DOWNLOAD PDF UNLIKELY NEIGHBORS AT RED CANYON: SEVIER FAULT

Chapter 1 : Bryce Canyon Landforms, What Type of Rock is Bryce Canyon | Travelwest

Geology Underfoot in Southern Utah Sevier Lake 6. Folded Rocks Unlikely Neighbors at Red Canyon: Sevier Fault

Why has this particular region so many great alcoves, lofty mesas, plateaus, and vertical cliffs? In brief the answer is: At a time long past, estimated at 13,, years ago, all of southern Utah and adjoining regions began to rise and continued its upward movement slowly and intermittently until the lands once near sea level attained altitudes exceeding 10, feet. During this great uplift that brought the former low-lying plains of the Bryce Canyon region to a position nearly two miles above sea level, the beds of rock were broken into earth blocks many miles in length and width. It is separated from its neighbors, Aquarius Plateau on the east and Markagunt Plateau on the west, by great cracks faults that extend scores of miles and along which the rocks on one side have been raised or on the other side lowered a few hundred to more than 2, feet. In consequence of this faulting, the plateau is bordered by cliffs of commanding height which, though originally straight lines or broad curves, have through the lapse of millions of years lost their simple structure. In place of an original simple escarpment directly determined by a fault, the boundary walls of Paunsaugunt Plateau stand some distance back of the fault line and are sinuous and crenulated to a remarkable degree. The western border of the Paunsaugunt block is the great earth fracture known as the Sevier fault that crosses the Panguitch-Bryce highway at the mouth of Red Canyon and extends southward through Alton, Glendale, Mt. Carmel, and on into Arizona. The original wall initiated by this fault remains as the Sunset Cliffs, now broken into sections by canyons and much decreased in height by the removal of rocks at their tops. The cliff that long ago marked the eastern border of the Paunsaugunt Plateau as a wall that rose some 2, feet above its surface has been almost entirely destroyed. A remnant stands at Table Cliffs, the southern salient of Aquarius Plateau, but southeastward along its ancient trend nothing remains of its former grandeur. In the rugged landscape along the southern border of the park the position of the Paunsaugunt fault is shown only by a break in the continuity of the strata; beds of sandstone abut against beds of limestone or of shale. The effect of faulting is clearly revealed at view-points on the eastern rim of the plateau. Thus at Sunset Point, the bed of rock on which the observer stands 8, feet above sea level on the western side of the fault is the same bed that forms the cap of Table Cliffs at 10, feet on the east side of the fault. View from Inspiration Point towards Sunset Point. Typical erosion in the Wasatch Pink Cliffs formation. Note in order the plateau, rim, pinnacles, and spires. Photo by Zion Picture Shop The uplift of the ancient lowlands of southern Utah and breaking them into blocks is the first great event in the making of the plateau landscape. The second event is the erosion of the blocks into their present scenic forms. This regional uplift introduced a long period of time during which the conditions have been favorable for erosion. On the original lowlands before it was broken into blocks, streams did little work. They flowed in broad shallow valleys of gentle gradient like those along the road from Red Canyon to the park headquarters. In consequence of the uplift which steepened their paths, the streams became powerful agents of erosion. Their accelerated speed permitted them to cut trenches in solid rock, and as the land rose progressively higher, to develop their trenches into the present profound canyons and to reduce the inter-stream lands to mesas and long flat-topped ridges. Though the plateau blocks were raised, their tops remained comparatively level. The Sevier River on top of the plateau has for long stretches a gradient of less than 15 feet a mile and has cut its bed but slightly. In contrast, the tributaries to the Paria after thousands of years of activity descend 1, to 1, feet a mile, and have cut deeply into the south and east faces of the Paunsaugunt Plateau and at present the erosion by Bryce Creek, Yellow Creek, Willis Creek, Riggs Creek, and many similarly placed streams are taking into their drainage areas channels that formerly carried waters northward to Sevier River. It is the product of erosion, the commonplace term which here seems to have a new meaning. As erosion has been continuous ever since the plateau lands were raised above sea level, the present erosion forms merely mark the present stage of a long train of geologic events. Formerly the layers of limestone that make the Pink Cliffs at Bryce Canyon extended eastward farther than the eye can reach, and a

thousand cubic miles of rock have been worn away in forming the lower lands, and still the region is geologically young. Though the work accomplished by the Paria and its tributaries is enormous, these streams have not completed their ultimate task of wearing down the Paunsaugunt Plateau to near sea level. The bed of the streams might be sunk 1, feet deeper and still have slopes sufficient to carry silt-laden water. They have been at work only for the few million years that make up the last chapter in a billion years of geologic history. In rock erosion, as in carving by human hands, time is a factor in producing forms. Progressively on the untrimmed block, new grooves and chipped surfaces appear. But unlike the human sculptor who finally completes his work, erosion though at times rapid and at other times slow knows no stopping place. In unnoticed ways, it daily modifies the form of canyons and cliffs and, continuing its task, rearranged the elements of a landscape until their individuality is lost. The resulting new landscape likewise eventually gives place to another. In the Bryce Canyon region the ancient landscapes bear little resemblance to the present surface forms, and future landscapes are likely to differ even more widely.

