TALLGRASS PRAIRIE SETTLEMENT: PRELUDE TO DEMISE OF THE TALLGRASS ECOSYSTEM

Daryl D. Smith
University of Northern Iowa, Cedar Falls, Iowa 50614, U.S.A.

Abstract. The tallgrass prairie was settled in less than a century and converted to cropland in the process. Rates of settlement and settlement patterns were influenced by natural features, origin of immigrants, presence of native Americans, available technology, and existing settlement patterns. The rates and patterns of settlement in Iowa are examined using local accounts, studies of specific factors, and early historical studies. The settlement and consequent demise of the Iowa prairie is a microcosm of what occurred throughout the tallgrass prairie ecosystem.

The tallgrass prairie is essentially gone. It is estimated that less than 3% of the 240 million acres of original tallgrass prairie remains. In Iowa, the loss was even more devastating; less than 0.1% of the original 30 million acres of prairie remains. Less well known is the rate at which the tallgrass prairie was converted to agricultural use. At the beginning of the nineteenth century, the tallgrass prairie was a major ecosystem occupying 240 million acres of mid-continent North America; by the end of the century, it was almost gone. In less than a century, Euro-American settlers obliterated a landscape that, according to Edwards (1948), was once thought to be so vast that it could not be subdued. It is astounding that an ecosystem of such magnitude could be vanquished so quickly. In fact, most of the tallgrass prairie was converted to agricultural use during the last 60 to 70 years of the nineteenth century. Rates of settlement and settlement patterns were influenced by features of the natural environment, such as vegetation type, topography, and rivers, and by the origins of the immigrants, the presence of native Americans, available technology, and existing settlement patterns. Table 1 summarizes the sequence and timing of settlement of the tallgrass prairie. Except for eastern outliers, overall settlement occurred between 1825 and 1920. The settlement of Iowa started in 1833 and ended with drainage of the wet prairie in 1920. The settlement and consequent demise of the Iowa prairie is a microcosm of what occurred throughout the entire tallgrass prairie ecosystem. This paper examines factors that affected the rates and patterns of settlement in Iowa. Information was obtained from personal accounts, local histories, and historical analyses of such factors as agricultural development, artificial drainage, land speculation, vegetation preferences of settlers, and geographic distribution of settlements.

Because the initial colonization of North America was on the eastern shore where woodland vegetation was dominant, the first two centuries of settlement occurred primarily in forests. Except for small patches that had been burned by Indians to raise corn, the farms of the eastern seaboard were carved out of a densely wooded landscape (Cochrane 1979). As pioneer farmers pushed westward across the Alleghenies during and after the American Revolution, they began to encounter *oak openings*, treeless meadows within the forest (Edwards 1948). Between 1790 and 1820, when the Pennyroyal section of Kentucky was occupied, they had a preview of the forthcoming prairie landscape. This grassland was designated *barrens* in reference to the near absence of forest cover. The vegetation of the uplands consisted of scattered clumps of trees, a dense undergrowth of shrubs, and occasional groves of large trees. For the most part, the valleys were heavily forested (Sauer 1963).

The early settlers of west-central Ohio found larger prairie openings in the forest; *islands of grassland* scattered across a dozen or more counties. These small prairies, dominated by big bluestem, Indian grass, and little bluestem, were outliers of the vast prairie farther west (Weaver 1954). As the wave of settlement moved

Table 1. Approximate settlement dates for portions of the tallgrass prairie.

Tallgrass prairie area	*Approximate dates of settlement*
Barrens of Kentucky	1790-1820
Small prairie openings of Ohio	1815-1825
Northwestern Indiana portion of Grand Prairie	1825-1831
Oak openings and small prairies of southern Michigan, southern Wisconsin, Illinois, and northeastern Missouri	1825-1835
Well-drained prairie east of Mississippi plus eastern Iowa, northern Missouri, and southeastern Minnesota	1830-1850
Grand Prairie of Illinois	1830-1850+
Well-drained prairie west of Mississippi, except Oklahoma District	1850-1870
Oklahoma District	1888
Wet prairie west of Mississippi	1880-1920

westward from Ohio into Indiana and northwestward out of Kentucky and Tennessee into Illinois and Missouri, the prairie openings increased in frequency. For the most part, these openings were neglected, except as pasture for livestock.

