

Dust Bowl Era

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INTRODUCTION

The Dust Bowl era was the period of drought from 1931 to 1939 that was coupled with severe wind-driven soil erosion of overgrazed rangeland and soil exposed by the use of farming practices not adapted to the semiarid U.S. Great Plains. The eroding soil from once productive range and crop lands filled the air with billowing clouds of dust that subsequently buried farm equipment, buildings, and even barbed-wire fences (Fig. 1); thus, making the living conditions of many Great Plains inhabitants unbearable. On the Great Plains wind is common and drought recurrent; therefore, farm implements and management methods were developed for producing crops under these conditions. Likewise, farmers have evolved into innovative practitioners of soil and water conservation techniques that rely on residue management practices and crop rotations with fallow periods to store precipitation in the soil for later crop use.

HISTORY

During a sustained drought beginning in 1931 and continuing until 1939, wind erosion of range and farmlands filled the air with clouds of dust for days at a time. The Dust Bowl shifted annually over the Great Plains to affect different areas and grew with the expanding drought to damage an annual peak of about 20 million hectares.^[1] However, the overall affected area (Fig. 2) encompassed almost 40 million hectares that extended from south of Lubbock, Texas (33° 34' N, 101° 52' W) to north of Colby, Kansas (39° 23' N, 101° 3' W) into Nebraska and from Great Bend, Kansas (38° 22' N, 98° 50' W) west to near Pueblo, Colorado (38° 16' N, 104° 37' W). The most severely affected farmland was located within a 160-km radius of Liberal, Kansas (37° 2' N, 100° 55' W), the center of the Dust Bowl.

The Dust Bowl land was native range for the North American bison and home to Native Americans prior to Euro-American settlement. It had been labeled the "Great American Desert" by explorer Stephen Long following his expedition to the area about 1820.^[2] The challenges of this region, whether invoked by the perceptions of "Desert"-life or by Native Americans protecting their homes and

hunting interests, limited cultivation. For example, in 1879 or about five years after the Red River Indian wars, only 264 ha were cultivated in all of the 26 counties that make up the Texas Panhandle,^[2] but cultivation expanded with favorable rains during 1882–1887 and 1895–1906.^[3] Native rangeland was typically cultivated by tillage methods adapted from the more humid U.S. regions, which buried most of the plant residues, e.g., a Lacrosse disc breaking plow that relied on as many as 12 horses and mules.^[4] Draft animal requirements for forage crops and native range limited some soil disturbance and provided, incidental, residues that protected the land. These farming practices that indirectly conserved soil were replaced by agricultural mechanization, which expanded tillage and allowed a single farmer to manage increasingly more land.

Agricultural mechanization and increased demand for wheat by Europe during World War I nearly doubled the amount of land cultivated from 1910 to 1920.^[1] However, mean annual rain during the period 1918–1929 averaged about 100 mm above the 515 mm norm^[3] and promoted continued farm expansion to about 16 million hectares that were largely placed into a wheat monoculture. The booming wheat market, beneficial rains, and increasing agricultural mechanization placed in motion rapidly expanding cultivation that exposed millions of hectares of land with potentially erodible soil. It was the climatic conditions of drought from 1930 to 1940 (Fig. 3) that ultimately triggered wind erosion of excessively tilled land and the Dust Bowl.^[3]

DUST BOWL LESSONS

In a 1936 report to President Roosevelt from the drought area committee, Morris Cooke and others outlined the nature, causes, and recommended lines of action to ameliorate factors resulting in the Dust Bowl.^[5] They noted that Great Plains agriculture had developed a dependency on over grazing and excessive plowing, which exposed loose soil to the wind. These farming practices did not conform to natural conditions of the Great Plains and resulted in an unstable agriculture and unsafe economy. The basic problem causing the Dust Bowl was identified as the attempt to impose farming practices suitable for humid regions on the semiarid Great Plains. The committee





Fig. 1 The devastation imparted by dust storms to Great Plains farmsteads from Texas shown at the bottom (1938 USDA Photo by: B. C. McLean, Image # 01D11486) north to South Dakota (1936 USDA Photo by: Sloan, Image # 00D10971).

further recognized, as unrealistic, the expectations of climate changes toward improved temperature, precipitation, and wind conditions. Therefore, in a region of limited annual precipitation, farming practices to reduce run-off and increase water storage in the soil were critical to agricultural success.

