

CUA INTERPRETIVE BACKGROUND INFORMATION

INTRODUCTION

As a guide in Zion National Park, you are viewed by your tour group as a local expert on the park and the surrounding area; you will also be working in view of the general visiting public. They will follow your example as to how to behave in our National Parks as they view the park through your eyes. You have an opportunity to educate them as well as to share a deep appreciation of this place. It is imperative that the information you provide is up to date and accurate. You may use any of the information provided here. *You are accountable for the accuracy of all information you choose to impart to your tour group.*

We must also provide a positive atmosphere for the public visiting the park. *Please refrain from all racist, sexist or derogatory comments.* Our commitment to maintaining a courteous and professional atmosphere will contribute to the continuation of the IBP program.

The following is basic information about the park which you may find useful. Sources for more in depth study can be found in the attached bibliography and on the park's website.

NATIONAL PARK SERVICE

By 1916 the Department of the Interior was responsible for 14 national parks and 21 national monuments but had no organization to manage them. To correct this problem, President Woodrow Wilson approved legislation creating the National Park Service on August 25, 1916. As stated in the National Park Service Organic Act, its *"purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."* The National Park System now includes 391 parks that cover the length and breadth of America. More on the history of the National Park Service can be found at <http://www.nps.gov/history/index.htm> and in various publications (see bibliography).

The National Park Service is the premier preservation agency in the United States and is the primary caretaker of the country's natural and cultural history. In order to fulfill the mission mandated by Congress and in accordance with a variety of environmental and historic preservation laws (National Environmental Policy Act, Endangered Species Act, Wilderness Act, Clean Air Act, Clean Water Act, National Historic Preservation Act, etc.), the agency has in place regulations which may seem overly restrictive, but do help to support the agency's primary purpose. These include restrictions on acceptable types of public use, collecting park resources, and harassing or feeding wildlife. As a result, some activities permitted on U.S. Forest Service or Bureau of Land Management and other public lands are not permitted in national parks. As a permittee in Zion National Park, it is important that you not only know and adhere to the rules and regulations of the park, but understand the reasons for them.

ZION NATIONAL PARK

Overview

Located in Washington, Iron and Kane Counties in Southwestern Utah, Zion National Park encompasses some of the most scenic canyon country in the United States. The park is characterized by high plateaus, a maze of narrow, deep, sandstone canyons and striking rock towers and mesas. Zion Canyon is the largest and most visited canyon in the park. The North Fork of the Virgin River has carved a spectacular gorge here, with canyon walls rising 2000-3000 feet above the canyon floor. The southern part of the park is low desert, with colorful mesas bordered by rocky canyons and washes. The northern portions of the park are high plateaus covered by forests.

Mission Statement

The Zion National Park mission is to preserve the dynamic natural process of canyon formation as an extraordinary example of canyon erosion and to protect and preserve the valuable cultural, geologic, vegetation and wildlife resources while providing safe, sustainable and cost-efficient access for visitors experience and enjoyment. In addition, the park aims to educate both visitors and the general public about this exceptional environment.

GEOLOGY

What makes the canyon so narrow at the Temple of Sinawava, while it is over a mile wide in the vicinity of the Visitor Center? At the end of the scenic drive, the Virgin River is cutting through and exposing essentially only one rock formation, the Navajo Sandstone. This layer of rock is relatively resistant to erosion, so when a stream of water is cutting into it, it tends to cut almost straight down through the rock, crumbling very little of it away from the sides and entrenching itself into extraordinarily deep and narrow gorges. The Virgin River Narrows is the best example of what water does when cutting only through the relatively resistant Navajo Sandstone formation.

At the lower end of the canyon, several other rock layers beneath the Navajo Sandstone have been exposed by the river, most of these being much softer and more crumbly than the overlying layer. The softer lower layers are more easily removed by the river and other forces of erosion, often undercutting the overlying Navajo sandstone. No longer supported from below, large chunks of Navajo sandstone break off (gravity works!), continually widening the canyon in the lower section.

Eventually in the Narrows section of the canyon, when the Virgin River has finally cut all the way through the Navajo Sandstone, it will begin to cut into the softer layers beneath. The canyon walls will then be rapidly eroded, undermining the support for the overlying sandstone, as is already happening downstream. This will cause the walls to crumble and fall, widening the canyon and doing away with the Narrows as we know it today. In turn, new sections similar to the Narrows may be created upstream in the Navajo sandstone. Although occurring quickly on the scale of geologic time, in our brief lives we'll not see the Narrows change much.

