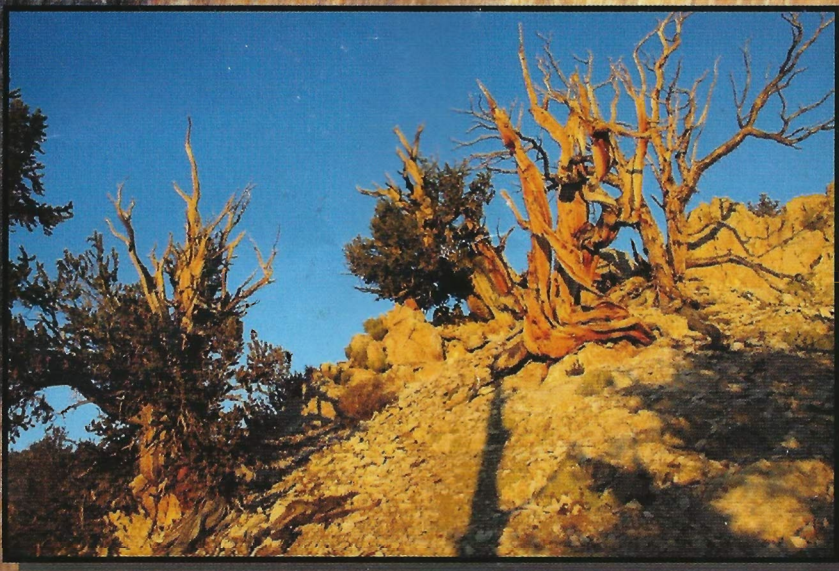


Methuselah Walk



Your journey through the oldest
known living forest....

Printing
Donation Requested **\$1**

Methuselah Walk

This four mile trail will lead you through the Ancient Bristlecone Pine Forest, past the oldest known living tree in the world.

Fantastic views, sculpted trees battered by the elements and serenely wild landscapes await the traveler.

Distance: 4 mile loop trail

Travel time: 2-3 hours

Elevation change: 800 feet

Bring: Water, snack, and sun protection

Change is slow, footprints last for years.

Help protect the trees — stay on the trail.



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Photos and design by Karen Lindquist
Illustrations by Carly Giesen



The Unique and Long-Lived Bristlecone

1

Explore the exciting Great Basin Bristlecone Pine. Important to science and known for its longevity and unique growing characteristics, this tree makes everyone's experience along this trail special. Meander through the most ancient part of the grove where Dr. Schulman did much of his work. Discover the secrets of longevity that enable these trees to grow for thousands of years as we follow the life of the bristlecone pine from seed to snag.

The Bristlecone Pine has thick needle growth along the branches, just like a fox tail. The bristlecones in front of and behind you are great examples of this.



*Seed cones
(above)
pollen cones
(right)*



From a Tiny Seed

2

For a new bristlecone pine seed to form, pollen from cones, like those growing on the tree to your left, must pollinate a small purple bristly seed cone. Once pollinated, the small cone closes and begins to grow before winter. Next spring, the captured pollen will fertilize the ovule and seeds will develop. The seed cone then grows rapidly and matures in the fall, opening to release a tiny white winged seed into the wind. Look for cones of various sizes on the tips of branches on the next few trees along the trail. Cones develop especially well where more direct sunlight is available.



Did you know.....?

A small percentage of bristlecone seed cones are green instead of purple. These cones, a simple genetic variation, lack the pigment anthocyanin. See how many you can find.



3

Seeds Need Moisture

Seeds may sprout the following year and grow only an inch or so each year for the first few years. Success depends on warmth and moisture. The sapling in front of you (perhaps 50 years old) has the advantage of growing on a north-facing slope. Here more moisture is retained because it receives less direct sunlight than the south-facing slope you can see across the canyon. Snow and water will melt and evaporate slowly on this northern slope, giving the tree more opportunity to use it. Notice how sparse the trees are on the south-facing slope across the canyon.

