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SCALING THE DUST BOWL

By Geoff Cunfer

THE DUST BOWL IN AMERICAN CULTURE

The story of the Dust Bowl is strong in American culture. New Deal reformers created the narrative in the 1930s, building into it a justification for their radical efforts to reorganize American agriculture. The tale, in brief, runs like this: In the late nineteenth century, American pioneers moved into the Great Plains to make farms. They plowed prairie sod in Kansas, Oklahoma, Texas, and northward through the Dakotas and Montana. Farmers sometimes did well for a few years, but they had unwittingly entered a landscape that, because of limited rainfall, was unreliable for crop agriculture. The World War I era and the 1920s saw a second assault on the grassland when industrial farmers using tractors plowed even more sod for commercial cash crop enterprises. When a long and deep drought arrived in the 1930s, the southern plains were all plowed up and the grass sod that had held soils in place was gone. Flatland winds picked up the topsoil and blew it into enormous dust storms that eroded farms and devastated the region (figures 4.1 and 4.2). Hundreds of thousands of destitute "Dust Bowl refugees" collected their meager belongings and moved to California looking for work. The Dust Bowl was caused by misuse of a fragile ecosystem. Recent research ques-

tions the spatial assumption of the traditional story: that dust storms happened where the most land was plowed.[1] This chapter questions the temporal assumption of the New Deal story: that dust storms happened only after the massive plow-up of the 1920s.

The traditional Dust Bowl story persists in our collective memory, in part because of the great art that surrounds it. Woody Guthrie's Dust Bowl ballads and John Steinbeck's *Grapes of Wrath* evoke the story. Poignant photographs by Dorothea Lange, Russell Lee, and Arthur Rothstein illustrate it (figures 4.3, 4.4, and 4.5).[2] Donald Worster's powerful

FIGURE 4.2

Dust storm, Prowers County, Colorado. April 1935.

Library of Congress, Prints and Photographs Division, FSA-OWI Collection, LC-USF343-001617-ZE.

◀ **FIGURE 4.1**

Dust storm approaching Stratford, Texas. April 18, 1935.

Photograph by George E. Marsh. National Oceanic and Atmospheric Administration (NOAA). Coast and Geodetic Survey Historic Image Collection, National Oceanic and Atmospheric Administration Central Library.

and beautifully written monograph, *Dust Bowl: The Southern Plains in the 1930s*, has become required reading, not just in environmental history classes, but also in many U.S. history survey courses over the past two decades.[3] As recently as 2006, Bruce Springsteen's album *We Shall Overcome: The Seeger Sessions,* included a track called "My Oklahoma Home" that reprises the story. Various authors emphasize different aspects of the story: the role of technology as farmers converted from horses to tractors, the social injustice of tenant farming, the ecological damage caused by commercial

FIGURE 4.3

Heavy black clouds of dust rising over the Texas Panhandle. March 1936.

Photograph by Arthur Rothstein. Library of Congress, Prints and Photographs Division, FSA-OWI Collection, LC-USZ62-125986.

FIGURE 4.4

Dust Bowl farm. Coldwater District, north of Dalhart, Texas. This house is occupied; most of the houses in this district have been abandoned. June 1938.

Photograph by Dorothea Lange. Library of Congress, Prints and Photographs Division, FSA-OWI Collection, LC-DIG-fsa-8b32396.

agriculture. Some blame farmers, some pity them, some intend to help them do better, but the underlying theme asserts that farmers caused the Dust Bowl by misuse of the land, whether because of innocent ignorance or because of thoughtless greed.

This chapter turns a critical eye on the standard Dust Bowl story, contending in particular with the historical narrative presented by Worster.[4] His *Dust Bowl*

develops a powerful argument that the cause of the dust storms was capitalism, which led farmers to misuse their land. The increasingly commercial character of American agriculture prompted farmers to plow land unfit for cropping, to treat their fields as factories that could yield short-term profits, and to pay little attention to the limits and fragility of the plains ecosystem. The result of this misguided rush for cash was one of the world's three worst ecological disasters. Worster writes,

> During the laissez-faire, expansionist 1920s the plains were extensively plowed and put to wheat—turned into highly mechanized factory farms that produced unprecedented harvests. Plains operators, however, ignored all environmental limits in this enterprise. . . . In a more stable natural region, this sort of farming could have gone on exploiting the land much longer with impunity. But on the plains the elements of risk were higher than they were anywhere else in the country, and the destructive effects of capitalism far more sudden and dramatic. There was nothing in the plains society to check the progress of commercial farming, nothing to prevent it from taking the risks it was willing to take for profit. That is how and why the Dust Bowl came about.[5]

In Worster's narrative, responsibility for the Dust Bowl rests firmly with farmers. They took a pristine wilderness that had been nurtured by Native Americans for ten thousand years and turned it into a wasteland in a matter of decades.[6]

Dust Bowl is built around two case-study locations: Cimarron County, Oklahoma, and Haskell County, Kansas (figure 4.5). Six chapters of the book address the particular experience and history of these two sites in the heart of the Dust Bowl. It is in part this case-study approach that gives the book its power. Reading it, we meet real people with names and faces and dramatic personal stories of suffering, loss, and perseverance. We find heroes and villains. We leave the story feeling that we know the place well and understand the role of local farmers who created and then lived through the Dust Bowl. Using case studies in this way is a powerful storytelling device, and a firmly established method for researching and writing history.

Worster develops the stories of these two counties, then asserts that their experience represents the southern plains generally. When Worster researched his study in the 1970s, historians did not have ready access to computer-supported methods of geographic analysis. GIS was in its infancy. Only a handful of technicians using mainframe computers could have contemplated a systematic analysis of regional geographic trends. The idea of researching and analyzing more than two hundred

FIGURE 4.5

Farmer and sons walking in the face of a dust storm. Cimarron County, Oklahoma. April 1936.

Photograph by Arthur Rothstein. Library of Congress, Prints and Photographs Division, FSA-OWI Collection, LC-USZ62-11491.

counties on the southern plains was simply unrealistic thirty years ago. The case study approach was an obvious choice.

The easy availability of GIS technology today means that one can now evaluate the causes of the Dust Bowl using an entirely different method.[7] Incorporating data about all of the counties on the southern plains into a GIS allows the researcher to view the question at a different geographical scale. This chapter argues that varying scale can

dramatically alter our understanding of the past. What seems clear when viewed up close in one or two communities can look quite different when zoomed out to the whole region. Worster's case studies appear to bear out his thesis: in Cimarron and Haskell Counties, farmers plowed a lot of land, and the dust storms followed soon after. But looking at the plains region of New Mexico, Texas, Colorado, Oklahoma, and Kansas—208 counties in all, instead of just 2—raises some contradictions.[8] For example, a dozen counties on the southern plains had little plowed cropland, less than 10 percent of their entire area, yet still suffered from serious dust storms. The shift in scale throws into doubt the primary causative force of the plow in creating the Dust Bowl. This regional method sacrifices the detailed description possible with case studies for systematic and comprehensive coverage of a broader region.