Chapter 2 : Bryce Canyon National Park, Utah. Hikes, Travels, & Tours. Pictures, Photos, Images, & Revie

16 UNLIKELY NEIGHBORS AT RED CANYON: Sevier Fault 17 A FAIRYLAND OF COLOR AND FORM: Bryce Canyon National Park 18 NATURE'S PALETTE: Escalante State Park and the Petrified Forest.

Since yesterday was a day off, waking up early this morning was bound to be difficult. But Ben, somehow, always manages to stay upbeat and full of pep. And this morning, in particular, he was beaming: This value, measured in mega-pascals one of which is equal to 10 bars or Poke some lichen on the surface, and the value will be too low. Poke at an angle slightly off perpendicular, and your value will be too low. Thus, many of your values will be too low. So, to be most accurate, you take the highest reading as the "closest-to-true" value. Of course, you still have to record all of the other values, you know, for posterity. Preparing to collect samples And so, as we scrambled about, poking rocks with our expensive scientific poking poker, our morning grogginess wore off, and we were able to enjoy the day. By the time Ben was done, we had finished poking rocks and collecting hand samples, so it turned out to be a day of immense fun and perfect timing, despite the rough start. Well, to tell you the truth, we took a day off to look at more rocks. What can I say? So, on our day off, we took a drive to Zion National Park. These angular striations, which we call cross-beds, are solidified evidence of ancient sand dunes. During the Jurassic around million years ago , the entire region was teaming with huge, roaming and sometimes vicious sand dunes. Therefore, Zion was the perfect place for a group of geologists to vacation. We expected to see some rocks, and we were not disappointed. There, behind what we estimated to be about twenty to thirty million people, we stood in line, waiting for a shuttle bus that would take us to a trail called The Narrows. Then, as if following some unheard call, pulses of people would pour down the trail and into The Narrows, which was geologically spectacular National Geographic all the way , but as busy and bustling as a shopping mall in downtown LA. Although there was no solitude to be found within a hundred-mile radius, there turned out to be a benefit to hiking with all those people: Take Curtis for example. Though a useful member of our geologic party, Curtis is a bit eccentric, possibly bordering on weird. But, due to the numerous personality types present within the national park, Curtis was statistically bound to make friends. And sure enough, he did. Do you speak Chinese? But, the rest of us were lost. We listened to their unintelligible conversation for about fifteen minutes, before context clues began to hint at what they were saying. The Chinese travelers seemed to understand, because they each pulled out their phones and started typing. He was sharing his email with them! He had managed, in the span of about fifteen minutes, to make about ten new friends! When all was said and done, on the car ride out of the park and back to camp, curiosity got the best of us. There was a brief pause before he answered: First traveling, then geology, then China, and ultimately the meaning of life and love. I mean, how can you connect with so many people on such a wide variety of subjects?

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Chapter 3 : Book: "Geology Underfoot in Southern Utah"

The Sevier Fault is actually one of many faults that make up the Sevier Fault Zone. This is a series of faults that extend from southern Utah to the Grand Canyon. This fault that you see on the hillside juxtaposes the red Claron Formation that makes up Red Canyon and Bryce Canyon against black basalt.