5

Fragile Roots are Sent Out

Bristlecone seedlings need to find food and water quickly. They rapidly grow lateral roots, but no deep tap root. Look at the exposed roots of this tree. They are shallow, usually found within the first foot or two of soil. Visitors who care deeply for these trees will stay on the trail to avoid compacting the soil which damages these shallow roots.

Each year new root tips grow. Some form a beneficial partnership with a mycorrhizal (underground) fungus. This may help with the uptake of nutrients and water and fend off other damaging fungi, such as root rot. Some roots reach an astounding 50 feet out away from the main trunk.

4

Reduced Competition on Dolomite

Few species can tolerate the nutrient-poor and highly alkaline dolomite soil. This gives the slow growing Bristlecone a chance to grow nearly competition-free. Although you can hardly call it soil, the white rock and rubble reflects sunlight and stays 2°- 5° F cooler than the nearby darker sandstone. Bristlecones have no trouble growing in this sedimentary rock. Look on the slope above you; they even seem to sprout from boulders.

6

A Tree without a Heart is Vulnerable

Water and nutrients move up from the roots to the wood tissue in the trunk of the tree. This sapwood acts like a pipe but eventually fills in to become the heartwood, the structural support of the tree. Bristlecone wood is very resinous and difficult for a fungus to attack. However, this particular tree in front of you was weakened from the inside by heart rot and eventually died. Note how the center of the tree is rotted and nearly gone.

Seeds Feed Wildlife

The seeds from pine trees, such as the Bristlecone Pine and the Limber Pine, are an important food crop for wildlife. Keep your eyes and ears open for the Clark's Nutcracker. They will eat some seeds, but also hide others underground, caching them for later use. This helps germinate many seeds which may sprout into new trees.



Little Precipitation in the Whites

The White Mountains are a desert mountain range, the air is very dry and it rarely rains. Most of the moisture received here (about 80%) comes during winter in the form of snow. Annual precipitation varies from 5-6 inches on the Owens Valley floor to 20 inches at the highest elevations. Schulman Grove may receive an average of 10-12 inches of precipitation each year.



7

Leaves Make Food

Water pulled up from the roots and through the trunk is passed to the leaves (needles) where food is made through photosynthesis. Bristlecone needles are short and waxy to combat the dry conditions. Each year a new set of leaves will emerge and are kept for decades. Can you find the difference between the old and new needles? Late in the summer you may even see new buds, ready to grow next summer's needles.

8

Bristlecones Grow Slowly

While the new needles may be easy to spot, a bristlecone's yearly growth is not. With its limited resources and short growing season only a thin layer of new tissue (a growth ring) is added to the trunk, branches and roots each year. A one inch thickness of growth may take a century to accomplish. Where conditions are tougher, such as this ridge, growth is even slower.

The sapling to your right, about the same size as the tree at the last stop, could be much older. It will continue to grow ever so slowly, and as the centuries pass, may begin to look like the tree to your left. It may not grow much taller on this exposed rocky ridge, but will continue to add small amounts of tissue, resulting in a very dense wood.



Needle Design

The pores (stomates) line the inside surface of the five needle packet (fascicle). This helps keep in moisture.



9

Diversity on the Fringes

Have you noticed a change? The hillside ahead is facing south, creating a drier environment. This transition zone into a different habitat, an ecotone, creates a higher diversity of plants and wildlife. Here sagebrush and Mountain Mahogany, the short trees just ahead, meet the outer edges of the Bristlecone Pine Forest.

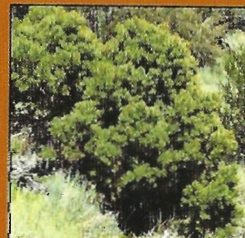
Wildlife will often resume their activities if we sit and remain quiet. Stop at the next bench and look and listen for birds, insects and other wildlife. To the east, take in the view of Deep Springs Lake and distant Death Valley mountain ranges.

10

Part of a Community

In this sub-alpine life zone, two main plant communities are found. Where dolomite soil is found, Bristlecone Pines and Limber Pine grow. Few shrubs are found, but Wax Currant, Fern Bush and Green Ephedra are the companions to our pine tree community.

