

An aerial photograph of a desert landscape. A large, circular area in the center has been plowed, creating a distinct keyline. The plowed area is filled with small, dark, irregular shapes, likely seeds or small plants. The surrounding desert terrain is sandy and sparsely vegetated. The overall image has a greenish tint.

K.I.S. Method:

Transforming Ecosystems Through
Keyline plowing, Imprinting, and Seeding

High Desert
NATIVE PLANTS LLC

The Problem

Desert lands throughout the southwest U.S., and indeed around the world, are experiencing rapid degradation as a result of a cycle of erosion, soil loss, evaporation, vegetation loss, and changing climates. Often, this land degradation is rooted in an anthropogenic source - development, grazing, or transportation are just a few examples. As a result of the land management, areas begin to dry out, lose vegetation, and suffer from erosion. Once the cycle begins, it continues and gets more severe, until something changes. Our land restoration strategy - affectionately known as KIS - provides an efficient and effective way or resetting the stage for ecological improvement with a tool set that can be rapidly deployed across a wide range of landscapes and soil types.

The Lordsburg Playa located in southwest New Mexico is the source of massive dust storms which have resulted in numerous motor vehicle accidents and fatalities on Interstate Highway 10 which crosses the southern edge of the playa. The dust storms develop rapidly at any time of year. Rapid erosion in the uplands surrounding the playa deposits sediments at a rate faster than they can be stabilized by vegetation. Historic and continued surface disturbance exacerbates the problems. The photo demonstrates the scale of a dust storm which would result in the closure of I-10 for safety reasons.

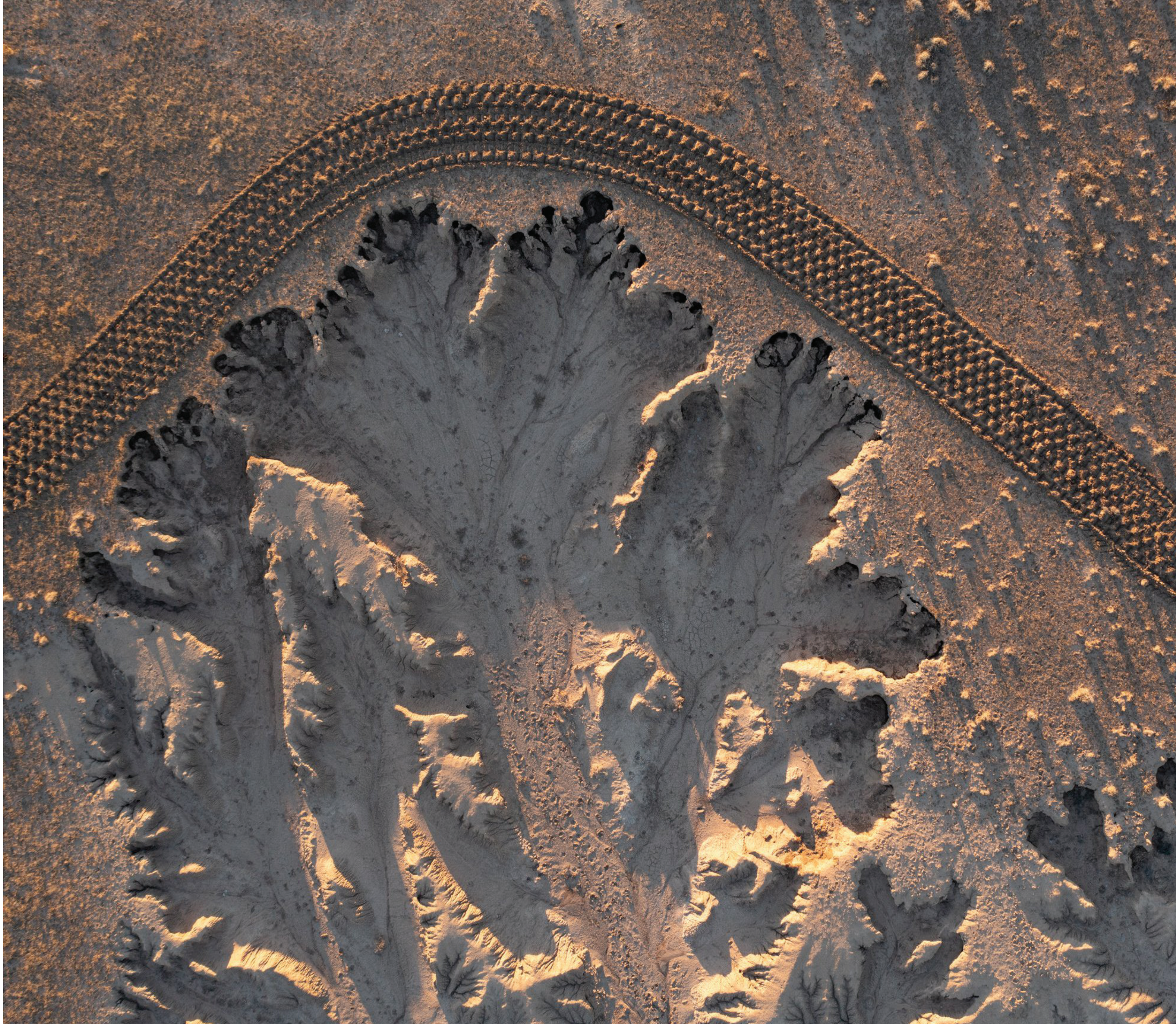
Photo: New Mexico Department of Transportation



The K.I.S. Method

The innovative K.I.S Method was developed by Gordon Tooley and Mike Gaglio through a collaborative experience on the Lordsburg Playa Dust Mitigation project. This groundbreaking approach integrates Keylining plowing, Imprinting, and Seeding in one pass to revitalize desert ecosystems in the most efficient way possible. Each component — Keylining for precision contouring, Imprinting for efficient water utilization, and Seeding for strategic vegetation growth — works together to rehabilitate degraded environments with a wide variety of soils and vegetation types.

