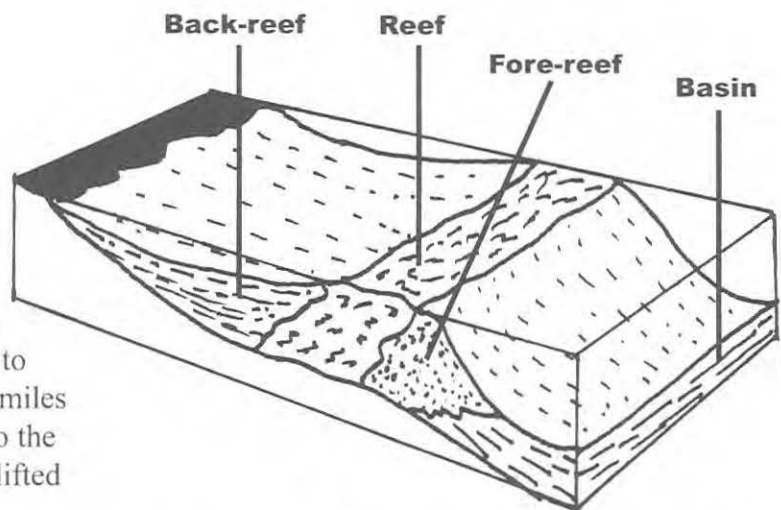




## Geology of The Western Escarpment

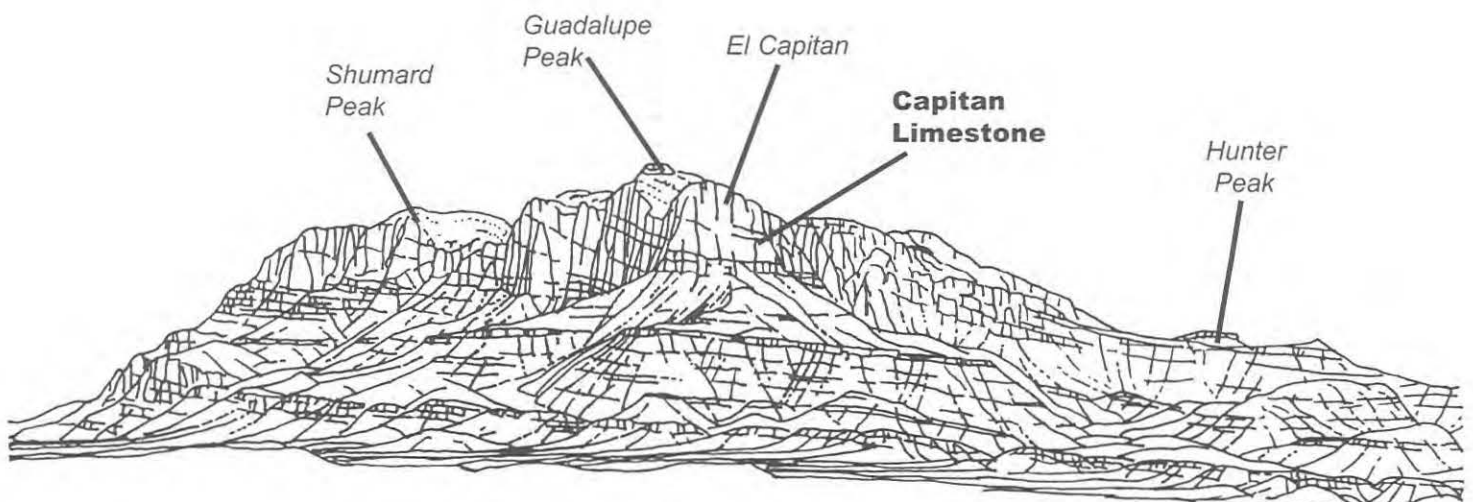
The Western Escarpment has played an important role in revealing the story of the Permian Period of geologic time in North America. These exposures present one of the finest cross-sections of rocks in the world, showing transitions from shallow-water deposits to deep-water deposits. Abrupt changes in rock types are caused by the change in depth from shallow submerged areas to the deep waters of the Permian Sea. Some two miles of Permian strata are exposed in and adjacent to the Guadalupe Mountains due to faulting which uplifted this section through the ancient fossil reef.

