

History of Grassland Plowing and Grass Planting on the Great Plains

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Abstract.—Plowing on the western plains started in the 1880s. First attempts to stop erosion by planting grasses came after the Dust Bowl (1930s). During the Soil Bank Program (1956-1969) 14.1 million acres of grassland were planted. These lands were re-plowed along with more than 4.5 million acres of previously unplowed grasslands in the 1970s and early 1980s.

This paper deals with some of the historical aspects of land use on the Great Plains of the United States.² The Great Plains, as defined in this paper, are the treeless steppes of North America that lie west of the 98th Meridian and east of the Rocky Mountains and extend from northern Mexico into southern Canada. The climate is semiarid to subhumid. The Great Plains were called "The American Desert" during much of the nineteenth century, a name that was prophetic of the conditions during the drought of the 1930s. Much of this paper will deal with the western and more arid part of the Great Plains nearest the mountains and generally receiving 15 inches or less of precipitation. The native vegetation of this area is dominated by shortgrasses and midgrasses.

The first human inhabitants of the Great Plains were the nomadic and non-agricultural Plains Indians who depended on game for food. The native grazing animals included the bison and pronghorn antelope, both of which were present in large numbers.

Settlement

Spanish explorers come into the plains in the sixteenth century and, during the latter part of the seventeenth century, established missions in southern Texas. However, they had little influence in the Great Plains. Parts of the Great Plains were explored by Lewis and Clark (1803-1806), Pike (1803-1807),

and Long (1819-1820). Until about 1830 explorers, fur trappers crossed the Great Plains to get to the foothills and mountains in search of beaver.

Starting in the 1840s, many travellers passed through the plains heading for somewhere else. Travellers on the Oregon Trail followed the Platte and North Platte Rivers in Nebraska and Wyoming starting in 1841. In the late 1840s, the same trail across the plains was used by the Mormons heading for Utah and by the gold miners heading for California. It is estimated that 350,000 people came across this trail in Wyoming from 1841 through 1866 (Dorn 1986).

The cattle industry had become well-established in Texas in the early nineteenth century. Cattle numbers in Texas increased rapidly, but marketing the stock was a problem. Following the Civil War, the railroads were extended west of the Missouri River. The great trail drives taking Texas cattle northward began in 1876 when cattle were driven to the railhead at Abilene, Kansas, to be shipped to Chicago and other eastern cities. As the railroads continued westward, so did the shipping points. Between 1867 and 1880, over 4 million cattle were trailed north to the railroads in Missouri and Kansas and shipped to the East (Webb 1931).

The first cattle came to the western part of the northern plains in 1866 when Charles Goodnight and Oliver Loving brought 1000 cattle through New Mexico on the Goodnight-Loving trail and sold them to John Wesley Iliff near Greeley, Colorado. The 1860s and 1870s was a period when large ranching operations were formed through the use of foreign capital (mostly English and Scottish) and "free" grass on the public domain lands. In northeastern Colorado, Iliff owned only 15,000 acres but, by virtue of controlling access to water, he dominated the whole northeastern part of Colorado and ran 35,000 cattle. The Prairie Cattle Company, a British company, controlled over 5 million acres in Colorado, New Mexico and Oklahoma and owned

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²The early history was drawn largely from McGinnies, W.J., and W.A. Laycock (In Press), *The Great American Desert—Perceptions of Pioneers, The Dust Bowl, and The New Sodbusters*, a paper presented at the Arid Lands Research Development Conference in Tucson, Arizona in October, 1985.

140,000 cattle (Steinel 1926). There were many other such ranching operations throughout the Great Plains. Cattle numbers in the Great Plains states increased from 1.1 million in 1870 to 4.4 million in 1880 to 8 million in 1886 (U.S. Senate 1936).

