Teacher Feature

Landforms

An erosional landform. Eastern Sierra Nevada Range. *Photo by Max Flanery.*

Landforms are the present-day features that make up the earth's landscape. They have been slowly sculpted throughout the earth's history. This process is continuous.

The United States contains tremendously varied landforms. Mountains, plateaus, badlands, coastlines, deep canyons and broad plains are examples of the dramatic contrasts.

There are two types of landforms: depositional and erosional. Depositional landforms have the character and shape of the deposits they're made of. They include beaches, stream terraces and alluvial fans at the foot of mountains. Erosional landforms have been created by such erosional factors as rivers, rain, wind and ice. The most widespread erosional landforms are those made by running water over very long periods of time.

Varied stream-eroded landscapes are produced in part by differences in rock types. Rock types range from massive, hard, and crystalline (such as granite) to those layered or stratified, (such as shale or limestone). When running water erodes massive crystalline rocks, it produces a regular arrangement of hills and valleys in a succession of bowl-shaped drainage basins. If flat-lying rocks of various strengths are layered, the running water will produce "stepped" slopes and plateaulike surfaces. If the layered rocks are tilted or folded, the resistant strata will be sculptured to form long ridges that mark the pattern of the folds.

Differences in landforms are also determined by the length of time an area has been exposed to erosion. If the time is short, flowing water can carve only shallow valleys or none at all; as water collects in the irregularities of the surface, swamps and lakes appear. An extended period of erosion will carve the land more deeply and will remove all vestiges of the original surface.

Glaciers also erode landscapes. During the last several million years, large ice sheets moved down from Canada and covered the northern part of the U.S. They rounded off ridges and mountains and enlarged some valleys. In the lowlands, the ice sheets left deposits of mixed sand, gravel, and clay that geologists call glacial drift. In some places, great low ridges known as moraines were piled at the forward edge of the ice.

Geologists and geographers have divided the U.S. into areas called physiographic provinces, each of which has characteristic landforms. In mainland U.S. more than 80 such divisions are recognized, but for simplification they are grouped into 24 major provinces. This classification of landforms is simplified further by grouping the provinces into six large regions. California is included in the region called The Cordilleran Mountain Region.