Exposures on the lower section of the western escarpment have been studied intensely by geologists. A portion of these lower layers has been proposed as a world-wide type section for middle Permian strata referred to as the Guadalupian. A type section serves as a defining unit of rock to which all other units of the same age can be compared. These exposures have been



**Position of reef, back-reef, and fore-reef sediments in a typical reef.**

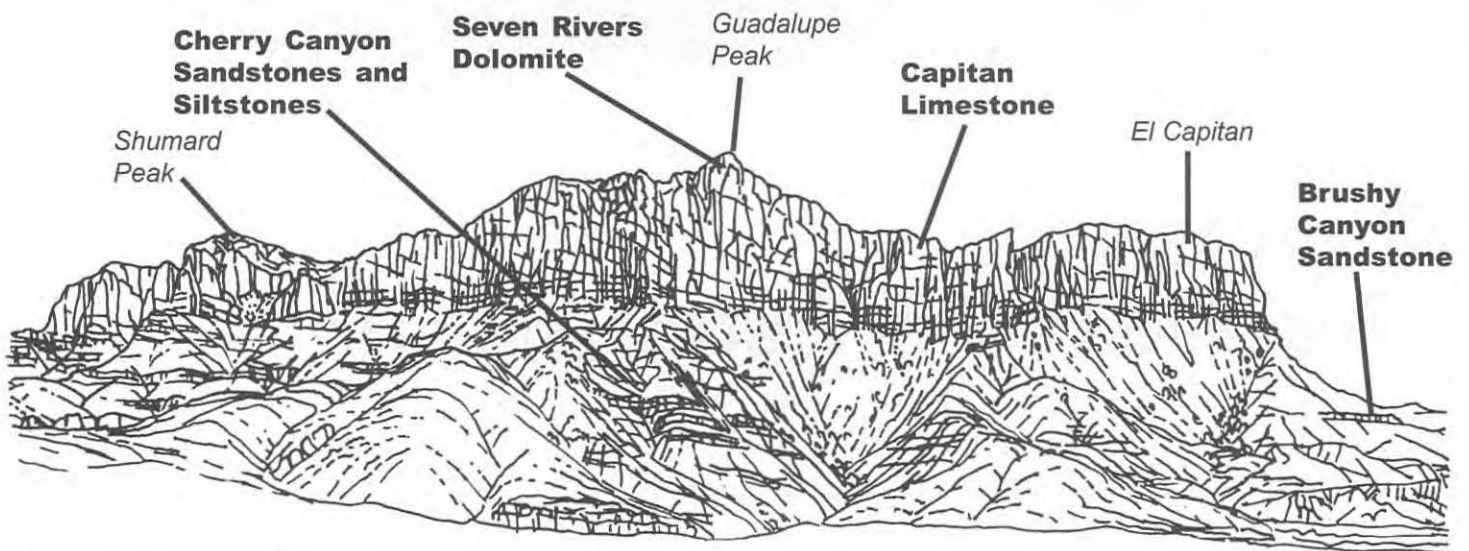
preserved so geologists can continue to study and learn about this ancient fossil reef and for the public to enjoy. **Collecting of any materials from the park is prohibited.**



### View from Turnaround Area

About two miles in from the second gate on the William's Ranch Road, a turnaround area provides an excellent view of the front part of the Western Escarpment. To the west, the Patterson Hills can be seen. The rock exposed on the top of the Patterson Hills, the Capitan Limestone, is also exposed on the top of the Western Escarpment. There is, however, a

3,000 foot difference in elevation between the two due to faulting that began about twenty-six million years ago. A series of branching faults runs close to the base of the Western Escarpment. The fault block comprising the Guadalupe Mountains was uplifted more than two miles from its original position below sea level.

