

The Colorado cuts progressively into deeper, older rocks. Its narrow V-shaped gorge at the base of the canyon is cut into Precambrian rock, so that the exposed layers of strata in the canyon set out more than a billion years of geologic history. As the Colorado cuts downward, processes of weathering and slope erosion work at the side walls and widen the canyon. Resistant layers of rock form steep cliffs and softer rock forms gentler slopes, giving the side walls a steplike appearance.

The nearby canyon of the Little Colorado River makes an interesting contrast with the Grand Canyon. The Little Colorado is carving a canyon with almost vertical walls into a rock plain, so that the width of the canyon is little more than the width of the river. From the road, only a narrow cut can be seen wandering across the plain.

Flagstaff, in the northern part of Arizona, perches on the southern end of the Colorado Plateau 2,100 meters above sea level. Annual precipitation at Flagstaff averages 50 centimeters (20 inches), and the hills are covered with conifers. Because of its elevation Flagstaff has cooler weather than the hot desert to the south, which is only a few hundred meters above sea level. On the road from Flagstaff to Phoenix, a distance of about 200 kilometers (125 miles), the vegetation changes from the conifers of the high country to giant cactus. The average annual precipitation in Phoenix is 20 centimeters compared to 50 at Flagstaff, and the average monthly temperatures at Phoenix are about 13°C (23°F) higher than at Flagstaff. Phoenix is surrounded by green irrigated fields, but the normal landscape of the region is sandy desert.

A Man-made Garden: The Imperial Valley

The Salton Sea, a new feature of the landscape in the Imperial Valley of Southern California, is not even 100 years old. The Salton Basin is a faulted basin nearly 70 meters (200 feet) below sea level north of the upper end of the Gulf of California. The Colorado River, which has its delta at the head of the Gulf, once drained into the Basin where it deposited a rich layer of sediment. Only water is needed to make the Basin a fertile agricultural region.

In the last half of the nineteenth century, the attention of land developers was drawn to the unique situation of the Salton Basin. They saw the possibility of irrigating it at little expense by constructing a short canal following natural channels and diverting some of the abundant water from the Colorado River. The Colorado River is tens of meters above sea level where it enters its delta, so leading water to the deep Basin presented no problems. Renamed the Imperial Valley for promotional reasons, the Salton Basin was producing profitable crops by 1904, a few years after irrigation was introduced.

Engineers cut through the bank of the Colorado to supply the main irrigation canal for Imperial Valley, but they failed to supply control devices at the cut, and in the spring of 1905 a series of unusually high floods finally tore the bank open at the cut. The Colorado plunged into the Basin and began filling it with water.

(opposite top) The Little Colorado River, near the Grand Canyon in northern Arizona, has cut downward to form a narrow, steep-walled canyon. Erosion of the side walls will eventually cause the canyon to become wider.

(opposite bottom) The desert of southwestern Arizona receives only a few inches of precipitation annually, and only plants specially adapted to dry conditions can survive there. The giant Saguaro cactus is a distinctive species in this region, but low shrubs such as creosote bush are more abundant.

The cut was not completely plugged until early in 1907, and by that time a large body of water named the Salton Sea had been formed. Today dams regulate the discharge of the Colorado River and the Imperial Valley flourishes under their protection.

Because the Imperial Valley is below sea level, irrigation water that percolates through the soil has nowhere to drain except into the Salton Sea, so the Sea is becoming increasingly salty from the constant input of saline drainage water.

Journey's End: California

West of the Salton Sea, the dry, unirrigated desert lands stretch to the eastern slopes of the Coast Range mountains, 1,300 meters (4,500 feet) high. To the west of this divide, the belt of land between the Pacific Ocean and the mountains is green and moist, particularly during the winter and spring rainy season. Vegetation varies from deciduous trees along the moist coastal lands in the north to chaparral and eucalyptus in the drier regions south of Los Angeles.

California is a geologically active region. Its sharply rising coastal mountains began their uplift only a few million years ago, and fault movements give a reminder that the process continues today. Hot springs and fault valleys, such as those along the San Andreas fault, are common features throughout the state. The coast, too, shows signs of uplift in its elevated marine terraces and steep cliffs, so different from the low submerged coastline along much of the eastern United States.

The trip could go on and on, to every land of the earth. Each new vista in each new direction would reveal the innumerable physical processes at work on the surface of the earth, shaping the materials at hand into unique combinations of climate, vegetation, soil, and landforms. Confronted by such variety and beauty, our understanding may, at the end, give way to a sense of marvel and wonder.

(opposite) The California coastline shown here at Oxnard is characterized by steep beach cliffs and newly uplifted mountains. By contrast, much of the coast of the eastern United States is low, submerged land with rounded, worn-down hills.