Mild winters had prevailed on the plains in the 1860s through the mid 1880s when this rapid expansion took place. However, the winter of 1885-86 on the southern plains was extremely severe and the following winter was also quite severe on the northern plains (Mitchell and Hart 1987). During these two years, hundreds of thousands of cattle either froze or starved to death. This, coupled with drought and a drastic decline in cattle prices, helped end the days of the vast cattle empires on the plains.

Another factor which influenced the decline of the cattle industry was the arrival of homesteaders in the western part of the plains. Congress had passed the Homestead Act in 1862. It allowed a person to take possession and farm 160 acres. The better lands in Iowa, Missouri, Kansas, Nebraska and other eastern plains states were homesteaded first. There, 160 acres was sufficient to make a living. In the western plains much of the land and the climate were not suited to farming, and 160 acres was insufficient to support an individual farmer and this family. However, large numbers of homesteaders started to reach the western Great Plains by the mid 1880's.

The transcontinental railroad across Nebraska and Wyoming was completed in the late 1860's. In the 1870s and 1880's other railroad lines were pushed into many parts of the western plains. Most of the railroads received a government subsidy in the form of land. The railroads were anxious to sell this land to settlers in order to raise capital and to provide a steady passenger and freight revenue. Land was also available for the settlers to homestead. To entice settlers to move to the Great Plains, it was first necessary to dispel the myth of the "Great American Desert." Promoters, called "Land Boomers," made extravagant claims about the productivity of these lands. They claimed that "rain follows the plow"; i.e., as soon as people started farming, more rains would come. Reports of exceptional crop yields (obtained during very favorable years) were widely reported in the Eastern press. Such high yields often occur immediately after sod is broken because of the initial availability of nutrients.

By 1890, 6 million people were living on the Great Plains, most who had come after 1886. Between 1880 and 1899, 104 million acres on the plains were plowed for crop production (U.S. Senate 1936). Wheat grown under dry land farming techniques has been the primary crop since the 1890's.

Shantz (1956) reported that, by 1908 in eastern Colorado, only 13% of the land had been plowed. When he again surveyed this same area in 1949, 96 percent of the land had been plowed. Most of the new plowing was done from 1915 to 1925 to grow wheat needed during World War I and the economic expansion that followed. It was also during this period that large-scale mechanization came to the wheat-growing areas of the United States. This permitted an individual farmer to raise crops on much more land. All of this plowing had a major effect on the severity of the dust storms during the Dust Bowl period.

The Dust Bowl, 1931-1936

The history of the Dust Bowl has been well documented. Of particular interest are recent books by Worster (1979) and Hurt (1981). Hurt (1981) pointed out that there were many severe dust storms before those of the 1930's. Dust storms were reported in 1830, 1854, 1860-1864, 1874-1878, 1886-1888, 1892-1893, 1895, 1901-1904, and 1912-1914. Shantz (1956) observed that, while there had been dust storms, there was no Dust Bowl until the native sod was destroyed by the plow.

In the United States, starting in 1931 and continuing until 1936, precipitation throughout the plains was extremely low. In some years the native grasses did not even green up and crops routinely failed. By 1933 almost any wind was creating dust storms from fields bare of crops (Hurt 1981). The major dust storms occurred in 1934 and 1935, some of which reached the east coast and out over the Atlantic Ocean. One such storm in May 1934 was cited by Hugh H. Bennett, first Director of the Soil Conservation Service, as a turning point in arousing public awareness of the problem:

"This particular dust storm blotted out the sun over the nation's capital, drove grit between the teeth of New Yorkers, and scattered dust on the decks of ships 200 miles out to sea. I suspect that when people along the seaboard of the eastern United States began to taste fresh soil from the plains 2,000 miles away, many of them realized for the first time that somewhere something had gone wrong with the land. . . . it took that storm to awaken the nation as a whole to some realization of the menace of erosion."

