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Winter 2003

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# WAVING “A BOUGH OF CHALLENGE”

## FORESTRY ON THE KANSAS GRASSLANDS, 1868-1915

BRIAN ALLEN DRAKE

Kansas is legendary for geographical monotony, for a landscape allegedly so absent of trees and relief that the state has become the butt of national jokes and a cultural synonym for flat. Kansas is not really flat; tilted might be a better description, for the state rises some 3,300 feet in elevation along the 400-mile stretch between Kansas City and Kanorado. Kansas is lacking in substantial tree cover, though, especially in its western third. US Forest Service researchers noted in 1999 that forests covered slightly less than 3 percent of

the state, concentrated mostly in the northeast and southeast corners. Such treelessness is due in part to the needs of the state's agricultural empire, but botanists, biologists, and ecologists tell us that environmental conditions play a more fundamental role. Basic ecology textbooks place most of the state in North America's temperate grassland biome, whose characteristic vegetation consists of great expanses of bluestem, buffalo, and grama grasses, and whose native trees are few and far between, confined mostly to riverbanks and isolated ridges.<sup>1</sup>

So prevalent is the idea of a treeless Kansas that few people are aware of the many concerted attempts, during its first seventy years, to forest the state artificially. The first white settlers in Kansas were as shocked by its lack of timber as any modern Easterner driving down Interstate 70. Yet those settlers were typical nineteenth-century Americans as well, steeped in contemporary beliefs about nature, agriculture, and progress, and so they attacked the treeless expanses with the devotion of crusaders. For five decades in the nineteenth and early twentieth centuries, as they dreamed about making a garden of the prairie, Kansans

KEY WORDS: climate modification, “forest boosterism,” grassland, Kansas forestry station, Kansas State Horticultural Society, seedling distribution program, Timber Act of 1872

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[GPQ 23 (Winter 2003): 19-34]

made serious attempts at forestry, trying to cover their state with the large and leafy groves that, to them, were an integral part of civilized life. They planted extensively on their farms and around their homes, formed their own state horticultural society in 1868, established two forestry experiment stations in 1887, and eventually attempted the creation of their own national forest from 1905 to 1915. All the while, information and advice about trees and tree planting circulated in agricultural bulletins, horticultural society reports, newspaper columns, and so on, as forestry became an obsession on the Kansas grasslands.<sup>2</sup>

That their efforts were generally unsuccessful is no surprise. Although trees can be grown on the Great Plains, its ecological character makes large-scale forestry in much of Kansas impossible, and the treeless spaces across the state's western third bear witness to the failure. Indeed, there is a temptation to snicker at the thought of Kansas forestry, and at anyone who would entertain such a concept in a land so ill suited to it. A more serious consideration of this effort, however, tells us much about settlers' views of the Great Plains environment. What motivated their grand forestry ideas and efforts in the face of such daunting environmental odds? Elliott West writes that whites came to the Great Plains with an idealized "vision" of a land civilized by towns, farms, and markets. Forestry efforts in Kansas reveal that the landscape itself was also an important part of this vision. For the state's settlers, trees and forests went hand in hand with towns, farms, and markets; a "civilized" natural environment was inseparable from civilization.<sup>3</sup>

In this article, I will explore the motives and efforts of the nineteenth-century Kansans who sought to turn the grasslands to forest. Those efforts were not always failures. Tree-planting Kansans did end up with respectable groves in the eastern part of the state, good shelterbelts and windbreaks throughout the center, and at least a few trees in the west. By the 1920s they had learned a great deal about which species to plant on the grasslands, where and how to plant them, and what horticultural

techniques would keep them alive and healthy.

But in the end the tree planters' ambitions far outstripped their achievements. Looking back on forestry's history in Kansas, state forester Albert Dickens claimed in 1928 that planted trees had "triumphed over the grass . . . and now wave a bough of challenge to the eternal prairie." The truth was less dramatic. Although they fantasized about forest acres numbering in the millions, Kansans never succeeded in covering more than a few thousand acres, a mere fraction of their state.<sup>4</sup>

The history of Kansas forestry, its successes as well as its failures, is part of the larger story of human interaction with the Great Plains environment. The history of the Plains, writes Donald Worster, paraphrasing Thoreau, "has been one of trying to meet . . . the expectations of the land," and Kansas forestry efforts in the nineteenth century give us a vivid example of this. Here, a people bent on controlling and shaping nature encountered a landscape that resisted their efforts and forced them, in the end, to temper their ambitions. Planting forests taught Kansas tree-planters about the expectations of their land, about the kind of agricultural activities the Plains ecosystems would allow, and about the ability, and inability, of humans to make the grassland into something it is not.<sup>5</sup>

The history of Kansas forestry begins with the land itself. "A grass covering," wrote historian James Malin in 1942, "is as natural to the prairie . . . as a forest covering to the humid east or jungle to the tropics." His observation still holds true today, though sixty years of subsequent scientific study have given us a few caveats. On the eve of white settlement, Kansas was indeed naturally grassy, and the standard argument says this was the result of a semiarid climate that limited tree growth outside riparian areas. But the story is really more complicated. Inarguably, Kansas was grassland when whites arrived. More precisely, however, it was a mosaic of diverse and ever-shifting grassland and grass-forest ecosystems shaped

by varying soil conditions and fire regimes as well as precipitation levels, and those variations were to have much effect on subsequent forestation efforts.<sup>6</sup>

The eastern quarter of Kansas is the wettest part of the state, receiving thirty-four to forty inches of precipitation per year. Andreas's nineteenth-century *History of the State of Kansas* tells us that over 90 percent of the area consisted of tallgrass prairie when white settlement began, but that number can be deceiving, for the dominance of those grasses was always somewhat tenuous. While often subject to extreme heat and drought, eastern Kansas is not dry enough to preclude the growth of forests. The tallgrass prairie relied largely upon fire, usually touched off by lightning but also set intentionally by native peoples, to maintain it by keeping woody growth down. Ecologist Daniel Licht writes that this area was "always a battle zone between forests and grasslands," constantly threatened by woodlands encroaching from the east, especially in wetter years. It was here that forestation efforts would be most successful; as settlers suppressed grassland blazes, tree cover in eastern Kansas spread, if not like wildfire, then certainly to a significant extent.<sup>7</sup>

It is in central and western Kansas that aridity really begins to assert itself on the region's ecology. The area near the modern Kansas-Colorado border, inside the rain shadow of the Rockies, receives an average of only eighteen to twenty-two inches of precipitation annually. Complimenting this are extremely high evaporation rates. Having lost their moisture over the mountains, the winds over western Kansas are so desiccated that they draw water out of the land; annual evaporation rates here exceed annual precipitation rates by a factor of nearly three to one. Not only does little rain fall, much of what does make it to the soil is quickly reabsorbed into the atmosphere. In fact, rain often never makes it to the ground in western Kansas during the summer, evaporating as it falls. Complicating things further is the fact that rainfall amounts across the whole of Kansas are highly variable

and severe drought a common occurrence, especially in the west. The state as a whole averaged thirty-two inches of precipitation per year between 1859 and 1973, but that number fluctuated wildly from year to year and from region to region. Over sixty inches fell on the state in 1951, for example, but only sixteen in 1860, with a dizzying number of peaks and valleys in the years between. In short, rainfall in Kansas is cyclical and unreliable across the whole state, and especially in the rain-shadowed western third, which in some years since statehood has received as little as a dozen inches of precipitation.<sup>8</sup>