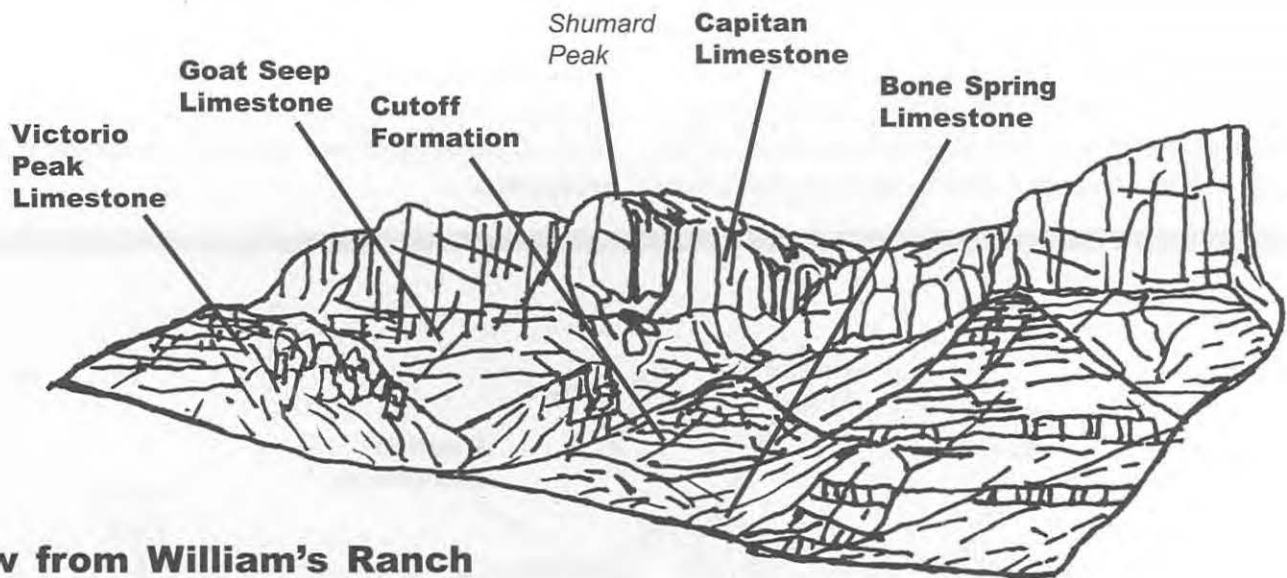


## View Between the Turnaround Area and William's Ranch

As you make your way toward William's Ranch, the entire face of the Western Escarpment comes into view. Now you can see from El Capitan all the way to Shumard Peak; El Capitan and Guadalupe Peak dominate the view. The sheer cliffs of El Capitan are composed of Capitan Limestone. Guadalupe Peak, the highest Peak in Texas at 8,749 feet, is also composed mostly of Capitan Limestone.

The very top of Guadalupe Peak, about 4,000 feet above you, is composed of back-reef deposits of Seven

Rivers dolomite, which was deposited in a quiet, shallow, underwater lagoon between the reef and the shoreline. The slopes below these cliffs consist of Cherry Canyon siltstones and sandstones and Brushy Canyon sandstones. Hike the El Capitan Trail in Shumard Canyon to observe ripple marks preserved in these sandstones. The more resistant, brown-weathering ledges in the middle of the slope below El Capitan are the uppermost Brushy Canyon sandstones that were deposited as sediment filled in sub-marine channels in the basin.



## View from William's Ranch

William's Ranch sits on the Bone Spring Limestone at the head of the Bone Canyon alluvial fan. An alluvial fan is an outspread, gently sloping mass of material deposited by a stream.

Behind the ranch is Bone Canyon. Its cliffs and slopes are formed of the oldest rocks in the Guadalupe. These rocks are the Victorio Peak limestone, the Cutoff Formation, and the Bone Spring limestone, which make up the lower portion or "bank-ramp complex" of the Western Escarpment. The bank-ramp complex formed from unbound carbonate sediments which were deposited as broad banks stretching ten to twenty miles, creating a gentle ramp dipping only one or two degrees toward the basin. These shallow carbonate ramps lack the binding organisms that are prominent components of the reef complex. These limestones are well bedded in contrast to the

massive reef deposits, and are exposed on the lower canyon walls.

The reef complex, which consists of Capitan limestone and underlying Goat Seep limestone, form the upper portion of the Western Escarpment. Shumard Peak, also composed of Capitan limestone and the second highest peak in the park at 8,615 feet, can be seen looking north from the ranch house porch.

The Brushy Canyon sandstone holds the water that was pumped through a pipeline two miles from Bone Spring to the ranch.

During Late Permian Time, the Capitan Reef stretched some 400 miles around the edge of the Delaware Basin. Only a small part of the reef towers above the Texas desert in the Guadalupe Mountains. Other parts are exposed in the Apache Mountains and the Glass Mountains.