A similar critique applies to temporal scale. *Dust Bowl* focuses primarily on two decades: the 1920s, when the wheat boom led to additional sod plow-ups; and the 1930s, when the dust storms rolled in. In this brief context, the story of plow-up followed closely by dust storms suggests a direct causal relationship. Zooming out to a broader temporal scale clouds the picture. There is unequivocal evidence of routine dust storms on the southern plains throughout the second half of the nineteenth century, when native grasses had yet to succumb to the plow to any great extent. These dust storms were just as intense as those of the 1930s (figure 4.6). The primary difference, it appears, is that they simply were not as well documented. In 1880, one of the dustiest years in Kansas history, there was no systematic national weather system, no activist federal government to hire world-class photographers and journalists as publicists to cover and promote the story, no recording and radio industry to popularize folk ballads. The story of the nineteenth century Dust Bowls are virtually unknown today because they went largely unreported and unpublicized. One might view the persistence of the Dust Bowl story as a result, in part, of twentieth-century mass marketing.

FROM CASE STUDY TO REGIONAL ANALYSIS

> A few years ago, at this time of the year we were cursed with disagreeable, suffocating and provoking sand storms. Sometimes they would last for several days in succession. We firmly believe we shall have none of consequence this spring. The climate is surely improving.
> –Salina, Kansas, *Journal,* March 1, 1877

Assembling available data into a GIS allows analysis not only of individual localities but of entire regions.[9] The county makes an excellent unit of analysis for topics that are regional in scale. It is general enough to be manageable yet precise enough to reveal detailed variations across large areas. The county is the basic reporting unit for key land-use data from agricultural censuses conducted by the federal government every ten years until 1920 and about every five years since then.[10] The state of Kansas conducted annual agricultural censuses, published at the county level, from

FIGURE 4.6

A dust storm passes over Midland, Texas, on February 20, 1894, when more than 96 percent of the Texas Panhandle remained in unplowed, native grass.

Photograph by H. G. Symonds. National Archives and Records Administration, Still Picture Branch, U.S. Weather Bureau, RG27, Series S, Item 2.

1874 through the present.[11] On the other hand, weather data, systematically collected by the National Weather Service since 1895, is available for weather station point locations and must be interpolated up to the county unit.[12]

Several kinds of county-level data help us understand where and when dust storms occurred and what caused them. When the land is wet, there is very little wind erosion. Only dry soils erode readily, so a central concern in understanding the occurrence of dust storms is the rainfall record.[13] Animation 1 (see the digital supplement) shows annual precipitation for counties on the southern plains between 1895 and 1942 (excerpt in figure 4.7). The legend breaks at 500 mm of annual precipitation, which is the rough minimum necessary to grow wheat, the most common plains cash crop. On these maps, counties in white had insufficient moisture to sustain wheat in the given year; counties in light blue had enough rain to do so, while the middle blue got enough moisture to support wheat or an even thirstier corn crop. On rare occasions, counties appear in dark blue, indicating extraordinarily wet years. The main thing to watch is the wild fluctuation between successful wheat crops and unsuccessful ones.

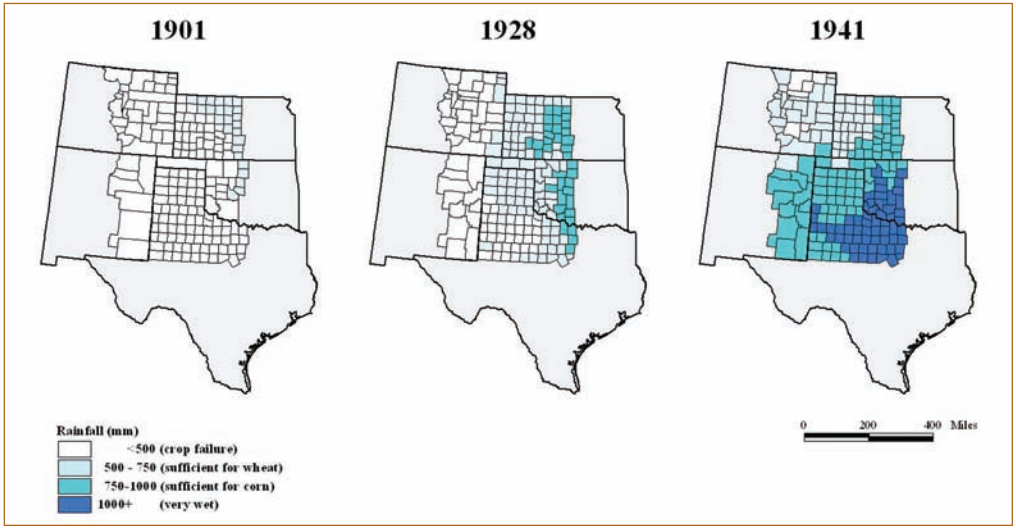

FIGURE 4.7

Excerpt from Animation 1 (see the digital supplement). Examples of dry, moderate, and wet years in southern plains counties.

Data courtesy of ArcUSA, US Census and ESRI, 2006 Data & Maps, CD-ROMs, states.shp.; Carville Earle and Changyong Cao, The Historical U.S. County Boundary Files, 1850-1970, Geoscience Publications (Baton Rouge: Department of Geography and Anthropology, 1991).

Animation 1 shows how variable plains climate is. Dry years were common, but very wet ones could come at any time. Some counties had enough rainfall for a good wheat crop over several consecutive years, only to succumb to drought later. Farmers new to the grassland must have had difficulty anticipating the coming season. Yet they also realized quickly that in much of the plains, crops would fail in two, three, or four years out of ten, even if they could not predict which ones.

Animation 2 depicts the progress of the plow-up in the southern plains over 65 years, from 1880, just after the beginning of agricultural settlement, through 1945 (excerpt in figure 4.8). The counties mapped in white had 90 percent or more of

