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Reclaiming Texas Brushland Range

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Within the Rio Grande Plains of Texas, 15,000,000 acres of former grasslands are now occupied by a maximum invasion of subtropical thorny trees and shrubs. This radical change in vegetation has had a profound adverse effect on the ranching economy, ranching operations and productive capacity of an area formerly covered with rich grasslands. Ranchers have been forced to attempt restoration of their ranges. With the aid of soil conservation districts, the Soil Conservation Service, the Extension Service, and experiment stations numerous methods have been tried. Out of the many methods tried, rootplowing seems to be the most successful for the type of brush found in this area. Ranchers are carrying out rootplowing followed by reseeding on a rapidly expanding scale.

The Rio Grande Plains of Texas, locally known as the "Brush Country", comprises the southernmost part of Texas between the Rio Grande River on the west and the Gulf of Mexico on the east, and bounded on the north by the Edwards Plateau. It is an area of low relief with elevations ranging from near sea level to 1,000 feet on the northwest. Rainfall decreases from near 30 inches on the east to 18 inches on the west. Drouths of one or more years duration occur frequently. Evaporation ranges

from 55 inches per year on the coast to 113 inches along the Rio Grande River (Bloodgood, Patterson, Smith, 1956). Temperatures are generally high with frost free periods extending from 270 to 320 days. Soils are deep except for a few thin gravelly ridges. Soil textures range from coarse sands to heavy tight clays. The geological formations are recent and have tilted to the southeast, resulting in bands of different types of soils, each several miles in width as one crosses the area from northwest to southeast. Vast extensions of the Rio

Grande Plains also occur south of the Rio Grande River in Mexico.

Brush Country Vegetation

The original vegetation consisted primarily of mid and tall grasses such as two and four-flower trichloris (*Trichloris* spp.), tanglehead (*Heteropogon contortus*), Arizona cottontop (*Trichachne californica*), sea-coast bluestem (*Andropogon littoralis*), plains bristlegrass (*Setaria macrostachys*) and pappus-grasses (*Pappaphorum* spp.). Grasses of an increasing or invading nature were present in minor amounts and are presently the most abundant. Among these are three-awns (*Aristida* spp.), red grama (*Bouteloua trifida*), whorled dropseed (*Sporobolus pyramidatus*), curlymesquite (*Hilaria belangeri*), sandburs (*Cenchrus* spp.), hooded wind-

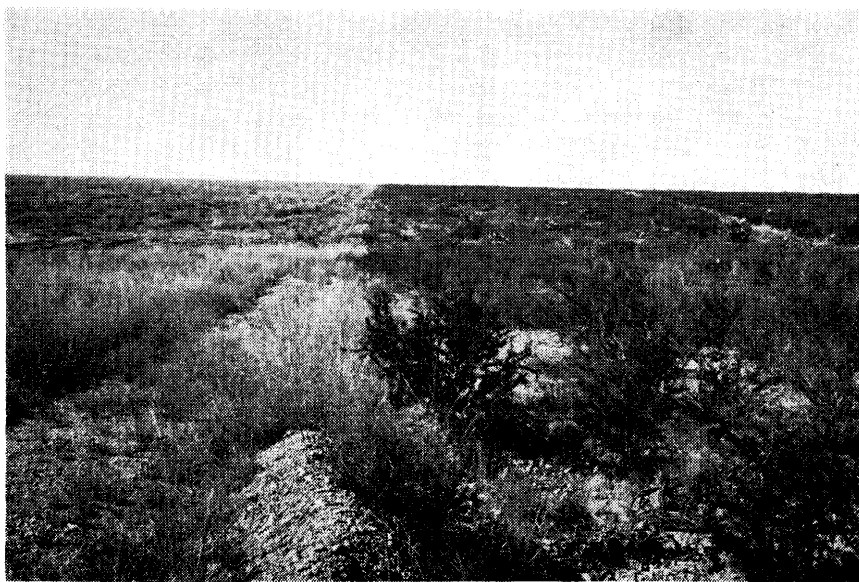


FIGURE 1. A gravelly ridge range site on the Dolph Briscoe, Jr., ranch, Catarina, Texas, showing brush control by rootplowing and seeding on the left and untreated range on the right. Work done in the spring of 1955; photo taken in December of the same year.

