jim Pingree, Jackie Smithson, Bob Stone, Guy Surian, and Bruce Thoemke.

Updates in 2013 by Thomas Hofstra, Instructor of Forestry and Natural Resources, Columbia College.

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