The timberless ecology of central and western Kansas was above all a function of this aridity. Over the centuries and millennia, only those plants able to withstand the heat, the winds, and the wild fluctuations in rainfall could establish themselves. The moisture levels required for nonriparian forests simply did not exist here, and so the region became the domain of shortgrasses—little bluestem, buffalo, and grama grass, all drought-tolerant perennials. Fire still played a role, although its impact was limited due to the light fuel loads generated by those species, and soil conditions unsuitable for trees contributed as well. But lack of water was the area's most significant ecological characteristic, and "to all intents and purposes," Licht tells us, "the . . . shortgrass prairie was a treeless ecosystem." Grass was Kansas's ecological essence, and it would not always yield easily, a fact the state's tree planters would be quick to discover.

"Whether for health, wealth, or moral reasons," historian Wilmon Droze writes, "the day of the tree planter had arrived in Kansas . . . by the 1850's," and for sixty years afterward Kansans would plant trees with enthusiasm. But why try to change the grassland landscape so drastically? Early tree planting was often a response to physical necessity. Kansas's scant riparian forests largely disappeared into fences and firewood within a few years of white settlement. Railroads complicated the problem, as timberhawks scoured the countryside for ties

and fuel, and so initial planting efforts were often simply individual attempts to increase the wood supply. Kansans also hoped that planted trees would shield them, their crops, and their livestock from the state's severe weather. Simple aesthetic concerns motivated planting as well, as settlers circled their homesteads with trees in an effort to soften the austerity of the landscape and "the [allegedly] less attractive environment of the prairie farm."<sup>9</sup>

Pragmatism often mixed with loftier ideals. Planted forests offered more than firewood or a nicer view; they could protect the yeoman as he carried agrarian independence onto the grasslands. The author of an 1883 US Department of Agriculture (USDA) report on prairie forestry, for example, declared with Jeffersonian passion at the report's end that "it is with the hope of contributing in some way to this useful and beautiful pursuit, which is to shelter the bare and blistered earth: which is to catch and hold the rain and the dew; which is to shelter the home and its occupants from summer's heat and winter's cold; which is to bring fuel and comfort to the housewife . . . , that this brief report is submitted to reading and thinking people." Foresting the grassland could be a kind of patriotic act; to plant trees was to give succor to the farmer and his family, the republic's most vital citizens.<sup>10</sup>

These noble sentiments are especially interesting, for they hint at deeper, unspoken cultural motivations behind grassland forestry efforts. Nineteenth-century settlers came to Kansas with all the cultural mores of the age, and foremost among these was an almost religious urge to tame the "unsettled" wilderness with axe and plow. Euro-Americans had been landscaping the wilderness since Jamestown, and by the mid-nineteenth century "civilizing the land" was a commonplace idea that dictated newcomers' relationship to nature. Uncultivated land was worthless to most Victorian-era settlers, existing only to be improved by human effort, to be made submissive, productive, and aesthetically pleasing by the hand of man. The rural landscape of the

East had long borne the stamp of this civilizing urge, its large wild forests reduced by the late 1800s to much smaller and tamer versions sprinkled among fields and meadows. For Kansas's settlers, many of them born and raised in places like Ohio, Indiana, Pennsylvania, and New York, the rural East no doubt embodied a kind of bucolic archetype. There, plowed field and tamed forest together formed an idealized pastoral landscape whose scenery was pregnant with agrarian beliefs and values. It was this Eastern-style idealized landscape—verdant, well-watered fields accented by leafy groves of trees—which they hoped to recreate in their new home state.<sup>11</sup>

Back east, civilizing the land and creating this pastoral landscape meant felling most of its trees, planting around the stumps, and harvesting the fruits of civilization along with corn and wheat. But on the Kansas grasslands the trees were already gone—untamed nature here took the form of horizon-to-horizon panoramas of bluestem and grama, not dark forests filled with wild beasts and men. How, then, to civilize it? Here, in an interesting cultural paradox, forests assumed the role of civilization's agent rather than its inhibitor. Beating back the austerity of the Plains required new civilizing tactics, and so planting trees, not felling them, became the key to making the grassland wilderness into a garden.<sup>12</sup>

All this required more than merely staking out farms and planting a few seedlings. Kansas was, of course, not like the agricultural East most settlers had left behind. It was hot, dry, and drought-ridden, and if it were to be pastoralized, it would have to be made wetter, more verdant, and more fertile than it was. The best way to do that, many Kansans believed, was through climate modification, or the idea that forests facilitated rainfall. A variation on the famous "rain follows the plow" concept, climate modification was a serious theory despite its seemingly whimsical, pseudoscientific aspect. There were many versions of it, but most revolved around the idea that forests, by stabilizing the soil and allow-

ing it to catch rainfall, in turn released that moisture back to the air through respiratory processes, which again fell to earth as rain, a process that repeated itself *ad infinitum*. Many believed that by planting large groves of trees on the prairie, especially in the drier parts of the state, Kansas's rainfall patterns could be increased and stabilized, its agricultural yields raised to cornucopian levels, and a life of pastoral abundance thus created on the formerly dry, harsh grasslands.<sup>13</sup>

The idea soon became a panacea for all of Kansas's perceived weaknesses, not only in terms of climate but in social and cultural development as well. Glen Marotz has noted that "planting for climatic change was promoted with almost religious zeal," and the amount of literature touting the ancillary social benefits of climate modification was enormous, from private letters to newspaper columns to federal publications. Forestry became a kind of social cure-all that would simultaneously bring the rains, tame the land, raise the cultural level of the populace, and make everyone rich, all at the same time.<sup>14</sup>

A prime example of this—we might term it "forest boosterism"—are the efforts of the Kansas State Horticultural Society (KSHS). Formed in 1868, the KSHS was the unrivaled champion of tree planting in Kansas, and its members took the first organized steps toward grassland forestry. Its coterie of middle-class farmers, businessmen, and academics met twice a year to discuss "the science and art of Horticulture" and swap information about their successes and failures, which the society published in its annual *Transactions*. Although concerned primarily with orchards and fruit production, forestry concerned the KSHS enough that it created a standing forestry committee and published annual *Reports* on its members' forestry efforts.<sup>15</sup>