millgrass (*Chloris cucullata*), lovegrasses (*Eragrostis* spp.), Hall's and filly panicums (*Panicum* spp.) and fringed signalgrass (*Brachiaria ciliatissima*). The limited rainfall, high temperatures and evaporation, lack of severe cold, and generally high humidity of the Rio Grande Plains provide conditions favorable to the encroachment of subtropical thorny brush and trees. The most prevalent species are mesquite (*Prosopis juliflora*), *Acacia* spp., spiny hackberry (*Celtis pallida*), cacti, whitebrush (*Aloysia ligustrina*), *Condalia* spp., guayacan (*Porlieria angustifolia*), cenizo (*Leucophyllum frutescens*), and paloverdes (*Cercidium* spp.).

Perhaps nowhere has such a profound change in vegetation on rangelands been so well documented and authenticated as in the Rio Grande Plains of Texas. Shipwrecked, Cabeza de Vaca, the first white man in what is now the United States, in 1530 mentions the vast grasslands in the account of his wanderings. He also relates feeding on pricklypear tunas (fruits) in the area around the springs near present day San Antonio. The early Spanish padres in their travels, while establishing the mission now known as the "Alamo", described the area as a grassy plain where forage and water for livestock were abundant, but wood was scarce (Rechenthin, 1956). Men living today in south Texas, like J. Frank Dobie, are positive in their recollections of the extensive grasslands with trees only to be found along the stream courses.

John Russell Bartlett, U. S. Boundary Commission, wrote in 1854 about the area roughly along a line east and west through San Antonio as "a table land descending to a vast prairie from 150 to 200 miles in width. The eastern portion of this plain is watered by numerous streams and in fertility is unsurpassed by any portion of the globe. The whole of the district consists of

gently undulating plains covered with the most luxuriant grass and without timber except along the margins of the streams. The indigenous prairiegrass is tall, coarse, full of seed at the top, and when young resembles wheat in the spring" (Renner, 1948).

The contrast today is so startling that most visitors express amazement at the thorny wilderness of brush and cacti. The causes of the brush invasion have been debated. In New Mexico and Arizona some authors are convinced that mere grazing management and maintaining grassland in good condition are not sufficient to prevent invasion of mesquite in the desert plains grassland (Humphrey, 1952), and that fire undoubtedly has some influence in keeping ranges free of brush. Texas workers, Young, Anderwald and McCully (1948), conclude that since repeated burnings do not seem to kill all the underground basal buds on mesquite, it seems doubtful that the prairie fires of the old days were actually agents in preventing the spread of the mesquite.

Allred (1948) also felt that fires had been of little or no importance in maintaining the extensive Texas grasslands on areas now largely occupied by mesquite and other shrubs. Indications in the Rio Grande Plains point to a direct relationship between overgrazing, reduced cover, development of crusted soil surfaces or hoofpans, and the invasion and establishment of brush. Overgrazing has been common and prolonged, beginning with the Spanish cattle and mustangs in the period 1750 to 1830 and continuing through the Civil War up to the present.

Recent observations by the author of near total kill of mesquite occurring in good grass stands in the Crystal City, Texas, area during the current drouth, tend to point out the effect of grass competition in eliminating mesquite. All authors are in

agreement that invasion of brush reduces grazing capacity, prevents recovery of grasslands after drouth, contributes to accelerated erosion through deteriorating soil conditions, increases the difficulty and cost of handling and moving livestock, and consequently has severely affected the economy of the livestock industry.

Early Brush Control Methods

The seriousness of the brush problem is evident by the effort and money with which ranchers are attempting to halt and beat back the invasion that is crippling their industry. Many methods have been devised and tried to control brush. Rechenthin (1956) estimates that some form of brush control work has been carried out by ranchers on three million acres in south Texas in the past ten years. The most common methods used were chaining, chopping, treating with kerosene or herbicidal sprays, and dozing. Most woody brush species in the Rio Grande Plains have the ability to resprout from underground basal buds after top growth has been removed by any of the above methods. Consequently, such control methods have not ordinarily resulted in effective kills. The necessity of re-doing control work on most of the acreages now faces the ranchers.