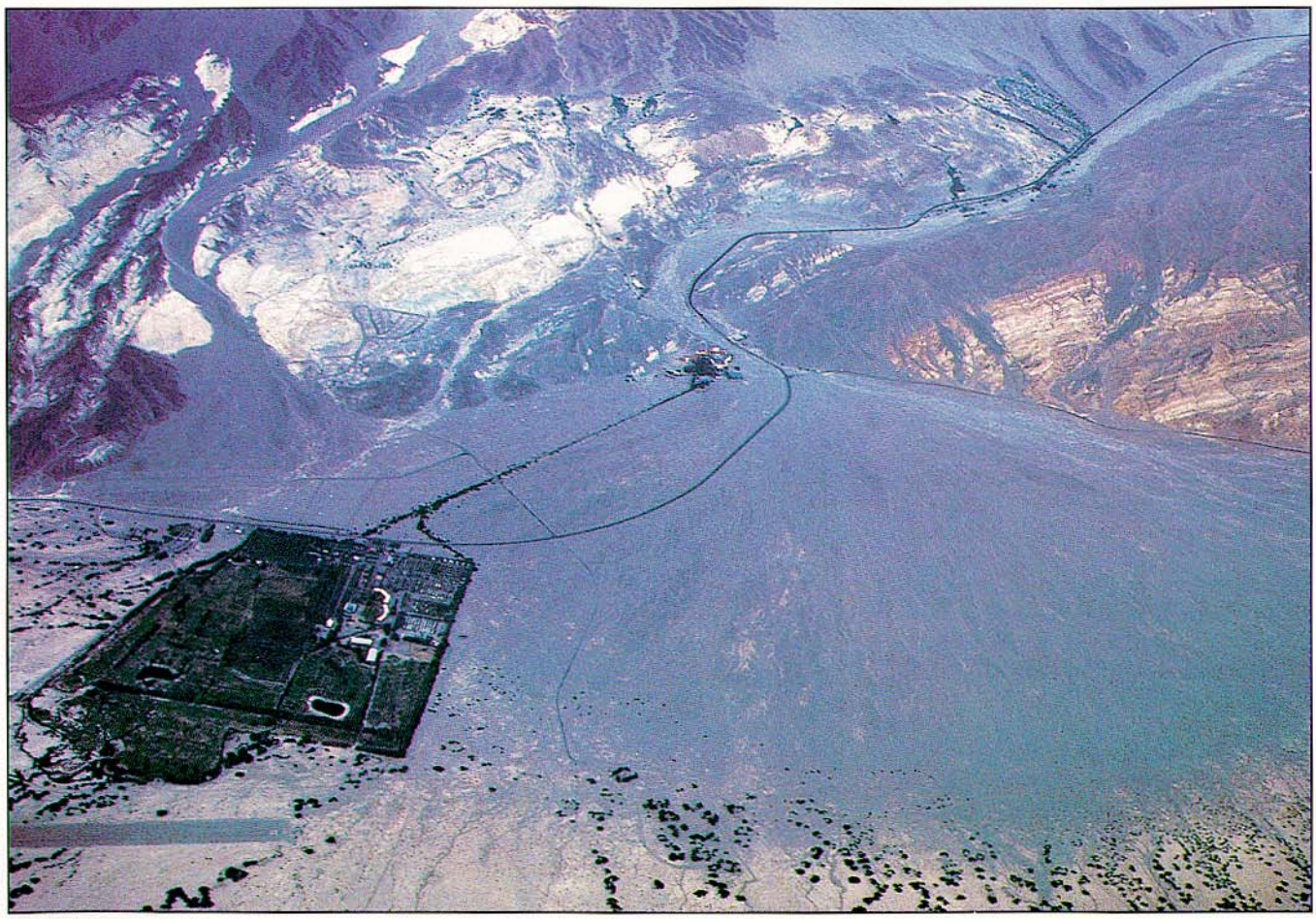
THE CORDILLERAN MOUNTAIN REGION

The Cordilleran Region is a wide mountainous belt that stretches from Central America northward to Alaska. Composed of a series of ranges, it occupies the western third of the U.S. The Rocky Mountains, extending from north-central New Mexico to Canada, form the eastern edge of the region. These mountains, carved by streams and glaciers, are the remnants of a complexly folded and uplifted segment of the earth's crust that began to rise about 100 million years ago.

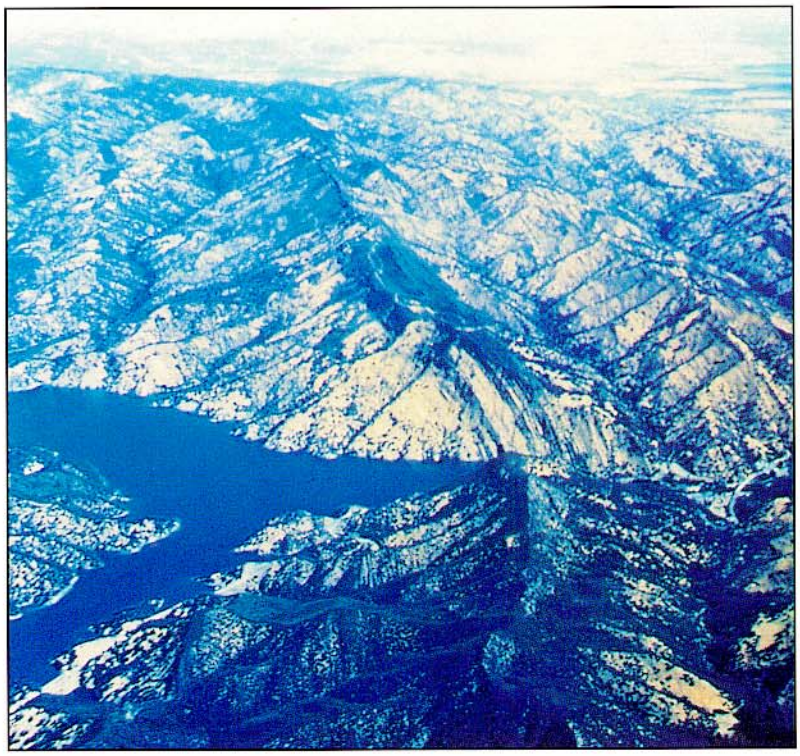
The Wyoming Basin forms a high gap across the middle of the Rocky Mountain chain where rocks of the earth's crust have been only gently folded and not raised as high as the areas to the north and south.