These dust storms spurred a formerly apathetic government into action. The Bankhead-Jones Act was passed in 1935, one portion (Title III) of which authorized the government to buy submarginal land that was not capable of supporting a family. Land Utilization Projects were established throughout the western part of the Great Plains as models for proper grassland agriculture. Many of these plowed lands were seeded to perennial grasses while others were allowed to return to a grass cover naturally through the process of secondary succession. These Land Utilization Projects were administered by the newly created Soil Conservation Service from 1938 until 1954. In 1954 most of these lands were turned over to the Forest Service and are now known as National Grasslands.

The New Sodbusters

During the period following the Dust Bowl, conservation practices were developed and put to use. In the 1940's, a decade of generally favorable precipitation, some additional land was plowed for wheat production, a result of the needs of World War II and the desire to take advantage of the high wheat prices in the post-war period. An intensification of plowing of previously unbroken grassland began in the mid 1970's after the historic Russian wheat sale of 1972 and continued into the 1980's.

National attention of such activity did not come until the spring of 1982 when a Canadian farmer purchased approximately 15,000 acres of rangeland in Weld County in northeastern Colorado and proposed to plow it (Steinmark 1983). The county commissioners, worried about the consequences, first tried unsuccessfully to get the state to intervene, then finally passed an emergency ordinance prohibiting plowing of grassland that had not been plowed in the past 5 years without a permit. Unfortunately, the 15,000 acres in question had already been plowed by the time the ordinance was passed.

This particular plowing incident and the legal action by Weld County drew national television and newspaper coverage and prompted widespread concern in Colorado and other states. Several other counties in Colorado and at least one county in Montana have adopted laws patterned after the Weld County legislation to try to prevent unwise destruction of native grassland. The Weld County incident was only one example of what had been happening in the previous years throughout eastern Colorado and in other plains states such as Montana (Walcheck 1983) and Nebraska (Aucion and Pierce 1983).

Approximately 4.5 million acres of previously unbroken grassland have been plowed during the recent past in the central and northern Great Plains (table 1). The greatest amount of plowing has been in Montana with 1.8 million acres plowed between 1977 and 1982. Newly plowed land in North Dakota (849,000 acres), South Dakota (750,000 acres), and Colorado (572,000 acres) make up the bulk of the additional area plowed (Laycock and Lacey 1984). Much of this was in land capability classes IVe, VI and VII.

In 1983, by far the greatest amount of grassland plowing activity was in Montana. The total acreage plowed in 1983 is not known, but was estimated to be 250,000 acres. Some very extensive areas plowed in solid blocks received widespread publicity. For example, one operator plowed a large part of the 50,000 acre Crow Rock Ranch in Garfield and Prairie Counties, and another plowed about 25,000 acres of 2 ranches in Petroleum

County. Much of this plowing was done in solid blocks, miles on a side, filling in gullies and waterways (Walcheck 1983, Crummett 1983). By 1984 declines in land prices and low wheat prices had stopped much of the plowing, at least on such a large scale.

Very little grassland would have been plowed if there were no economic incentives to do so. Of primary importance has been the depressed state of the cattle industry. Cattle prices have been and remain low, and many cattle raisers have lost money on their operations for a number of years. Until recently, a great many ranchers had stayed in business only by using steadily increasing land values as collateral for loans for operating capital.

The loan value of the land stimulated some of the plowing (Huszar and Young 1984) because farm land was worth two to three times as much per acre as rangeland with little regard for the long-term productive capacity of the land or the erosion hazard. In fact, some plowing apparently was forced by banking or agricultural lending organizations insisting that certain lands be plowed in order to qualify for loans. Some of this type of plowing to increase land values was done by individual ranchers or farmers, but more often it was done by speculators, at least in the late 1970s and early 1980s. In the last several years, drastically decreased land prices have temporarily taken the speculators out of the picture.