Com , No obligation! Bryce Canyon National Park, Utah. Bryce Canyon National Park, Utah: We wish to thank Wikipedia, the free encyclopedia for some of the information on this page. We share information with Wikipedia. The major feature of the park is Bryce Canyon, which despite its name, is not a canyon, but a collection of giant natural amphitheaters along the eastern side of the Paunsaugunt Plateau. Bryce is distinctive due to geological structures called hoodoos, formed by frost weathering and stream erosion of the river and lake bed sedimentary rocks. The red, orange, and white colors of the rocks provide spectacular views for park visitors. Bryce sits at a much higher elevation than nearby Zion National Park. The rim at Bryce varies from 8, to 9, feet 2, to 2, m. The Bryce Canyon area was settled by Mormon pioneers in the s and was named after Ebenezer Bryce, who homesteaded in the area in The park covers 35, acres Bryce Canyon National Park is located in southwestern Utah about 50 miles 80 km northeast of and 1, feet m higher than Zion National Park. The national park lies within the Colorado Plateau geographic province of North America and straddles the southeastern edge of the Paunsaugunt Plateau west of the Paunsaugunt Fault Paunsaugunt is Paiute for "home of the beaver". The edge of the Kaiparowits Plateau bounds the opposite side of the valley. Bryce Canyon was not formed from erosion initiated from a central stream, meaning it technically is not a canyon. Instead headward erosion has excavated large amphitheater-shaped features in the Cenozoic-aged rocks of the Paunsaugunt Plateau. This erosion exposed delicate and colorful pinnacles called hoodoos that are up to feet 60 m high. A series of amphitheaters extends more than 20 miles 30 km north-to-south within the park. The largest is Bryce Amphitheater, which is 12 miles 19 km long, 3 miles 5 km wide and feet m deep. A nearby example of amphitheaters with hoodoos in the same formation but at a higher elevation, is in Cedar Breaks National Monument, which is 25 miles 40 km to the west on the Markagunt Plateau. Rainbow Point, the highest part of the park at 9, feet 2, m , is at the end of the mile 29 km scenic drive. Yellow Creek, where it exits the park in the north-east section, is the lowest part of the park at 6, feet 2, m. Little is known about early human habitation in the Bryce Canyon area. Archaeological surveys of Bryce Canyon National Park and the Paunsaugunt Plateau show that people have been in the area for at least 10, years. Basketmaker Anasazi artifacts several thousand years old have been found south of the park. Other artifacts from the Pueblo-period Anasazi and the Fremont culture up to the midth century have also been found. The Paiute Indians moved into the surrounding valleys and plateaus in the area around the same time that the other cultures left. These Native Americans hunted and gathered for most of their food, but also supplemented their diet with some cultivated products. The Paiute in the area developed a mythology surrounding the hoodoos pinnacles in Bryce Canyon. They believed that hoodoos were the Legend People whom the trickster Coyote turned to stone. At least one older Paiute said his culture called the hoodoos Anka-ku-was-a-wits, which is Paiute for "red painted faces". Mormon scouts visited the area in the s to gauge its potential for agricultural development, use for grazing, and settlement. Small groups of Mormon pioneers followed and attempted to settle east of Bryce Canyon along the Paria River. In , the Kanarra Cattle Company started to use the area for cattle grazing. The Church of Jesus Christ of Latter-day Saints sent Scottish immigrant Ebenezer Bryce and his wife Mary to settle land in the Paria Valley because they thought his carpentry skills would be useful in the area. The Bryce family chose to live right below Bryce Canyon Amphitheater. Bryce grazed his cattle inside what are now park borders, and reputedly thought that the amphitheaters were a "helluva place to lose a cow. The beauty of Bryce Canyon National Park is caused by the erosion of it sedimentary rocks which has created its natural arches. A technical description from Wikipedia of this erosion is as follows. The Bryce Canyon area shows a record of deposition that spans from the last part of the Cretaceous period and the first half of the Cenozoic era. The ancient

depositional environment of the region around what is now the park varied. The Dakota Sandstone and the Tropic Shale were deposited in the warm, shallow waters of the advancing and retreating Cretaceous Seaway outcrops of these rocks are found just outside of the park borders. Different sediment types were laid down as the lakes deepened and became shallow and as the shoreline and river deltas migrated. Several other formations were also created but were mostly eroded away following two major periods of uplift. The Laramide orogeny affected the entire western part of what would become North America starting about 70 million to 50 million years ago. This event helped to build the Rocky Mountains and in the process closed the Cretaceous Seaway. The Straight Cliffs, Wahweap, and Kaiparowits formations were victims of this uplift. The Colorado Plateaus were uplifted 16 million years ago and were segmented into different plateaus, each separated from its neighbors by faults and each having its own uplift rate. This uplift created vertical joints, which over time were preferentially eroded. The easily eroded Pink Cliffs of the Claron Formation responded by forming freestanding pinnacles in badlands called hoodoos, while the more resistant White Cliffs formed monoliths. The brown, pink and red colors are from hematite iron III oxide Fe O ; the yellows from limonite consisting of a mixture of hydrated iron III oxide-hydroxides in varying composition. Also created were arches, natural bridges, walls, and windows. Hoodoos are composed of soft sedimentary rock and are topped by a piece of harder, less easily eroded stone that protects the column from the elements. Bryce Canyon has one of the highest concentrations of hoodoos of any place on Earth. The formations exposed in the area of the park are part of a large geographic formation called "the Grand Staircase. A small amount of overlap occurs in and around each park. There are more than native plant species that live in the park. There are three life zones in the park based on elevation: The lowest areas of the park are dominated by dwarf forests of pinyon pine and juniper with manzanita, serviceberry, and antelope bitterbrush in between. Ponderosa pine forests cover the mid-elevations with blue spruce and Douglas fir in water-rich areas and manzanita and bitterbrush as underbrush. Douglas fir and white fir, along with aspen and Engelmann spruce, make up the forests on the Paunsaugunt Plateau. The harshest areas have limber pine and ancient Great Basin bristlecone pine, some more than 1, years old. The forests and meadows of Bryce Canyon provide the habitat to support diverse animal life, from birds and small mammals to foxes and occasional bobcats, cougars, and black bears. Mule deer are the most common large mammals in the park. Elk and pronghorn, which have been reintroduced nearby, sometimes venture into the park. The park has two trails designated for overnight hiking: Both require a backcountry camping permit. In total there are 50 miles 80 km of trails in the park. Snowshoes are required in the winter. Most park visitors sightsee by using the scenic drive, which provides access to 13 viewpoints over the amphitheaters. Bryce Canyon has eight marked and maintained hiking trails that can be hiked in less than a day round trip time, trailhead: Several of these trails intersect, allowing hikers to combine routes for more challenging hikes. That way you will have the best sun lighting for taking your photos. We noticed that many other visitors were using the same plan! Including two profesional photographers.