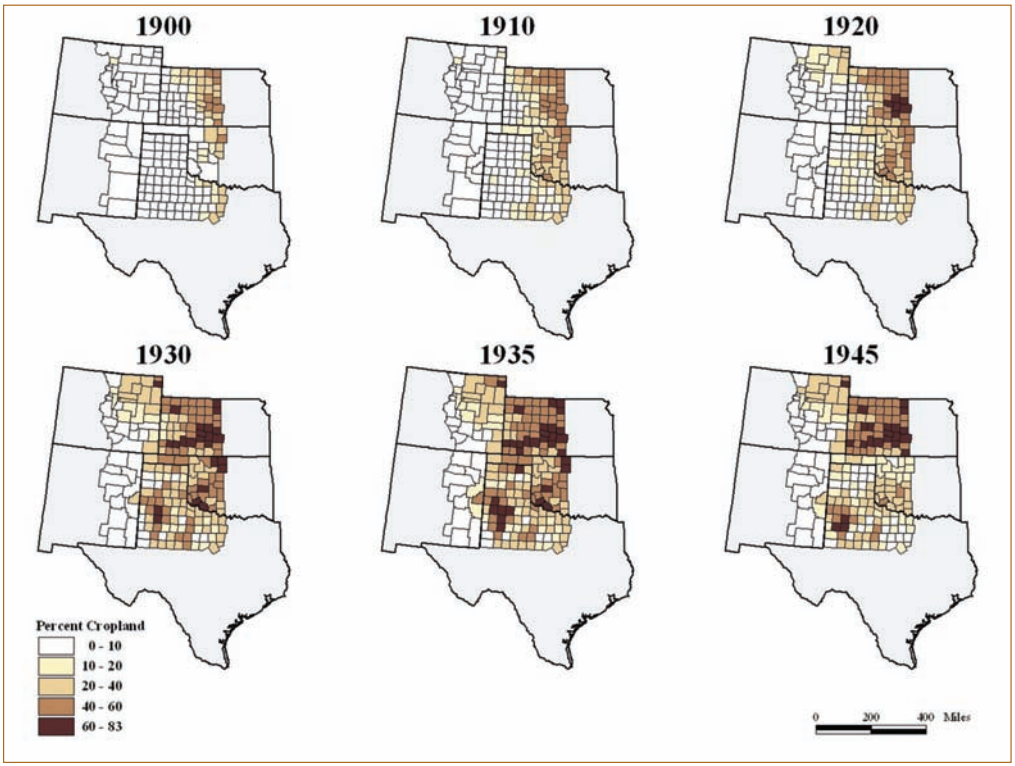

FIGURE 4.8

Excerpt from Animation 2. Percent of total county area devoted to cropland.

Data courtesy of ArcUSA, US Census and ESRI, 2006 Data & Maps, CD-ROMs, states.shp.; Carville Earle and Changyong Cao, The Historical U.S. County Boundary Files, 1850-1970, Geoscience Publications (Baton Rouge: Department of Geography and Anthropology, 1991).

their entire area in unplowed native grassland. Counties in pale yellow retained at least 80 percent of their land in grass, while those in tan and brown had 40 to 80 percent of their original land cover intact. Only about 15 percent of the counties ever dropped below 40 percent grassland and thus into the darkest brown category. Animation 2 shows that pioneer farmers made little progress at plowing up the plains in the nineteenth century. As late as 1900, farmers in less than three dozen counties along the eastern edge of the plains had plowed more than 20 percent of their land. The big plow-up came in the early decades of the twentieth century. A lot of new land went into crops just fifteen or twenty years before the onset of the Dust Bowl in 1934.

Figure 4.9 overlays the 1935–1936 dust storm region on the county maps of plowed area.[14] As late as 1925, relatively little land within the Dust Bowl boundaries had been plowed. In that year, more than half of the native grass sod was intact in 58 of the 60 Dust Bowl counties; in 40 counties on the western side of the region more than 80 percent of the original grass remained. Cropping expanded considerably in the decade before 1935, especially in the Texas and Oklahoma panhandles and in southwestern Kansas. By then, 14 Dust Bowl counties had less than 40 percent of their original grass sod, exposing considerable amounts of plowed cropland to the winds. Haskell County, Kansas, for example, consisted of 71 percent cropland and 29 percent grassland in 1935. In the Texas Panhandle, a dozen recently plowed counties tracked closely the outline of the Dust Bowl's southern lobe. In these locations, the fresh plow-up was likely a contributor to wind erosion. But the Dust Bowl was a big region, including 42 counties with more than half of their native grass intact and 15 where 80 percent or more of the grassland had never been plowed.

The least plowed counties on the western fringe of the southern plains were as dusty as the hardest hit core of the Dust Bowl. Only 9 percent of the native sod was plowed for crops in Harding County, New Mexico, for example, but severe dust storms visited the area repeatedly in the mid-1930s. Employees of the federal government's Agricultural Adjustment Administration (AAA) in the town of Mills reported that "the physical discomfort and menace to health occasioned by the almost continuous blinding dust storms which have swept the area during the past three months, have rendered it distinctly unsuitable for human occupancy." Significantly, even unplowed grassland was subject to wind erosion: "the soil has been completely cut away from the roots of native grasses by blowing sand and gravel."[15] These dusty, little-plowed western counties were upwind of the more cultivated eastern parts of

the plains. Prevailing winds throughout the area are from the northwest. While dust storms can be regional phenomena, traveling hundreds of miles, they do not move upwind. If anything, the dry, little-plowed western portion of the Dust Bowl was the contributor to, not the recipient of, dust storms from afar. Figure 4.9 suggests that the big plow-up of land in the 1920s did contribute to the Dust Bowl. It also suggests that there is more to the story.

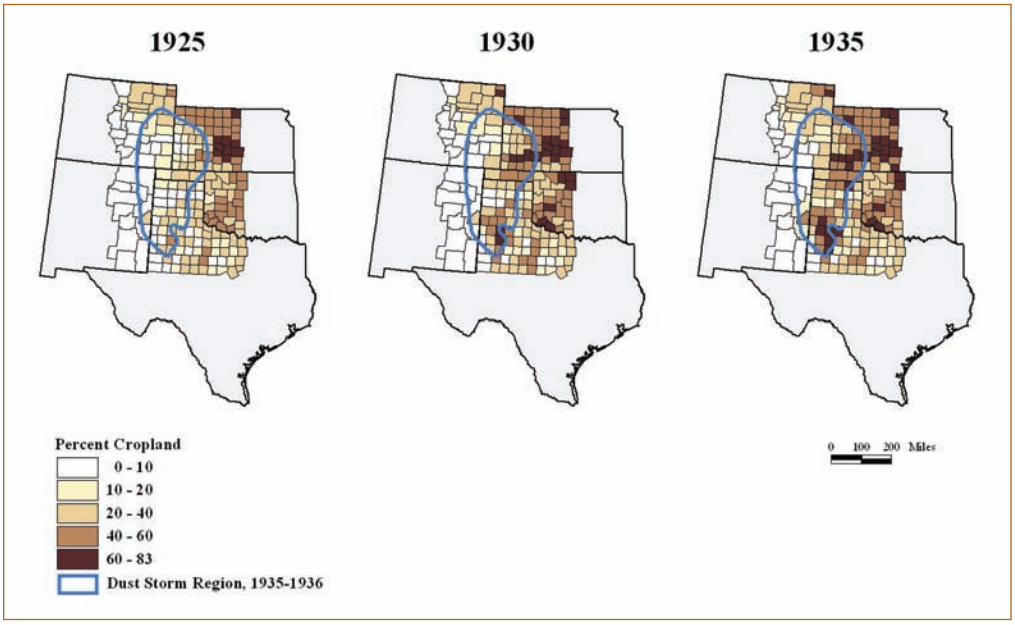

FIGURE 4.9

Percent of total county area plowed compared to 1935–1936 dust storm region.