The chair of the forestry committee and eleven-year president of the KSHS (1875-86) was Elbridge Gale, who came to Kansas via Bennington, Vermont, in 1864. A professor of horticulture at Kansas State Agricultural College as well as a Baptist minister, Gale wrote

extensively on grassland forestry and climate modification, and his observations give us a hint of the religious zeal that accompanied them. "Through the earnest prosecution of sylvaculture for this vast region," he enthused in the society's *Transactions*,

it may be made the home of millions of happy and prosperous agriculturalists, thereby adding untold treasures to the wealth of the nation. . . . [By] a neglect of this culture we leave it only to be the transient home of a few thousand cattle herders, an almost dreary waste forever, and hence the weakest portion of our great national domain. . . . The thought that rises highest, and is really the directing and leading consideration, is the modifying influence which sylvaculture is to have upon the climate at large; and hence, the influence which it is to exert upon the condition of the soil, and upon the standard of civilization which is to be found in this vast region in coming ages. The great questions of material, social and moral prosperity are here involved. Are we to rise to the demands of the age and of the nation, or shall we fall short of it [*sic*]?<sup>16</sup>

Gale's evangelical tone is revealing, for grassland forestry was much more than a way to make it rain. The many physical, social, and cultural improvements to be wrought by planting bordered on the miraculous, and there seemed no end to the benefits artificial forests would bring to Kansas. Some even argued, for example, that as the state's aesthetic character improved with planting, the manners and cultural sophistication of the people were certain to follow. "To cultivate a taste of refinement," maintained the *Miami County Republican* in 1872, for example, "nothing conduces more to promote it than the planting of a few shade trees."<sup>17</sup>

Taming the land could simultaneously fatten the wallet as well, and simple profit motivated tree planters as surely as did any mission of moral and cultural uplift. "Is there money,"

continued the *Republican*, "in planting forest trees . . . ? What signifies the beautying of our homes, the sheltering and protection of cattle, the modifying influence of the climate, the planting of forest trees to supply . . . timber, if the almighty dollar is not attainable?" The outlook, the newspaper assured its readers, was good. "[I]t will pay; on this we have sufficient authority to say it will return a good per centage for every day's labor or cost expended." The 1883 federal report on grassland forestry predicted that planted forests would "increase by millions the well-earned profit of [the] nation," and Elbridge Gale was confident that Kansas could "raise a crop of trees as certainly" as a crop of corn, "and in the end more profitably."<sup>18</sup>

Clearly the forestry urge in Kansas was a mélange of physical necessity, aesthetic ideal, moral imperative, and simple profit-seeking. Horticulturist John Warder summed up the goals of grassland forestry in an 1873 state agricultural report when he appealed to his countrymen to "wait no longer, but begin at once to plant forest trees." Plant them, he urged, "for their intrinsic beauty. Plant them for the shelter they afford. Plant them for their happy effects in modifying and equalizing the climate, in checking the force of the winds, and thus preventing excessive evaporation and cold. Plant them for their *utility* upon the farm. Plant them for patriotic purposes. Finally, if you can be touched by no refined statement, plant timber trees as a farm crop for their *profit*, which is demonstrable." Thus inspired, many Kansans, KSHS members in particular, began to plant apace in anticipation of the great social, cultural, and financial changes that were sure to come with the trees.<sup>19</sup>

The planting mood was infectious even outside Kansas, for the federal government took an increasing interest in grassland forestry during the 1870s and '80s. The USDA, for example, had investigated the possibilities of tree planting since the 1870s. It concluded in 1875 that "the continually increasing moisture in the atmosphere" resulting from initial plantings would guarantee that "but a short

period must elapse before all kinds of forest trees can be successfully cultivated on the plains." Three years previously, the federal government had actively encouraged tree planting with the famous Timber Culture Act of 1872. The act allowed settlers to claim and secure title to 160 acres of publicly owned grassland, provided that they planted forty of them with trees and tended them for eight years. The ultimate intention of the act was not just to bring settlers onto the land but rain as well, through climate modification.<sup>20</sup>

The Kansas government went even further than its federal counterpart. In 1887 it created a forestry commissioner post and set up two forestry experiment stations in the western part of the state. Located in Trego and Ford Counties, the experiment stations were a cooperative effort of the state government and the Kansas State Agricultural College, overseen by the forestry commissioner and dedicated to the promotion of "practical forestry." The idea of state experiment stations had been popular for some time. The *Kansas City Journal*, for example, suggested in 1884 that Kansas "forestry stations . . . after a few years' work in the right direction, would result in the art of growing trees." The KSHS had been pushing forestry stations for years, convinced that government support for tree planting was a matter of the public good. R. S. Elliott, industrial agent and timber specialist for the Kansas Pacific Railroad, had argued that "a few thousand dollars" of state money would be well spent on a state-sponsored tree nursery. "In ten years," he predicted, "for every fifty millions of trees then growing, the State will be ten millions of dollars richer." Aided by a handful of state employees and dedicated to producing those fifty millions of trees, the forestry commissioner was to supervise experiments in tree planting at the two stations, coordinate the free distribution of seedlings grown there, and report yearly to the governor on the stations' overall progress.<sup>21</sup>

By the late 1880s it seemed that the forestry juggernaut had begun to roll. With the government behind it, aided by the knowl-

edge and experience of the KSHS and sanctioned by contemporary cultural mores, it looked as if Kansas forestry might soon make the arid, treeless grasslands a thing of the past. Of course, there were a few dissenters. In a spirited speech to the KSHS, T. C. Henry argued that the state's "present atmospheric and climatic phenomena will never be materially disturbed by 'Kansas' forestry." In the East, he observed tartly, "the mountains and waste places reproduce forestry with surprising rapidity. . . . Here in Kansas, however, where nature has abandoned the attempt . . . our 'homesteaders,' with Quixotic hardihood, are attacking this problem *de novo*."<sup>22</sup>

But such sentiments were usually lost amid overwhelming enthusiasm, and the only question seemed to be not how much of Kansas could be forested, but how much *should* be. F. P. Baker of the USDA told the Kansas state board of agriculture in 1884 that "we must accustom ourselves to speak of a hundred or a thousand acres of [artificially planted] trees, just as we now do about so much corn." And in 1891, none other than Bernhard E. Fernow, chief of the USDA Forestry Division and predecessor to Gifford Pinchot, summed up the enthusiasm for prairie forestry in a speech before that same board: "It is forests that are wanted; not trees merely, but masses of foliage. The State of Kansas should have at least 10,000,000 acres of forest cover—real acres of forest." Fernow was ambitious, for 10 million acres was nearly 20 percent of the entire state. How many of those acres would actually become forested, however, had yet to be seen.<sup>23</sup>

Although contributors to its *Transactions* and *Reports* could be as grandiloquent as any Victorian poet, it was results, not rhetoric, that interested the Kansas State Horticultural Society. Planting trees was its primary mission, and Elbridge Gale assured members that "the best and surest way to establish the facts" concerning Kansas forestry was to "[begin] at once to plant." And plant they did. Many members of the society engaged in their own experimental tree planting, and there was a

brisk trade of information, tips, and advice about planting in the pages of the society's seven forestry *Reports*, published annually between 1880 and 1887.<sup>24</sup>

Suggestions about proper planting techniques, species selection, pruning, spacing, and a host of other concerns flooded into the KSHS from its members. They made the annual *Reports* a hefty read, each often reaching 100 pages in length as its editors crammed in every last shred of advice from the field. That advice, if often redundant and sometimes contradictory, was also enlightening, for it underscored the prerequisites for success in an unfriendly grassland ecosystem—selection of species appropriate to climatic conditions, proper planting techniques for each species, and judicious care of seedlings in drought, wind, and cold.

