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# THE SHELTERBELT PROJECT IN THE SOUTHERN GREAT PLAINS--1934-1970 - A GEOGRAPHIC APPRAISAL

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By

JAMES B. LANG

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Dedicated to

Jane and Matt

THE SHELTERBELT PROJECT IN THE SOUTHERN GREAT PLAINS--

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APPROVED FOR THE DEPARTMENT OF GEOGRAPHY

By

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## CHAPTER I

## INTRODUCTION

In the early 1930's, conditions throughout the Great Plains, particularly in the "Dust Bowl" area, were such that some plan of action was needed to help stabilize the physical environment and to provide relief for the region's inhabitants. Drought, wind, and crop failures were creating havoc within the region. To compound these problems, the nation was in the grip of a financial depression. Many farmers were in particularly dire straits. The drought and wind were causing widespread crop failures, and where the farmer could not produce a crop, he was in danger of losing his land. Even where crops were produced, the prices were so low that the farmers could barely meet the payments on their debts. Winds were blowing topsoil as far east as Washington, D.C. and, on occasion, even onto ships out in the Atlantic. Many farmers abandoned their farms and headed west or moved to more favorable areas in the humid east, leaving behind their farms, once quite productive, but now buried under an ever-shifting sea of dust. The adverse weather conditions prohibited the vegetative growth necessary to provide a cover to hold the soil in place during the high winds of spring. Farmers who stayed behind stood by helplessly watching their precious topsoil blow from their farms. All they could do was hope for a miracle to alleviate their suffering.

President Franklin Roosevelt had long been aware of the plight of the Great Plains farmer, and the problem was brought right to his doorstep when a layer of fine, red dust settled over the capitol--dust blown in from the Great Plains. One of the programs he chose to bring relief to the Great Plains was an enormous tree planting scheme known as the Shelterbelt Project, a program which was destined to become one of the most controversial ones of the New Deal. This Shelterbelt Project is the subject of this study.

## Statement of Problem

What is the present status of the Shelterbelt Project (officially, the Prairie States Forestry Project), started in 1934 as one of several government schemes to stabilize the soil and the economy of the Great Plains and to change this drought-stricken area into a more productive agricultural region? Thirty-five years have elapsed since the beginning of the Project. Most of the Shelterbelt vegetation has had an opportunity to reach maturity, and a proper evaluation of the success or failure of the project can be made. The stated objectives were to assist in stabilizing those portions of the Great Plains adapted to tree planting and to provide employment for the people of the area. Though these were its declared purposes, perhaps it had hidden objectives and consequences equally as important. Was this project really designed just to provide jobs through government work? Was the sale of trees and shrubs by commercial nurseries a means to add money to the nation's depressed economy? Are there any microclimatic effects of the shelterbelts? If so, what is the relation of these microclimatic effects to making the environment more habitable for people? Has wildlife conservation been fostered

or deterred by the presence of shelterbelts? Was the project successful in carrying out its goals? If so, were the goals of 1934 the same as those of 1970? If the initial goals were not achieved, what factors contributed to their failure? To what extent has the land once used for shelterbelts been diverted to non-forest uses? These and other questions will be assessed in an analysis over time and space. Although a summary of the whole Shelterbelt program will be given, the greatest emphasis in this thesis will be placed upon those parts of it that are in Oklahoma and Texas.

Although this study is to be a geographic one, the literature in the field of professional geography is somewhat restricted as far as the Shelterbelt Project is concerned. Although some articles were found in geographic journals, most of those used were published by the forestry profession. There were numerous articles published in the November and December 1934 issues of the Journal of Forestry that dealt with professional criticism which arose over this controversial program. In the same issues, there were also rebuttals by those who felt the criticism unwarranted. These writers attempted to explain the program and to correct some misconceptions concerning it. In addition to the academic magazine articles, many popular ones of the time have been used. Their number is a good indicator of the general public's interest in the project.