Data courtesy of ArcUSA, US Census and ESRI, 2006 Data & Maps, CD-ROMs, states.shp.; Carville Earle and Changyong Cao, The Historical U.S. County Boundary Files, 1850-1970, Geoscience Publications (Baton Rouge: Department of Geography and Anthropology, 1991); and Dust Storm Region digitized by author from "Great Plains Area" map, Soil Conservation Service, March, 1954, held in National Archives and Records Administration, College Park, MD, RG 114, Entry 5, 330/c/17/1-2.

Drought explains the location of dust storms in the 1930s better than land use. Figure 4.10 maps rainfall shortages in the southern plains. It presents a sequence of maps in which the drought and the dust storms moved roughly in tandem from year to year. Each item in the figure shows a dust region overlaid on a map of county rain shortage for the five years prior to that dust season.[16] The figure maps rainfall deficits relative to average rainfall for each county. The first conclusion to be drawn from figure 4.10 is that the drought was deep and extensive during the 1930s. Only a handful of counties had more rain than average between 1932 and 1940, and very few fell into the -10 to 0 percent category. The majority of counties had rain shortfalls of greater than 10 percent, and more than 80 counties, mapped in maroon, were at least 20 percent drier than average. Across the region

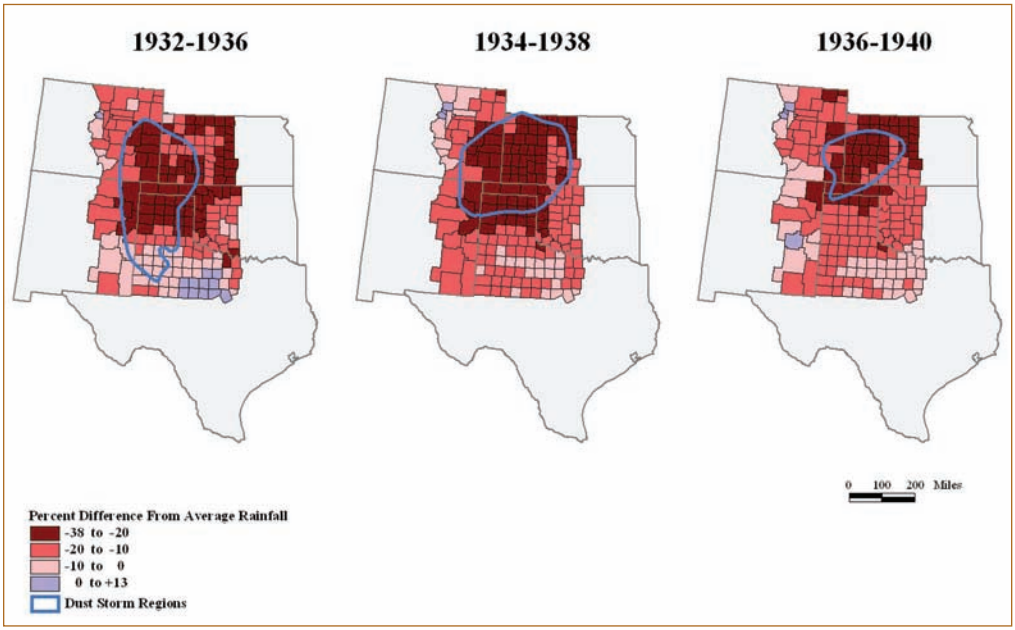

FIGURE 4.10

Percent differences from average rainfall for five-year periods preceding dust seasons, 1932–1940.

Data courtesy of ArcUSA, US Census and ESRI, 2006 Data & Maps, CD-ROMs, states.shp.; Carville Earle and Changyong Cao, The Historical U.S. County Boundary Files, 1850-1970, Geoscience Publications (Baton Rouge: Department of Geography and Anthropology, 1991); and Dust Storm Regions digitized by author from "Great Plains Area" map, Soil Conservation Service, March, 1954, held in National Archives and Records Administration, College Park, MD, RG 114, Entry 5, 330/c/17/1-2 and from "The Dust Bowl: Agricultural Problems and Solutions, U.S. Department of Agriculture Editorial Reference Series No. 7, July 15, 1940, NOAA Central Library.

the drought was deep, extensive, and persisted for nearly a decade. The 1930s was the driest time Euro-American farmers have faced in the 110 years since systematic weather monitoring began on the plains. A second conclusion from figure 4.10 is the marked coincidence between rain shortfalls and dust storm locations. The Dust Bowl followed the movement of drought during the decade. As dry weather moved northeastward and contracted, dust storms did likewise.

Viewing the Dust Bowl from a regional scale broadens our understanding of the sequence of events leading up to the storms and their spatial progression over nine years. It also suggests that the cause of the Dust Bowl may combine human activity and natural phenomena in complex ways. In figure 4.10, the Dust Bowl followed the drought quite closely. The exception was in the Texas Panhandle in 1935–1936, where it was not as relatively dry as in other parts of the southern plains. The Texas Panhandle, however, is just where much new sod had been broken only five to ten years earlier. These maps suggest that while drought has the power, regardless of human activity, to cause considerable wind erosion and dust storms on the Great Plains, human land use can tip the balance in some cases, enhancing the likelihood of blowing soil.

DUST STORMS BEFORE THE BIG PLOW-UP, 1854-1896

> When the March winds commenced raising dust Monday, the average citizen calmly smiled and whispered "so natural!"
> –Salina, Kansas, *Journal,* March 12, 1885

> The howling winds of Monday lifted the surface of the earth into the air. . . . The earth did not go up in minute particles of dust, but bodily.
> –Salina, Kansas, *Journal,* February 7, 1889

> One of the seven wonders of the world. We haven't had a dust storm for a week.
> –Salina, Kansas, *Herald,* June 21, 1895

In addition to shifting the spatial scale, it is useful to expand the temporal scale to understand dust storms on the southern plains. Implicit in the traditional Dust Bowl story is an assumption that the 1930s dust storms were extraordinary and unprecedented. If they were a new occurrence, then it makes sense to ask what changed just before their advent. The most obvious answer is the big plow-up that happened

between 1910 and 1935, but broadening the temporal scale casts a different light on the story. The occurrence of dust storms in the 1930s is thoroughly documented, in newspapers, in photographs, in oral histories, and in the documents of federal government employees dispatched to the region to try to solve the crisis. But dust storms were not really new in the 1930s. Consider this report from central Kansas in 1880:

> Another windy, dusty, trying, headache-producing, vexatious, disgusting, terrific, upsetting, tearing, rearing, careering, bumping, sign-lifting, chimney absorbing, lung slaying, garment destroying, eye blinding, and rip-roaring storm, last Monday. The gale which prevailed here last Saturday seems to have been an installment which came up from the south over a large area of country, and which occasioned much damage in certain parts of the state. It was furious, and in this locality summoned all the dust between here and Kingdom come to the august presence of the Salinaites. The buildings seemed on the point of being lifted from their foundations and the day was uncommonly dark from the clouds of dust.[17]

Local newspapers from throughout the region contain unequivocal evidence that dust storms happened on the southern plains throughout the late nineteenth century, before a significant amount of the grassland had been plowed.