Chapter 4 : Colorado Geology Overview

Note: Citations are based on reference standards. However, formatting rules can vary widely between applications and fields of interest or study. The specific requirements or preferences of your reviewing publisher, classroom teacher, institution or organization should be applied.

Wieder, and David G. Bibliographic record and links to related information available from the Library of Congress catalog. Contents data are machine generated based on pre-publication provided by the publisher. Contents may have variations from the printed book or be incomplete or contain other coding. Reading a Lava Landscape: Snow Canyon State Park 2. When Water Cleaves Rock: Frisco and the Horn Silver Mine 5. A Desiccated Remnant of Lake Bonneville: In the Heart of the Transition Zone: An Ancient Desert Sleeps: The Navajo Sandstone 9. Weeping Rock, Zion National Park The Springdale Landslide Castle Rock Campground A Record of Explosive Eruptions: Fremont Indian State Park Obsidian at Fremont Indian State Park Fish Lake Valley Unlikely Neighbors at Red Canyon: A Fairyland of Color and Form: Bryce Canyon National Park Escalante State Park and the Petrified Forest Someone Pass the Tabasco and a Cold Beer!: An Oyster Reef in the Desert A Weathered Army on the March: Temple Mountain Uranium Mines Slithering through a Slot Canyon: The San Rafael Reef Uplift and Erosion on the Colorado Plateau: Goosenecks of the San Juan River Mesas, Buttes, and Spires: Valley of the Gods Natural Bridges National Monument A Sea of Fins: The Fiery Furnace Weathering the Tests of Time: Arches National Park and the Entrada Sandstone In the Footsteps of Giants: Copper Ridge Dinosaur Tracks Intruders in a Sedimentary Domain: Round Mountain and the La Sal Laccoliths Permafrost and Flowing Earth:

Chapter 5 : Portal:Utah/Selected article - Wikipedia

Unlikely Neighbors at Red Canyon: Sevier Fault A Fairyland of Color and Form: Bryce Canyon National Park Nature's Palette: Escalante State Park and the Petrified Forest

No where else in the world can one find a concentration of pinnacles with odd shapes like those found in Bryce Canyon. Each park attracts visitors for different reasons. Gravity defying arches of Arches National Park form in resistant sandstone by frost wedging and water erosion in fractures. Continuous down cutting by the Colorado River forms deep incised meanders in sandstone layers at Canyonlands National Park. Bridges form in sandstone by river action eroding into fins at Natural Bridges National Monument. Capitol Reef National Park was formed by water erosion that exposed vibrant rock layers folded into a monocline by an ancient fault. All the parks mentioned contain massive structures, which tower over awed spectators. It seems inconceivable that anything other than the strong erosive force of water could have carved and exposed these immense landforms. These are commonly known as Hoodoos. The mystical shapes inspire imagination and intrigue. It appears impossible that the destructive forces of water carved these fragile landforms. Instead many believe the hoodoos of Bryce Canyon were formed by wind. This is a mistaken idea. Wind is an effective form of erosion for many locations. However, for Bryce Canyon wind has little effect on the creation and destruction of the various shapes. Hoodoos formed over thousands of years by the same processes that form the features of surrounding parks. Water, ice at varying intervals and gravity are the forces that form Bryce Canyon. These three erosive forces coupled with the differential erosion of the four rock types of the Claron Formation produced a different morphology than that of other parks. Breaks called joints formed in the plateau during the uplift. Joints allowed water to flow into the rock. As water flowed through joints erosion widened them into rivulets and gullies. Over time, deep slot canyons formed in the sides of the plateau. Bryce Canyon receives an average rainfall of 10 inches a year in the valley and approximately 19 inches a year on the plateau. Majority of the precipitation falls in mid to late summer. It comes in the form of monsoons, usually in the afternoon. These thunderstorms can be fierce, dropping an inch or two of rain in under an hour. Hail storms often accompany heavy rains in the region. Most of the rainfall is not absorb by the thin layer of soil covering the rocks. Because soils at Bryce Canyon are very dry, much of the water runs off the surface. Only the top inch, or so,of soil absorbs rainfall before it starts to run off. When this happens at Bryce Canyon flash floods are the result. At Bryce Canyon water in the form of ice is the most efficient form of erosion for breaking rock into smaller pieces. The Paunsaugunt Plateau receives approximately inches of snowfall a year. Which means that everyday a small amount of snow melts and runs into the joints and freezes at night. When water freezes it expands to form an ice wedge in the joint widening the space. As the ice wedge grows by more water leaking into the joint and freezing it will finally break the rock. This is called frost wedging. Small pebbles and large Volkswagen bus sized boulders commonly fall from the sides of existing hoodoos and the sides of the Paunsaugunt Plateau by frost wedging and gravity. The smaller pieces are washed away by the monsoons and snow melt. Boulders explode into cobble sized pieces when they impact the ground. The resulting debris is washed down slope by snowmelt, flashfloods and gravity. Rock type is another factor in the creation of the bizarre shapes of hoodoos. The hoodoos at Bryce Canyon are carved in the Claron Formation. Limestone, siltstone,dolomite and mudstonemake up the four different rock types that form the Claron Formation. Each rock type erodes at different rates. Dolomite, limestone and siltstone are very hard and form the protective caprock on most of the spires. Frost wedging is the erosional force that breaks apart the harder rocks. Mudstone is the softest rock in a hoodoo and is easily identified because it forms the narrowest portion of the pinnacles. As mudstone moistens it erodes easily and will run down the sides forming a stucco or protective coating. Every time it rains the stucco is renewed. Eolian or wind forces erode at slow rates. If wind does not erode the stucco layer fast enough it will renew before eolian erosion affects the rock. For this reason wind has little to no affect on hoodoo formation or destruction. Another sign that wind is not responsible for