Sometime in the 1830s, the westward movement confronted the true prairies of midcontinent North America. Although Edwards (1948) selected 1840 as the confrontation year, settlement maps based upon census data (Billington 1960) indicate an earlier time. Because the forests, the oak openings, and the small prairies of Michigan, Indiana, Wisconsin, Illinois, Missouri, and Iowa had been settled, prairie was the only remaining option available for the settlers. To people accustomed to woodland, the vast tallgrass prairie landscape must have been an awesome sight: "...the pioneers hesitated on the edge of the large prairies with their seemingly endless expanse of thick grass. There was a sense of vastness about them that seemed overpowering, an impression of greatness that could not be subdued" (Edwards 1948). But the prairies were settled. No bands played; no flags waved to mark the occasion; the conquest began out of necessity. Cautiously at first, using the earlier patterns of settling along the rivers and streams, at forest edges, in outlying groves, and along prairie margins, the occupation of the tallgrass prairie began. Consequently, the fringes of that vast 240 million acre prairie ecosystem were domesticated, but much remained undisturbed. Then, slowly, but persistently, the lines of settlement fanned out onto the prairie from the wooded river valleys. Although the settlers hesitated on the edge of the open prairie, and moved slowly at first; the pace of prairie settlement soon quickened. Once committed to settling on the prairie, they moved rapidly; the prairie frontier lasted only about 10 to 20 years in a particular area. In little more than ten years, the prime prairie land of the Grand Prairie of Illinois was settled. In Iowa in 1840, the western line of settlement encompassed less than a fourth of the state; by 1850, close to half of the state was occupied by settlers. The regions most distant from the watercourses were the last settled. Pioneer farmers reached the interior prairie of northeastern Illinois last among all regions of the state. In Iowa, settlement of interior counties lagged at least ten years behind those with major streams.

At the onset of the Civil War, the well-drained portions of the tallgrass prairie east of the Mississippi and in the eastern half of Iowa, northern Missouri, and parts of southern Minnesota were well settled. Post-Civil War expansion, from 1865 to 1890, completed the agricultural settlement of the tallgrass prairie to its western limits in eastern Kansas and Nebraska, southwestern Minnesota, and the eastern Dakotas (Edwards 1948, Billington 1960). The only unsettled tallgrass prairie was in the Oklahoma District; that remnant evaporated a few hours after a gunshot signaled the Oklahoma Land Rush of 1888.

The stage for Iowa's settlement was set in April 1832 with an ill-advised attempt by Chief Black Hawk and his Sauk tribe to return to their ancestral lands along the Rock River in Illinois. Prior to that attempt, the Iowa region was controlled by native Americans and was off-limits to all but a few Euro-American settlers. The defeat of the Sauk 15 months later at the Bad Axe Massacre expedited the *Black Hawk Purchase* so that on June 1, 1833, the first portion of Iowa was opened for settlement. The rush of people began at once; eager settlers jammed the trails and waited days to cross the Mississippi on ferries (Billington 1960). Initially, the settlement pattern was a natural expansion of the frontier from neighboring states. People from northeast Missouri and south-central Illinois overflowed into southeastern Iowa, and people from northern Illinois moved westward to Dubuque.

