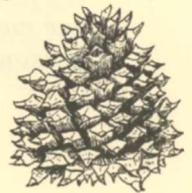


MOSES SPRING TRAIL GUIDE



Pinnacles National Monument



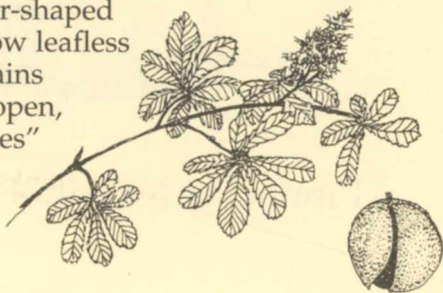
Welcome to the Moses Spring, Self-Guided Trail.

This moderate, 0.7-mile trail ascends a narrow, steep-walled canyon to the upper portion of Bear Gulch Cave. Sixteen numbered posts along the trail correspond to the numbered, explanatory entries in this guide.

Please note that the trail passes above and not through the cave. The Bear Gulch Cave may be closed or have limited access to protect sensitive wildlife habitat.

Five major plant associations are found at Pinnacles National Monument and are experienced along the Moses Spring Trail. These associations are **rock and scree, chaparral, oak woodlands, grasslands, and riparian**. The reoccurring patterns of these associations are influenced by solar exposure, soil type, moisture availability, and fire history. Recognizing the conditions that influence the presence and distribution of each association also allows us to determine the conditions favorable to particular wildlife.

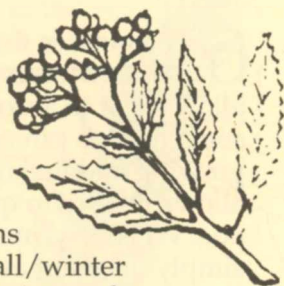
1 **California buckeye** (*Aesculus californica*) is well suited to the hot dry summers and cool wet winters of central California. Its form changes to fit the season. Bright green, palmate leaves emerge in early spring and grow large and luxuriant. By May long spikes of fragrant flowers adorn the branches. As the summer temperatures rise and the soil dries, the buckeye's leaves wither and hang brown on the branches. This conserves precious moisture in the buckeye's trunk, branches, and roots. By autumn, pear-shaped fruit hang from the now leafless branches. As winter rains begin, the fruit splits open, dropping the "buckeyes" to the ground. *Don't try to eat these buckeye nuts. They're poisonous!*



2 Above you are several **blue oaks** (*Quercus douglasii*), the dominant species of this oak woodland. Oak woodland and grassland associations serve as vital sources of food and shelter for many kinds of animals at Pinnacles. Although exotic annual grasses from southern Europe now dominate the understories of most oak woodlands of California, native perennial bunchgrasses can still be seen at this spot. Look for individual bunches of grass with long slender leaves. You have found California native grass. These areas of remnant, native grasses provide vital information for restoration projects at Pinnacles.

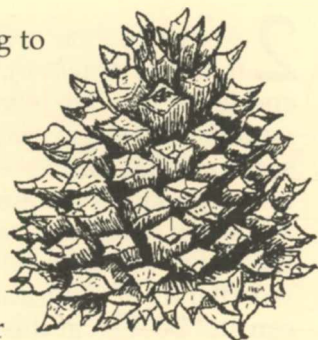


3 Like all flowering plants, **toyon** (*Heteomeles arbutifolia*) depends on seasonal factors, such as day length, temperature, and moisture to regulate its flowering time and berry maturation. Toyon blooms during the summer and ripens its bright red berries just before the fall/winter holidays—thus toyon is also called christmas berry. Besides being relished by many birds, toyon berries were an important food for the aboriginal people of the area.



4 The spires and crags that give Pinnacles its name are part of the rock and scree association. Thin soil or no soil with rapid cooling and heating characterize this rocky region. Plants growing here must be able to take immediate advantage of water to withstand prolonged periods of drought. Where weathering and decomposition have cracked the rock and produced pockets of soil, grasses, shrubs, and even trees may grow. Animals such as chipmunks and lizards use the cracks, hollows, and cliff shade of these areas to escape the hot sun. Higher rocky areas also provide nesting and roosting sites for birds of prey, vultures, and swallows.