hoodoo formation is the absence of a dominant wind direction pattern carved into the plateau. If eolian forces were responsible for erosion in the area hoodoos would erode parallel with the prevailing wind direction. At Bryce Canyon National Park hoodoos do not align with the prevailing air currents. Hoodoos protrude from the sides of the plateau in lines that follow joint patterns caused by faults that uplifted the area. Some of the walls and fins meet at almost a degree angle. Wind erosion would not form patterns like this. Below is a photo showing fins in a linear patterns extending from the plateau. After a heavy rain, soil in the region dries out and forms a hard crust. Wind erosion requires loose particles to be transported with in the air column and impacted into a surface for erosion to take place. The particles need to be free and not attached to a crust. Because of the crust there is not a large supply of loose particles to be used for wind erosion in the area. Vegetation also keeps loose grains in place by their roots and by slowing the gusts of wind as it blows through the branches. Erosional scours paralleling the hillslopes are carved on the slot canyon walls. They are common in many places within the park. As hikers descend into Wall Street on the Navajo Loop a close inspectionof the canyon walls will show diagonal erosive marks cutting through horizontal bedding planes. The photos show show horizontal bedding planes and the diagnol scour marks. These scour marks show the erosion point of historical hillslopes. If wind erosion were responsible for the formation of walls, fins and hoodoos the old scour marks would have been eroded away along with the hillslope. Hoodoo surfaces would be smoother and more round if wind erosion were responsible for their creation. Angular pinnacles, stuccoed sides, boxy erosional patterns and scour marks are some of the more obvious tells of water erosion. While visiting Bryce Canyon National Park look for signs of wind and water erosion. It is suprizing how visible the numerous signs of water erosion are, when you know what to look for. Ancient Sedimentation Our dynamic planet is constantly being shaped and reshaped by dramatic events such as earthquakes, volcanoes, and mudslides. Other changes may not be detected in a human lifetime. Geological timespans or Periods cover millions of years. The Cretaceous Period began some million years ago and lasted until about 63 million years ago. The rock formations you see exposed at Bryce Canyon began to develop during this time. For 60 million years a great seaway extended northwestward into this area, depositing sediments of varying thickness and composition as it repeatedly invaded, retreated, then re-invaded the region. Retreating to the southeast, it left sediments thousands of feet thick. Their remnants form the oldest, lowest, gray-brown rocks at Bryce Canyon. In the Tertiary Period, between 66 and 40 million years ago, highlands to the west eroded into shallow, broad basins. Iron-rich, limy sediments were deposited in the beds of a series of lakes and streams. These became the reddish rocks of the Claron Formation from which the hoodoos are carved and for which the Pink Cliffs are named. Deformation, Uplift, and the Grand Staircase Horizontal compression related to the formation of the Rocky Mountains deformed these rocks. Then volcanic flows from the north covered parts of the region: About 10 million years ago the Earth pulled apart, moving and tilting great blocks along north-south trending fault lines. Layers, once connected, were displaced vertically by several thousand feet, forming the High Plateaus of Utah. Older Cretaceous layers rested side by side with younger Tertiary layers across fault lines. Streams began to remove sediments deposited by their ancestors. Working on the weakened edges of the upthrown blocks, water gradually removed the uppermost Tertiary layers and exposed Cretaceous rocks once again. Now these drab former marine sediments lay on the surface of the land side by side with the brightly colored deposits of freshwater lakes and streams. Differential Erosion Water erodes rock mechanically and chemically. Scouring, abrading, and gullying occur when fast-moving water scrapes its silt, gravel, and rock debris against firmer bedrock. Slow-moving or standing water enters minute rock pores and dissolves cements holding the rock together. This leaves loose grains to wash away. Softer Cretaceous rocks were loosened and carried away from the upthrown block by the Paria River.