From the floor of Zion Canyon, several of Zion's rock layers can be seen; the most predominant is the Navajo Sandstone. It forms nearly all of the tall, sheer, vertical walls that we see in the canyon. Such familiar landmarks as the Great White Throne, Mountain of the Sun, the Streaked Wall, and the Three Patriarchs have been carved from it. The Navajo Sandstone is a massive deposit of fine, rounded grains of quartz, believed to have been blown into this area when it was a desert, during the Jurassic Period, roughly 180 to 190 million years ago. This sand-dune desert covered the entire Colorado Plateau and was possibly the biggest field of sand dunes in our planet's history. The sweeping patterns seen in the Navajo sandstone are *cross-beds*, the surfaces of these ancient sand dunes. The well-sorted grains of quartz sand are cemented together by calcium carbonate (a.k.a. lime), iron-oxides and silica, which make the rock more resistant to erosion than the layers beneath. The calcium carbonate cement can dissolve in rainwater (slightly acidic), making the rock crumbly when wet—so don't expect to see any climbers when it is raining. Here at Zion, the Navajo Sandstone is up to 2,200 feet thick; the Earth's tallest known sheer sandstone walls.

Another layer of sandstone, this one much thinner, sits on top of the Navajo Sandstone. Called the "Temple Cap", it forms the small caps seen atop the East and West Temples. This represents a bit more desert time here, before the Zion region was inundated with a shallow arm

of the sea. This sea and bordering tidal flats left behind a layer of limestone and some siltstone, approximately 165 million years ago, which is now known as the Carmel Formation. This layer is difficult to see from most places in Zion Canyon, but hikes up onto the higher plateau will reveal this beige-colored band of rock, and sometimes fossil shells from creatures in that ancient shallow sea. (Remember, of course, that fossils and other rocks may not be collected within a National Park.) Much of the lime substances which act as a cementing agent in the underlying Navajo Sandstone have percolated down from this formation.

Beneath the Navajo Sandstone are several less conspicuous layers of rock that were formed under much different circumstances. In descending sequence, these rock layers are: the Kayenta, the Moenave, the Chinle, and the Moenkopi formations. These four rock layers are composed chiefly of mudstones, siltstones, sandstones, and some limestones; colorful banded layers that contrast with the more massive cliffs above. These lower layers were deposited by streams, lakes and along the margins of shallow inland seas during the Triassic and Early Jurassic Periods, roughly 200 to 245 million years ago. Many of these layers represent wetter environments than the desert which followed, including stream channels, flood plains, tidal flats, and tropical swamps. Dinosaur tracks, fossil plants, fish, and shells, as well as petrified wood, found in some remote areas, testify to the variety of life in this region at the time. The very lowest layers found in Zion are limestone of Permian age (Kaibab & Toroweap Formations), from an earlier shallow sea. This limestone is found only in the Kolob Canyons section of Zion, but it can also be found nearby at the LaVerkin Overlook and at the rim of the Grand Canyon.

After all of these sedimentary rock layers were deposited, the land in this part of the country underwent a gradual, but tremendous uplift. Rock layers that were once near sea level were raised to elevations exceeding 10,000 feet. Geologists are still uncertain about exactly what caused this uplift, but in general, it was related to large-scale plate tectonics. It was this gradual uplift that created conditions favorable for the cutting and carving of Zion Canyon, and the uplift continues today.

What causes the colors in the rocks? The most predominant color in Zion is, of course, the bright red seen in many of the rock formations. This red is caused by iron-oxide, more commonly known as rust. As little as one percent of iron oxide is enough to color the sandstone various shades of red or brown.

Several things can turn the cliffs black:

1. Lichens and mosses living on the cliffs.
2. Carbon from decayed plant matter carried over the rock faces by water. The water will gradually evaporate leaving the organic carbon compounds behind.
3. Manganese oxides and iron oxides that have probably been fixed to the rock face by colonies of bacteria consuming air-borne dust particles. When these oxides are thick and look shiny, we call them "desert varnish."

White rock is the result of two different processes: as a surface stain of lime deposits, usually found near spring lines, and as the color in the upper portions of the Navajo Sandstone where iron-oxide is absent.

Sentinel Slide: As you drive up the canyon, the road climbs very steeply from the mouth to the Court of the Patriarchs, then flattens out and is very gradual for quite a distance in the area of the Lodge. A tremendous landslide fell from the Sentinel about 8,000 years ago, damming the Virgin River. This created a lake upstream, in which clay, silt and sand beds were deposited. The river ultimately cut a channel through the dam, draining the lake and leaving the lake

sediments behind. The sediments extend up-canyon as far as the base of Angels Landing, suggesting that the lake extended over three miles upstream from the dam. The steep section at the mouth of the canyon is the ancient dam, and the broad, flat plain in the Lodge area is the accumulation of sediments left behind from the standing lake.