In the 1940s, historian James Malin meticulously sifted through enormous numbers of newspapers archived at the Kansas State Historical Society. Weekly newspapers from the first forty years of Kansas's Euro-American history, 1854–1896, revealed that dust storms were quite common throughout the settlement era. In an extraordinary 71-page article published over three consecutive issues of *Kansas Historical Quarterly,* Malin laid out evidence of intense, routine, and anticipated dust storm activity at dozens of locations throughout the state, all before 1900.[18] The article is unwieldy—it reads more like Malin's research notes, chronicling hundreds of dust storms, one after another, than like a carefully honed scholarly argument. But it brings home the fact that these were not freak events; they were the norm. Dust storms did not come every year, but they were routine, and often occurred in conjunction with extended droughts. When dust storms arrived, usually in spring, sometimes in early fall, they seldom happened in isolation. All of the drama revealed by the photographers, journalists, documentary filmmakers, and songwriters of the 1930s Dust Bowl are present in these obscure and forgotten newspaper clippings from one-horse Kansas villages.

The documentary record of dust storm activity culled by Malin from local newspapers and government weather summaries illustrates the widespread and

routine character of blowing dust on the southern plains. He identified hundreds of reports of dust storms in Kansas, such as this item from Atchison in April 1860: "During nearly three months we have had dry weather, with hardly even a sprinkle of moisture. And now that the soil is perfectly dry, the wind is doing its best to blind every inhabitant of this section of country with dust. And such clouds of it! It penetrates everywhere; and has grown to be a most intolerable nuisance."[19] Other items come from across the southern plains. Central Kansas and eastern Colorado, 1882: "Monday was a regular, old-fashioned dusty day. . . . On Monday when the dust was flying here [Salina, Kansas] to all points of the compass, there was a terrific sand storm on the Colorado desert. . ."[20] Midland, Texas, in January 1886: "a heavy sandstorm occurred at 10 AM, of the 26th, during which it was impossible to see objects one hundred yards distant."[21] Residents of El Reno, Oklahoma, reported in April 1895 that "About 4 o'clock yesterday afternoon a cloud of sand came up from the southwest and totally obscured the sun. Buildings could not be seen fifty yards and the sand was scattered along as though sown broadcast from a great hand. The falling of the sand continued for more than an hour, and those out in it had a hard time to breathe."[22]

Malin's extensive excerpts demonstrate that while dust storms did not happen every year, they happened often enough to be received without surprise. "Kansas is herself again. The wind blows and the dust and sand flies, but no rain descends."[23] Newcomers reacted with shock and dismay, more experienced people with resignation. "The month of March thus far has not been the 'regulation March' of Kansas. We have had few dust storms and very fine weather most of the month. Last Sunday was a Kansas March day in every respect. The clouds of dust were stupendously suffocating all day."[24] Malin's article documents hundreds of dust storms at dozens of locations around the state, including many years when dust storms were daily or nearly daily occurrences for a month or more, and some years—1855, 1879, 1880, 1881, 1894, 1895—when they persisted for several months.

The descriptions of these dust storms match those reported in the Dirty Thirties. As in the 1930s, nineteenth-century dust storms penetrated the interiors of buildings, coating homes and furnishings with dirt: "the dust and dirt in some houses was nearly an inch deep" (1880).[25] Dust storms darkened the sky at midday: the wind "filled the air with such clouds of dust that darkness of the 'consistency of twilight' prevailed. Buildings across the street could not be distinguished" (1879).[26] Storms drifted soil from farm to farm: "the past few weeks a large amount of real estate, in the shape of dust, has changed ownership" (1882).[27] In extreme cases dunes formed: "drifts of sand six feet deep are piled up along the railroad tracks at the west line of the state [Kansas] (1895).[28] Some storms carried dust across the continent,

depositing it many hundreds of miles eastward: "This process of raising great clouds of dust, carrying them south and east and depositing the dust. . . must have begun in Montana on the 10th to be concluded in Ohio, Kentucky, Louisiana, and Texas on the 12th and 13th. . ." (1895).[29] Figure 4.6 shows a black blizzard in 1894 that appears as ferocious as any of the photographs from 1934. And all of this happened when farmers had plowed only a tiny fraction of the immense Great Plains.

Most of the dust storms described in newspapers must have come from unplowed native grassland. The occurrence of dust storms in conjunction with dry years is a regular component of southern plains ecology. Deep wind-blown loess soil deposits around the region are the geological accumulation of thousands of years of dust storms and wind erosion. Farmers suffered from the dust storms considerably, and they exacerbated the phenomena in some cases. But they did not single-handedly cause the Dust Bowl. The southern plains have weathered Dust Bowls for a very long time.

Using GIS methods, it is possible to map the dust storm observations that Malin unearthed. Animation 3 uses a simplified legend to apply rough categories to a dataset that represents a messy shoebox full of newspaper clippings (excerpt in figure 4.11). These are qualitative sources, not quantitative, and therefore are challenging to incorporate into a GIS. The present approach is to evaluate the newspaper descriptions and assign them to one of four categories for each year between 1854 and 1896. Some accounts describe a single dust storm for a given location in a given year; these are coded as category 1. Others describe several dusty events in one place, and are coded as category 2. It is not unusual for the newspaper record to reveal an entire month of dusty conditions and in some places a whole season of several months of blowing dust in a particular year; they are coded as categories 3 and 4. These groupings are admittedly vague. It is not always clear where to draw the line between categories 2 and 3—when do "several" dust storms merge into a whole "month" of dusty weather? I have tried to be conservative. When in doubt, I rounded down.

There is a danger that the implied authority of a statistical and cartographic rendering of this dust storm activity might suggest more comprehensive knowledge than is possible with qualitative sources. There is no way to evaluate nineteenth-century dust storms systematically. Large sections of Kansas—including the driest, western parts of the state where dust storms were most severe in the 1930s—had few observers who might write down or publish accounts. There were undoubtedly many dust storms that went unobserved or unreported. Such events are absent from these maps. In the 1850s the only Euro-American settlements, and thus the only

newspapers, were in the eastern part of the state. By the 1870s, newspapers were emerging in central Kansas. Much of western Kansas was only settled in the 1890s, just as the map series in animation 3 ends. Given the known geography of 1930s dust storms, it is likely that in very dusty years like 1879–1881, western Kansas had a lot of wind erosion. We just do not have any accounts from there.