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Chapter 6 : Table of contents for Geology underfoot in southern Utah

The mile Sevier Fault Zone stretches through southern Utah, passes beneath the Grand Canyon in Arizona and ends just south of the Grand Canyon. About 67 miles of it are in Utah; the UGS study.

March 12, All scientists know for sure is that the Sevier Fault Zone, which is beneath Panguitch, is more active than suspected earlier. It is capable of unleashing a temblor of magnitude 6. Lund, a senior scientist with the Utah Geological Survey. About 67 miles of it are in Utah; the UGS study focused on this part. To date earthquakes along the infamous Wasatch Fault that runs through Salt Lake City, geologists look for scarps, "places where the ground has been displaced in recent geological time," Lund said in a telephone interview. They can cut trenches across scarps and search for organic material buried in earlier earthquakes, then date the debris through radiocarbon techniques. Another way had to be found to date ground movements. They were about 25 miles apart. They showed how far the ground had moved since the volcanoes erupted. When the lava flows were checked through argon dating techniques, they were found to be to about 5. The last in this area, said Lund, was about 1, or 1, years ago. At the part of the Sevier Fault studied, the interval between big earthquakes of magnitudes 6. Is an earthquake overdue? But they know that it does slip, so the zone is considered active. Each magnitude is 10 times as powerful as the previous number, so an earthquake of 7. The recent Wells, Nev. Because the fault is west-dipping, that means it extends to beneath the Garfield County town. That could put the epicenter of an earthquake on the Sevier Fault below it or a few miles away. George would know it, Kanab would know it, Richfield would know it" by the jolts residents would feel. But Panguitch is the closest town, "which implies that the ground-shaking there would be greatest. Panguitch has a lot of risk because they have a lot of URMs, unreinforced masonry buildings. Pressure could be building for a good-sized shake.

Chapter 7 : Geology Underfoot in Southern Utah

Cliffs at the mouth of Red Canyon on Panquitch-Tropic road. Sevier fault separates basalt (left) and top from Wasatch limestone (right). Garfield County, Utah

Good Compiled at 1: Location of fault from 1;,scale mapping of Anderson and Christenson Fault also documented by Cashion , Carpenter and others , Anderson and Miller Displacement on the fault generally increases from south to north. At the southern end, displacement is generally low and similar to that of the northern part of the Aubrey fault zone [], with which it merges. As much as m of Cenozoic normal displacement has occurred across the fault zone near the Grand Canyon. Total normal displacement decreases to less than m on the Kanab Plateau north of Toroweap Valley, but then dramatically increases to nearly m north of the Utah-Arizona stateline. On the basis of three-point solutions and projections to the fault, Anderson and Christenson estimated m of throw at the Coral Pink Sand dunes, north of the Utah-Arizona stateline. Anderson indicate about m of throw on the basement at Red Canyon east of Panguitch, Utah. Length km This section is 89 km of a total fault length of km. Striations with a southerly component of rake indicate that the southern part of the fault in Utah has left-lateral oblique slip. Dip Direction Paleoseismology studies Geomorphic expression The fault strikes north-northeast and consists of numerous right- and left stepping generally echelon faults on which rocks are typically downthrown to the west-northwest Hintze, The escarpment on the upthrown block of the fault is on bedrock, and along much of its length, bedrock is also exposed in the downthrown block. Spectacular bedrock scarps in the Orderville-Glendale area are largely the result of erosion of the relatively weak Cretaceous rocks that are downfaulted against the resistant Navajo Sandstone Cashion, Southeast of Panguitch, m Anderson and others, of offset in the ka Best and others, Red Canyon volcanic flow suggests faulting during late Pleistocene time. Quaternary basalts at Black Mountain, northeast of Glendale, are possibly faulted up to 23 m Cashion, , but the amount of displacement is difficult to determine due to uncertainties in distinguishing scarps related to landslides, pre-flow topography, and faults. Near Alton, differential erosion of indurated Quaternary deposits and relatively weak Cretaceous rocks formed a southeast-facing fault scarp. An unfilled sediment trap formed against a small Age of faulted surficial deposits Quaternary Most recent prehistoric deformation late Quaternary Comments: The time of the most recent movement is based on characteristics such as range-front steepness and linearity along the fault suggest recent movement; although locally these are likely fault-line characteristics resulting from juxtaposition of resistant and nonresistant rocks. Southeast of Panguitch, m of offset in the ka Red Canyon volcanic flow suggests faulting during late Pleistocene time. Recurrence interval Slip-rate category Less than 0. Lund and others suggest late Quaternary vertical displacement rates are low in contrast to prior results. The only offset Quaternary deposits are at Red Canyon southeast of Panguitch where ka basalts Best and others are offset m Anderson and others, Anderson and Christenson infer most of the m displacement to be distributed throughout the middle and late Pleistocene; thus, resulting in a geologic slip rate that is within the above stated bounds. Date and Compiler s Bill D. Geological Survey References Anderson, L. Long Beach, California, Fugro, Inc, 35 p. American Journal of Science, v. Geological Survey Water-Supply Paper , 91 p. Utah Geological and Mineral Survey Bulletin , p. Utah Geological Survey Bulletin , p. Utah Geological and Mineral Survey Map, scale 1: Utah Geological Survey Special Study , 31 p.

