

Active dune fields of the Navajo Nation, southwestern United States

Redsteer, Margaret H., Bogle, Rian, and Vogel, John;
U.S. Geological Survey, 2255 N. Gemini Dr. Flagstaff, AZ 86001

Dune fields and sheet sands cover approximately one-third of the semi-arid 65,000 km² Navajo Nation on the southern Colorado Plateau. This eolian-dominated landscape contains a myriad of dune forms that exist under meteorological conditions promoting the entire spectrum of dune mobility, from mostly stable, mostly active, to fully active during periods of drought. The risk of increased sand dune mobilization within this region is high. A consensus of climate modeling indicates that significant drying in the region throughout the 21st century is expected, and should already be underway. In recent years, the Navajo Nation has been experiencing drought conditions that may surpass the severity of all droughts in the 20th century. Moreover, this region has seen the greatest increase in average annual temperature of all regions in the lower 48 of the U.S., exacerbating arid conditions. Current work indicates that reactivation of stabilized sand is occurring in many areas of the Navajo Nation. Dune mobility is today inundating housing and causing transportation problems. It also may be contributing to a loss of rare and endangered native plants and grazing land. Many of the more recent active dunes may have formed as the region began a long-term drying trend that began in the late 1800's. As a result of increasing aridity, perennial surface water features have become ephemeral. Active dune fields receive new pulses of sediment from periodic flooding of nearby washes and streambeds during high intensity summer monsoons that act to mobilize sediment. The current rate of dune migration in active regions varies from year to year, depending on local meteorological conditions. During recent conditions in 2009, an unusually windy and dry year, we have measured dune migration rates as high as 34 to 48 m/yr.