Several books were used to get a general understanding of the Great Plains and the conditions of the times. Some of the more important of these were Carl F. Kraenzel's The Great Plains in Transition, Wilmon H. Droze's "The New Deal's Shelterbelt Project, 1934-1942," a chapter in Essays on the New Deal (a good treatment of the political problems involved in the Project), and Lawrence Svobida's An Empire of Dust (one

man's account of how he battled the drought and finally gave up). Edgar B. Nixon's Franklin D. Roosevelt and Conservation, 1911-45, (two volumes) was especially important because it provided an insight into FDR's thinking along the lines of the project. Three other sources of information valuable to this study were E. L. Perry's "History of the Prairie States Forestry Project" (an unpublished report for the U. S. Forest Service), Fred Floyd's "A History of the Dust Bowl" (an unpublished Ph.D. dissertation, University of Oklahoma, Department of History, 1950), and Paul H. Roberts' "History of the Shelterbelt Project" (an unpublished manuscript).

The richest source of materials for this study was found at the Rocky Mountain Forest and Range Experiment Station, Lincoln, Nebraska. Here the historical files of the Prairie States Forestry Project are stored. These files were generously opened for use by the writer.

The records of the plantings of the Shelterbelt Project now held by the Soil Conservation Service at Vernon, Texas, for the Texas plantings and at Fort Worth, Texas, for the Oklahoma plantings were also used, along with several county soil surveys published by that agency. The records provided much insight into some of the problems faced by the project workers. The Possibilities of Shelterbelt Planting in the Plains Region provided a great deal of technical information about the Shelterbelt Project.

From available Soil Conservation Service records, a spatial pattern of the shelterbelts in the southern Great Plains was determined. Then, using aerial photographs of the period and others of more recent times, a random sampling of areas was conducted to choose selected sections for more intensive study. Once areas were selected, fieldwork began.

In the field, still other areas were examined so that comparisons could be made. Interviews were conducted with personnel of the Soil Conservation Service and Forest Service as well as with landowners in the study areas. Using these tools and methods, an evaluation of the Shelterbelt Project has been attempted.

## CHAPTER II

## THE PHYSICAL ENVIRONMENT

### Climate

Within the continental United States the Great Plains region includes all or part of twelve different states and comprises about 30 per cent[1] of the total area of the country. It can be divided appropriately into two sub-regions, the tall-grass prairies in the east and the short-grass plains in the west.

During the 1930's disaster struck the Great Plains. The persistent and pervading drought called for immediate action for the relief of the people and for control of wind erosion. One such action plan was the Shelterbelt Project with which this study is concerned. Before discussing the project, however, it is necessary to examine the various aspects of the physical environment of the Great Plains in order to understand better the impact of the prolonged dry period.

The various physical geographic factors, such as climate, topography, and soil fertility, working together in a variety of combinations or separately, can influence the agricultural conditions of a region. Of these factors, Kincer says that climate is the "most

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[1]Raphael Zon, "What the Study Discloses," Possibilities of Shelterbelt Planting in the Plains Region (Washington, D.C.: Government Printing Office, 1935), p. 3.

fundamental, unalterable, and important, not only in influencing the distribution of particular crops, but also in determining the suitability of land for agricultural purposes."[2] So it is with the climate of the region under discussion.

Some authorities describe the climate of the Great Plains as being unique.[3] Whether plainsman or outsider, one must realize this particular point if he is to understand the Plains region and its peculiar problems. This climatic uniqueness has a special importance to this study, because understanding it will help to elaborate the problems affecting the whole Shelterbelt Project. A brief general summary of the physical environment, it is hoped, will illustrate the need for some means to help hold this land and to control soil blowing.

Kraenzel, in describing the Great Plains, said it is a region that is "not an arid land" for, if it were, its place could readily be understood. Likewise, the Plains are not a humid or subhumid land, because if they were they would stand shoulder to shoulder with such areas as the Midwest, the South, and the East in benefiting fully from "the preponderantly urban and industrial civilization in the United States today."[4]

Zon, speaking of the climate of the Great Plains, calls it a "transition zone between the humid region to the east and the semiarid

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[2]Joseph B. Kincer, "The Climate of the Great Plains as a Factor in their Utilization." Annals of the Association of American Geographers, XIII (June, 1923), 67.