Mountain Sagebrush grows on the drier, richer soils where you will also find Mountain Mahogany, Long-leaved Paintbrush, and the Golden Forget-me-not. Surprisingly, scattered Pinyon Pines can now be found at this high elevation, an indication of a warming climate trend.



Single-leaf Pinyon Pine (*Pinus monophylla*) is found throughout the Great Basin in elevations from 5,900 ft. to 9,500 ft. You can taste their large seeds which mature in the fall; look for "Pine Nuts" at your local market.



11

Bristlecones Keep Growing

These mature bristlecones may be 200 or 300 years old and can reach heights of 50 feet. Some have main trunks, others have multiple trunks, like this tree.

Needles growing on these trees are in groups called whorls; one whorl represents a year's needle growth. Count the whorls on a branch, and see if you can determine when it started to grow.

12

Few Needles Fall to the Ground

Because bristlecones keep their needles for so long (30-40 years), very few are dropped to the ground each year. The forest floor in front of you is very bare. This lack of forest floor litter prevents the spread of fire but also limits the establishment of soil nutrients by decomposition.

Compare this to the Mountain Mahogany behind you. Can you see the difference in leaf litter?



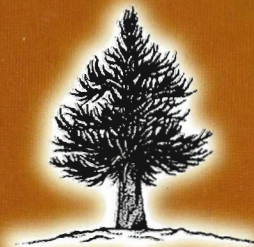
Mountain Mahogany (*Cercocarpus ledifolius*), an evergreen tree or large shrub, is found at elevations of 7,000 ft. to 10,500 ft. Their tight leathery leaves retain moisture well. You might find their long fuzzy-tailed seeds. Their spiral shape helps them 'drill' into the soil when moisture causes them to untwist.



Small petal-less flowers of the Mountain Mahogany (left)



Long fuzzy-tailed seeds of the Mountain Mahogany (right)



13

Struggle for Survival

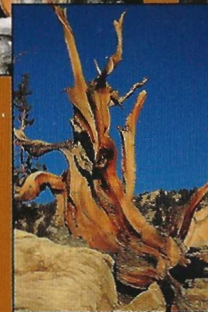
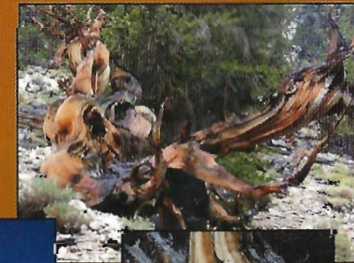
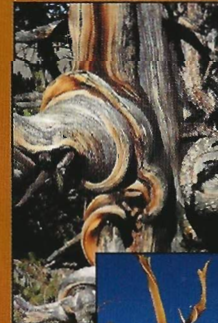
What happens when erosion, drought or disease prevents a root from bringing in water and nutrients? The root and portion of trunk and branches it supports die back. Notice the tree in front of you with dead branches and partially exposed trunk. A sacrifice has been made in order to keep the tree alive. This die-back technique allows bristlecones to survive extreme conditions.

14

Sculpted by the Elements

These trees, many of which are thousands of years old, have been sculpted by wind, ice and extreme exposure to the elements. Their contorted shapes seem to defy nature. Take the trail slowly and be sure to enjoy this natural sculpture garden.

The Sculpture Garden



Time and Soil March On

15 If we could speed up time so a thousand years could pass in a second, you would see a small avalanche of soil roll past your feet. The relentless tug of gravity leaves many roots totally exposed. Look to the roots up-slope. On the most recently exposed root you can still see living tissue along the bottom. Depending on the steepness of the slope, six inches to a couple of feet of soil can erode every 1000 years.

Methuselah Grove

16 You have arrived at a historic location. In 1957 Dr. Edmund Schulman, searching for climate records in tree rings, increment bored a tree from this grove. Upon counting the rings under the microscope back at camp, he nearly shouted at his colleague "we've got a 4,000-plus tree". The oldest living tree had been found!! It was dated to be over 4,600 years old.