All this information and experiment seemed encouraging, and it looked as though large artificial forests were only a matter of trial and error and time. Elbridge Gale was particularly optimistic about the chances for success, undisturbed by an apparent lack of initial progress in planting. "To the casual observer," he wrote,

it may appear that there has been really little accomplished. . . . [Yet] when we look at the small beginnings to be seen . . . over the whole settled portion of the state, we must feel that they are significant tokens of the grandest results, to be realized at no very distant day. These small patches of timber are the innumerable host of witnesses who will settle forever, past controversy, the possibilities of forest culture in Kansas. . . . Hence, small as may be these scattered beginnings . . . by their success or failure [they will teach] us . . . how and what to plant upon a much larger scale in the future.<sup>25</sup>

Every year between 1880 and 1887, the Kansas State Horticultural Society's forestry committee sent out circulars to its leading members in each county, inquiring about existing forestry conditions and the progress of



their own efforts during the preceding year. Circular no. 2 (1883) asked, for example, whether "forest tree planting [was] a success in your county in 1882? What classes of trees were most extensively planted? What varieties promise the greatest success? What culture and treatment were given to them? What per cent failed? What were the causes of failure?"<sup>26</sup>

The circulars revealed that the volumes of planting advice in the *Reports* and untold hours of work by the planters had yielded some commendable results, although not nearly on the level anticipated by forest boosters like Gale. Not surprisingly, the greatest successes could be found in Kansas's moister eastern counties. Planters in eastern counties like Douglas and Shawnee were able to establish many good-sized groves composed of several different species, from which they could secure firewood, poles, and other small pieces of lumber. In 1880, for example, H. E. Van Deman of Allen County reported that the seedlings he had planted that year were doing very well. Indeed, he noted that the oldest planting in his county, composed of cottonwoods set in 1860, had reached an average height of forty feet and a diameter, at breast height, of eighteen inches. W. H. Litson concurred, noting that the oldest plantings in Butler County, five-year-old cottonwoods, box elders, and black walnuts, averaged twenty-five to thirty feet high and five inches thick at breast height.<sup>27</sup>

Moving west, results became more modest, though not entirely disheartening. W. B. Kritchfield of WaKeeney, for example, planted several varieties of trees in 1882, and he typified the experiences of KSHS members in the center of Kansas. "Forest-tree plantings," he reported in response to the 1883 circular, "where properly done, were a success. Varieties which promise the greatest success: Cottonwood, Ash-leaved Maple [box elder], Ash, and Black Walnut; evergreens, Red Cedar." There were some problems, however. "Under best treatment," he continued, "25 per cent failure occurred, and in cases where neglected the failure was of the entire planting. The main

causes were neglect, dry weather, and damage by stock." J. W. Bidwell of Ness County was more blunt, declaring that "the culture of forest-trees has not been successful," and he doubted its future potential.<sup>28</sup>

Results did not seem to improve over time, despite the perennial confidence of the planters. Data for plantings in 1880 looked nearly identical to those of 1887—solid success in eastern Kansas, diminishing success as one went westward, and notably limited success as one neared the Colorado border, where annual losses regularly topped 50 percent and complete failures were not uncommon.<sup>29</sup> In spite of planters' assertions that any failures were entirely the fault of the tree grower, the geographic correlation between planting successes and location suggests strongly that climatic limits, as much as improper or insufficient care, were a factor in the results.

Experimentation by its members yielded valuable information. In 1887 the KSHS felt confident enough to recommend the ten best trees for grassland planting (nearly all of them native species, not surprisingly), but it could not point to any successes on the grand scale hoped for by forest boosters. Rows and small blocks of trees could survive in western Kansas, if sheltered from drought, heat, and evaporation during their early years. But the great arcadian forests that had engaged the imaginations of men like Elbridge Gale were still only imaginings due to the formidable restraints of climate. By 1888, however, the state experiment stations had begun operation, and it seemed that official forestry might succeed where private initiatives had failed.<sup>30</sup>

Planting at the stations began on 27 April 1888 under forestry commissioner S. C. Robb, and in the summer of that year Robb reported to the state on his efforts. "No trouble has been experienced so far in maintaining a stand once obtained," he assured his superiors. "At least 98 per cent of all the spring stand" at the Trego station had "matured into good and useful seedlings." The Ford station initially had "a fine stand of tree plants" as well, though a hailstorm on 17 June "destroyed everything."

But by December, Robb acknowledged some difficulties with the grassland's ubiquitous aridity. In a supplemental to his report, Robb noted that the summer of 1888 had been one of western Kansas's "most trying seasons," marked by "unprecedentedly small" amounts of rain and very high temperatures. "There need be little wonder," he declared, "if some failures must be reported in trying to grow somewhat extensive forest trees . . . on the plains of Western Kansas." Despite his difficulties, Robb managed to ship some 500,000 free seedlings to 1,014 applicants, a feat he believed "demonstrates very clearly . . . that with proper management trees can be grown" on the grasslands. Many seedlings did die after shipping, and though applicants understandably blamed severe drought in follow-up surveys sent out by the commissioner, Robb believed those deaths were "actually caused by improper planting, cultivation, and care."<sup>31</sup>

The next season results improved somewhat under commissioner Martin Allen. The Ford station lost 50 percent of its initial crop to hail in June 1889, but by the end of the summer some 2 million free seedlings had been distributed to 4,175 applicants. Experiments with different tree species yielded largely negative results. Native species like cottonwood, box elder, black and honey locust, and osage orange had done relatively well in the stations' first year, largely surviving the dry heat of summer, and other species showed promise. Yet "not much short of one hundred other species," Allen noted in his report to the state, had "already been put on trial . . . some of which are already gone, others are going, and still others will fade away in the future—some near and others more remotely."<sup>32</sup>

The experiment stations continued to distribute seedlings until the late 1890s, with the results from each planting season being largely similar to those of previous years. Weather regularly assaulted the seedlings, killing large numbers of them. A considerable quantity survived to be distributed, and subsequent commissioners were upbeat in their reports. In 1892 George V. Bartlett informed his supe-

riors that nearly all the reports he had seen concerning the fate of distributed seedlings expressed "perfect success in the growth of all varieties delivered." Failures, he claimed, were "entirely owing to neglect after transplanting by the grower." E. D. Wheeler argued in 1894 that in light of Kansas's still-pressing need for aesthetic improvement, evaporation reduction, and climate modification, "we must acknowledge the necessity for extensive tree planting" augmented by the experiment stations, despite problems with drought and mortality.<sup>33</sup>