The landslide, though it occurred some 8,000 years ago, is still very evident along the Sand Bench Trail. The site of this landslide is still a very active area; many more slides have occurred there in recent years. The most recent slide was April 12, 1995. This smaller slide also temporarily dammed the river--until the river found a weak spot--and washed out a section of the park road. This stranded over 300 people up the canyon at the Zion Lodge. An emergency access was opened, the canyon was evacuated, (with only a skeleton crew left at the Lodge), and work began to open the road by Memorial Day weekend.

How was the canyon formed? As unbelievable as it may seem, Zion Canyon is the result of erosion by the Virgin River, the seemingly placid stream that now flows through the canyon.

Prior to the tremendous uplift, (There is much controversy over the dates of the rising of the Colorado Plateau, and the time that the river has been carving the canyon. It would be best if dates were left out, and something in the line of the brochures' explanation be used. "Long before today's landscape even appeared streams, oceans, deserts, and volcanoes deposited thousands of ...") lowland streams did little work. They flowed in broad, shallow valleys of gentle gradient. With the uplift, the streams began running more steeply downhill and became powerful agents of erosion. Their accelerated speed permitted them to carry larger amounts of sediment and debris, cut trenches in solid rock and, as the land continued to rise, continue to scour and carve their trenches into the present deep canyon. According to Dr. Robert Eves of Southern Utah University, there is no consensus among geologists on the age of the Colorado Plateau uplift, though it is generally thought to have begun as long as 40 million years ago. A more accelerated uplift has occurred over the past 10 to 15 million years, when the Virgin River would have begun its work. In fact, most of present day Zion Canyon was probably carved within the past 2 million years.

On most days of the year, the Virgin River runs clear – carrying very little sediment, and doing little to carve the canyon. It is, of course, during flood season when the action of the water causes the greatest erosion. During a flood, the river can be so heavily laden with rocks and sediment, uprooted trees and other debris, that it can very rapidly abrade and erode the banks and canyon walls far faster than at its normal flow. The Virgin River, with its steep gradient of 50 to 70 feet to the mile, carries away as much as one million tons of rock and sediment each year. Although the stream deepens its trench but a tiny fraction of an inch each year, the Virgin River's relatively short geologic life of several million years (There is much controversy over the dates of the rising of the Colorado Plateau....see comment above) is ample time to accomplish its work.

The Virgin River originates at Cascade Falls, which spill out of Navajo Lake, upstream of Zion. From its headwaters at Navajo Lake to its confluence with the Colorado River in Lake Mead, the Virgin River drops 7,800 feet in elevation. The average gradient is 48 ft/mile throughout its length; the gradient within the park is 71 ft/mile. (For comparison, the average gradient on many segments of the Mississippi River is less than one foot/mile.)

People often ask how the Virgin River was named, but no one actually knows and several theories exist. One theory involves the earliest white explorers in this area. In 1776, two

Spanish priests, Dominguez and Escalante, led an expedition trying to find a route from a mission in Santa Fe, New Mexico, to one in Monterey, California. They were the first Europeans to travel through the area. Knowing that earlier efforts to find a direct route between missions had been frustrated by unsuccessful attempts to cross the Colorado River, Father Escalante followed trails that led northwestward, bringing him to the Virgin River. It is suggested that he named the river for the Virgin Mary, however, there is no clear evidence to support this. Another theory suggests that the river was originally named the Sevier River (and vice-versa) and at some point the two names were switched.

Still another theory is that Jedediah Smith named the river for a friend of his, Thomas Virgin. About 1800, Smith, a famous trapper and explorer, was searching for a route to California when his company of about 16 men was attacked by Mojave Indians. The attack took place southwest of Zion, probably near the confluence of the Colorado and Virgin Rivers. Thomas Virgin was wounded. In Smith's journals, though, he named the river after his president – the Adams River.

However the river got its name, many jokes have been made about it. If you choose to include any jokes, make sure they are not offensive in any way. Humor is wonderful, but insults and degrading remarks are not.

Many visitors to Zion National Park recognize the rare opportunity they have to visit three national parks within a few hours drive of one another. Most visitors who come to Zion take the time to visit Bryce Canyon and Grand Canyon National Parks, too. What many people don't realize is that the three parks are somewhat interconnected in terms of their geological strata. The rock formation that makes up the lowest layer of rock in Zion is the same as the highest layer at the Grand Canyon. Likewise, Zion's uppermost layer of rock is the same as the lowest layer at Bryce Canyon. The three parks are part of the "Grand Staircase", and each of the three represents a giant step in that staircase.