Schulman named this tree Methuselah. It is unmarked for its protection, but it continues to survive and even produce viable seeds just like many of its 3,000 and 4,000 year old neighbors. Greater adversity grows stronger trees, century after century after century.

Did you know....?

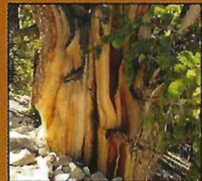
Dr. Schulman had different nicknames for the unorthodox tree shapes which made increment boring a bit of a puzzle.



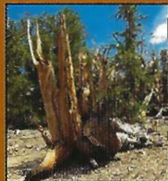
Eagle's Aerie



Massive Slab



Pickaback



Lightning Strikes

17 Exposed ridges are easy targets for lightning bolts and the tree on your right has been blackened by fire. The forest's open structure and lack of fuel kept the fire from spreading. Dense wood impedes the fire and many trees will continue to live even though partially burned. Fire may or may not have been the cause of this tree's death.

There are many other 'blackened' trees along the trail like the one to your left. Here the exposed wood has been weathered to a darkened condition but not burnt.

Wood Changes Color

18 The exposed dead wood of these ancient trees seem to have their own color palette. Yellows, browns and russets make a colorful display. Fungi that feed on the exposed wood of trees are partially responsible for these colors. Sunshine, wind, ice and aging all have their effect. Polished surfaces like the tree behind you are the result of wind and ice blasting the surface in the winter months for thousands of years.

Six different species of Paintbrush are found in the White Mountains. See if you can notice the differences.



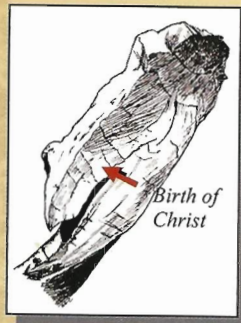
Golden-mantled Ground Squirrels (*Spermophilus lateralis*) are found from 7,000 ft. to 14,000 ft. and lack head stripes. They have to fatten up all summer in order to hibernate during the long cold winter. They eat lots of seeds, nuts and fruits.



19

Growth Rings Record Events

Bristlecones were made famous for their age, but are most important to science because of their ability to record climate trends. Because the year's growth depends entirely on the conditions of that year, the trees are sensitive to environmental changes, unlike a tree that may grow next to a stream and have the same amount of available moisture each year. Bristlecone's sensitive nature gives scientists records of the past. Climates, droughts, severe frost, fires, and volcanic eruptions can all be recorded in these ancient pieces of wood.



The piece cut from this specimen is dated from 1000 BC to 650 AD. The growth rings are very hard to see because they are so thin. An inch may contain 100 or sometimes up to 300 growth rings.

20

Ancients Grow Unconventionally

A growth "ring" may be a misnomer for the bristlecone, especially for the old, mostly died-back ancients. The tree in front of you is what Dr. Schulman might call 'slab growth'. Only the left and right sides have living tissue and continue to grow, adding partial tree-rings on just those sides, not around the whole trunk. Try following the strips of living bark up the tree in its circuitous path to the green branches.



Did you know....?

You can use your binoculars like a magnifying glass. Just flip them around so that you are looking through the large end and slowly get really close to what you would like to look at.

21

Snags - Dead but not Done

What will cause a bristlecone to finally die? Severe drought, heart rot, and root fungus can all bring its life to an end. But standing dead trees are still a useful part of the forest. Insects that like to eat or make homes in dead wood move in. They in turn are eaten by birds like the Mountain Bluebird. Cavity nesting birds like woodpeckers, wrens, and nuthatches will also put the snag to good use.

Sapsuckers, a bird in the woodpecker family, are occasional visitors to the Bristlecone Pine forest. Look for evidence of their visit at the tree immediately adjacent to the next rest bench.