Yet, notwithstanding the fact that they had achieved some success in raising seedlings, the experiment stations ceased distribution around the turn of the century. The reason, wrote assistant state forester William Hall in 1904, was "on account of the exceedingly meager results from it." He cited data showing that, of 2,880 seedlings from the first distribution in 1888, only 14.76 percent were still alive in 1904. Box elder seedlings had done fairly well, with an 80 percent survival rate, but green ash seedlings had only a 21 percent survival rate, and black cherry and white pine seedlings had all died. "In fact," Hall wrote, summing up the history of distribution, "there can be no results pointed to that are satisfactory."<sup>34</sup>

Hall did not offer an explanation for these mortality rates, but if the station's planting experiences were any guide, the harsh Kansas climate was the primary culprit. Despite their complaints about applicants' "lack of proper care" for the seedlings they received, even the state's forestry commissioners, all professionally trained horticulturists and foresters, could not avoid routine catastrophic losses from drought, hail, and the like. The commissioners, at least, had the state money and the labor required to replant. That ordinary farmers could not keep their trees alive, in the face of stern ecological limits and limited financial means, comes as no surprise. Indeed, Hall missed the fact that, after fifteen years of grassland life, it was remarkable that so many trees were still alive at all.



FIG. 1. An undated photograph of the state forestry station at Ogallah. Courtesy of the Kansas State Historical Society.

In addition to distributing seedlings, the stations also did on-site tree planting to determine the relative fitness of different species. These experiments were far from grand—the results suggested little hope for large-scale plantings—but they offered a realistic assessment of grassland forestry, and a wealth of information on techniques for success.

An 1890 Kansas State Agricultural College bulletin, for example, discussed the relative merits of different conifers that the stations had planted and the best techniques for raising them. Red cedar, native to much of Kansas, was the best conifer for planting, “not specially on account of its beauty . . . but because of its general hardiness” and resistance to drought. Table Mountain pine also did well, though it never grew large or straight enough

to be anything more than an ornamental tree. Colorado blue spruce, native to the Rocky Mountains, did surprisingly well, scarcely seeming to “suffer a check under the worst weather that occurs in this part of the state,” if “given a fair start in planting.” White pine, on the other hand, often suffered severely from drought and heat, and Siberian silver fir was a complete failure, as were many other pines, several species of cedar, and six varieties of “Japan Cypress.”<sup>35</sup>

A 1910 Kansas State Agricultural College bulletin, authored by Albert Dickens, summed up the stations’ plantings in detail. Writing with obvious pride, Dickens was convinced of the “lessons . . . for the present and future settlers of Kansas” to be found in the stations’ successes, though he often glossed over its

many failures. Green ash planted in 1892, for example, "fought a good fight" against drought and what Dickens considered less than adequate cultivation. They were now the stations' greatest success, with a 90 percent survival rate, an average height of eleven feet, and an average diameter of four inches at three feet above the ground. Honey locust also did well, "given good care," and at the Ogallah station many had reached heights of twenty feet and diameters of five inches. Osage orange showed remarkable spunk, resprouting after a fire to reach heights of ten feet and a diameter of over two inches. Red cedar and Austrian pine fared similarly, the pines reaching heights of twenty-two feet and a diameter of four inches at four feet above the ground. Cottonwoods did not fare as well, represented "by a few dying trunks from which a few sprouts are growing." Dickens did not consider these results indicative of the species' potential, however, deeming it "worthy of regard." Finally, he mentioned the plantings of private individuals located near the stations, including the ten-acre Haywood plantation southwest of Dodge City, to augment the successes of the stations.<sup>36</sup>

The stations' plantings, despite their obvious successes, could not be said to be forests in the vein of Fernow and Gale's predictions. Pictures accompanying the text revealed their limited nature. One plate, for example, showed the Ogallah station's green ash plantings. Silhouetted against the prairie sky and surrounded by grasses and weeds, they seem small and unassuming in comparison to Dickens's glowing descriptions. The Haywood plantation, shown in another plate, fared better, approximating an Eastern-style grove, but it was the lone exception in a parade of rather humble photographs. Finally, Dickens's descriptions of the stations' successful plantings ignored the many failures that Commissioner Allen had noted in his annual report.<sup>37</sup>

In light of predictions about state forestry made just thirty years previously, the station plantings seemed anticlimactic. With proper nurturing and years of hard work, many vari-

eties of trees had been grown successfully and a good deal was learned about the proper selection of species and planting techniques. But these results were a far cry from the dreams of tree boosters; it seemed that grassland forestry was doomed, even with care and technique, to remain a small-scale occupation at best. By 1917 both stations had been shut down and abandoned.

Meanwhile, federal government forestry encountered its own problems in Kansas. The Timber Act of 1872, for example, had been a spectacular failure in the state and across the Great Plains. Initially, the act allowed settlers to claim 160 acres of federal land by planting forty of them to trees and caring for those trees for ten years, at which time two credible witnesses testified to the claimant's efforts and results. The forty-acre figure shrank within a few years, after complaints about its excessive financial demands, since prices for forty acres' worth of seedlings could run upwards of \$100. The figure then shrank several more times before the act's repeal, at which time it required only ten acres of trees, planted over several seasons. Thus made more manageable, the act became a popular means for land entries, and forest boosters had high hopes for its success. "The operation of this law," gushed a promotional pamphlet from Trego County in the late 1870s, for example, "will in a few years make [the] County the best timbered county in the State."<sup>38</sup>

On paper, the Timber Act seemed a success in Kansas; settlers entered 9,702,653 acres in timber claims by the date of the act's repeal, some 2 million of which reached final proof. Yet where were the forests? It was a lack of tangible results that had been behind demands to lower the acreage requirements and which eventually killed the act outright. Many acres had been proved up under the act, but few trees could actually be found on timber claims, leading to widespread charges of laxity, fraud, and corruption.<sup>39</sup>

The Timber Act was widely abused. It was far too easy for a settler to file a timber claim, make half-hearted attempts to forest it, with-

draw the claim and then refile under other homestead laws, if so inclined. Witnesses to claimants' efforts were often less than credible. Many ranchers used timber claims to fend off competitors, and there was the inevitable wave of speculation as profit-seekers traded claims in legal and not-so-legal ways. But climatic limits played a role, too. According to Paul Nieder, the act was "imperfectly fitted to the environment" of western Kansas, blind to the realities of grassland ecology, and even honest planting efforts were almost certainly doomed to fail. A few western timber claims did succeed—the Haywood plantation was a particularly good example—but "one thing is certain," observed Wilmon Droze. "The trees planted under the Timber Act were not very visible in the wide expanse of the prairie-plains."<sup>40</sup>