Erosion in the uplands causes massive loss of topsoils which get deposited on the playa - resulting in bare ground in the uplands as well as the playa. Often this erosion starts in location of surface disturbance such as a cattle trail or wheel rut. Vegetation is slow to colonize in these eroded areas because water quickly runs off the landscape.



Keyline Plow (K):

Our specialized Keyline Plow is a vital component of the K.I.S Method. Designed for minimal soil disturbance, it opens the land with precision, optimizing deep water infiltration and distribution. The plow's efficiency stems from its multiple shanks creating furrows perpendicular to runoff being repeatedly and quickly installed across the landscape to help "plant the rain" higher in the landscape at the same time without causing undue disruption by turning the soil over as conventional plows do.

Land Imprinter (I):

The land imprinter we use was developed by Bob Dixon in southern Arizona in the 1980s where it was envisioned that the action of the rolling cleats mimicked the hoof action of a massive herd of native bison. The imprints serve as micro-catchments that capture seed, mulch, soil, and rainwater. This process is essential for maximizing water retention and facilitating seed germination in environments where water scarcity is a challenge. Rather than allowing rain to run off the land surface and cause devastating erosion which further exacerbates land degradation, the imprinted land holds the water where it lands, and allows it to soak into the soil - right where the plants need it.

Seed Hopper (S):

A seed hopper is integrated into the KIS setup to distribute a blend of native grass, forb, and shrub species, with each species selected for its role in the ecological succession of the site. Seeds are broadcast in front of the imprinter and will migrate to the bottom of the imprint where they will be protected by windblow mulch, covered by soil, and watered with rain.



Keyline Plow

Land Imprinter

Seed Hopper

Keyline plowing:

Keyline Plowing (or simply Keylining) is a land treatment technique integral to our K.I.S. Method. Keyline plowing allows us to work with the existing topography and open the soil profile to accept deep percolation of water that would normally run-off the soil surface. By keylining along the land's contour, we optimize water distribution into the soil, setting the stage for improved soil moisture, better soil fertility, and increased sustained plant growth. The Keyline Plow, a specialized implement, is employed to create these subtle contours. Its design minimizes soil disturbance, a crucial aspect for preserving the delicate structure of desert soils.

A tractor follows the land contours using an on-board geographic information system (GIS) map and a real-time global position system (GPS) receiver. Even though the land appears flat, the GIS map used by the tractor operator reveals the subtle contours of the land. Keylining on contour allows us to capture more water and prevent erosion.



Imprinting:

Imprinting involves the application of our rugged soil imprinter to create a textured surface on the soil that allows for the capture of water during natural rainfall events. Combined with the deep openings of the keyline plow, over an inch of rainwater can be captured and held in the soil, where it falls, improving soil moisture and preventing erosion. Imprinting also creates a roughness in the soil surface that slows wind and holds seed, soil, and mulch in a compact space at the bottom of the imprint, creating a tiny nursery that supports and protects germinating plants. When fresh, imprints are roughly six inches deep and one square foot in area and can hold over a gallon of water each. In repeating imprints that cover hundreds of acres, literally hundreds of thousands of gallons of rainwater can be held in the soil to nourish fragile seedlings, rather than running off creating erosion. This technology proves essential for rehabilitating arid environments that have been subjected to erosion and degradation where every drop of water counts.

Fresh imprints across a large area of bare soil already hold new seeds and will capture thousands of gallons of water and aid in the prevention of wind and water erosion.

Photo: Esha Chiochio



Seeding:

Seeding is integrated with imprinting in the KIS method, bringing life back to barren landscapes. We carefully select a blend of native species that will be most likely to grow in the site-specific conditions of the area being treated. Seed blends include native perennial grasses, annual and perennial wildflowers, and shrubs - each selected to fill a role in the development of the ecosystem with the goal of a healthy cover of perennial grasses to protect the soil surface. This critical step catalyzes the restoration process and contributes to the sustainable rehabilitation of the degraded and fragile desert land.

One year after KIS treatment, the landscape comes to life with a burst of annual grasses and wildflowers. This photo represents an optimal first year response to the KIS treatment.





Project-Specific Needs:

Each restoration project necessitates a tailored approach, unique to the needs of the site. Given the variability and harshness of the deserts in which we work, our equipment is designed to minimize negative environmental impact and efficiently set the stage for plant germination across a large area. The machinery's efficiency, coupled with a focus on preserving native flora, ensures that the K.I.S Method aligns seamlessly with the unique requirements of rangeland restoration projects throughout the deserts of the U.S. west.

Credits

Lordsburg Playa Land Restoration work:



Tooley's Trees & Keyline Design

Stream Dynamics, Inc.

High Desert Native Plants LLC

Project Management by Barr Engineering Co.

Cover and Credits page photos © Esha Chiocchio

All other photos © Mike Gaglio

Work supported by NMDOT and FHWA

In cooperation with NM State Land Office, Bureau of Land Management, and lease holders

Owen and Tricia Washburn

High Desert

NATIVE PLANTS LLC

4200 Doniphan Dr, El Paso, TX 79922
www.highdesertnativeplants.com

(915) 490-7034