All but one of the rock layers found at Zion and Bryce Canyon National Parks have been eroded from the top of those at the Grand Canyon. Zion has lost all but one of the layers found at Bryce Canyon, yet the Virgin River in Zion has barely begun to expose the layers represented at Grand Canyon. Bryce Canyon National Park is the only one of these three areas where all of the rock layers are still present; most of Zion's and Grand Canyon's formations are still hidden beneath the layers exposed at Bryce Canyon.

COMMUNITIES:

Zion is located at the convergence of three major physiographic provinces: the Colorado Plateau, the Great Basin, and the Mojave Desert. With its widely varying elevations (3,666'-8,726'), cool canyons, plateaus, forests, and river bottoms, the park includes elements of all three, giving it the greatest biodiversity in Utah. There are several easily identifiable vegetation communities all of which support a variety of plant life.

Riparian Areas: The riparian zone includes the sections of canyon floor in and adjacent to streams. These areas may be subject to frequent flooding. Plants that grow in the riparian zone are exceptionally water dependent. For example, cottonwoods (one of the most common trees on the canyon floor) require large amounts of water. Their roots must be in or near the water table in order for them to survive. They are able to reach the water table with their deep taproots, enabling them to endure during times of drought. In the dry western U.S., they are an indicator species of water in the vicinity, as they are unable to survive away from it. Other notable species are boxelder (*Acer negundo*), velvet ash (*Fraxinus velutina*), and scouring rush

(*Equisetum*) or horsetail, which are also found along the canyon bottoms. Due to the abundance of water and vegetation in the riparian zone it is an ideal place to watch for birds and other wildlife.

Lower Slopes: The sloping section of the canyon walls rising from the canyon floor toward the sheer cliffs provide a different environment for plants to grow. Since these slopes are out of reach of the floodplain, the plants that thrive here are much heartier and more drought tolerant than their neighbors in the riparian zone. Within Zion Canyon these lower slopes are dominated by pinon/juniper woodland. Zion is home to two types of juniper, the Utah juniper (*Juniperus osteosperma*) and the Rocky Mountain juniper (*J. scopulorum*). The Rocky Mountain juniper is easily distinguished from the Utah juniper by its slender, drooping branches. Also common upon these slopes is the Gamble oak (*Quercus gambelii*), live oak (*Q. turbinella*), yucca (*Yucca angustissima* and *Y. baccata*), four-wing saltbush (*Atriplex canescens*), and even prickly pear cactus (Cactaceae family).

Canyon Walls: The canyon walls sustain life as well. Resurrection moss *Selaginella* sp., adapted to living in hot dry environments with sporadic rainfall, clings to the walls. True to its name, it is dormant during hot dry periods, with a dull, dark gray color. When it rains, the moss will open up, absorb water, turn green, and begin to photosynthesize within a short time. As it dries out, it again becomes dormant. The canyon walls are also home to peregrine falcons (*Falco peregrinus*). Peregrines nest high on the cliff walls, and return to the same sites year after year. They dive off of the walls to catch prey (other birds, often the white throated swifts), at times exceeding 200 miles per hour. Peregrines are sensitive to human encroachment during their nesting periods. While the birds are on their nests, the NPS closes those areas to rock climbers until the young are fledged. The canyon walls are also home to several different species of bats; 18 can be found in Zion National Park. In the summer months, bats can be seen starting at sunset as they begin to fly in search of insects. The easiest bat to identify is the western pipistrelle (*Pipistrellus hesperus*). This is the smallest bat found in Zion and is the first to venture out in the evening. It is generally the only bat to head out before complete darkness and therefore is the only one identifiable on the wing.

Plateau: The upland plateau surrounding Zion Canyon is home to an entirely different community. The canyon walls rise three thousand feet in places, providing for a rapid increase in elevation. When it rains in the canyons and lower elevations during the winter, snow covers the high plateau. In this community are higher elevation, sun loving plants such as the ponderosa pine (*Pinus ponderosa*), Rocky Mountain juniper (*Juniperus scopulorum*), and Douglas fir, and at the highest elevations, quaking aspen (*Populus tremuloides*). The plateau region is also the home of Rocky Mountain elk (*Cervus elaphus*).

Wildlife

Wild Turkey: *Meleagris gallopavo*. Turkey feathers have been found with Native American remains in Parunuweap Canyon. However, no historical records of Wild Turkeys exist for this area. The first lone Wild Turkey was spotted on 1964. Additional southwest Utah transplants were seen in 1968. Turkeys have been seen periodically since then becoming more prevalent in Zion Canyon since 1995. They can be seen most frequently between Court of the Patriarchs and The Grotto. They eat a variety of foods, including leaves, seeds, nuts, insects, and small invertebrates, such as lizards and snakes. In historic times their populations have decreased primarily because of habitat loss. They have been reintroduced in Utah and are hunted outside of the national parks.

