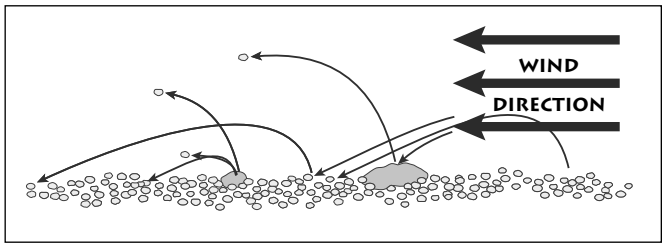
Kelso Dunes
National Natural Landmark



One jump at a time, sand grains leap-frog downwind. Fine sand can be lifted with wind speeds of just 16 km/hr (10 mi/hr). Even the strongest winds rarely lift sand grains more than a meter (3 ft) above the surface.

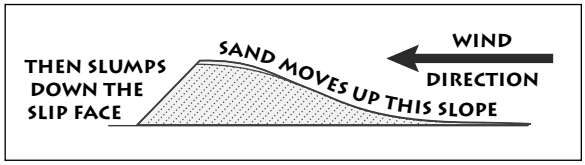
eastward by the Mojave River, through Afton Canyon, and were finally dropped into a broad basin. As long as the lake stayed wet, the sediment was protected. When the lake bed dried out, sediment was exposed to the wind and the particles were ready to move!

Kelso Dunes on the Move

All it takes is a bit of breeze to put fine sand in motion. The finest grains may be suspended in the air and carried along (suspension). Heavier grains tend to bounce along as they are lifted into the air, fall back to the ground, then bounce back up again (saltation). The heaviest grains the wind can move are usually nudged along by impact from bouncing, saltating grains (impact creep).

Pile 'em Up!

When sand begins to pile up, ripples and dunes can grow. Wind continues to move sand up to the top of a pile until it is so steep that it collapses under its own weight. The collapsing sand comes to rest when it reaches just the right steepness to keep the dune stable. This angle, usually about 30-34°, is called the angle of repose. Every pile of loose particles has a unique angle of repose, depending upon the properties of the material it's made of.



Repeated climbing, then slipping leaves its mark on the internal structure of the dune. Ancient slip faces of sand dunes that migrated across the Mojave region over 160 million years ago (Jurassic Period) are preserved in the Aztec Sandstone.

The repeating cycle of sand inching up the windward side to the dune crest, then slipping down the dune's slip face allows the dune to inch forward, migrating in the direction the wind blows. Wind blowing from the northwest gradually carried Kelso's sand southeastward. In the path of the prevailing winds lie the Providence Mountains and the pink pinnacles of the Granite Mountains. The rocky crags and sloping fans of the two ranges block the moving sand. Sand piles up at the base of the mountains and along their flanks, forming dunes and sand sheets.

Stack Upon Stack

Where the sand piles up researchers found that the dunes are actually made up of several sets of dunes, stacked one on top of another. Each set formed in response to some past climate change! The Kelso Dunes depend upon times when the sand grain (sediment) supply is enhanced. This happens whenever the climate is dry enough to expose the raw material of dunes, sand, to the wind. In fact, most of the eastern part of the Kelso Dunes formed when water-filled Soda Lake and Silver Lake dried up, exposing the lake bottom sediment. The entire dune system was stacked up in five major pulses over the past 25,000 years.

Plants Move In

Over the past few thousand years plants have progressively covered and stabilized areas once covered by drifting sand. Many animals inhabit these stabilized dunes, but they usually remain hidden from the hot desert sun. Although you might not see any of these desert denizens if you visit mid-day, from dusk to dawn there's a flurry of activity. As you explore Kelso Dunes, keep an eye open for tracks left behind by the many creatures that call these remarkable dunes home.