Historians are used to this type of incomplete information. Traditional narrative history is built upon the scraps of information left behind—what happened to get

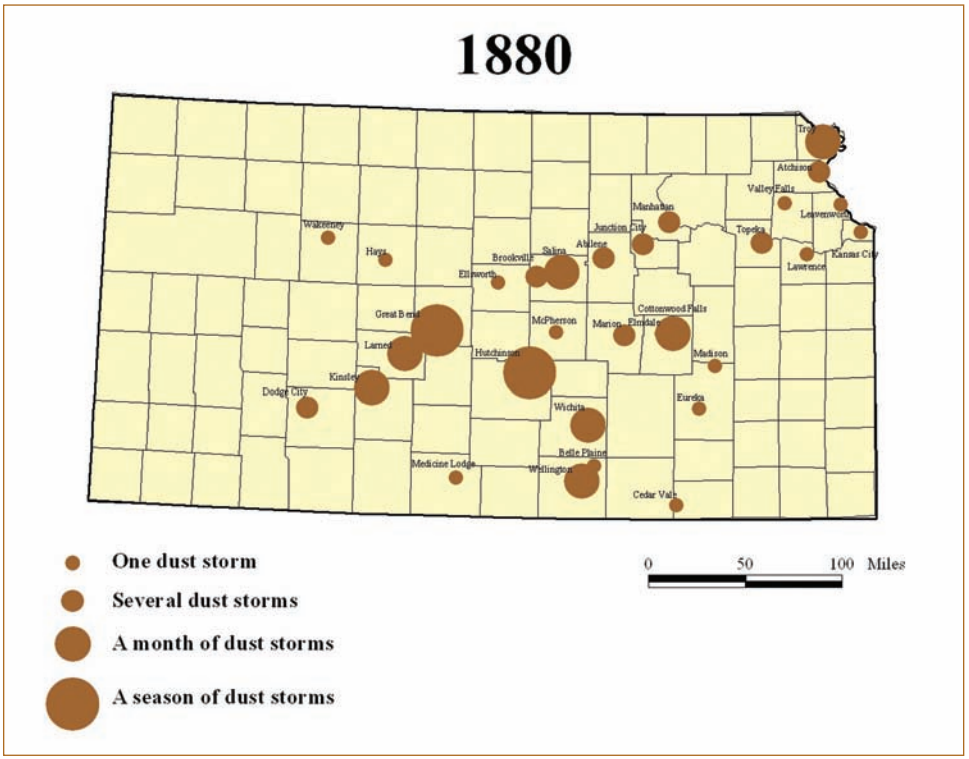

FIGURE 4.11

Excerpt from Animation 3 (with place-names added). Kansas dust storms, 1880. Proportional circles appear at each newspaper's city of publication.

Data courtesy of ArcUSA, US Census and ESRI, 2006 Data & Maps, CD-ROMs, states.shp.; Carville Earle and Changyong Cao, The Historical U.S. County Boundary Files, 1850-1970, Geoscience Publications (Baton Rouge: Department of Geography and Anthropology, 1991); James Malin, "Dust Storms," Kansas Historical Quarterly *14 (1946).*

written down, what happened to be preserved, what the researcher happened to find. Historians acknowledge a level of incompleteness in their sources and are comfortable with it. The maps in animation 3 do not indicate where or when dust storm activity was greatest in Kansas, but rather where and when it is known to have occurred. These maps do, however, offer powerful evidence that wind erosion was not an anomaly in the 1930s. Dust storms were, in fact, quite common throughout Kansas history, not just at a handful of places or on rare occasions, but year after year, often for months at a time, and at dozens of sites.

SOD-BREAKING AND PLOWED CROPLAND IN KANSAS, 1874–1936

While newspaper descriptions of dust storms are neither systematic nor quantitative, censuses are. Kansas conducted the most thorough and long-running census of agriculture of any state in the United States. Beginning in 1874, and continuing annually through the end of the twentieth century, Kansas surveyed all farmers about their agricultural practices—acreage devoted to various crops, number of horses, cattle, and hogs, and, later, number of tractors. County totals appeared in the *Biennial Reports* of the Kansas State Board of Agriculture. The totals are available in paper form for 1874 through the present. They are available in electronic form for 1874 through 1936, and it is the latter dataset that supports the maps of cropland in animation 4 (excerpt in figure 4.12).[30]

Euro-American settlement began in Kansas around 1853, but was spatially limited and confined to the eastern third of the state until the 1870s. Between 1870 and 1890 settlers occupied most of the rest of the state, homesteading farms, creating rural villages, fencing pasture for grazing, and plowing land for crops. The process of occupation and sod-breaking moved generally from east to west across the state.

Animation 4 shows the sequence of cropland expansion (and occasional contraction) from 1874 to 1936. The series begins when agricultural settlement was already underway in eastern and central Kansas, but most of the state was still unplowed; only 27 eastern counties had more than 10 percent of their land plowed for crops, and only 11 of them exceeded 20 percent. During the 1870s, settlers poured into Kansas to take free homesteads or to buy farms from railroad land agents. The eastern half of the state saw rapid sod-breaking that decade as many counties moved into the 20–40 percent plowed category. But the westward expansion was not straightforward. It flowed around the Flint Hills in east central Kansas. These hills, with their shallow, rocky soils, were unsuited to crop agriculture, although they

provided exceptional grazing. The dozen counties of the Flint Hills remained as an island of mostly native grassland in a sea of expanding cropland.

By 1888, every county had at least 1 percent cropland. The western third, however, was still more than 90 percent native pasture. The maps reveal a temporary contraction of cropped land in 1890 that coincided with a severe drought and significant out-migration. But by 1891, cropland levels matched those of the 1880s, and a slow cropland expansion resumed through the rest of the 1890s. During that decade, many central Kansas counties moved up by one map category to more than 40 percent cropland, and the far northwest of the state now plowed more than 10 percent of its land for the first time. Still, two dozen counties in southwest Kansas remained practically unplowed as late as 1900.

The high crop prices and patriotic incentives surrounding World War I led farmers to increase cropland. Between 1915 and 1930, farmers expanded cropland in the western third of the state. By the peak in 1931, every county had more than 10 percent cropland. Although many western counties still had less than 40 percent

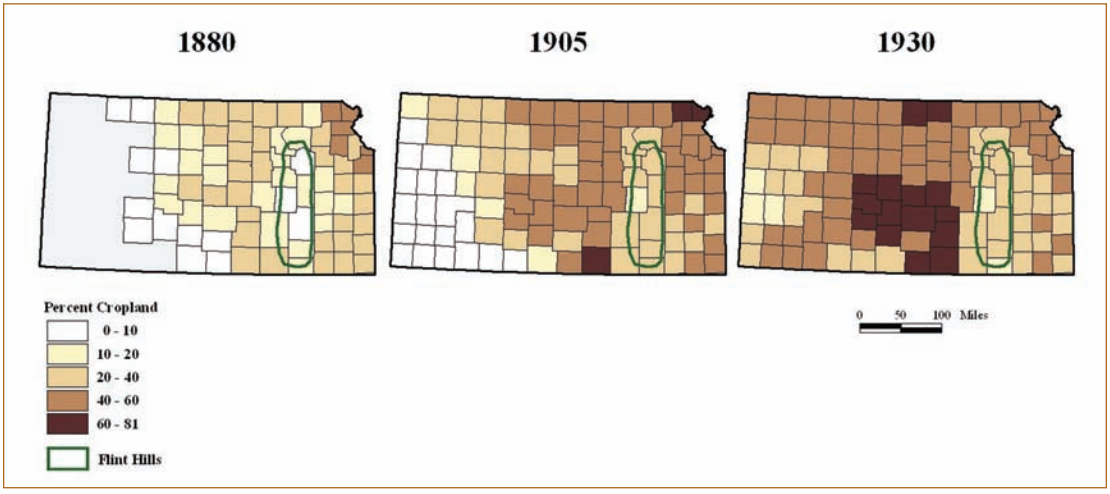

FIGURE 4.12

Excerpt from Animation 4. Percent of total county area devoted to cropland, Kansas.