Beaver: *Castor canadensis*. Along the canyon drive, you may notice a number of damaged trees, evidence of another wildlife species in the canyon. This is the work of the resident beaver population. Although beaver eat a wide variety of plant material, they often feed on the inner bark of trees. Beaver will cut down larger trees in an effort to access the thinner barked branches found in the upper reaches. Unlike our teeth, which stop growing at adolescence, rodent incisors continue to grow throughout their life to support the chewing required to meet their basic needs. Beaver in Zion seldom, if ever, use trees to build dams or lodges. As the Virgin River frequently flash floods and river levels vary dramatically, beaver have adapted to life here by burrowing into the river and stream banks for shelter. Some people call these beavers “bank beavers”, but they are the same species found throughout North America. The bank dwelling is typical of beavers that reside in and around streams that frequently flood or rivers which are too fast and deep to dam.

Coyote: *Canis latrans*. Coyotes live in the lower canyon, but are rarely seen. Like many of the mammals in Zion, coyotes are crepuscular or nocturnal creatures, coming out at dawn and dusk or throughout the night to hunt for food. You may hear them howl or bark during the late and early hours of the day. The Latin name for the coyote, *Canis latrans*, means “barking dog”. Coyotes are predators, eating rodents and other small mammals, as well as lizards, snakes, birds, insects, fruits and other plant material. They are opportunistic feeders, and can easily become habituated to humans if fed.

Mountain Lion: *Puma concolor*. Mountain lions (also called cougars, catamounts, or pumas) tend to have a large home range which includes numerous parts of Zion National Park. The cats are very protective of their territory and will defend it from other lions. Male ranges generally do not overlap with those of other males, though they may overlap with those of one or two females, helping to foster mating. Ranges tend to be large, particularly in areas such as the Southwest, where the prey base is small. The less prey there is in the home range, the larger it needs to be in order for the cougar find adequate food. There may be several mountain lions using the canyon as *part* of their home ranges *(1). Lions are stealth hunters; they hunt at dawn and dusk along the edges of clearings, where they can use vegetation as cover in order to surprise their prey. Lions generally hunt medium to large-sized prey (such as mule deer). When mountain lions hunt, they will typically strike at the neck or throat of the prey animal. The lion will gorge itself, eating as much as possible. It will then find a cool dry place to stash the remains of the kill and cover it with leaves, branches, and dirt to camouflage it. The National Park Service has found several such caches over the years in the canyon.

Mountain lions can be dangerous and they have been observed frequently in the park. An attack is unlikely—there is a far greater risk of being struck by lightning. Zion National Park has never had a reported attack on a human or pet, but mountain lions have attacked in other parts of the country. While we do not want to alarm people, we want them to be vigilant and to know what to do in case of an encounter. We recommend the following for safety:

1. Watch children closely, and never let them run ahead or lag behind.
2. Solo hiking or jogging is not recommended.
3. Never approach a mountain lion. Most will try to avoid a confrontation. Always give them a way to escape.
4. DO NOT RUN! Make yourself look large. Put your arms up or hold your backpack above your head.
5. If a mountain lion approaches, wave your arms, shout, and throw rocks or sticks at it.
6. If attacked, fight back.
7. Report any mountain lion sightings or encounters to a Park Ranger as soon as possible.

Porcupine: *Erethizon dorsatum*. Porcupines are quill-bearing rodents and are the second largest rodent species in North America. The quills are stiff, modified hairs, about 3 inches long, with barbs on the ends. Contrary to popular belief, porcupines do not throw their quills. Instead, a porcupine may drive its tail against its assailant, and dozens of easily detached quills may remain embedded in its attacker's skin. As herbivores, they eat leaves and other green plants, twigs and tree bark. Watch for these animals in the upper portions of cottonwood trees. They are nocturnal and rest by day in hollow trees and logs, or in underground burrows. The best time to see them is late in the evening or early morning.

Porcupine quills have been used in traditional American Indian arts. Artisans, particularly of eastern or Great Plains tribes, use quills to decorate clothing, tools and to weave baskets.

Mule Deer: *Odocoileus hemionus*. One of the most common large mammals you're apt to encounter in the park is the mule deer. Mule deer get their common name from their over-sized ears, which resemble those of a mule. These ears serve a valuable purpose in addition to hearing. The abundance of veins and capillaries located in the ears aid in dissipating excess heat. You are most likely to see mule deer during the early morning or evening hours, as summer daytime temperatures are usually too warm for them to be active, and low light levels at these times make them more difficult for predators to detect. Be sure to advise visitors never to feed or approach adult deer or fawns.

