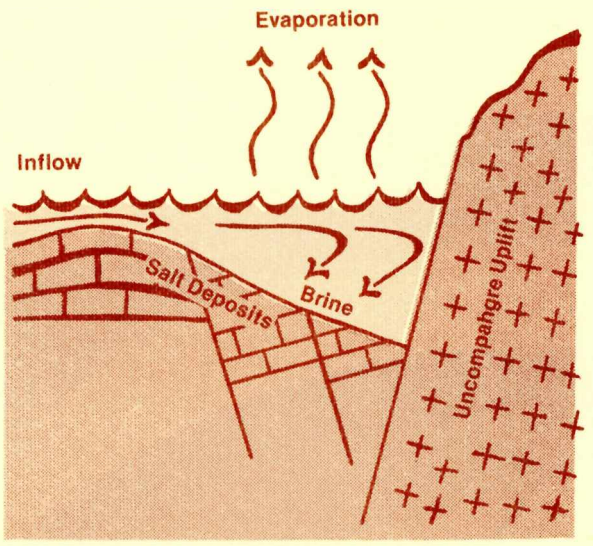
Ever step on a board lying on some muddy ground, and notice how the mud will squeeze up through a knothole? . . much the same happened at Upheaval Dome — a great salt dome in Canyonlands National Park. But here salt, not mud, squeezed up through thousands of feet of sedimentary rocks.



Much of this region was once a deep salt sea, long before life we know today, even before the dinosaurs. The sea was trapped, landlocked against a mountain range we now call the Uncompahgre. Water flowed in, but none out: through evaporation it slowly became more and more salty. From this brine crystallized 29 layers of salt, at a rate of two inches per year. They formed a bed thousands of feet thick.

With time, 300 million years or so, the Uncompahgre was largely washed away; mud and rock from its slopes spread over the salt bed. Oceans came and left their deposits of limestone and fossils, followed by freshwater shales and clays. And there were deserts, of sands blown from the north. The cover at one time was more than one mile thick, most of which today has been carried away by erosion.

On the granite floor far below there is a hump or rise. As salt and sediments covered this rise it was built into them as an anticline. Over the crest of the anticline the layers thinned, forming a zone of weakness which was to become quite important in the creation of the salt dome. (An earlier explanation stated that an igneous intrusion pushed up the strata *after* they were deposited. That theory is not accepted today.)

The pressure of 3000-to-6000 feet of rock above is considerable. And salt under pressure is plastic — that is, it can be shaped much as if you were to pinch a blob of clay between your fingers. It is also less dense than sandstone, and as oil in water will be displaced or rise if allowed. Thus, triggered by this zone of weakness and the pressure from above, the salt flowed upward into the anticline. It pushed and caused more doming, deforming the layers above, shoving sections 1000 feet out of place and turning them almost on edge. The surrounding area from which it moved slowly sank, forming what we see today as a trench or syncline around the outer walls of the crater.

For the next 40 million years the land was stripped away. With the uplift of the Colorado Plateau and the birth of the Colorado and Green Rivers, the erosion was quickened. Finally this disturbed region beneath the crust was exposed. Sliced across by the removal of the layers above, it appeared as a vast bullseye 3 miles in diameter.

Its center was a mountain of loose rock and earth easily worked by erosion. Through a break in its walls to the west rainfall and flood would move the debris to the Green River five miles away, creating Upheaval Canyon.

So the great core of Upheaval Dome is exposed — an inner void some 1500 feet deep, one mile between its Wingate sandstone walls. Its floor is the purple and green and gray of the Moenkopi formation, and circles 500-foot spires of widely distorted sandstone pushed up from the White Rim layer 1000 feet below. This core with its Wingate cliffs is in turn ringed by a valley of the Kayenta shales, then a wall of Navajo sandstone (Whale Rock), and last by the rim syncline.

To the west the syncline forms a canyon system, its north arm a tree-filled and spring-fed valley. Into this a conditioned hiker can travel with ease, and by an old Indian route from here onto the bizarre core floor itself.

