Mitigating severe dust storms using the K.I.S. method and erosion control techniques to decrease bare soil and increase vegetation cover on overgrazed land at the Lordsburg Playa in southwest New Mexico

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PREE H_2O Internship Program

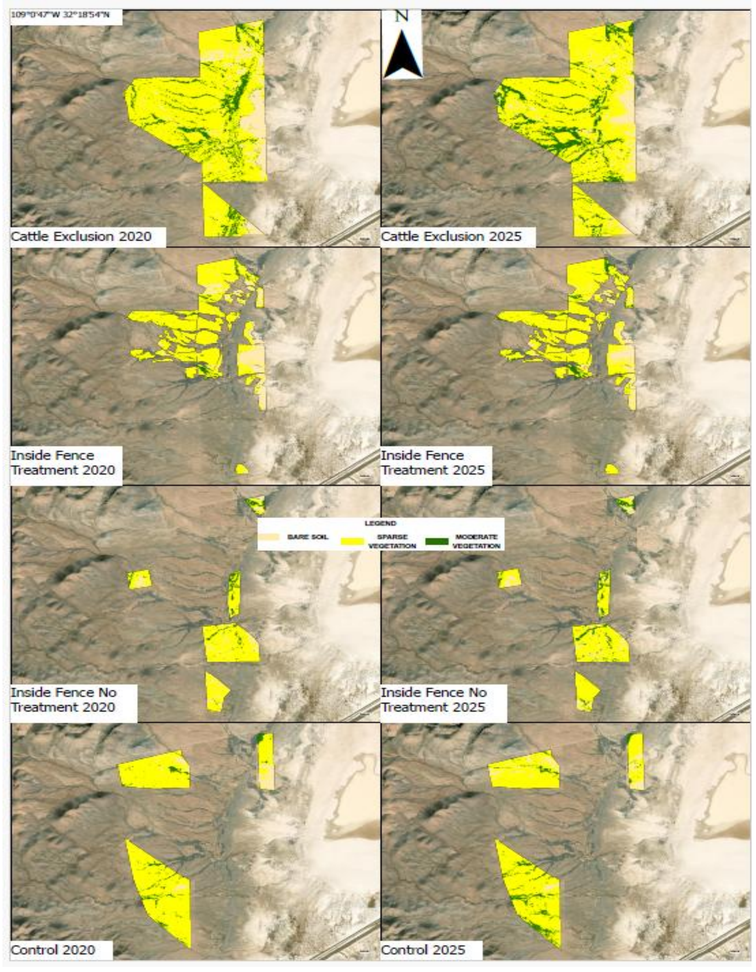
Introduction/Abstract

Since 2012, 121 dust events have caused low visibility conditions resulting in 21 fatalities and 39 road closures along I-10 on the Lordsburg Playa in southwest New Mexico. This dry lakebed has been utilized for cattle grazing for two centuries and is arguably in a severely degraded ecological state as a result of overgrazing and watershed modifications by failed legacy ranching infrastructure such as dirt tanks and water diversion berms. As a result, soil is often disturbed and bare throughout large areas on the playa which contributes to the dust problem affecting I-10. A technique called the K.I.S. method (Keyline plowing, Imprinting, and Seeding) combined with constructing hand-built rock erosion control structures was implemented along with grazing exclusion at North Breach, a site identified as a high-risk erosion area. Land treatments started in September 2020 with approximately 1220 acres treated and 1500 rock structures installed. ArcGIS was used to analyze satellite imagery acquired before treatment in June 2020 and compared to imagery from June 2025 to evaluate changes in percent vegetation cover. Quantitative analysis indicates overall that grazing exclusion alone resulted in increased vegetation cover, while erosion control structures increased vegetation in their immediate areas of effect, and KIS treatments resulted in some noticeable increase in vegetation cover.

Methods

Satellite images were publicly obtained from Sentinel 2 that provided visible and near-infrared region spectral bands at 10 meters. Ground truthing was performed via aerial drone surveillance while Normalized Difference Vegetation Index was extracted from satellite imagery to reference for changes in plant growth. Sites were identified by a surveying team then a tractor equipped with a Keyline plow, imprinter, and seeder (K.I.S.) opened up the ground without turning over the soil such as in traditional plowing. Imprinting creates micro-catchments that allow for water to collect in approximately 1-gallon sized tracks while the seeding reintroduced native plant species to enable new growth.

Figures and Results

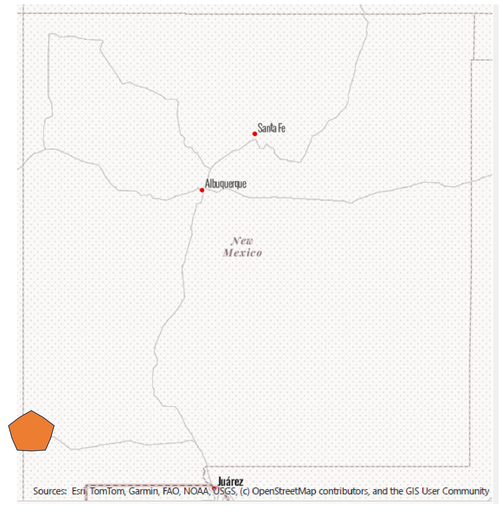


Percent Change in Square Kilometers from 2020 to 2025

	Cattle Exclusion	Inside Fence with Treatment	Inside Fence No Treatment	Outside Fence (Control)
Bare Soil	-22.3%	-29.7%	+0.02%	+22.1%
Sparse Vegetation	+1.2%	+6.5%	-3.8%	-2.0%
Moderate Vegetation	+20.4%	+34.1%	+36.87%	-1.6%

Conclusion

Cattle exclusion zones from 2020 to 2025 yielded a 22.2% increase in vegetation while decreasing 22.3% in bare soil land cover. The treated zones inside the fence decreased bare soil by 29.7% compared to the slight increase of 0.02% of the non-treated inside zone. The control group, which was still available for livestock grazing, increased bare soil by 22.1%. This suggests that cattle play a role in the degradation of the desert ecosystem and by excluding this factor, plant growth can be stimulated with the intention of regenerating depleted plant matter. In addition, without the surface disturbance caused by herds of cattle more sediment is sequestered into the ground and can become less likely to be introduced into a severe dust storm. Furthermore, the K.I.S. treatment can be one tool that be utilized in the desert to facilitate regrowth of native landscapes. With the intensification of the dust storms, one approach to mitigate the severity is to exclude cattle from high erosion land allotments such as the Lordsburg Playa.



Acknowledgements

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