In addition to the economic factors discussed above, government agricultural support programs have played a major role in grassland conversions (Walcheck 1983). Crop price supports, crop insurance, disaster payments, Farm Home Administration loans, land set-aside payments such as the Payment in Kind program (PIK), and storage loans enhanced the expected returns from grasslands converted to crop land and accelerated the plowout. It is at these federal subsidies that Sen. William Armstrong (R-Colorado) aimed his "sodbuster" bill, which passed the Senate in 1982 and again in 1983 but failed to pass in the House in both years. Different versions of the "sodbuster" bill passed both houses of Congress in 1984. However, the conferees could not agree and the legislation died. The Food Security Act (FSA) of 1985 contained "Sodbuster" and "Compliance" features and also provided for a "Conservation Reserve" which would pay farmers for putting highly erodible land back to pasture or other permanent vegetation.

Table 1.--Area of previously unplowed grassland in the northern and central Great Plains, plowed in the 1970's and early 1980's. Figures are estimates from the Soil Conservation Service in each state.

State	Area (thousand acres)
Colorado	572
Kansas	15
Montana	1,842
Nebraska	400
North Dakota	849
South Dakota	750
Wyoming	71
Total	4,449

¹Land plowed through 1982. An additional 250,000 acres was estimated to have been plowed in 1983, but cannot be substantiated.

Efforts to Revegetate Plowed Lands

The first major effort to replace perennial grasses on plowed land on the Great Plains came after the Dust Bowl. By 1951, 0.9 to 1.1 million acres were seeded on the almost 6 million acres of the Land Utilization projects in 12 states (from undated and unpublished file report "Policies Regarding Conservation and Development and Use of Land Utilization Project Lands Administered by the Soil Conservation Service"). No record was found of the species used or success of the seedings. Entire Land Utilization Projects were put under proper grassland management and the lands have been retained in Federal ownership preventing any replowing. Except for those in Montana, the Land

Utilization lands were turned over to the U.S. Forest Service in 1954 and have been administered as National Grasslands (table 2).

Most information concerning the drought of the 1930's was focused on the Great Plains of the United States. Gray (1967) published a book "Men Against the Desert," which outlined what happened in the Palliser Triangle of Alberta, Saskatchewan and Manitoba in Canada. The drought started earlier in this area than in much of the United States and crops first failed in 1929. The drought prevailed into 1936 with record high temperatures recorded in 1931, 1934, and 1936. The Prairie Farm Rehabilitation Administration (P.F.R.A.) was formed in 1935 to rehabilitate the land and put it back into grazing use. At least one million acres were seeded to perennial grasses, mainly to crested wheatgrass (*Agropyron cristatum*). The seeded and intermingled natural prairie area were fenced into "community pastures." This fenced land totaled 1.0 million acres by 1942, 1.4 million by 1948 and 2.3 million by 1965. These lands are still administered and managed by P.F.R.A., and grazed by local ranchers organized into cooperatives.

The use of shelterbelt planting constituted another approach to prevent erosion during and after the drought of the 1930's on the Grain Plains. In 1934 the federal government proposed to plant windbreaks in a strip 100 miles wide south from the Canadian border to Oklahoma. The first shelterbelt was planted in Oklahoma on March 18, 1935 (Anonymous 1986). By 1942, when much of the effort was completed, 223 million trees had been planted on 30,000 farms and ranches. (Anonymous 1986). These shelterbelts stayed in place, for the most part, until the mid-1970's when farm and machinery size expanded and the shelterbelts began to be viewed as "in the way" of both machinery and the new center-pivot sprinklers. The specter of an another

Table 2.--Area of Land Utilization Lands which became National Grasslands (from Rowley 1985).

State	Area (thousand acres)
Montana	1,900
North Dakota	1,105
South Dakota	864
Colorado	612
Wyoming	573
New Mexico	134
Texas	117
Kansas	107
Oregon	103
Nebraska	94
Idaho	48
Oklahoma	47
Total	5,704

¹Lands in Montana were turned over to the USD1 Bureau of Land Management. All other lands became National Grasslands administered by the USDA Forest Service.