Available transportation strongly influenced the migration patterns of Iowa's early settlers. In the 1830s, there were two primary routes from the eastern United States into Iowa. Wagon travelers used the the *National Road*, which crossed the Allegheny Mountains from the Atlantic coast to the headwaters of the Ohio River. There, joined by settlers from above and below the Ohio, they continued on the National Road into Indiana and Illinois, heading toward the Mississippi River (Richman 1931). The ferries at Keokuk, Ft. Madison, and Burlington were the most frequent destinations. As an alternative, upon reaching the Ohio, they could proceed down river by flatboat and then find passage on a steamboat bound up river on the Mississippi. The second route involved water travel using canal boats and lake steamers through the Erie Canal and across the Great Lakes to Chicago. From Chicago, there were two choices: a wagon trail across Illinois entering Iowa via the ferry in the vicinity of Dubuque or a route following the Rock River, either by boat or by an Indian trail along its course, entering Iowa via the Buffalo ferry at the confluence of the Rock and Mississippi rivers just below Davenport (Harter and Stewart 1930). Prior to 1840, those entering Iowa by wagon outnumbered those entering by steamboat nine to one (Richman 1931). Later, as the number of people from the northeastern United States and foreign countries increased, the steamboats assumed a larger role.

Limited availability of ferries tended to concentrate the points of entry at Keokuk, Ft. Madison, Burlington, Buffalo, and Dubuque. Initial settlement was in the wooded eastern and southeastern parts of the state along the Mississippi River and its tributaries: the Des Moines, Skunk, Iowa, Cedar, Wapsipinicon, Maquoketa, and Turkey rivers. Early settlers tended to remain close to rivers and major streams. The watercourses provided ready transportation access into new areas, and as settlements were established, they served as routes to import and export commodities. The Des Moines, Iowa, and Cedar valleys were especially popular for home sites. By the late 1840s, settlers had followed the Missouri River north into the Council Bluffs area of southwestern Iowa (Swierenga 1968). According to Parker (1940), the tendency for settlement to ascend streams, a constant factor in settlement, is better illustrated in Iowa than any state except Ohio.

Although in some areas of the United States, native Americans impeded settlement, they had little effect on settlement in Iowa. Bogue (1963) conjectured that the *Spirit Lake Massacre* of 1857 may have slowed settlement slightly, but probably less than the depression of 1857. Billington (1960) suggested that the ruthless actions of the U.S. forces in the final battle of the Black Hawk War may have discouraged resistance and expedited treaty making for the removal of Indian tribes occupying the area. Usually, federal officials negotiated cession treaties in advance of the fast-moving frontier. As illustrated in Figure 1, the boundaries of the various cessions and the timing of the signing of the treaties affected where and when settlement could occur. The first treaty in Iowa, in 1924, was a minor land cession in the southeastern tip for the benefit of mixed-blood descendants of the Sauk and Fox. Following the Black Hawk Purchase of 1832, Indian titles were cleared from the remainder of the state by a series of treaties signed between 1832 and 1851.

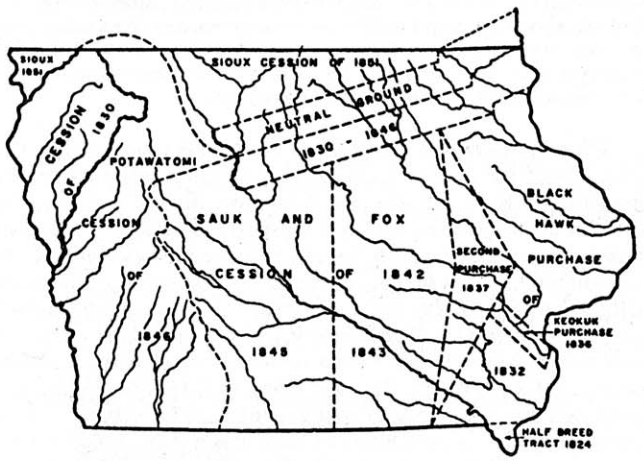

Figure 1. Indian land cessions by treaties of 1824, 1830, 1832, 1836, 1837, 1842, 1846, 1851 (adapted from Swierenga 1968).

