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Using Large-Scale Roughness Elements to Control Sand and Dust Flux at the Keeler Dunes, Keeler, CA

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Controlling dust emission from areas that subsequently degrade air quality and threaten human and animal health and reduce the quality of life for people residing in proximity to such sources is necessary, but also challenging. Recent research has indicated that arrays of large roughness elements (height >0.3 m) can be used effectively to modulate sand transport and the associated dust emissions. Prediction of the rate of sand flux reduction as a function of downwind distance upon entering an array of roughness elements, and the equilibrium flux reduction in the interior of the array is possible using the known geometric properties of the roughness elements, their number, and published relationships. Air quality in the town of Keeler, CA (36 deg 29' 17.92" N, 117 deg 52' 24.62" W) is degraded by levels of particulate matter <10 μm aerodynamic diameter (PM10) during periods of elevated wind speeds due to sand transport and dust emissions in the nearby Keeler Dunes. A demonstration project was designed to evaluate the effectiveness of an array of roughness elements composed of solid elements and managed vegetation to meet sand and dust flux reduction criteria. This project has two major goals: 1) to demonstrate that solid roughness elements placed on areas of the Keeler Dunes immediately arrest sand movement to specified levels (target of 85% reduction), and 2) to assess whether native plant species, planted in the sheltered area of the solid roughness elements can effectively thrive and subsequently replace the solid roughness to achieve the desired sand flux reduction control efficiency. This poster describes the results related mostly to objective one, as considerable time has to pass before sufficient data will be obtained to evaluate the success of the planted and managed vegetation to achieve a control level provided by the solid element roughness array.