COMMON PLANTS IN ZION CANYON

Fremont Cottonwood (*Populus fremontii*): Most of the tall trees growing along the riverbanks are Fremont cottonwoods. Their name is derived from the cotton-like seeds produced in the spring. These seeds rely on wind as the primary means of dispersal. Cottonwoods are always found growing close to a water source because they need an incredible amount of water in order to survive. Pioneers burned the wood from the cottonwood and mixed the ashes with animal fat to produce a form of lye soap. It was an effective detergent, but very harsh and irritating. Indians later introduced them to the soap of the yucca root, which is very mild and much less harmful by comparison.

Utah Juniper (*Juniperus osteosperma*): The wood of this tree is very similar to that of the cedars (*Cedrus spp.*), but they are not closely related. Junipers are members of the Cypress Family while true cedars are found in the Pine Family. Pioneers mistook this tree for a cedar, and consequently misnamed Cedar City and Cedar Breaks National Monument. The juniper had many uses for the Native Americans and pioneers who once inhabited this area, in addition to using the very durable wood for building and firewood. The foliage of the tree was sometimes steeped in boiling water to make a tea, which was used to treat cure for tuberculosis. The small, light-blue berries are actually modified cones. These "berries" were picked and put inside of a hollowed-out gourd to make a rattle used in various ceremonies or rituals. Today juniper "berries" are used as a flavoring in gin, sauerkraut, and other foods. The bark of the juniper, which is very stringy and fibrous, was sometimes stripped off the tree and worked with the hands until it was soft and fluffy. This bark was then stuffed down between skin and clothing to act as an insulator against cold winter air, very similar to the way we use fluffy goose down to keep us warm today. The bark of the juniper is also very absorbent, so Indians and pioneers would sometimes use it as a canteen. Strips of bark were soaked until they had become saturated with water. Then, taking this along on a hot hike, they could quench their thirst by simply sucking on the bark. This very absorbent bark was also used as a baby diaper. Stuffing

wads of fluffed-up bark between the cradle boards in a baby's cradle would help absorb moisture, thus providing a very convenient and completely disposable diaper. Although it seems the bark would be itchy and uncomfortable, the oils and resins in the bark are said to have a soothing effect on the skin.

Oak trees (*Quercus sp.*): There are three species of oaks in the park: the Gambel oak (*Quercus gambelii*), which looks like a typical oak tree with tall, scaly, gray bark, and lobed leaves about 5 inches long, shrub live oak (*Quercus turbinella*), which has small bluish-green leaves very similar to those of a holly, and wavy-leaf oak (*Quercus x pauciloba*), a hybrid produced by the two other species of oak. Gambel oak has deciduous leaves; that is, the leaves fall off the tree each year. Shrub live oak, on the other hand, is an evergreen, hence the name "live" oak. Both species produce acorns which are an important source of food for many of the park's birds and mammals. Indians and pioneers who once lived in this area also depended upon the oak's acorns for nourishment. They would soak the acorns in water for several days before eating them, leaching out the very bitter tannic acid. The acorns would then be roasted, boiled, fried, ground into flour, or made into a soup. The abundant protein, vitamins and nutrients they contain made them an excellent food source.

Yucca (*Yucca sp.*): Both the Spanish bayonet or narrowleaf yucca (*Y. angustissima*) and the datil yucca (*Y. baccata*) occur in the park, but the former is more common. The yucca has one of the most interesting pollination stories of the plants at Zion. It is entirely dependent upon a small white yucca moth. In the spring and summer, when yucca moths emerge from the ground where they over-winter, they fly directly to the closest yucca plant. Deep in the large white flower of the yucca, a moth will lay its eggs in the stigma (the top of the female part of the flower). Once the eggs are laid, the yucca moth rolls some of the plant's sticky pollen into a ball and stuffs it into the stigma of the flower. This pollinates the plant and ensures the larvae will have seeds to eat. The seed pods, containing seeds and yucca moth larvae, will then drop to the ground. After up to two years in the seed pod, the larvae will burrow into the ground, spin cocoons and emerge the next spring as moths. This plant is of interest not just because of its pollination story; it was also used in a variety of ways by the native people of the southwest. The leaves are extremely strong and fibrous and can be woven after being soaked in water. They were used for making sandals and baskets. A thread and needle for sewing can also be obtained by breaking off the sharp tip of a leaf and pulling off the individual fibers. American Indians of the area showed the pioneers how to use the yucca root to create soap.