Settlers were anxious to occupy the newly acquired land. In some cases, settlers would congregate along the boundary line prior to the opening of a new cession. Forty-five years before the famous Oklahoma Land Rush, the first North American land rush occurred when the eastern portion of the Sauk and Fox Cession of 1842 was opened at midnight April 30, 1843. At the deadline, troopers stationed along the border fired their guns into the air, and the settlers dashed pell-mell into the area to stake the claims they had scouted earlier. By sundown May 1, in Wapello County alone, more than one thousand farms were staked out, and a half dozen towns were laid out along the Des Moines River (Biggs 1865, Boyd 1867). It was reported that 10,000 people staked claims in the new purchase in the first two weeks (Gaylor 1843). The land to the east was not fully occupied, but the *sooners* were speculative, seeking the best water power and town sites and the choicest woodlands. The western half of the cession was opened midnight, October 11, 1845, and the scene of May 1 was repeated (Turrill 1857).

Goodwin (1919) wrote that the decade beginning in 1850 showed such an increase in Iowa population that a migrating tide swept over the state, inundating the valleys and hills with human energy. He cited several reasons for the population increase: completion of railroad lines to the Mississippi, the beginning of advertisement of western land by railroad companies, inducements from land companies and speculators, glowing accounts in emigrant guides, severe drought in the Ohio Valley, and a cholera epidemic in the Middle States. During the two years from 1854 to 1856, there was an increase in Iowa population of more than 190,000. Two quotes in Clark's article (1914) illustrate the magnitude of the influx. "The immigration to Iowa this season is immense, far exceeding the unprecedented immigration of last year, and only to be appreciated by one who travels through the country as we are doing, and finds the roads everywhere lined with movers." "The steam ferry at Rock Island was running 100 trips daily and couldn't handle all the traffic."

Population growth in Iowa slowed during the Civil War, but afterward, the annual increases were dramatic. These increases were primarily caused by four factors: discharged soldiers seeking new opportunities, an upswing in European immigration, the rapid development of farm machinery, and publicity surrounding the signing of the Homestead Act in 1860 (Harter and Stewart 1930). The expansion of settlement was accelerated by the rapid extension of railroad service. Prior to 1860, rail lines served only a portion of eastern Iowa. By 1870, three main lines extended across the state from east to west, and two others extended from the Mississippi River almost to the center of the state.

Census reports indicate that the rapid rate of settlement continued into the latter part of the century. During the 1870s, 430,595 people were added to the state. The population growth of Iowa from 1865 to 1900 was unprecedented, increasing from 756,209 to 2,231,853, a gain of almost 200%. Similar rates of settlement were occurring in the states adjoining Iowa (Harter and Stewart 1930).

According to the 1890 census, the population of Iowa was 1,911,896. Every county in the state had attained a density of 15 or more persons per square mile, the criteria for full agricultural settlement. Attaining this limit implies at least four families per section, one family per 160 acres (Harter and Stewart 1930). Figure 2 illustrates the regional and chronological development of Iowa from 1840 to 1890. The final stages of settlement in Iowa involved draining the wet prairie and coincided with the settlement of the remainder of the tallgrass prairie, with the exception of Oklahoma.

Patterns of settlement in the westward movement followed a general sequence from forest into grassland. A commonly held view is that settlers in the early and middle 1800s chose wooded areas along water courses and avoided prairies until they were forced by lack of forest areas to move onto the prairie. It is thought that earlier settlers avoided prairies, in part, because they believed the absence of trees indicated infertile soils. As late as 1860, population distribution in Story County, Iowa, showed a marked agreement with accessibility of timber (Hewes 1950). More significant reasons for selecting forested areas over prairies were probably the availability of wood for buildings, tools, and fuel and the accessibility of drinking water (Shimek 1911). Recently, some writers have challenged the view that forest sites were the first choice of settlers (Jordan 1964, Baldner 1984). They cite a number of examples in which the initial settlers selected sites on the edge of the prairie or on land that contained a significant portion of prairie. Jordan (1964) suggested that part of the problem stems from limiting the comparison of site selection to just forest or prairie and that a third choice should be included, an area of combined prairie and forest, or *savanna*. In a savanna, the settler could benefit from the advantages of both prairie and forest. The wood needed for construction and fuel was readily available, but the backbreaking work of forest clearing was avoided. As the line of settlement moved farther west, the availability of forest decreased, and the choices became more limited. However, wood remained an important commodity, and those that settled on the prairie often purchased wood lots as nearby as possible (Hewes 1950). The discovery of coal in some areas provided an alternative fuel and reduced the dependence on wood (Payne 1911).