Table 3.--Land area in Soil Bank Program in the Great Plains at its peak (1960-1961) and total cost (1956-1969).

State	Land area (Thousand acres)	Total cost (million \$)
Colorado	1,300	91
Kansas	1,450	136
Montana	630	46
Nebraska	880	72
North Dakota	2,705	209
Oklahoma	1,494	123
South Dakota	1,822	140
Texas	3,667	299
Wyoming	125	8
Total Great Plains	14,073	1,124
Total U.S.	28,661	2,477

drought had been forgotten or disregarded, and a great many of the shelterbelts were removed and maintenance of many of the other was discontinued. Thus, the trees and shrubs that had been planted with government subsidies were removed to grow more crops which were subsidized by the same government.

The first major effort to get perennial cover planted on plowed private land was the Conservation Reserve Program established in 1956 under the Soil Bank Act. The primary purpose of the program was to divert land from crop production. The secondary purpose was to establish and maintain protective vegetative cover (trees, perennial grass, etc.) on the land taken out of crop production (undated and unpublished file report, Soil Conservation Service "Final Report, Conservation Reserve Program, Summary of Accomplishments, 1956-1972).

The Soil Bank was a voluntary program. Each participating farm signed a contract to withdraw a designated area of cropland from production for 3 to 10 years. Other agreements were to; (1) comply with any acreage allotments, (2) reduce the total cropped acreage by the amount placed in the reserve, and (3) provide and maintain approved conservation cover on the reserve land. The farmer was eligible for cost sharing for establishment of the conservation cover and received annual rental payments to compensate for the loss of income on the acres retired.

At the peak of the program in 1960 and 1961, there were more than 306,000 farms with approximately 28.7 million acres under contract (table 3). About half of these acres (14.1 million) were in the Great Plains and most of these were planted to perennial grass. Total cost of the program was \$2.48 billion for rental payments and \$162 million cost sharing for establishment. The average annual payment was \$11.85 per acre, and the average total payment for the life of the program was \$86.43 per acre. All contracts had expired by the end of 1969.

It appears to be debatable whether the primary purpose of the Soil Bank, i.e., to divert land from crop production, was achieved. Figure 1 shows the acreage enrolled in the Soil Bank Program and the total acreage of wheat in the Great Plains. It is assumed that most of the land put into the Soil Bank in the Great Plains were wheat lands. The Soil Bank does not appear to have

resulted in a substantial drop in the acres of wheat planted in the plains. The drop in wheat acreage in 1957 may have resulted more from a separate voluntary Acreage Reserve Program in 1956-58 that paid farmers not to grow crops. This Acreage Reserve Program idled about 11 million acres on the Great Plains in 1957. There were similar cropland set-aside programs in 1969-1972 for 12-20 million acres each year. These tended to reduce wheat acreage during the period when the Soil Bank contracts were expiring.

The secondary purpose of the Soil Bank, i.e., to establish and maintain protective vegetation, also failed in the long run, at least on the Great Plains. A fairly dramatic increase in wheat acreage starting in 1973 resulted in most Soil Bank lands being plowed and was at least partially a response to prices. Wheat was selling for about \$1.80 per bushel in 1972. A large wheat sale to Russia pushed prices to more than \$4.00 a bushel in 1973 and 1974. By 1977 prices had fallen to \$2.30 per bushel and this, coupled with new set aside programs in 1978 and 1979, again reduced wheat acreage. The drop in acreage in 1983 (fig. 1) appears to be a result of the PIK (Payment in Kind) Program.

It appears that the Soil Bank Program was successful as a conservation measure only during the life of the contracts. Although data are not available, experienced observers have indicated that, on the Great Plains, almost all of the cropland planted to grass in the Soil Bank Program were plowed again in the early 1970's or later. Thus the \$2.6 billion spent (\$86 per acre under contract) was not effective as a long-term conservation measure. Although much more difficult to determine, it also appears that the Soil Bank had little immediate or long term effect on the reduction of acreage planted to wheat.