22

Dwarf Forests are Older

Large tree size does not necessarily indicate older trees. This is especially true in the Bristlecone Pine forest. These stunted trees are 3,000-4,000 years old and grow old not in spite of adversity, but *because* of it. Even at this ripe old age, Great Basin Bristlecone Pines do not show signs of degeneration. Studies have shown that old bristlecones show the same cell growth as young bristlecones, equally vital seeds and pollen, as well as growth of buds and needles.



Did you know....?

Bluebirds are not really blue. The structure of their feathers reflects blue light. If a bluebird flies overhead between you and the sun it will look brown.

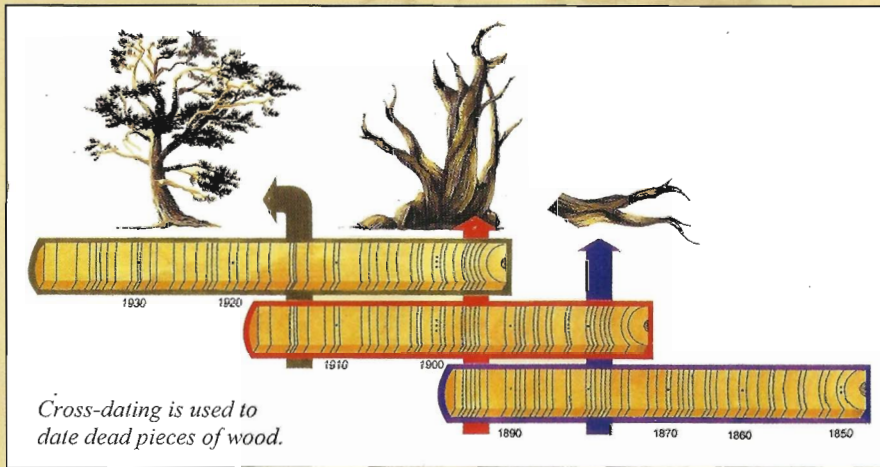


23

Dead Wood Decays Slowly

A snag may stand for thousands of years before it will eventually fall. This dead and down wood is of particular interest to scientists. Because the wood is so slow to decay, scientist can find pieces that are over 11,000 years old! Tree ring patterns in the dead and down wood are matched to other pieces and eventually to a living tree, allowing an exact date to be determined. This is called cross-dating and it has helped to recalibrate the radiocarbon dating process, linking these trees to history all over the world.

As dead wood decays it slowly releases nutrients back into the ground for other trees to use.



They Call Themselves 'Tree-Ringers'

Each summer, volunteers from the Laboratory of Tree-Ring Research at the University of Arizona spend several weeks in this forest collecting new tree-ring samples. These cores are dated and may extend the known chronology for the bristlecones.

24

The Journey Continues

The amazing Great Basin Bristlecone Pine will continue to thrive in this harsh environment. Dolomite, climate and dense wood all play roles in its secrets to longevity. Yet there are many mysteries yet to solve. We do know that the oldest trees survive in the most difficult situations. Perhaps there is a life lesson there for all of us. We hope you take many memories with you from the trail. Continue to take in your surroundings and look for your own discoveries in this land of the ancients.

Birds Share the Forest

Evidence of the many birds that share the Bristlecone Pine Forest is just upslope to the right. The small round hole in the tree trunk is the doorway to a White-breasted Nuthatch nest cavity. Look for these small gray and white, insect eating birds hopping head first down trunks and branches.