Chapter 8 : Utah History - MRS. GROENDYKE

North of Red Canyon, the main branch of the fault trends into the volcanic bedrock of the Sevier Plateau and dies out (Doelling, #; Hintze, #). Age of faulted surficial deposits.

Basketmaker Anasazi artifacts several thousand years old have been found south of the park. Other artifacts from the Pueblo -period Anasazi and the Fremont culture up to the midth century have also been found. The Paiute in the area developed a mythology surrounding the hoodoos pinnacles in Bryce Canyon. They believed that hoodoos were the Legend People whom the trickster Coyote turned to stone. It was not until the late 18th and the early 19th century that the first European Americans explored the remote and hard-to-reach area. Army Major John Wesley Powell in His mapmakers kept many of the Paiute place names. In , the Kanarra Cattle Company started to use the area for cattle grazing. The Bryce family chose to live right below Bryce Amphitheaterâ€”the main collection of hoodoos in the park. Bryce grazed his cattle inside what are now park borders, and reputedly thought that the amphitheaters were a "helluva place to lose a cow. A combination of drought , overgrazing and flooding eventually drove the remaining Paiutes from the area and prompted the settlers to attempt construction of a water diversion channel from the Sevier River drainage. When that effort failed, most of the settlers, including the Bryce family, left the area. These scenic areas were first described for the public in magazine articles published by Union Pacific and Santa Fe railroads in Ruby Syrett, Harold Bowman and the Perry brothers later built modest lodging, and set up "touring services" in the area. Visitation steadily increased, and by the early s the Union Pacific Railroad became interested in expanding rail service into southwestern Utah to accommodate more tourists. A movement to have the area protected was soon started, and National Park Service Director Stephen Mather responded by proposing that Bryce Canyon be made into a state park. The governor of Utah and the Utah State Legislature , however, lobbied for national protection of the area. Mather relented and sent his recommendation to President Warren G. Harding , who on June 8, declared Bryce Canyon a national monument. From to , Bryce Canyon Lodge was built from local timber and stone. Pacific Fleet from September 15, , to June 30, A portion of the profits from all bookstore sales are donated to public land units. Responding to increased visitation and traffic congestion , the National Park Service implemented a voluntary, summer-only, in-park shuttle system in June In , reconstruction began on the aging and inadequate road system in the park. Geology of the Bryce Canyon area Erosion of sedimentary rocks has created natural arches. The Bryce Canyon area shows a record of deposition that spans from the last part of the Cretaceous period and the first half of the Cenozoic era. The ancient depositional environment of the region around what is now the park varied. The Dakota Sandstone and the Tropic Shale were deposited in the warm, shallow waters of the advancing and retreating Cretaceous Seaway outcrops of these rocks are found just outside park borders. Different sediment types were laid down as the lakes deepened and became shallow and as the shoreline and river deltas migrated. Several other formations were also created but were mostly eroded away following two major periods of uplift. The Straight Cliffs, Wahweap, and Kaiparowits formations were victims of this uplift. The soft Pink Cliffs of the Claron Formation were eroded to form freestanding pinnacles in badlands called hoodoos, while the more resistant White Cliffs formed monoliths. Hoodoos are composed of soft sedimentary rock and are topped by a piece of harder, less easily eroded stone that protects the column from the elements. Bryce Canyon has one of the highest concentrations of hoodoos of any place on Earth. The formations exposed in the area of the park are part of the Grand Staircase. The oldest members of this supersequence of rock units are exposed in the Grand Canyon , the intermediate ones in Zion National Park, and its youngest parts are laid bare in Bryce Canyon area. A small amount of overlap occurs in and around each park. Ecology[edit] Bryce Canyon has extensive fir forests. More than native plant species live in the park. There are three life zones in the park based on elevation: Ponderosa pine forests cover the mid-elevations with blue spruce and Douglas fir in water-rich areas and manzanita and bitterbrush as underbrush. Douglas fir and white fir , along with aspen and Engelmann spruce ,

make up the forests on the Paunsaugunt Plateau. Together these organisms slow erosion, add nitrogen to soil, and help it to retain moisture. Activities[edit] Snowshoes are required for winter hiking. Most park visitors sightsee using the scenic drive, which provides access to 13 viewpoints over the amphitheaters. Bryce Canyon has eight marked and maintained hiking trails that can be hiked in less than a day round trip time, trailhead: Several of these trails intersect, allowing hikers to combine routes for more challenging hikes. The park also has two trails designated for overnight hiking: Park rangers host public stargazing events and evening programs on astronomy, nocturnal animals, and night sky protection. In honor of this astronomy festival, Asteroid was named after the national park. Additional loops and Sunset Campground are open from late spring to early autumn. The room Bryce Canyon Lodge is another way to stay overnight in the park.