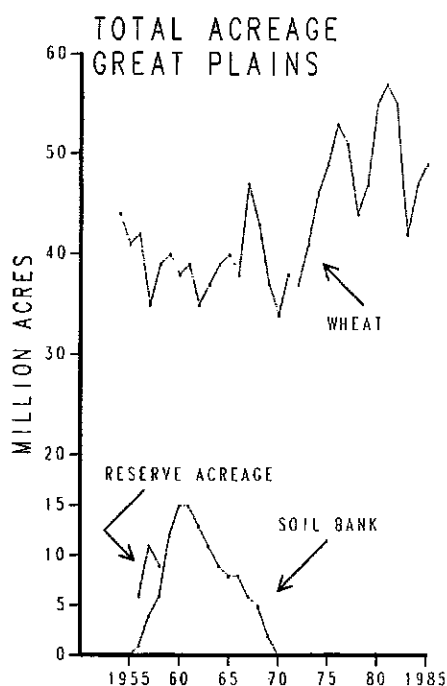


Figure 1.—Total acreage of wheat on the Great Plains and amount of land in the Soil Bank, 1956-1969.

Table 4.—Great Plains range and pasture lands identified as having high and medium potential for conversion to cropland in the next 10-15 years (Hexem and Krupa, 1987).

State	Area (thousand acres)
Northern Plains (ND, SD, NE, KS)	20,397
Southern Plains (TX, OK)	25,927
Plains "Fringe" (MT, WY, CO, NM)	11,410
Total	57,734

Conservation Reserve--1985

The Conservation Reserve Program (CRP) of the Food Security Act of 1985 provides for up to 45 million acres of highly erodible land to be planted to permanent cover. Other papers in this proceedings will discuss the CRP in detail. It is important to note that this program is very expensive (average cost of a Conservation Reserve contract will be \$450-500 per acre as compared to the \$86 paid during the Soil Bank program). In the western Great Plains this is many times what the land could be purchased for at the present time.

Will the current CRP succeed where the Soil Bank failed and result in permanent retirement of these erodible lands? The Sodbuster and Compliance provisions of the 1985 FSA should help accomplish this. The main question is whether USDA policy and Congressional legislation will remain resolute in preventing re-plowing of these lands when CRP ends. Past history does not provide much encouragement that such resolve will prevail. We seem to be very willing to modify our conservation laws and policies to take advantage of short-term economic opportunities.

One indication of conflicting and potentially harmful policies is the publication of a study by the USDA Economic Research Service on the amount of land not currently cropped that could be converted to crop use (Hexem and Krupa 1987). They reported that about 35 million acres in the United States have a high potential for conversion to crop use and 117 million more acres have medium potential for conversion over the next 10-15 years. They identified 57.7 million acres of range and pasture land in the Great Plains states with a medium or high potential for conversion to cropland (table 4). Although the range and pasture land was not identified by land class, from other figures presented it can be concluded that much of the land identified for possible conversion is in land capability classes IV through VIII.

It appears that some serious policy conflicts are occurring and will continue in the future. Identifying more than 57 million acres of range and pasture land in the Great Plains as having potential to be plowed in the next 10-15 years at the same time that 45 million acres are being taken out of crop production in the Conservation Reserve Program in the entire U.S. does not bode well for a future consistent policy either by USDA or Congress. Plowing new land at the same time or following retirement of substantial amounts of erodible land would negate the effects of a very expensive conservation program.

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United States
Department of
Agriculture

Forest Service

Rocky Mountain
Forest and Range
Experiment Station

Fort Collins,
Colorado 80526

General Technical
Report RM-158



Impacts of the Conservation Reserve Program in the Great Plains

Symposium Proceedings

September 16-18, 1987

134 pp.