5 The roots you see here belong to a **gray pine** (*Pinus sabiniana*) growing 30 feet above you. Gray pine roots can grow up to 150 feet long in search of water. Dull green needles and cones weighing up to 3 pounds characterize Pinnacles' only pine species. Both saplings and mature trees burn easily, but their thick-shelled seeds are fire-resistant and sprout in large numbers after a fire. Woodpeckers, squirrels, and other rodents dine on the abundant, nutritious seeds of this pine.



6 The **mosses** that cover this rock are very simple plants. Mosses only have a few cell layers, which allow them to absorb water quickly. From a dry state, some mosses can come out of dormancy and begin growing and making food within 2 hours. This also allows mosses to quickly lose water during dry periods. When dry, mosses can appear dead, but they are simply dormant awaiting the next rain so they can re-hydrate and begin growing again.

7 **Lichens** splash hues of orange, green, yellow, and brown on the rocks, trees, and shrubs of the monument. On this rock alone, there are more than 15 kinds of lichen. Lichens are actually two organisms, a fungus and an alga, living together. The fungus protects the alga from the drying sun, secures it to the rock and helps it obtain water. In turn, the alga produces food for itself and the fungus through photosynthesis. Lichens produce a weak acid, which help break down their rocky homes into soil for other plant to grow in. Lichens obtain some of these nutrients directly from the atmosphere and are quite sensitive to air pollution. Their health is a good indicator of air quality.

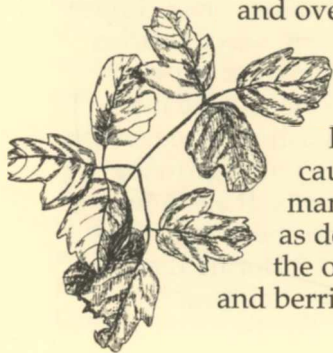
8 Moisture-loving **coast live oaks** (*Quercus agrifolia*) always grow where water is near the surface. Deep roots give live oaks a strong foothold and a constant water supply. "Live" refers to the fact that these oaks are evergreen instead of deciduous. A waxy coating on their spiny leaves helps prevent moisture loss. Like the other oak species growing in the monument, their acorns provide an abundance of food for many mammals, birds, and insects and were once a primary food for aboriginal people.



9 "The Fern Grotto" is a riparian association of water-loving plants, such as the large **western chain ferns** (*Woodwardia fimbriatum*) that you see here. Riparian associations are characterized by perennial water sources, which support lush vegetation and help support an abundance of wildlife. Although these associations only cover a small part of Pinnacles, at one time or another, most of the monument's wildlife comes to these rich water sources to drink and feed



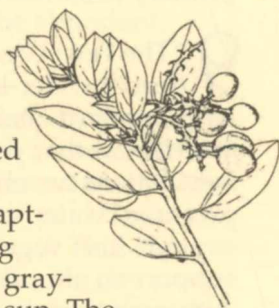
10 Recognize **poison oak** (*Toxicodendron diversilobum*) by its three-lobed leaflets. It may grow as a ground cover, a shrub, or a vine that climbs trees and over other shrubs. Bright green in the summer, its leaves turn scarlet or gold in the autumn. Urushiol, an oil found in the poison oak's leaves, stems, roots, and berries causes an itchy, blistering rash on many people. Many animals, such as deer and birds, are not affected by the oils and readily eat the leaves and berries of poison oak.



11 **Moses Spring** was named by Pinnacles' first ranger, Zotic N. Marcot. In 1923, while Ranger Marcot and his fellow workers were picking into the rock to make this trail, they accidentally opened the water-bearing seam you see. This reminded them of the biblical story of Moses thrusting his staff into the earth and having water flow forth. Thus Ranger Marcot named this spot Moses Spring.

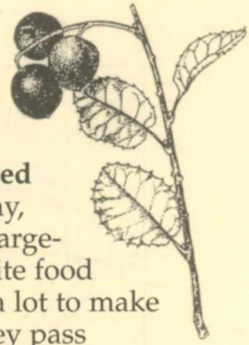


12 Big-berried **manzanita** (*Arctostaphylos gluaca*) is a common shrub of the **chaparral** association. In spring, it bears small white, lantern-shaped flowers followed by marble-sized berries. Like many chaparral plants, manzanita is fire adapted. Its seeds germinate best after being exposed to fire. To conserve water, its gray-green leaves turn edgewise to the hot sun. The berries or "manzanitas" ("little apples" in Spanish) are a favorite food of squirrels, gray foxes, and deer. Aboriginal people and early European settlers crushed the berries into a cider.