Undaunted, the federal government took grassland forestry efforts into its own hands in 1905 with ambitious plans for a 30,000-acre Kansas National Forest, to be located just outside Garden City. At the time, the idea did not seem far-fetched. The US Forest Service had had considerable success in planting trees on the Nebraska Sandhills a few years previously, and similar geography in the Garden City area led it to expect similar results there. Federal foresters were also the ultimate Progressive-era specialists, confident in their expertise and dedicated to efficient, scientific management of nature for the betterment of American society. A little aridity, they believed, was no match for professional training and scientific rigor.<sup>41</sup>

As in Nebraska, the Forest Service planned, after a period of experimentation with plantings, to sow the entire area with the most successful species. Climate modification was not a motivation—by now there was ample evidence that Kansas's rainfall patterns had not changed a bit since tree planting began—but hope for large forests remained. Locals, however, still believed the rains would come. The Garden City Industrial Club, for example, boasted that the Kansas National Forest would soon "be of incalculable benefit to this part of

the state, as it will undoubtedly exercise a marked influence on the climate, tempering the heat of summer and increasing the rainfall."<sup>42</sup>

Planting began in 1906, with two-year-old yellow pines, one-year-old honey locusts, and a variety of other seedlings, mostly osage orange, red cedar, and Russian mulberry, shipped from the Nebraska National Forest nursery in Halsey. Only 27 percent of the pine and 32 percent of the honey locust lived through the first season, and all other species failed completely. By March 1907 prairie fire had destroyed the remaining crop, but the Forest Service, undeterred, soon expanded the forest boundaries by a factor of ten, to 302,387 acres.<sup>43</sup>

Planting recommenced in 1908 and continued for several years, with an average of 125,000 seedlings set annually. But by March 1911, Willis Sorensen has written, "there were signs that the planting was not a success." An "extreme drought" during that month, in the words of forest administrators Carlos Bates and Roy Pierce, killed almost the entire planting, and subsequent efforts to replant with a larger proportion of drought-resistant conifers failed as well. Jack pine, for example, had done quite well in Nebraska, but in Kansas it failed "in a large measure due to the greater warmth of the region . . . , the more extreme drought conditions which may prevail, and the greater severity of the summer winds." Even the famously hardy red cedar died in droves.<sup>44</sup>

In the end, the Forest Service's experts—the best minds in their field, with a thorough knowledge of forestry techniques and the resources of government at their disposal—could not make the grassland of Finney County sprout large forests for any length of time, and they reluctantly admitted defeat. By 1915 the Kansas National Forest was finished, "a total failure," in Sorensen's words. Indeed, in 1923 the *Topeka Capital* noted acerbically that "all of the former Kansas National Forest is now grown up to soapweed, cactus, and clear, invigorating prairie air." The Forest Service temporarily converted the forest into a game

preserve, then returned it to the public domain for settlement.<sup>45</sup>

When all the boosterism, advice, and tree planting were said and done, how much of Kansas had been successfully forested? Bernhard Fernow's challenge to plant 10 million acres of "real forest" never came close to fulfillment. In 1881 the state board of agriculture reported that Kansas had some 92,839 acres of artificial forest composed of trees at least one year of age. By 1887 that figure had risen to 307,952, but by 1897 it had fallen to 146,601 acres. Five years later, in 1903, the total had increased to 162,564 acres, only to fall again in 1904 to 141,942 acres, after which the board no longer kept track. Even at their height, forestry efforts had succeeded in covering only about .58 percent of the state, a mere 3.07 percent of Fernow's ideal number.<sup>46</sup>

Measured against boosters' dreams, the results were terribly meager. It was an outcome not entirely lost on the state's tree planters, and in later forestry literature there is much more restraint than in writings like Elbridge Gale's. In a 1920 Horticulture Society bulletin, for example, one F. L. Kenoyer sounded the familiar call to plant forest trees in Kansas. On the surface the boosterish enthusiasm of years past remained, but the grand predictions of vast groves were gone. Kenoyer's ideal for the state was only 1.7 million acres, set out in shelterbelts, windbreaks, and five- to ten-acre woodlots—a far cry from the visions of Gale or Fernow.<sup>47</sup>

When the next forestry effort came to Kansas in the form of the New Deal's Great Plains shelterbelt program, one of its most significant characteristics was the attention its planners gave to previous planting experiences and the grudging respect they had for the grassland's environmental limits. Nature-dominating zeal, climate modification, and ideal pastoral landscapes were still a part of the program, but historical experience served to temper an excess of enthusiasm about potential acreage and subsequent effects. Few New Deal foresters imagined turning Kansas

into another Ohio or New York. This may be the most important lesson garnered from Kansas's great forestry experiment—an appreciation of environmental reality. They may have been ecologically arrogant, but the state's tree boosters also had the good sense to experiment, to listen to the grassland and discover what kind of forestation activities it *would* allow. When they did this, they and their New Deal successors were often rewarded with at least a modicum of success, if not with the extensive forests of a booster's imagination.<sup>48</sup>

Ironically, in some places forestry efforts, assisted by nature, nearly realized the original dream. One of the most drastic ecological changes on the Great Plains during the last century has been what Daniel Licht calls its "arborescence." Fire suppression combined with aggressive tree planting has increased woody vegetative cover dramatically in the area's moister regions. Even a casual tour through northeastern Kansas reveals that the modern landscape, averaging about 7 percent forest cover, bears less resemblance to typical prairie than to the farmland of southern Ohio or western Kentucky. With its fields, groves, and shelterbelts it looks, in fact, not unlike the ideal Eastern-style rural landscape of the nineteenth century. And reliable rain has come to the grasslands, too—not from climate modification, but drawn from aquifers and showered from center-pivot irrigation rigs onto fields bursting with grain and corn. Perhaps Kansas, or at least its eastern reaches, has been pastoralized after all.<sup>49</sup>

But pastoralization has come with a price, and much has been lost as trees have gained a foothold on the eastern Great Plains. The spread of forest ecosystems has played havoc with the region's ecology by fragmenting grassland habitat when not replacing it outright. The result has been the relentless spread of eastern forest species and a simultaneous decline in the diversity and numbers of native grassland animals, especially birds and insects. Sadly, one nonnative tree species, Russian olive, has spread so vigorously it has become a

serious pest. Of course, grassland agriculture has created problems of its own, from soil erosion to groundwater depletion to fertilizer runoff to overproduction, which make its long-term future uncertain.<sup>50</sup>