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Chapter 9 : Sevier Fault capable of strong quake | Deseret News

In its entirety, Thunder Mountain Trail is 7 miles one way, but the rangers at the Red Canyon Visitor Center suggest hiking to the unmarked Inspiration Point and back. You find a good turn-around spot at about miles, where the trail drops down and takes a hard turn to your right (west).

Skip to Archean Backstop, 2. Here, I sketch the big picture in Colorado, as best I can put it together, from past to present. Subsequent sections will flesh out the details, also in chronological order. The mobile belt added to the continent during this time is known as the Colorado Province. Buffalo Mountain Around 1. Colorado intrusive rocks with radiometric dates in the 1. Just Add Granite and Stir Mount Evans from Denver A large number of granitic intrusions , ductile shear zones, differential basement uplifts and rifts peppered the Colorado Province , along with the rest of the continent, in the Berthoud orogeny at 1. The Berthoud and Grenville orogenies appear to have occurred in response to convergent plate interactions playing out far to the south. The many granitic intrusions at 1. Continental Crack-up Afar Region Rifting Over the long span of Proterozoic time, several major intracontinental rifting events repeatedly tried to pull the western two-thirds of the US apart, Colorado included, just as the East African Rift splits northeast Africa today. Although an ocean-forming continental break-up never ensued in or around Colorado, the recurrent rifting left behind a rhombic network of deep-seated intersecting normal extensional basement faults. The E-W and NE-SW extensional stresses driving the rifting produced primarily north- and northwest-trending normal faults and pull-apart basins. The particularly deep west-trending Uinta rift basin was a notable exception. Many of the rift faults probably cut the entire lithosphere. During the Laramide, two surviving rift basins filled with Precambrian sediments now the Uinta and Uncompahgre formations were squeezed and inverted to form the Uinta uplift and the southern San Juan portion of the Uncompahgre uplift as well. Around 28 Ma, rifting returned to Colorado with the arrival of the Rio Grande rift. Missing Evidence Between 1. This enigmatic period is marked by a 0. Colorado spent most of the ensuing Early Paleozoic underwater, accumulating great thicknesses of tropical marine sediments primarily sandstones, limestones and shales laid down flat on the planed-off Late Precambrian basement surface. The two largest island mountain ranges developed in Coloradoâ€”Frontrangia on the east and Uncompahgria on the west. By Ma The current Rockies first rose over 70 Ma ago and are now higher than ever and still rising. The Ancestral Rockies were made of similar materials but apparently lacked the advantage of continuing uplift. If anything, the tropical and desert climates of their time would have been less erosive than the temperate climates faced by the current Rockies. The regional deformation apparently occurred in response to the onset of accelerated, low-angle flat-slab subduction of the young Farallon plate beneath the western margin of North America. The resulting basement-cored faulted uplifts and their flanking sedimentary monoclines continue to define the broad features of Rocky Mountain and Colorado Plateau topography. As always, the Laramide uplifts began to erode as soon as they began to rise. By Oligocene time, their debris had filled the structural basins surrounding the uplifts to overflowing. Today, the stream-dissected syntectonic strata of the upper Denver Basin expose a clear record of the progressive unroofing of the rising Front Range block â€” a process repeated throughout the Laramide orogen. The Laramide died out around 40 Ma Along the way, Laramide magmatism got the mineralization of the Colorado Mineral Belt off to a good start. The causes of this fiery outburst remain obscure. Over most of the state, the far-flung Tertiary volcanics have been long lost to erosion, but the San Juan Mountains and the West Elk Mountains right are major exceptions. Before their removal by erosion, volcanic accumulations helped to reposition streams directly over several then-buried Laramide uplifts. The Black Canyon of the Gunnison is but one of the results. This uplift added over 1. During the this time, the cohesive Colorado Plateau once again moved as a unit relative to the Rockies, this time to the northwest to accommodate the opening of the Rio Grand rift. Today, with the help of erosion-driven isostatic rebound , mantle-driven regional uplift continues, albeit at a much slower pace, maintaining the height of the Rockies and the Colorado

Plateau in the face of ongoing erosion. Stream incision was swift and deep, and intermontane basins were cleared of their sediments, thanks to continuing regional uplift and a wet Late Tertiary climate. Antecedent streams setting their courses on the low-relief Eocene erosional surface eventually found themselves cutting through buried uplifts that would become the ridges and even ranges of the current Colorado landscape. The range-front basins were uncovered and incised as well. Glacial Sculpting Gore Range By Pliocene time, the Rockies and the Colorado Plateau had been thoroughly dissected by stream erosion but continued to stand high between the deep canyons. The devastating glaciations that would come next, primarily in Pleistocene time, around 1. The less lofty Colorado Plateau largely escaped the ice. Maroon Bells When the last of the glaciations finally melted away at the close of the Tertiary around 10 Ka Purple mountain majesty indeed.