Data courtesy of ArcUSA, US Census and ESRI, 2006 Data & Maps, CD-ROMs, states.shp.; Carville Earle and Changyong Cao, The Historical U.S. County Boundary Files, 1850-1970, Geoscience Publications (Baton Rouge: Department of Geography and Anthropology, 1991); Flint hills layer drawn by author.

cropland, most of the state was over 20 percent; 19 counties across central Kansas plowed more than 60 percent of their land. Cropland declined again as the century-drought of the 1930s set in, though only in small measure. Animation 4 shows a 60-year chronology of the human impact on vegetative cover during the half century leading up to the Dust Bowl.

Although they only overlap for a couple of decades, it is interesting to compare the series of dust storms reported in Kansas newspapers (1854–1896) with the cropland series (1874–1936). Animation 5 shows the newspaper accounts of dust storms overlaid on the map of cropland for the period 1874 to 1896, when both are available (excerpt in figure 4.13). This series is difficult to interpret. Most of the dust storms occurred in counties with 80 percent or more of their land in unplowed native grass. Some happened in counties with 90 percent or more grassland. On the other hand, the circles representing dust storms often appear over the darker, more plowed counties on the map. This could indicate that dust storms were more common where

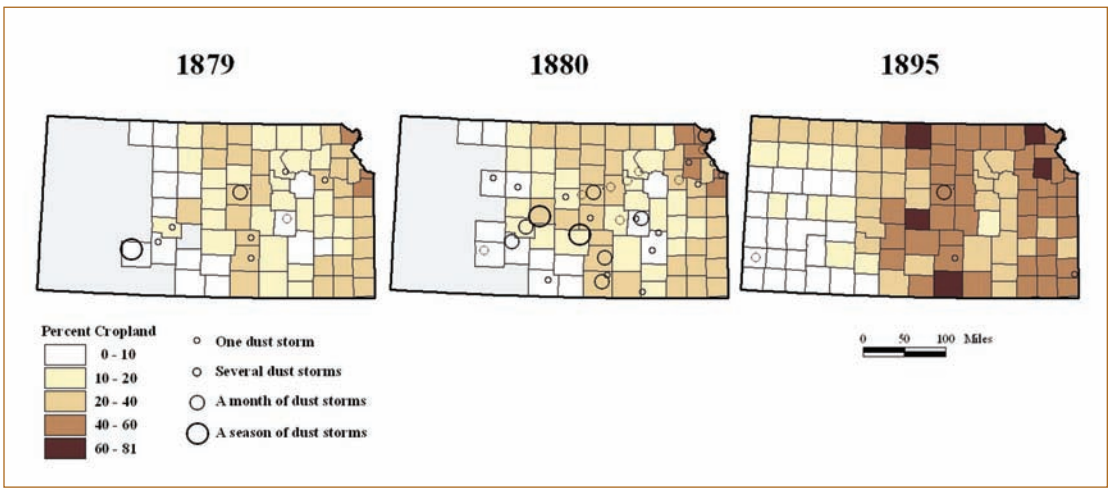

FIGURE 4.13

Excerpt from Animation 5. Percent of total county area devoted to cropland, Kansas, with dust storm overlays. Sample maps from near the beginning and the end of the time series show wide spatial distribution across the state.

Data courtesy of ArcUSA, US Census and ESRI, 2006 Data & Maps, CD-ROMs, states.shp.; Carville Earle and Changyong Cao, The Historical U.S. County Boundary Files, 1850-1970, Geoscience Publications (Baton Rouge: Department of Geography and Anthropology, 1991); James Malin, "Dust Storms," Kansas Historical Quarterly *14 (1946).*

more land was plowed. It could also be because counties with higher crop acreages generally had more people, more towns, and thus more eyes to observe and more newspapers to report.

The question of observational power, of the need for a critical mass of people to be present for an event to enter the historical record, is crucial. It helps us understand not only the plains dust storm record but also the American consciousness of Dust Bowl history. The Dust Bowl of 1879–1881 is virtually unknown to the public because there were not many people living in the plains then. Those few who experienced the dust storms were disinclined to tell anybody about them. Newspaper editors were always the biggest boosters in newly settled towns, all of which hoped to attract more settlers, to become the next Chicago, the next Denver. Great Plains newspapers were routinely tight-lipped about drought, crop failure, and out-migration. It is remarkable that we have any newspaper record of dust storms at all. M. M. Murdock, editor of the Wichita, Kansas, *Eagle* acknowledged the tension, writing,

> the probability is that the individuals in this valley are scarce who would have the temerity to assert that the *Eagle* has ever proven remiss in blowing Kansas. But we come now to acknowledge that the blowing she has done for herself the past week has nipped our blowing pretensions in the bud. It may as well be asserted here and now that Kansas as a paradise has her failings, not the least of which is her everlasting spring winds. If there is man, woman or child in Sedgwick county whose eyes are not filled with dust and their minds with disgust, he, she, or it must be an idiot or awfully pious.[31]

Few in the plains were advertising dust storms in the nineteenth century or promoting them to a national audience.

That changed in the 1930s. Plains residents were still reticent about their troubles, to be sure, but now there was a federal bureaucracy and a cadre of modern journalists prepared to spread the Dust Bowl news to the nation. The Dust Bowl seemed to justify New Deal policies aimed at reforming American agriculture, and government propagandists exploited the dust storms to build support for new agencies like the Farm Security Administration, the Soil Conservation Service, the Land Utilization Program, and the Agricultural Adjustment Administration, all newly created in the mid-1930s in response to the Great Depression. Skilled promoters created the Dust Bowl story in the American mind, and it has been firmly established there for 75 years.