As settlers became more familiar with the open prairies, there was an increased awareness of negative factors associated with prairie settlement. The menace of prairies fires and the ferocity of winter storms were significant factors. The modern technical term *wind chill* was unknown to the settlers, but they probably could have provided a good functional definition. In addition, the tough, heavy, prairie sod, formed from intertwined roots of the prairie plants, was too much for their inadequate implements and limited numbers of draft animals. Much of the flat prairie was low, marshy, and poorly drained; many settlers suffered from fever and ague (malaria) on these wet prairies. Access to streams for water transportation was limited, and in the spring, mud caused the prairie trails to be practically impassable to horses and wagons (Sauer 1916, Weaver 1954).

Berry (1927) was of the opinion that artificial drainage was as important as the railroad in bringing new prairie land into agricultural use. Although artificial drainage converted thousands of acres

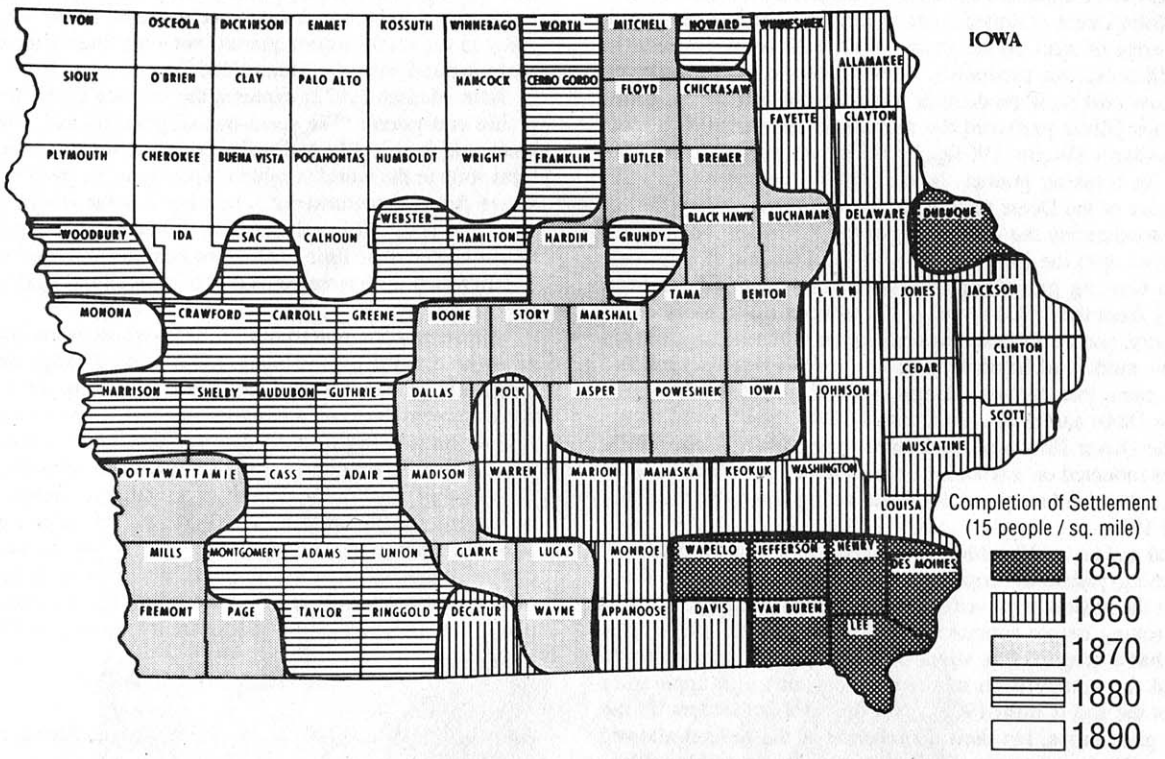

Figure 2. Chronological and regional development of Iowa from 1840 to 1890. Land was considered *settled* when a density of 15 or more people per square mile was attained (adapted from Harter and Stewart 1930).

of prairie into some of the world's richest farmland, Berry, perceptively, raised the question of whether Iowa, in particular, and the United States as a whole, really benefited from the drainage. In his opinion, the increased corn production resulting from drainage could have been accomplished on corn lands already in use. He noted that, with the exception of a few years during World War I, drainage contributed to surpluses that upset farming conditions to the point of threatening the foundations of agriculture. He further indicated that artificial drainage lowered ground water throughout Iowa and destroyed most of the valuable breeding ground of migratory birds in the central United States.

The fertility of prairie soil undoubtedly contributed to the prairie's demise. The extent of the original prairie and the distribution of rich, black soil correlate well. A study directed by Marbut (1934) classified approximately 26 million acres of Iowa as Grade 1 agricultural land. Grade 1 correlates well in amount and distribution with the black, fertile, prairie soils. The black color indicates a high content of organic materials, accumulated over time from