Common Plants Along the Methuselah Walk



Rock Spiraea



Sulphur-throated Forget-me-not



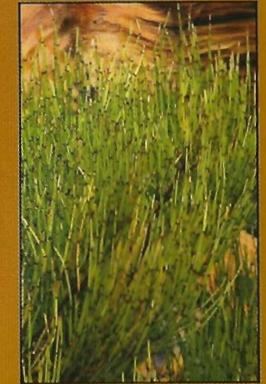
Long-leaved Paintbrush



Fern Bush



Wax Currant



Green Ephedra

Discovery Trail

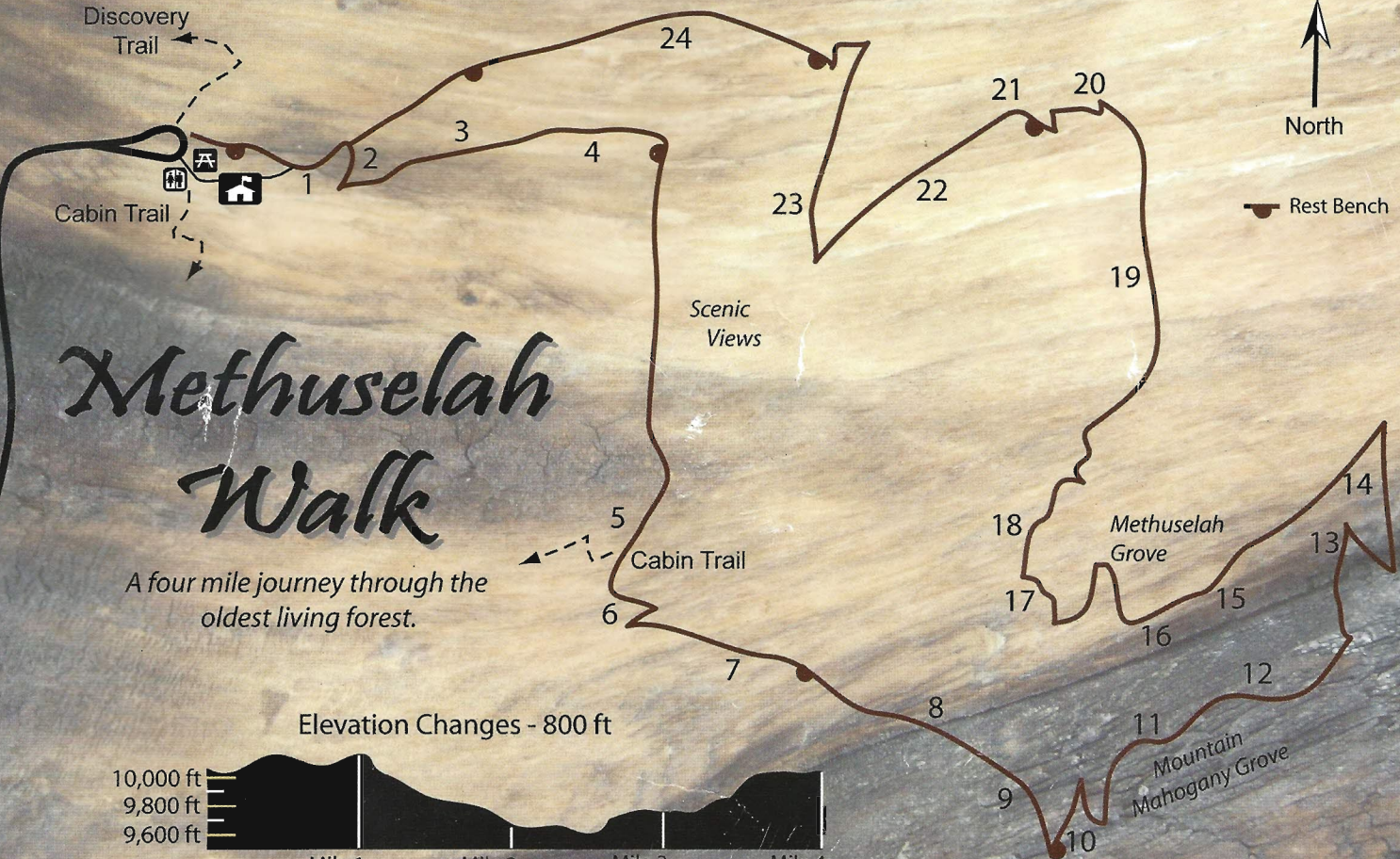
Cabin Trail

Methuselah Walk

A four mile journey through the oldest living forest.