The drought area committee further stated that the 1862 federal homesteading policy exacerbated land degradation by offering unrealistically small farm allotments for the semiarid Great Plains west of the 100th meridian.^[5] That is, the government policy actually encouraged over utilization of pasture and cultivated land. Subsequent

efforts to correct the homesteading policy by increasing land allotments as late as 1916^[6] were heralded by the often-cited 1909 Bureau of Soils Bulletin 55 claim of an “indestructible and immutable soil resource.”^[7] The hazard of over cultivation and grazing was the exposure of loose soil to wind and erosion. This damage was aggravated further by volatile wheat markets that encouraged speculative production by absentee landowners relying on tenant farmers. In some cases, the tenants were transient farmers that only custom planted and harvested crops without remaining on the land. The proportion of land farmed by tenants increased from about



The Dust Bowl



Fig. 2 The United States and the overall affected “Dust Bowl” area, from the “American Experience.”^[13]

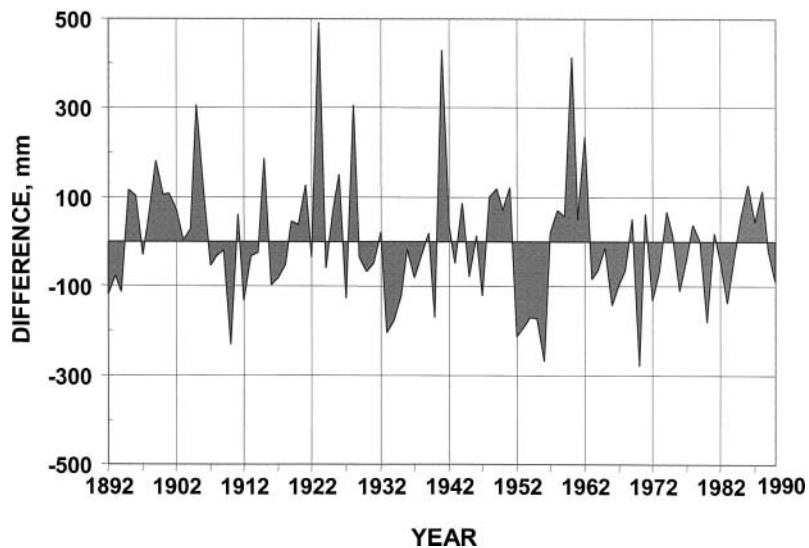


Fig. 3 Deviation from the mean annual precipitation (515 mm) at Amarillo plotted for the period 1892–1990.

16% in 1880 to over 40% in 1935,^[5] but the transient tenant farmers abandoned the land when commodity markets collapsed.

Agriculture capable of withstanding recurrent drought periods replaced the excessive tillage practices that incorporated crop residues and degraded the structure or natural cohesiveness of soil. Alternative tillage practices were developed to control weeds and the use of precipitation stored as soil water. These tillage practices

also undercut rather than inverted the soil, thus reducing soil disturbance and increasing crop residues retained at the surface to conserve soil and water.^[8] Revised land policies promoted conservation practices by rewarding farmers for using contour plowing, listing, and strip cropping methods.^[9] The Dust Bowl wheat monoculture required timely fall and winter precipitation for crop establishment and growth; however, in much of the southern Great Plains mean monthly precipitation is



limited during this critical period (see example for Amarillo area, Fig. 4). In lieu of wheat monocultures, practical wheat and summer crop rotations with an intervening fallow (i.e., two crops in three years) were developed to take advantage of summer rain (Fig. 4) and to provide sufficient opportunity for storing precipitation as soil water during fallow and improve crop establishment.

The damaging effect of excessive tillage contributed significantly to soil erosion throughout the Dust Bowl, but it may have been overstated as in Rexford Tugwell's film *The Plow that Broke the Plains*.^[1] Soil erosion was also triggered by overgrazing and drought conditions, which were reduced through improved cattle management and the use of irrigation. Depressed commodity prices, however, virtually eliminated irrigation of crops, e.g., the Texas Panhandle had some 170 irrigation wells in 1930 or 60 to 80 fewer wells than a decade earlier in 1920.^[10] Irrigation expanded slowly until drought conditions of the 1950s promoted rapid growth from Texas to Kansas.^[11,12] Irrigation as a solution to drought in the Dust Bowl region almost exclusively depends on the Ogallala aquifer,^[12,7] which has now dramatically declined. If irrigation was the dominant factor preventing soil erosion during the 1950s by offsetting drought conditions, it would follow that the Dust Bowl miseries may eventually return when irrigation from the southern Ogallala becomes impractical.^[7]