a residue of prairie vegetation with extensive root systems. It is ironic that the prairie was initially thought to be sterile because it did not support trees. Atwater (1829), a long-term proponent of prairie fertility, disagreed with that opinion of the Iowa prairies: "We are often told by eastern scientific empirics who have seen them of the sterility of the soil where the prairies are, but the very reverse is the fact." Albert Lea (1836) was impressed by the agricultural productivity of the prairie soil. Undoubtedly, by the early 1840s as farmers began to bring the prairie under cultivation (Bogue 1963), many were becoming aware of the fertility of the prairie soil.

The plow is symbolic of the demise of Iowa prairie. The tough prairie sod was an almost insurmountable obstacle to the early prairie settlers. The extensive intertwined root systems of the prairie plants did not yield to the plows developed for turning forest soils (Bogue 1963). Much of the initial prairie breaking was done with massive unwieldy breaking plows pulled by several yokes of oxen and operated by custom crews (Coffin 1902). Subsequent technological developments changed the problems of plowing prairie sod from formidable obstacles to temporary inconveniences. In 1837, John Deere designed a one-piece, wrought-iron plow with a cutting edge of steel on the share. Within 20 years, his plant in Moline, Illinois, was producing 10,000 plows a year (Cochrane 1979). Low cost plow production was accomplished in the 1860s when James Oliver perfected the process of making chilled cast-iron plowshares (Bogue 1963). These plows proved to be very effective for breaking prairie. Madsen (1972) compared the utilitarian beauty of the Deere plow with that of the Lancaster rifle. In terms of accelerating the destruction of the prairie, it might better be compared with the Henry or Winchester repeating rifle or, perhaps, the Gatling gun. Technological improvements in farm machinery from the 1840s to the 1870s reduced labor, eased farming drudgery, and accelerated the conversion of prairie to cropland. Successful models of harrows, planters, cultivators, reapers, and threshers came into common usage in the tallgrass prairie region during the 1860s and 1870s. By the mid-1870s, Deere and Company and the Oliver firm were each marketing a *sulky plow*, one or two plows mounted on a wheeled frame with a seat, which enabled farmers to plow land more rapidly while sitting down (Bogue 1963, Cochrane 1979).