The great high plateau areas—the Columbia Plateau and Colorado Plateau—lie to the west of the Rockies. The Columbia Plateau is essentially a thick pile of ancient lava flows, trenched by canyons and deep valleys. The Colorado Plateau is an uplifted area displaying either gently folded or nearly horizontal rock layers sliced by streams, many of which are deeply entrenched in canyons, such as the Grand Canyon of the Colorado River.

The Basin and Range Province, centered principally on Nevada, but extending across the southern parts of Arizona, New Mexico and a part of eastern California is a large area mostly occupied by desert plains interrupted by great north-trending mountain ranges formed from a series of tilted fault blocks. A large part of this area is known as the Great Basin because its



A depositional landform. Looking east at Furnace Creek alluvial fan. Death Valley National Park, Inyo County. Furnace Creek comes out of the canyon (upper right of photo) delivering sediment to the fan surface. This area is in the Basin and Range Province. *Photo by Burt Amundson.*



An erosional landform. Looking north towards the Sacramento Valley. Tilted layers of Cretaceous age rocks form strike ridges. Lake Berryessa (Monticello Dam just out of view, lower center). *Photo by Burt Amundson.*

drainage waters do not reach the sea but evaporate in saline lakes on the plains between the mountain ranges.

Part of the western Cordillera consists of two great north-trending mountain chains, the Sierra Nevada and Cascade Range. The Sierra Nevada Range to the south, is an area of uplifted and tilted granite, much steeper on the east than on the west. Along its eastern margin the land rises abruptly from below sea level to heights greater than 14,000 feet, forming one of the most imposing escarpments* in the U.S. The highest peak of the range, California's Mount Whitney (14,495 feet), is also the highest point in the continental U.S.

The Cascade Range to the north is composed mostly of volcanic rocks and is crested by Mounts Shasta (in California), Baker, Rainier, Adams, Hood, Jefferson, and other extinct or dormant giant volcanoes.

* Mountains (or cliffs) formed by erosion occurring at irregular or varying rates.

The western edge of the Cordillera, as well as the western edge of the continent, is marked by a belt of rolling hills and mountains that forms the Coast Ranges within the Pacific Border Province. Along the coast these mountains are 2,000 to 4,000 feet high.

Although now considered stable, parts of the Cordillera are still moving (especially the Sierra Nevada and the Coast Ranges) as seen by continuing earthquakes. The most active area is the Coast Range of California where the rocks were uplifted above the sea fewer than 2 million years ago and where movement is continuing along great fractures (called faults) in the earth's crust. The most famous of these is the San Andreas Fault Zone, which extends over 600 miles from north of San Francisco to the Gulf of California! Geologists believe the major movement along this fault is horizontal and the western side may have moved as much as several hundred miles in the last 70 million years.

In some places, such as the Cascade Mountains and the Colorado Plateau, volcanoes have been active within the last 2,000 years, and the original forms of many of them are well preserved. Escaping steam and hot water in Yellowstone Park (and other areas) indicate that rocks are still hot at shallow depths.

Information taken from Landforms of the United States *by John T. Hack, U.S. Geological Survey, Information Services, P.O. Box 25286, Denver, CO 80225. 1997.*

A depositional landform. Bolinas Lagoon along the coast, north of San Francisco looking southeast. Longshore currents have deposited sand, creating sand bars that almost close the narrow inlet to the lagoon. *Photo by Burt Amundson.*