Occasionally, brushwork of some kind was effective in killing mesquite, only to release more obnoxious, shallow-rooted species such as whitebrush, twisted acacia (*Acacia tortuosa*), catclaw acacia (*Acacia greggii*), *Condalia* spp., tasajillo (*Opuntia leptocaulis*), guayacan, creosotebush (*Larrea tridentata*), and spiny hackberry. Significant research in the use of herbicides is being carried out with indications that effective controls for mesquite and whitebrush may be successful in years of normal rainfall.

The popular control methods were rarely followed by reseed-

ing of either native or adapted introduced grasses and only occasionally by desirable management methods, such as deferments from grazing and proper stocking. Range conservationists of the Soil Conservation Service in observing field trials noted that the lack of desirable follow-up range management favored the regrowth or re-establishment of undesirable brush species following control work.

Development of Rootplowing

Evolution in brush control methods has resulted in the development of a process known as rootplowing. Within the past four years 250,000 acres of brushland range have been treated with the rootplow at a cost of over \$2,000,000. The method is now a widely used and economically feasible means of controlling brush. Rootplowing is essentially the pulling of a horizontal V-type blade 10 to 20 inches below the surface. The blade is mounted on or pulled by a large crawler type tractor. The blade severs the roots of the brush and trees from the root crown and top growth. Deprived of a root system, many brush species die, especially if soil conditions remain dry.

Rootplowing appears to have had its origin as a means of clearing land to be put into cultivation. The management of the King Ranch of Texas adapted the method for use in controlling brush on rangeland, where many thousands of acres have been cleared with varying results. In recent years, technicians of the Soil Conservation Service, conservation contractors, machinery companies, soil conservation districts and their rancher cooperators have been successful in modifying and supplementing the technique of rootplowing, resulting in more effective brush control work.

Rootplowing in the past has often resulted in failure either by lack of brush kill, especially the understory species, or failure

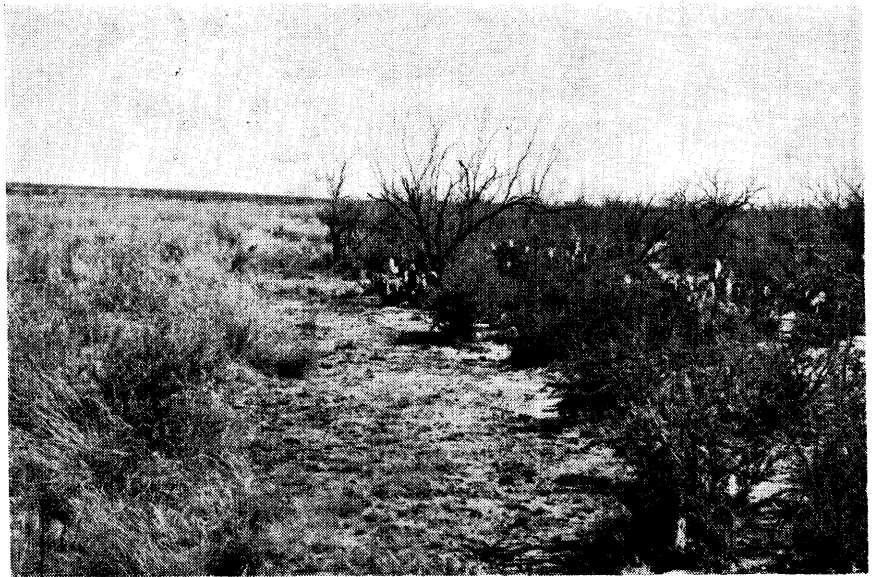


FIGURE 2. Effective control obtained on sandy loam range site on the J. E. Maltsberger ranch, Cotulla, Texas. Range land on the left rootplowed and seeded to blue panic grass in the spring of 1955; untreated on the right. Photo taken six months after rootplowing.

to secure a stand of grass after the operation. Technicians, ranchers, and brush contractors studying the problem concluded that the plow should be modified with several fins mounted at a 25 degree angle on the blade, with a length sufficient to reach the surface of the soil with the rootplow in operation. This modification resulted in severing or heaving roots and root crowns to the surface, thereby vastly augmenting the kill of the shallow rooted brush species. Brush kills of 75 to 95 percent are now common with this new technique, whereas jobs done without fins frequently resulted in failure due to re-establishment or resprouting of brush, especially the understory types like whitebrush. Crusted, rain-shedding, compacted surfaces are common on all soils except coarse sands on brushy, poor condition pastures in the Rio Grande Plains, and, therefore, a second welcome effect of the fins was the shattering of soil crusts. Thus, a favorable condition was set up for intake of rainfall and germination and establishment of residual or seeded grass.