Forty years ago, Kansas historian James Malin (in an uncharacteristic moment of environmentalist reflection) argued that the successful occupation of the Great Plains could be "measured in terms of the ability to fit [human] culture into conformity with the requirements of maintaining rather than disrupting environmental equilibrium." Evaluated in these terms, Kansas forestry was largely a failure. The same might be said of much of the Great Plains' agricultural activities in general. Modern agriculture has brought wealth and prosperity to the Plains, or at least to some of its residents. And, like Kansas forestry, it has taken the creation of Edenlike material abundance, unrestrained by environmental conditions, as its primary mission. But hitched to an ideology of technologically intensive, ever-expanding economic growth and severed from ecological restraint, that agriculture has always been less interested in listening to the grassland than in forcing it to say what its champions want to hear. Perhaps the lesson of working within environmental limits might be utilized by those who would make the Great Plains bloom for the long term. The work of agricultural scientist Wes Jackson, for example, takes this lesson as a starting point, exploring techniques and crops designed to harmonize with the region's unique ecological makeup.<sup>51</sup>

"People do not master their environment," Elliott West writes. "They bargain with it." Kansas's great forestry experiment suggests the truth of this observation. Forcing a grand vision onto the natural environment of the Great Plains without recognition of natural limits often ends in failure, and even success does not always follow the cultural script. So, when a future generation waves its own "bough of challenge" at the grassland, whatever its guise, history tells us that it will best succeed if that bough resembles an olive branch.<sup>52</sup>

## NOTES

1. Earl C. Leatherberry, Thomas L. Strickler, and John K. Aslin, *An Analysis of the Forest Resources of Kansas*, Research Paper NC-334 (St. Paul, Minn.: USDA, 1999), pp. 3, 49. See also Gerhard K. Raile and John S. Spencer, *Kansas Forest Statistics*, 1981 (Washington, D.C.: US Government Printing Office, 1981), p. 1; G. Tyler Miller Jr., *Living in the Environment*, 10th ed. (Belmont, Calif.: Wadsworth Publishing Company, 1998), pp. 172-74. The author would like to thank Donald Worster, Elliott West, Adam Rome, Kevin C. Armitage, and all the participants at the Hall Center Nature and Culture Seminar, University of Kansas, 25 August 2000, for their extensive comments and criticisms.

2. On immigrants and their cultures in Kansas, see James R. Shortridge, *Peopling the Plains: Who Settled Where in Frontier Kansas* (Lawrence: University Press of Kansas, 1995).

3. Elliott West, *The Contested Plains: Indians, Goldseekers, and the Rush to Colorado* (Lawrence: University Press of Kansas, 1998), p. xxiii.

4. Albert Dickens, "The Forest Situation in Kansas," in *Trees in Kansas: Report of the Kansas State Board of Agriculture* (Topeka: Kansas State Printing Plant, 1928), p. 7.

5. Donald Worster, *Under Western Skies: Nature and History in the American West* (New York: Oxford University Press, 1992), p. 251.

6. James C. Malin, "An Introduction to the History of the Bluestem-Pasture Region of Kansas," in *History and Ecology: Studies of the Grassland*, ed. Robert Swierenga (Lincoln: University of Nebraska Press, 1984), p. 184.

7. Huber Self, *Environment and Man in Kansas: A Geographical Analysis* (Lawrence: The Regents Press of Kansas, 1978), pp. 58-65; Alfred Theodore Andreas, *History of the State of Kansas*, vol. 1 (Chicago: A. T. Andreas, 1883), p. 35 and passim; Daniel S. Licht, *Ecology and Economics of the Great Plains* (Lincoln: University of Nebraska Press, 1997), p. 81. Some geographers have argued that fire alone is responsible for Kansas's historical treelessness. See Philip V. Wells, "Scarp Woodlands, Transplanted Grassland Soils, and Concept of Grassland Climate in the Great Plains Region," *Science* 148 (April 1965): 246-49. Others have argued that the grasslands were entirely a creation of anthropogenic fire, though the evidence for this is controversial. See Stephen J. Pyne, *Fire in America: A Cultural History of Wildland and Rural Fire* (Princeton, N.J.: Princeton University Press, 1982), pp. 84-99.

8. Self, *ibid.*, pp. 58-65.

9. Wilmon H. Droze, *Trees, Prairies, and People: A History of Tree Planting in the Plains States* (Denton: Texas Woman's University, 1977), pp. 6, 9, 3-18.

10. USDA, *Preliminary Report on the Forestry of the Mississippi Valley, and Tree Planting on the Plains* (Washington, D.C.: US Government Printing Office, 1883), p. 36.

11. On the sources of immigration to Kansas, see Shortridge, *Peopling the Plains* (note 2 above), pp. 1-14.

12. For the taming of wilderness, see Roderick Nash's seminal *Wilderness and the American Mind*, 3d ed. (New Haven, Conn.: Yale University Press, 1982), especially chs. 1-3. Forests are heavily freighted with symbolic meaning, both positive and negative, in Western culture. For a detailed discussion of "forest symbolism," see Robert Pogue Harrison, *Forests: The Shadow of Civilization* (Chicago: University of Chicago Press, 1992).

13. On climate modification through forestry, see Droze, "Trees, Prairies, and People" (note 9 above), p. 30; Walter and Johanna Kollmorgen, "Landscape Meteorology in the Plains Area," *Annals of the Association of American Geographers* 63 (December 1973): 424-41; and Paul Travis, "Changing Climate in Kansas: A Late 19th-Century Myth," *Kansas History* 1 (spring 1978): 48-58. For other, more outlandish theories on climate modification, see Clark C. Spence, *The Rainmakers: American "Pluviculture" to World War II* (Lincoln: University of Nebraska Press, 1980).

14. Glen A. Marotz, "Trees, the Plains, and Water Management," *Journal of the West* 22 (April 1983): 49.

15. This phrase originally appeared in the Kansas State Horticultural Society constitution and is reproduced on the frontispiece of its annual *Transactions*.

16. Elbridge Gale, "Forest Tree Culture," in *Transactions of the Kansas State Horticultural Society for the Year 1872 . . .* (Topeka: Commonwealth State Printing House, 1873), pp. 13, 15. For the history of the KSHS, see George Filinger, *The Kansas State Horticultural Society: One Hundred Years of Progress 1867-1967* (Manhattan: Kansas State University, 1968).

17. *Miami Republican*, 9 March 1872.

18. Ibid.; Elbridge Gale, "Report of Prof. E. Gale," in *Transactions of the Kansas State Horticultural Society for 1873* (Junction City: The Union Office, 1874), p. 97; USDA, *Preliminary Report* (note 10 above), p. 36.

19. J. A. Warder, "Forest-tree Culture," in *Report of the Kansas State Board of Agriculture for 1873* (Topeka: State Printing Works, 1874), p. 268.

20. *Report of the Commissioner of Agriculture for the Year 1875* (Washington, D.C.: US Government Printing Office, 1876), pp. 336-40. On the Timber Culture Act, see Wilmon H. Droze, "Changing the Plains Environment: The Afforestation of the Trans-Mississippi West," *Agricultural History* 51 (January 1977): 14-16.

21. *Kansas City Journal*, 23 January 1884; R. S. Elliott, *Forest Trees for Kansas: A Series of Letters* (Lawrence, Kans., 1872), p. 5.