HUMAN HISTORY

Human use of the Zion National Park landscape dates back to at least 7,000 B.C. Archeologists have divided this long span of human history into four cultural periods, each characterized by distinctive technological and social adaptations that are briefly summarized here.

During the Archaic period (approximately 6000 B.C.- A.D. 500), small groups hunted game and collected wild plants, seeds, and nuts across the broad expanse of the Great Basin and western Colorado Plateau. This mobile lifeway left few traces in the archeological record, with the exception of materials recovered from dry caves and a few deeply buried sites. In these protected settings, perishable artifacts, such as baskets, cordage nets, and yucca fiber sandals, survived. The Archaic toolkits also included flaked stone knives, drills, and stemmed dart points. The dart points were hafted to wooden shafts and propelled by throwing devices, called atlatls.

By about 300 B.C., some archaic groups had begun to supplement wild foods in their diets by cultivating small patches of corn and squash along rivers and near springs. Archeologists have labeled these groups the “Basketmakers”, because of the abundance of coiled and twined baskets found in many late Archaic sites. These early experiments with horticulture reduced group mobility and increased the need for food storage. Basketmaker sites often have grass or stone-lined storage cists and shallow, partially underground dwellings, called pithouses.

Within a few centuries, small-scale gardening had intensified into the full time horticulture that typifies the Formative Period (A.D.500-1300). Two distinctive horticultural groups, the Ancestral Puebloan (formerly referred to as the Anasazi) and Parowan Fremont, appear in the archeological record of Zion National Park during this period. They established year round habitation sites (often called “pueblos, the Spanish word for “village” or “community”) with pithouses, storage cists, and later, above-ground masonry room blocks. Grinding stones (“manos and metates”) signal the importance of corn in the diets of both groups. Sedentary lifestyles encouraged the production of plain and painted ceramic vessels. These were used for storage, food preparation, and as trade goods across broad geographic areas. The new technology of the bow and arrow also gained widespread acceptance during the Formative Period. The extent to which the Ancestral Puebloan exploited wild plants and game is still unclear. Some researchers suggest that they were almost totally dependent on cultivated foods. By contrast, the Parowan Fremont may have continued to hunt and collect a broad spectrum of wild resources to supplement cultivated foods.

Ancestral Puebloan sites typically occur on river terraces along the Virgin River and its major tributaries, overlooking the fertile river bottoms where corn, squash, and other crops could be grown. There is evidence that hunting and collecting parties made forays to nearby upland areas, like the Kolob Plateau. Parowan Fremont sites are found along stream courses and near springs. They cultivated a drought and cold tolerant variety of corn (called Fremont Dent) that could be successfully grown at higher elevations. The Ancestral Puebloan and Parowan Fremont appear to have interacted along cultural contact zones, such as the Kolob Plateau, during the last years of the Formative period.

Both the Ancestral Puebloan and the Parowan Fremont disappear from the archeological record of southwestern Utah by about A.D. 1300. Extended droughts in the 11th and 12th centuries, interspersed with catastrophic flooding, may have made horticulture impossible in this arid region. Some researchers have suggested that the sedentary horticultural groups could not successfully compete for wild resources with the more mobile Numic language speakers (such as the Southern Paiute and Ute) who were in the region by at least A.D. 1100.

The time span between A.D. 1300 and the late 1700s has been described as the “Neo-Archaic” by some researchers, since the lifeways were reminiscent of the earlier adaptation. The Numic language speakers were the only occupants of the Zion landscape. They depended on a wide array of wild plants and animals, moving seasonally to hunt game or collect ripe seeds and nuts. This mobile lifestyle was reflected in their material possessions, which consisted of baskets, nets, and snares, as well as bows and arrows. Some, particularly the Southern Paiute, also planted fields of corn, sunflowers, and squash to supplement their collected wild foods. These more sedentary groups made brownware vessels that were for storage and cooking.

The Historic period begins in the late 1700s, with the exploration and settlement of southern Utah by Euro-Americans. Initial explorations by traders from New Mexico blazed the Old Spanish Trail, which followed the Virgin River for a portion of its length. During the next century, American fur trappers and government surveyors added new overland travel routes

across the region. In 1872, John Wesley Powell explored the areas around Zion Canyon, as part of western surveys conducted by the U.S. Geological Survey. The early pack trails soon became well-used wagon roads, connecting Santa Fe to the California markets.

In 1847, Brigham Young led members of the Church of Jesus Christ of Latter Day Saints (Mormons) to Utah Territory, establishing settlements in the Great Salt Lake Valley. Within a decade, Mormon pioneers were sent to settle the southern part of the territory and grow cotton in Utah's "Dixie". Towns like Shunesberg, Springdale, Grafton, Adventure, and Paradise sprang up along the upper Virgin River during the 1860s.