Reseeding and Management Needed

Rechenthin and Allison (1956) relate how brush kills by rootplowing in the neighborhood of 100 percent were achieved on the Duval ranch, but shortly thereafter new brush seedlings appeared, thereby reducing net brush kill to 62 percent. This effect was of considerable concern to range conservationists. In an effort to offset this detrimental effect, SCS range technicians turned to range seeding in an effort to establish a quick, competitive cover to eliminate or reduce brush seedling germination. Native grasses ordinarily return unaided to rootplowed rangeland over a period of two to four years but are too slow to provide the early competition necessary to eliminate new brush seedlings.

Grasses such as blue panicum (*Panicum antidotale*) and buffelgrass (*Pennisetum ciliare*), selected and given trials by the Soil Conservation Service, were then used in an effort to establish quick cover and provide competition. Failures or spotty stands occurred when seeding was done by hand from the tractor or from horseback or air-

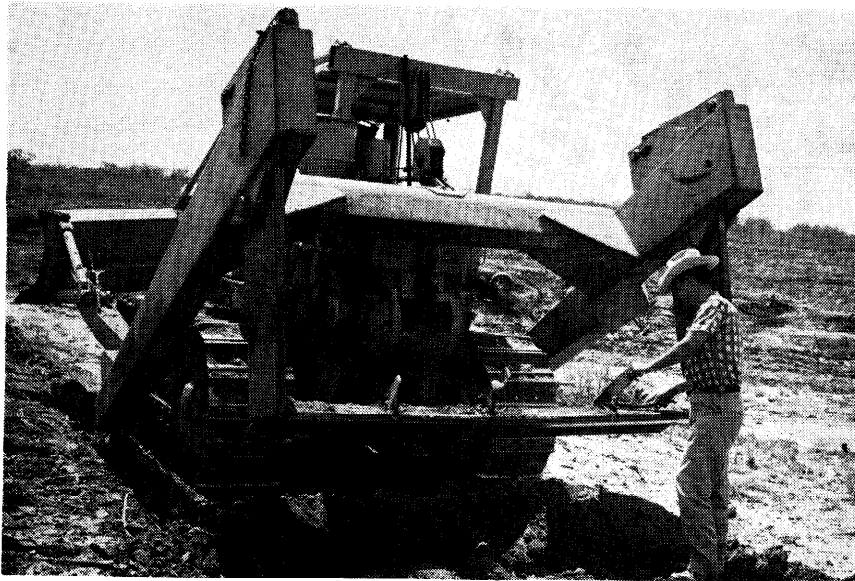


FIGURE 3. Equipment used to rootplow brush-invaded rangeland in south Texas. The fins mounted on the blade are necessary to sever or aerate shallow roots of understory brush for effective kill and to shatter the crusted soil surface. The blade runs below the surface at a depth of 10 to 20 inches. Seeder boxes, operating automatically and connected with the tractor exhaust to get even distribution of seed back of the rootplow blade, are shown just left of center.

plane. A study of the problem and further trials resulted in the development of seeder boxes mounted on the rootplow tractor and connected with the exhaust system in order to blow the seed in an even pattern far enough back of the rootplow to prevent the seed from falling into the deep cracks opened by the blade as it moves through the soil. The new seeding techniques were an immediate success.

Ranchers, with encouragement and technical assistance from soil conservation districts, soon learned to carry out a coordinated job of brush control and reseeding. The ability to bring back raw brushland to highly productive grasslands in one growing season, even during a drouth, has been of great encouragement to ranchers and an important source of income to them. The Agricultural Conservation Program has assisted financially in the work on many ranches.

