

Restoration of Hydrologically Dysfunctional Rangelands

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Many rangelands cannot provide the essentials necessary for optimal production of multiple uses desired by landowners or the ecological services required by society because they are hydrologically dysfunctional. Good vegetative cover of perennial bunchgrasses is highly efficient for conserving water, soil, nutrients, and organic material. Drought, long-term excessive grazing, excessive densities of woody plants and forbs (weeds), and desert termites can reduce permanent vegetative cover below minimum thresholds and render rangelands dysfunctional relative to the water and mineral cycles and energy capture. Special water conservation treatments, such as contour ripping, wing ripping, and diking, along with reseeding can be effective for restoration of arid and semi-arid rangelands that have deteriorated beyond a critical threshold in the downward desertification spiral. These mechanical soil disturbances resist runoff and enhance rainfall infiltration, and some, such as ripping, fracture subsurface hardpans that may be present. When properly installed and spaced on the contour, these mechanical soil disturbances function on the principles of runoff farming or water harvesting. This paper summarizes results from research on the utility of these practices for restoration of degraded rangelands in western Texas. Rainfall has percolated to a depth of 4 to 5 ft along rips, wing rips, and dikes, compared to only 0.5 to 1.5 ft on adjacent, untreated areas. At 6 years after treatment at one study site, grass production was 76, 210, and 1380 lb/acre on untreated, ripped, and ripped and herbicide-treated rangeland, respectively. Ripping increased the carrying capacity of the range site almost 3 fold while ripping plus weed control increased carrying capacity 18 fold. We attach a single-row grass planter to rippers and disk dikers that facilitates installation of the mechanical soil disturbances and seeding in one operation. However, grass establishment has rarely been highly successful, because of drought and inadequate seedbed preparation. Success with ripping, wing ripping, and diking has been greatest when applied where some of the better grasses remain alive and capable of immediately utilizing the water that has been concentrated in the soil along the mechanical disturbances.