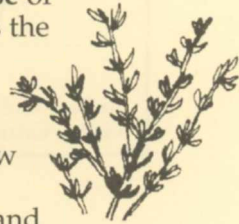


13 The shrub-covered hills across from you are part of the **chaparral** association, which covers 80 percent of Pinnacles. Drought resistance and fire adaptations characterize this dense vegetation. Most chaparral plants have small leaves with thick, waxy cuticles and tiny hairs or spines, which help reduce exposure and moisture loss. Extensive root systems take maximum advantage of available soil moisture. Fire benefits many chaparral plants by stimulating new growth, seed germination, and species diversity. It also reduces competition among plants. Listen for the songs of the wrentit, the spotted towhee, or the California thrasher. These birds make their homes in the chaparral.

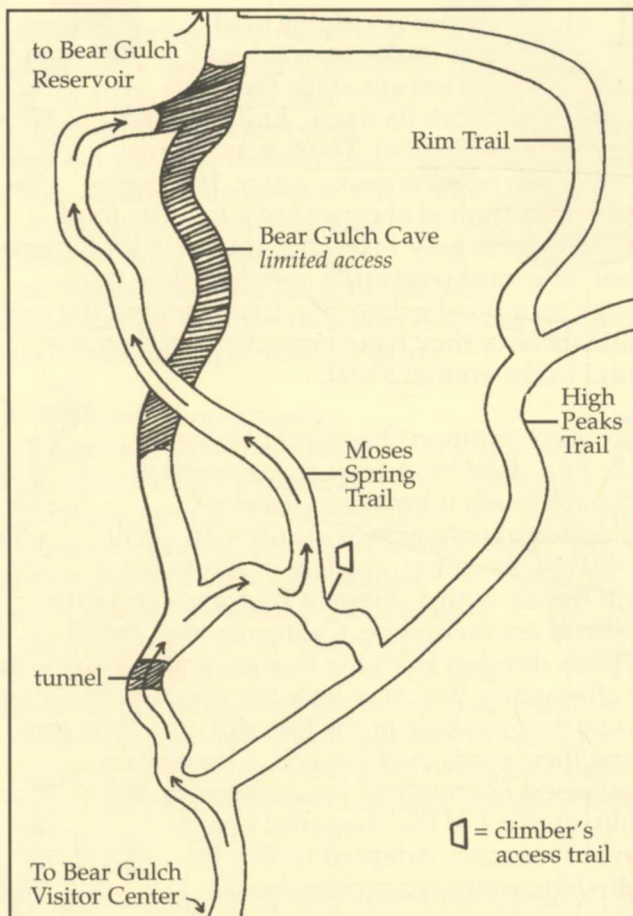
14 Notice the leaves of this plant. Stiff, shiny, dark-green leaves like holly and, in season, dark red cherries, give this shrub its name, **holly-leaved cherry** (*Prunus ilicifolia*). The leaves' shiny, waxy surface help conserve water. The large-seeded, thin-fleshed cherries are a favorite food of raccoons and gray foxes, but it takes a lot to make a meal. The hard seed coats soften as they pass through an animal's digestive tract, helping the seeds germinate once they have been deposited on the ground in the animal's scat.



15 Two common chaparral plants can be seen here. A favorite browse for deer, **buckbrush** (*Ceanothus cuneatus*) is an appropriately named shrub with small oval leaves. In spring, clusters of white flowers fill the air with a pungent fragrance and give this shrub another name, California lilac. Small seedpods develop from the flowers and, for a few summer afternoons, you may hear the popping of the seedpods as they explode in the hot, dry air—thus propelling their seeds over the soil. **Chamise** or **greasewood** (*Adenostoma fasciculatum*) is the dominant plant of the chaparral association at Pinnacles. Adapted to fire, its needle-like, water-conserving leaves contain volatile compounds, which allow them to burn, even when green. As chamise ages, its branches begin to die and over the years it becomes more and more prone to wildfires. Following a fire, chamise will quickly sprout new growth from its charred base.



16 You are now at the upper end of the Bear Gulch Cave and the end of the Moses Spring, Self-Guided Trail. We hope you enjoyed your hike. You can return to the Visitor Center area or continue on to the reservoir. From the reservoir you can return to the Bear Gulch Visitor Center via the Rim Trail.



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