The importance of sound range management in supplementing the brush control and reseeding techniques cannot be overlooked.

Dolph Briscoe, Jr., ranching in the Dimmit Soil Conservation District has controlled the brush on thousands of acres. He states that the conversion of raw brushland to grassland is a means of drouth-proofing his ranch, and that management consisting of proper stocking, deferments, and water developments will be used to maintain the grass cover once established. Failures in establishing a grass stand and controlling brush have occurred at Cotulla, Crystal City, Eagle Pass and elsewhere in the Rio Grande Plains where control work was not followed by seeding, deferment, or proper stocking.

Costs and Benefits

Costs of rootplowing and seeding vary from \$8 to \$12 per acre, depending on the size of the operation, type and size of brush and the amount of seed used. With seeder boxes mounted on the tractor and operating automatically, conservation contractors have found it possible to do the seeding without cost to the rancher, except for the seed used. Ranchers like Briscoe expect the

returns from increased beef production to pay the costs of rootplowing and seeding in two years with adequate rainfall.

On a 6,000 acre pasture, stocking rates were 60 acres per cow, with supplemental feeding required. After brush control and deferment, Mr. Briscoe stocked the pasture on October 11, 1955, with 512 steers weighing an average of 625 pounds. On April 10, 1956, with no supplemental feeding and no rain during the period, the steers weighed off at 897 pounds. Total gain was 126,464 pounds of beef. Immediately following removal of the steers, the pasture was stocked with 300 cows with calves weighing 325 pounds. The calves were sold in September, 1956, averaging 522 pounds and graded good to choice. The beef production during the twelve month period was 185,564 pounds, or 30.1 pounds per acre. An additional 250 cows were moved into the pasture immediately after removal of the calves. Mr. Briscoe states that the pasture is now in better condition than in the drouth year of 1956.

Herbage production increases of several hundred percent are common. Brush infested, poor condition rangelands rarely produce more than 500 pounds of total herbage per acre per year. Reclaimed pastures normally produce 4,000 to as high as 10,000 pounds, based on air-dry weight clipping at ground level. Pastures with stocking rates formerly as low as 60 acres to the animal unit yearlong are now able to carry an animal unit to 6 acres. However, ranchers are acutely aware of the needs for preventing re-establishment of brush and maintenance of an adequate grass cover to insure maximum intake of rainfall and, therefore, are cautious in planning on stocking rates exceeding 10-20 acres per cow over the long stretch. Violent fluctuations in annual rainfall are common, and stocking rates aimed at retaining grass cover over long

periods is sensible. Ranchers interested in cover for deer and other wildlife are leaving strips and blocks of brush in otherwise cleared pastures for their protection.

C. S. Alexander of Carrizo Springs, Texas, prior to brush control work, was limited to one cow to 33 acres during favorable rainfall years, and was required to burn pricklypear for feed. He is now carrying a cow to five acres without any supplemental feed. Vernor Williams of Carrizo Springs, had the same problem of low stocking rates and feeding. On a brush controlled pasture, he stocked a steer to 8.8 acres, and in seven months they gained 270 pounds per head. Production was 30 pounds of beef per acre. During this period, only 10 inches of rain were received.

Roy Jones and son Leroy of Dentonio, Texas, related the difficulty of producing a 400 pound calf in 10 months on his brushy pastures. They now produce calves averaging 565 pounds in 8 months.

The process of rootplowing and reseedling has been so successful in restoring pastures over a wide area of south Texas that it has displaced most other types of brush control work. Trials are being set up by soil conservation districts having different types of brush problems—in the Trans-Pecos, Edwards Plateau, Rolling Red Plains, and Blackland Prairies of Texas. Rootplows are being purchased by Mexican ranchers for work in Mexico. The results of their work has not yet been ascertained. The ultimate spread of the technique of rootplowing and seeding may extend far beyond the brushlands of Texas. No doubt modifications to meet local conditions will be necessary, just as they were crucial to successful use in south Texas. The success of the range improvement work in south Texas has enabled range conservationists to achieve their objectives of soil, water, and plant conservation, as well as being of great economic benefit to the ranching industry.

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