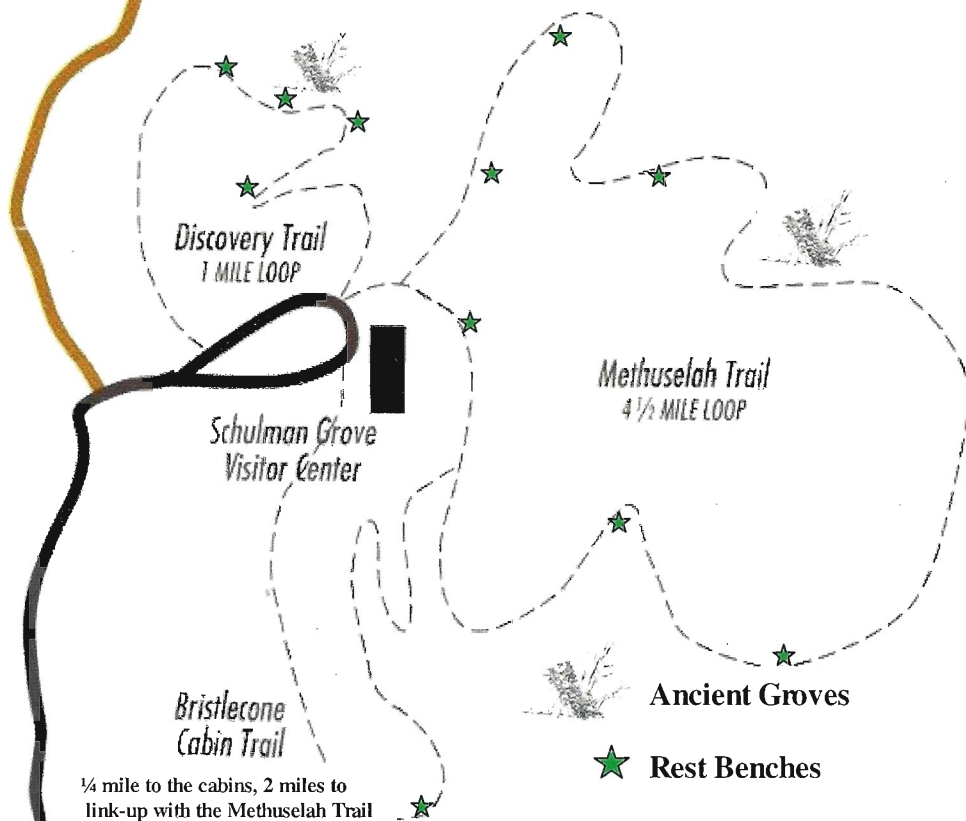
Elevation Changes - 800 ft

10,000 ft
9,800 ft
9,600 ft



To Patriarch Grove:
12 Miles

Schulman Grove Trails



Hiking through the bristlecone forest is a wonderful way to explore and learn about the ancient trees.

The Discovery Trail is a short interpretive trail that loops through a grove of three to four thousand year-old trees. It begins and ends from the parking lot at Schulman Grove and is $\frac{3}{4}$ of a mile long with rest benches and interpretive trail panels along the route. The trail gains then loses about 300 feet in elevation, suitable for kids - leashed dogs are allowed.

The Bristlecone Cabin Trail wanders out to some old mining cabins a short distance from the visitor center. Continue on to join the Methuselah Trail to make for a longer hike or return back to the visitor center on the same trail. The cabins dates back to the 1860's but are not stable *and are unsafe to enter.*

The Methuselah Trail is a 4 $\frac{1}{2}$ mile hike through an ancient bristlecone pine forest. The trail journeys past ancient trees, a view spot into Death Valley National Park, a mountain mahogany woodland and the magical Methuselah Grove. It is a moderately strenuous hike with an 800 foot elevation loss which regains the elevation as the trail returns to the visitor center. Rest benches are available along the way so take your time, water, sun protection and a snack; enjoy your journey through the ancients. An interpretive trail guide is available at the trailhead (\$1.00). Since anonymity is its best defense against souvenir hunters, the Methuselah Tree is not marked, signed, or identified in any manner.