By trial and error, the settlers determined the most effective way of converting prairie to cropland. They had to turn the sod late enough in the season to prevent regrowth but early enough to allow time for rotting before autumn (Bogue 1963). In the 1870s, they learned that a crop of flax sown on April-plowed ground could withstand the competition of the native plants and apparently helped rot the sod (Coffin 1902). Not only did the settlers till the land and plant crops, but their disturbance of the ground allowed numerous alien species to move in and compete favorably. Bluegrass could endure the plow and became quite common; plantain came with the settlers; dandelions followed shortly thereafter. However, as late as 1854, there were no dandelions in some of the eastern counties, and, surely, none to the west. In that year, some settlers sent to Pennsylvania for dandelion seed (MacBride 1895). Cockleburs thrived on land disturbed by cultivation, as did the ragweeds, which spread beyond their former natural confinement.

The wet prairie was one of the last frontiers of the tallgrass prairie. In converting the tallgrass prairie to cropland, the well-drained prairie ridges were the first to be plowed. The farmer who settled on land with wet prairie broke the high ground and looked to lowlands and sloughs for pasture and wild hay. Much of north-central Iowa, southwestern Minnesota, and the Grand Prairie of Illinois was topographically controlled by the Wisconsin glaciation. Because surface drainage patterns were poorly developed, large areas were frequently water covered or wet much of the year. Wet prairie beyond the Wisconsin drift boundaries was caused by relatively impervious subsoils and local drainage limitations. These extensive stretches of wet prairie delayed settlement in Iowa and in Minnesota and Illinois. Great stretches of Iowa's wet prairie lay in virgin sod while settlers by-passed it to gamble five years of their lives trying to win a free homestead in the sandhills of Nebraska. Drainage of the wet prairie was a long-term effort; drainage attempts prior to 1870 were limited (Bogue 1963). Drainage on a large scale did not begin in Iowa until about 1888 (Berry 1927). Each year thereafter, an increasingly larger acreage of wet prairie was brought into cultivation.

Based upon population density, Harter and Stewart (1930) concluded that agricultural settlement of Iowa was completed by 1890; whereas Bogue (1963) selects 1900, when most Iowa counties recorded their largest total of farm units. By the turn of the century, most of the Iowa prairie had been converted to farmland; the prairie ecosystem was close to extinction. Even the prairie slough, usually the last to go under the plow, was lamented as becoming obsolete (Aldrich 1903). In 1911, Shimek (1911) noted that native prairie was fast disappearing and being replaced with artificial groves, cultivated crops, and introduced weeds. Practically all the wet prairie had been drained for cultivation by 1918 or 1920 (Berry 1927). By 1925, comparatively little native prairie remained in Iowa; a few unbroken tracts were scattered about the state, especially in the northwestern quarter, but even these were disturbed by pasturing and mowing (Shimek 1925).

John Madsen (1972) captures the essence of the demise of the prairie ecosystem: "We spent our tallgrass prairie with a prodigal hand, and it probably had to be that way, for these are the richest farm soils in the world... tallgrass prairie is the most difficult of all native America to conserve... because it is the worlds's most valuable farm soil." It is unbelievable that so vast an ecosystem could be eliminated in so little time. Two hundred and forty million acres of tallgrass prairie were converted to agricultural land in about seventy years.

Apparently the nineteenth century settlers were not aware that an entire ecosystem was being obliterated. Perhaps there was just too much; abundance tends to create an illusion of limitlessness. As is so often the case, a heritage was lost before its value was tallied or its passing noted. The pioneering characteristics that prompted people to leave a sheltered society to settle a new land were instrumental in the demise of the tallgrass prairie. Motivated by a need for personal accomplishment, burdened with a daily struggle against an overwhelming prairie wilderness that could destroy much of their fragile gains, and ultimately justified by a perceived destiny to feed the world, the prairie settlers plowed and planted the tallgrass prairie ecosystem into extinction (Smith 1981).

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