The mouth of the Colorado River has an extensive delta, much like the Mississippi River. The delta fans west out westward from Yuma to the Salton Sea and the Sea of Cortez. Like the Mississippi River delta, the Colorado River delta is very flat and the course of the river varied over thousands of years over a wide area, being periodically diverted by silt deposits remaining after floods. Sometimes the river flowed into the Sea of Cortez, as it does today, and other times it turned westward toward the Salton Trough. Each time the Salton Trough received the river flow, a large freshwater lake called Lake Cahuilla formed. The last Lake Cahuilla covered much of the Imperial, Coachella and Mexicali Valleys as late as 1450.

Because the Salton Sea has been periodically dry in the geologic past, the prevailing westerly and northwesterly winds carried sand from the dry Lake Cahuilla eastward and formed the Algodones Dunes. Many of the dry lakes in the Great Basin have similar associated dune fields, but the Algodones, like the Salton Sea, is the largest in the Great Basin at 45 by 6 miles. In 1877, the Salton Sea (Lake Cahuilla) had been dry for about 400 years and the Southern Pacific Railroad, building from Los Angeles to El Paso, routed its grade to avoid the Algodones Dunes.

This southwestward view shows the SP mainline, recently upgraded to concrete ties, skirting the edge of the dunes, seen in the distance. The flatness of the Colorado River delta, seen between the tracks and the dunes, made for relatively easy railroad construction.

Although the SP route avoids the dunes, the surrounding desert land surface is flat wind-blown sand with scattered creosote bushes.

Eastbound containers on the SP (now UP) mainline skirt the northeast edge of the Algodones Dunes.