In the fall of 1858, the first non-native explorer came into Zion Canyon. He was a young Mormon missionary named Nephi Johnson, called by Brigham Young to explore the Virgin River farther upstream and hunt for suitable places for settlement. It is not known how far Johnson went up the canyon, but later, recalling his experience, he said there were places where the "sun never shone" because the walls were so high and the canyon so narrow.

Three years later, in the fall of 1861, Isaac Behunin came to the Zion area. He settled at the confluence of the North and East Forks of the Virgin River until a flood in January of 1862 drove him further upstream to Springdale. In addition to building a home and farming in Springdale, he visited Zion Canyon in the summer of 1863 and started operations there by building a one-room cabin not far from there Zion Lodge now stands.

Within a few years, other settlers found their way into the canyon. William Heap began farming across the river from the Behunins at the mouth of Emerald Pools (now Heap's) Canyon, and built a log cabin on the west bank of the river north of the Emerald Pools stream. John Rolf built two cabins above the Behunins.

It was about this time that the canyon received its name. The Mormon settlers were devout and religious. It seems to have been Isaac Behunin who proposed the name of Zion, with which others agreed. Behunin had been with the Mormons since they left New York. He had been through all the "driving of the Saints" in Missouri and Illinois, and he was looking for a place of peace. Here in Zion, he felt that at last he had reached a place of safety where there would be no more harassment and abuse. He proposed to name the canyon "Zion," a Hebrew word meaning "place of peace."

During the remainder of the century, the small communities and homesteads struggled to survive. Catastrophic flooding by the river, little arable land, and poor soils made agriculture in the upper Virgin River a risky venture. Some of these settlements, including Shunesberg and Grafton, were ultimately abandoned for more favorable locations.

At the same time, the Southern Paiutes, members of the Kaibab Band, also occupied this area. They were semi-nomadic and lived in the Zion area only part of the year. Seeds were their most important food, although the men skillfully hunted deer, rabbit, bighorn sheep and other animals. The broad desert valleys of this area were once rich with perennial grasses and flowering plants that early explorers described as "brushing up against the horses' bellies." The seeds of these plants were gathered all summer and into the fall, when the Paiutes would congregate in the mountains to harvest pine nuts and hunt deer. When food supplies dwindled by late winter or early spring, the Paiutes were prepared to move south where winters were less severe, and cactus and agave could be found and eaten.

They had only as many possessions as could be easily carried and they wore little clothing in this hot, dry region. The Paiutes are famous for the hunting nets they wove, for their well-made baskets and for the warm robes they wove from strips of rabbit pelts. Each robe would be constructed of as many as 150 to 200 rabbit skins.

With the coming of the settlers, the Paiute land and culture were drastically changed. They could not compete with the new people and their new ways, and within a single generation the grassy valleys, abundant game and the old nomadic life were gone.

By the first decade of the 20th century, the scenic qualities of southern Utah, and Zion Canyon in particular, had been recognized as a potential destination for tourism. In 1909, a presidential Executive Order designated Mukuntuweap National Monument, in Zion Canyon. The new monument was, however, virtually inaccessible to visitors, since the existing roads were in poor condition and the closest railhead a hundred miles away. The Utah State Road Commission, established in that year, began construction on a state highway system that would eventually improve access to the southern region. State officials also negotiated with the Union Pacific Railroad to develop rail and automobile links and tourism facilities in southern Utah. By the summer of 1917, touring cars could finally reach Wylie Camp, a tent camping resort that comprised the first visitor lodging in Zion Canyon. Mukuntuweap National Monument was renamed as Zion National Monument in 1918.

In 1919, a Congressional bill designating Zion National Park was signed into law. Visitation to the new national park increased steadily during the 1920s, particularly after the Union Pacific extended a spur rail line to Cedar City. The Utah Parks Company, a subsidiary of the Union Pacific, acquired the Wylie Camp in Zion, and offered ten day rail/bus tours to Zion, Bryce, Cedar Breaks, Kaibab, and the North Rim of the Grand Canyon. Construction on the Zion Lodge complex, designed in "Rustic Style" by architect Gilbert Stanley Underwood, began in the mid-1920s. In 1930, the newly completed Zion-Mt Carmel highway allowed motorists to travel through Zion to Bryce and points east. This highway was one of the greatest engineering feats of modern times, requiring the construction of a 5,613-foot tunnel to negotiate the vertical sandstone cliffs of Zion.

Visitor numbers at Zion National Park have continued to increase over time, necessitating the construction of trails, campgrounds, and other facilities. The economic benefits of tourism now support the small communities surrounding the park, ensuring their survival into a new millennium of human history.

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