CONCLUSION

The dust did not stop blowing in 1940. Dust storms continue to be routine on the southern plains, usually in late winter and early spring, sometimes in fall.[32] Lubbock, in the Texas Panhandle, for example, reported thirty-five dust storms in fall 1973 and spring 1974, and surrounding towns more than a dozen.[33] Some years are worse than others. There has not been a series of years to match the 1930s, but then there has not been a drought as deep or as long lasting either. When such a drought returns, as it likely will, perhaps in the coming decade, perhaps in the coming century, we can expect to see serious and persistent dust storms, regardless of human land use.

The use of a GIS-based methodology shifts the scope markedly, from an intense two-county case study to a broad two-hundred-county region at a coarser resolution, but one which allows for systematic analysis and a broad context. The broader spatial scale and the longer temporal scale make the 1930s Dust Bowl look quite different than it does up close in a couple of communities during a couple of decades. It appears that dust storms are a normal part of southern plains ecology, occurring whenever there are extended dry periods. They can originate in unplowed native grassland when it has been diminished by extended drought. Dust storm activity can be exacerbated or locally enhanced by plowing for crops, but that was not the sole and simple cause of the Dust Bowl.

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NOTES

1. Geoff Cunfer, *On the Great Plains: Agriculture and Environment* (College Station: Texas A&M University Press, 2005), 143–63; Geoff Cunfer, "Causes of the Dust Bowl," in *Past Time, Past Place: GIS for History,* ed. Anne Kelly Knowles (Redlands, Calif.: ESRI Press, 2002), 93–104.

2. For a discussion of New Deal photography as propaganda, see Bill Ganzel, *Dust Bowl Descent* (Lincoln: University of Nebraska Press, 1984), 3–11.

3. Donald Worster, *Dust Bowl: The Southern Plains in the 1930s* (New York: Oxford University Press, 1979).

4. Part of this research was supported by grant numbers HD33554 and HD44889, both from the National Institute of Child Health and Human Development of the U. S. National Institutes of Health, and by a grant from the Canadian Social Sciences and Humanities Research Council.

5. Worster, *Dust Bowl,* 6–7.

6. See William Cronon, "A Place for Stories: Nature, History, and Narrative," *Journal of American History* 78 (March 1992): 1347–76, for an analysis of several Dust Bowl narratives, including Worster's.

7. For introductions to historical methods using GIS, see Anne Kelly Knowles, *Past Time, Past Place: GIS for History* (Redlands, Calif.: ESRI Press, 2002) and Ian N. Gregory, *A Place in History: A Guide to Using GIS in Historical Research* (Oxford: Oxbow Books, 2003).

8. The 208 southern plains counties represented here are bounded by the Rocky Mountains on the west and the line of 700 mm of average annual precipitation on the east. The southern boundary approximates a gradual shift from grassland toward desert, while the more arbitrary northern boundary follows the Colorado and Kansas borders.

9. See Cunfer, *On the Great Plains.*

10. Myron P. Gutmann, Great Plains Population and Environment Data: Agricultural Data, 1870–1997 [United States] [Computer file]. ICPSR04254-v1. Ann Arbor, Mich.: University of Michigan [producer], 2005. Ann Arbor, Mich.: Inter-University Consortium for Political and Social Research [distributor], 2005-06-22.

11. Kansas State Board of Agriculture, *Annual and Biennial Reports* (Topeka, 1877–1973).

NOTES (CONTINUED)

12. Climate data comes from two sources. First is T. R. Karl, C. N. Williams, Jr., F.T. Quinlan, and T.A. Boden, United States Historical Climatology Network (HCN) Serial Temperature and Precipitation Data, Environmental Science Division, pub. no. 3404, Carbon Dioxide Information and Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee. The historical climatology data is stored as point data for weather stations at monthly intervals for 1221 stations in the United States. The second source of climate data is National Climatic Data Center, Arizona State University, and Oak Ridge National Laboratory, Global Historical Climatology Network (GHCN). This dataset includes comprehensive monthly global surface baseline climate data. The Great Plains Population and Environment Project interpolated data from 394 weather stations in the Great Plains to counties for each month between 1895 and 1993 by generating a triangulated irregular network (TIN) with Arc/INFO GIS software. That created 3,492 surfaces, which were then converted to 5 km cell data. The cell data were spatially averaged across each county using a zonal mean function.

13. For more information on the physics of wind erosion, see Myron P. Gutmann and Geoff Cunfer, "A New Look at the Causes of the Dust Bowl," pub. no. 99–1 (Lubbock, Tex.: International Center for Arid and Semiarid Land Studies, 1999).

14. Dust regions come from maps published in the Washington, D. C. *Evening Star,* Dec. 8, 1939, C–7; see also Worster, *Dust Bowl,* 30.

15. "Mills Land Use Adjustment Project, New Mexico Proposal A–4, Final Plan," May 15, 1935; "Land Acquisition Plan (Part One) Mills Land Use Adjustment Project LA–5–38," Feb. 14, 1938, both manuscripts at Kiowa National Grassland Office, Clayton, New Mexico.

16. Dust regions come from maps published in the Washington, D. C. *Evening Star,* Dec. 8, 1939, C–7; see also Worster, *Dust Bowl,* 30.

17. Salina, Kansas, *Journal,* April 1, 1880.

18. James C. Malin, "Dust Storms, 1850–1900," *Kansas Historical Quarterly* 14 (May, August, November 1946): 129–44, 265–96, 391–413.

19. Atchison, Kansas, *Freedom's Champion,* April 7, 1860.

20. Salina, Kansas *Journal,* April 20, 1882.

21. J.T. Lovewell, "Meteorological Report," in Kansas State Board of Agriculture, *Report for the Quarter Ending March 31, 1886,* 16.

22. Topeka, Kansas, *Daily Capitol,* April 7, 1895.

23. Salina, Kansas, *Journal,* April 22, 1880.

24. Salina, Kansas, *Journal,* March 22, 1883; Salina, Kansas, *Herald,* March 22, 1883.

25. Salina, Kansas, *Herald,* April 24, 1880.

26. Salina, Kansas, *Journal,* March 20, 1879.

27. Junction City, Kansas, *Union,* April 15, 1882.

28. Topeka, Kansas, *Daily Capitol,* April 16, 1895.

29. *Monthly Weather Review* 23 (January, 1895), 15, 18–19.

30. Stephen J. Decanio, William N. Parker, and Joseph Trojanowski, "Adjustments to Resource Depletion: The Case of American Agriculture—Kansas, 1874–1936," data archived by the Inter-University Consortium for Political and Social Research, ICPSR file no. 7594.

31. Wichita, Kansas, *Eagle,* April 15, 1880.

32. M. J. Changery, "A Dust Climatology of the Western United States," NUREG/CR–3211(Asheville, North Carolina: National Climatic Data Center, 1983); A. S. Goudie, "Dust Storms in Space and Time," *Progress in Physical Geography* 7 (1983): 502–30; A. S. Goudie and N. J. Middleton, "The Changing Frequency of Dust Storms through Time," *Climatic Change* 20 (March 1992): 197–225.

33. Gutmann and Cunfer, "A New Look at the Causes of the Dust Bowl," 14.