AGRICULTURE—DUST BOWL VICTIM OR VILLAIN

In 1933, the director of new Soil Erosion Service, Hugh H. Bennett, indicted Americans as great destroyers of land as substantiated by the Dust Bowl conditions and called for awakening to improved farming practices.^[13] Farmers and

their children likewise recognized the fragility of the land and the inappropriate nature of their farming practices in laments that “All the good soil will blow off this land if these sand storms continue”^[14] and “It would be better if the sod had never been broke . . .”^[15] Many farmers expanded production to offset lower prices and passively relied on luck to “hit big” with a crop that would change their fortune even as the commodity market collapsed in the 1920s.^[12] The resulting economy was unstable and led to a general depopulation trend and agricultural collapse that was squarely in line with the creation of a “Buffalo Commons”^[16] whereupon the government would step in to buy abandoned Great Plains farmland and restore it to an undisturbed range condition.

In response to the disastrous effects of the Dust Bowl, government programs were redesigned to encourage diversified agricultural crop production using tested practices and improved tools. That is, agriculture was empowered with new noninverting tillage implements capable of penetrating the hard dry soils like the Graham-Hoeme plow for controlling weeds while retaining crop residue at the soil surface.^[8] Innovative wheat-sorghum cropping sequences optimized soil water storage opportunities and increased the probability of capturing rain for crop use. A growing number of managers now farming the Great Plains minimize soil disturbance and protect their crop residues as vital resources to optimize the storage of precipitation as soil water.^[17] The efficiency of precipitation storage in the soil has improved from about 20% during the Dust Bowl to more than 40% by using innovative crop sequences with fallow periods and no or reduced tillage.^[18] Farmers now utilize preplanned alternative rotation sequences to optimize crop water use during periods of beneficial rain and include other production inputs like fertilizers in response to specific

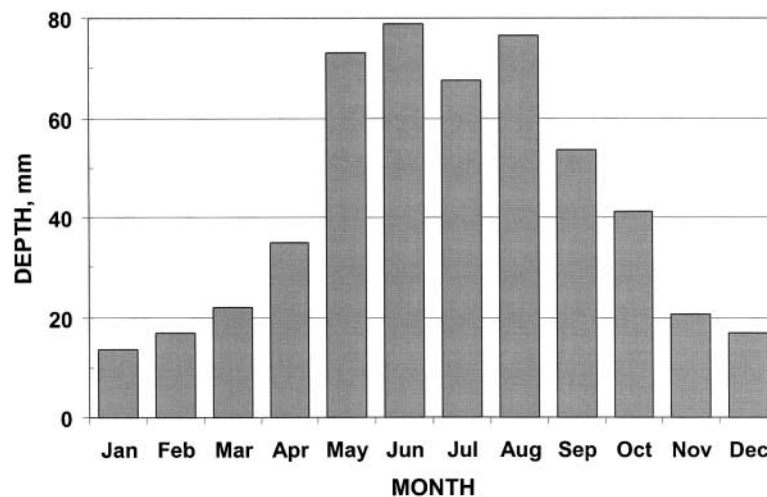


Fig. 4 Mean, 1892–1990, monthly precipitation at Amarillo.



needs.^[17] These innovations, in contrast to Dust Bowl soil management using inversion tillage and wheat monocultures, have resulted in substantially more stable economies and slowed the depopulation trend.

In contrast to the farmers of the Dust Bowl hoping to “hit-big” on a crop, many of today’s Great Plains farmers are more proactive managers that respond to adverse growing conditions with alternative technology.^[12] For example, when drought conditions reappeared during the early 1950s, Kansas farmers widely adopted irrigation to stabilize production. Since that time fluctuating irrigation costs and the competition for and depletion of water resources have driven innovation in irrigation. These innovations include irrigation scheduling methods to meet plant demand and improved application technologies such as low-pressure center pivot systems. While these innovations will prolong the use of irrigation to offset recurrent drought conditions, the finite nature of Ogallala water supply^[7,10–12] focuses concern on the potential of a recurrent Dust Bowl. The development and application of new soil and crop management practices not available during the 1930s will determine if the Dust Bowl is as recurrent as drought.

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