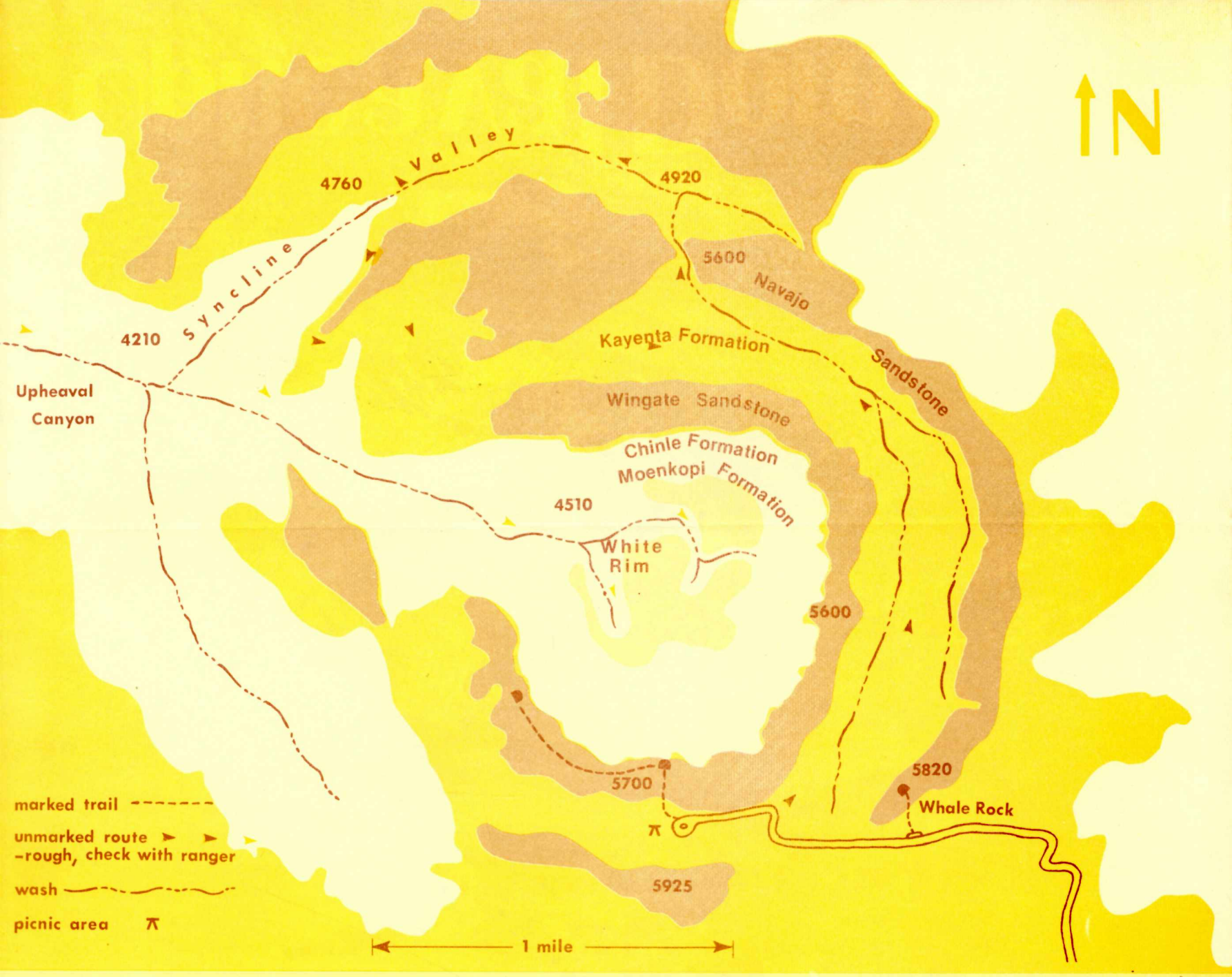
All in all, ten major rock layers have been turned on edge by the salt and six are exposed like the rings of an onion. If you begin at Whale Rock and walk to the very core, you will in effect have walked down the face of the highest Canyonlands cliff to the White Rim shelf of the Island in the Sky. By the time you park your car at the overlook you are better than half-way there.

Upheaval Dome is technically a salt dome, because of the manner in which it has been formed. Other theories have called it a volcanic crater, suggested it was caused by a meteor, or even by a subterranean gas explosion (a cryptovolcano). But the extensive salt deposits in this area and their other effects — the grabens in the Needles District, Salt Valley anticline in Arches National Park, and many others — make salt the most reasonable explanation.

Unique? Not really — salt has done something similar in at least a thousand other places on the globe. In the Louisiana-Texas oil fields alone there exist more than 450; and the salt flows like glaciers from domes in Iran. But most salt domes are poorly exposed. Nowhere in the world is one so well displayed or detailed as this.

Upheaval Dome is a strange structure. Because it is so strange it has a special quality of its own. No effect of lights omits its hues, its shadows. No angle betters another; each point along its inner rim produces a variation on a single theme. In a land of shapes and impressions it is the great abstraction.

Upheaval Dome



The map above and the cross-section below are a geologist's interpretation of Upheaval Dome. The map is drawn on U.S. Geological Survey contours where significant; it generally stresses the surface features

The topography is directly related to the major rock formations illustrated in the cross-section below. (Vertical scale twice - exaggerated.) Each formation — the same formations prevalent in the entire Canyonlands — has contributed to the "bullseye." Where most resistant to erosion, these layers have become the concentric walls. The rock formerly capping the crater itself was swept away through a convenient crack in the west rim.

You can hike much of Upheaval Dome — around the inner crater, from Whale Rock along the outer slickrock wall, or through the cleft due north into the Syncline Valley, from here down a steep, 200-foot talus slope to Upheaval Canyon, then left in the crater. **But Caution! Let a ranger know you're going. There is no water (except unpurified springwater in the valley); it is rough and strenuous; and your return is all uphill!**

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