22. Speech of T. C. Henry before the KSHS, 6 December 1882, reprinted in the *Topeka Daily Capital*, 9 December 1882.

23. *Fourth Biennial Report of the Kansas State Board of Agriculture for the Years 1883-84* (Topeka: Kansas Publishing House, 1885), p. 649; speech by Bernhard E. Fernow to the Kansas State Board of Agriculture, 15 January 1891, reprinted in *Seventh Biennial Report of the Kansas State Board of Agriculture 1889-90* (Topeka: Kansas Publishing House, 1891), p. 200.

24. Gale, "Report of Prof. E. Gale" (note 18 above), p. 100.

25. Ibid., p. 94.

26. *Fourth Report on Kansas Forestry by the Kansas State Horticultural Society for 1883* (Topeka: Kansas State Publishing House, 1884), p. 1.

27. H. E. Van Deman in *Second Report on Kansas Forestry by the Kansas Horticultural Society for 1880* (Topeka: Kansas State Publishing House, 1881) p. 37; W. H. Litson, *ibid.*, p. 40.

28. W. H. Kritchfield in *Fourth Report on Kansas Forestry* (note 26 above), p. 71; J. W. Bidwell in *Fourth Report on Kansas Forestry* (note 26 above), p. 62.

29. J. W. Bidwell, *ibid.*

30. *Seventh Report on Kansas Forestry by the Kansas State Horticultural Society for 1886* (Topeka: Kansas Publishing House, 1887), p. 28. Those species, in order of preference, were black walnut, western hardy catalpa, white ash, white elm, white maple, osage orange, cottonwood, box elder, honey locust, and red elm. Preferred conifers included red cedar, Austrian pine, and Scotch pine.

31. S. C. Robb, *First Annual Report of the Commissioner of Forestry for the Year 1888* (Topeka: Kansas Publishing House, 1888), pp. 5, 11, 13, 14.

32. Martin Allen, *First Biennial Report of the Commissioner of Forestry, Kansas, for the Years 1889-90* (Topeka: Kansas Publishing House, 1890), p. 4.

33. George V. Bartlett, *Second Biennial Report of the Commissioner of Forestry, Kansas, for the Years 1891-92* (Topeka: Kansas Publishing House, 1892), p. 3; E. D. Wheeler, *Biennial Report of the Commissioner of Forestry for the Two Years Ending June 30, 1894* (Topeka: Press of Hamilton Printing Company, 1894), p. 18.



34. William L. Hall, "The Work of the Bureau of Forestry in Kansas" in *Transactions of the Kansas State Horticultural Society* 38 (Topeka: State Printing Office, 1906), p. 283.

35. E. A. Popenoe, S. C. Mason, and F. A. Marlatt, "Notes on Conifers for Kansas Planters," *Kansas State Agricultural College Experiment Station Bulletin* 10 (Topeka: Kansas Publishing House, 1890), pp. 5, 7, 10.

36. Albert Dickens, "Report of the State Forester," *Kansas State Agricultural College Bulletin* 165 (Manhattan, 1910), pp. 299, 312-29.

37. *Ibid.*, pp. 312, 316.

38. "Trego County, Kansas" (Chicago: Warren, Kearney, and Co., n.d., probably 1878).

39. On abuses of the Timber Act, see C. Barron McIntosh, "Use and Abuse of the Timber Culture Act," *Annals of the Association of American Geographers* 65 (September 1975): 347-62.

40. Paul Nieder, "The Timber Culture Laws in Western Kansas 1873-1891" (master's thesis, University of Kansas, 1966), pp. 47, 110; Droze, *Trees, Prairies, and People* (note 9 above), p. 27.

41. The seminal work on Progressive efficiency and scientific management of forests is Samuel P. Hays, *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement 1890-1920* (Cambridge, Mass.: Harvard University Press, 1959).

42. Willis Conner Sorensen, "The Kansas National Forest, 1905-1915," *Kansas Historical Quarterly* 35 (Winter 1969): 389; Garden City Industrial Club, "Garden City and Finney County, Kansas: The Gems of the Great Arkansas Valley" (Garden City: Morris Bros. Printers and Binders, 1905), p. 32.

43. Carlos G. Bates and Roy G. Pierce, "Forestation of the Sand Hills of Nebraska and Kansas," *Forest Service Bulletin* 121 (Washington, D.C.: US Government Printing Office, 1913), p. 24; Sorensen, "Kansas National Forest" (note 40 above), p. 389.

44. Sorensen, *ibid.*, p. 393; Bates and Pierce, *ibid.*, p. 38.

45. Sorensen, *ibid.*; *Topeka Capital*, 9 September 1923.

46. "Agriculture Statistics" in *Third Biennial Report of the Kansas State Board of Agriculture for the Years 1881-82* (Topeka: Kansas Publishing House, 1883), p. 566; *Sixth Biennial Report of the Kansas State Board of Agriculture for the Years 1887-88*, pt. 2 (Topeka: Kansas Publishing House, 1889), pp. 77-80; *Eleventh Biennial Report of the Kansas State Board of Agriculture for 1897 and 1898* (Topeka: Kansas Department of Agriculture, 1899), pp. 831-33; *Fourteenth Biennial Report of the Kansas State Board of Agriculture for 1903-4* (Topeka: Kansas Department of Agriculture, 1905), pp. 1028-29. Financial figures are revealing as well. Forest boosters were fond of claiming that Kansas would someday raise wood as profitably as corn. In 1887 Kansas produced wood valued at \$239,305. Corn values that year totaled \$26,836,422.70. By 1908 corn values exceeded \$82 million, and wood values had dropped to a mere \$102,989 (*Sixth Biennial Report*, pt. 2, pp. 11-14, 77-80; *Sixteenth Biennial Report of the Kansas State Board of Agriculture for the Years 1907 and 1908* [Topeka: Kansas Department of Agriculture, 1909], pp. 988, 1041).

47. F. L. Kenoyer, "The Farm Wood Lot: A State Asset," *Bulletin of the Kansas State Horticultural Society*, February 1920, p. 15.

48. Droze, *Trees, Prairies, and People* (note 9 above), pp. 3-47. See also Donald Worster, *Dust Bowl: The Southern Plains in the 1930s* (New York: Oxford University Press, 1979), pp. 220-23.

49. Licht, *Ecology and Economics* (note 7 above), p. 61; Ronald L. Hackett, "Forest Area in Kansas, 1981" in *North Central Forest Experiment Station Research Note NC-298* (St. Paul, Minn.: US Forest Service, 1983), pp. 1-4. See also Leatherberry et al., *Analysis of the Forest Resources* (note 1 above), p. 3.

50. Licht, *Ecology and Economics* (note 7 above), pp. 52-81.

51. Malin, "Introduction to History of Bluestem-Pasture" (note 6 above), p. 66; Wes Jackson, *New Roots for Agriculture* (San Francisco: Friends of the Earth, 1980).

52. West, *The Contested Plains* (note 3 above), p. 233.