[3]Carl F. Kraenzel, The Great Plains in Transition (Norman: University of Oklahoma Press, 1955), p. 12; John R. Borchert, "The Climate of the Central North American Grassland," Annals of the Association of American Geographers, XL (March, 1950), p. 14.

[4]Kraenzel, The Great Plains in Transition, 12.

region to the west, embracing all the gradations between the two."[5] If the region cannot be described as semiarid or subhumid, what would be the best term for the Plains' climate?

Again, Kraenzel provides some insights by further expanding on what Zon said. The Great Plains are a "semiarid land, not in the sense that they are halfway between humid and arid." They are not half dry and half wet. He explains the climate of the Plains in three patterns: in some years, they are dry, even arid, while in others they are very wet, and in still other years they are wet or dry at the wrong times "in terms of agricultural production and yields." This "undefinable aspect of semiaridity" gives the region its distinctiveness.[6]

Both of the authors just quoted have described the Great Plains climate in rather broad, general terms. Now the task is to examine some of the major characteristics which go to make up its "uniqueness" or "distinctiveness."

The location of the region contributes to this unique climate, whose overall character is continental. Its interior position, its distance from large water bodies, and its relation to the north-south trending mountains to the west influence its major weather components: precipitation, temperature, evaporation, and winds.

## Precipitation

The first of these factors, precipitation, is of extreme importance to the people and the economy of the Plains. As mentioned earlier, the moisture in this area varies from year to year and from

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[5]Zon, "What the Study Discloses," 3.

[6]Kraenzel, The Great Plains in Transition, 12.

month to month. So, whenever one discusses precipitation, particularly rainfall in the Great Plains, he must talk about its variability as well as the annual "average" precipitation.

The moisture received in the Plains is dependent upon three major air masses and their relation to each other.[7] The air masses of Arctic origin are generally cold and dry, those coming off the Rocky Mountains are usually dry and warm, and those coming from the Gulf of Mexico and South Atlantic areas are warm and moist in nature.

Of the three air masses, the Gulf-South Atlantic air mass is of most importance as a carrier of moisture to the Great Plains region. It is this dependence upon one source and southeasterly winds which is largely responsible for the limited quantities received in the most northern and western portions of the Plains, for the great variability in precipitation in the southwest part of the area, and for the frequent recurrence of droughts. Together with this factor, dependence on one moisture source, is the southerly course of some cyclonic storms during the winter, which results in extremely low precipitation in the North, with the ratio of winter moisture to the annual amount increasing southward.

The two remaining air masses supply the Great Plains with little precipitation, mainly because moisture from the Pacific is largely cut off by the Pacific ranges and the Rockies. Pacific moisture is drawn

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[7]For more extensive coverage of this subject, see: C. G. Bates, "Climatic Characteristics of the Plains Region," Possibilities of Shelterbelt Planting in the Plains Region (Washington, D.C.: Government Printing Office, 1935), pp. 87-88; Borchert, "The Climate of the Central North American Grassland," 21-23; Glenn T. Trewartha, The Earth's Problem Climates (Madison: The University of Wisconsin Press, 1966), pp. 259-66; George R. Rumney, Climatology and the World's Climate (London: The Macmillan Company, 1968), pp. 355-62; Kraenzel, The Great Plains in Transition, 12-13.

from the winds as they ascend the mountain barriers, and as the winds descend on the lee side, they are dried and warmed, allowing only desiccated Pacific air to arrive in the Great Plains. As for the Arctic air, because of its cold nature, as it enters the drier interior grassland, it is even less likely to add any appreciable moisture. Whenever there is a collision between two of the three air masses, especially if one is the maritime tropical air mass, precipitation often results.

Figure 1[8] shows the average annual rainfall for the Great Plains for a forty-year period, from 1895 to 1934. However, since this study has to do only with that strip of it known as the Shelterbelt zone, the average annual precipitation for that area is more meaningful. In the northern portion of the zone it varies from 24 to 16 inches, whereas in the southern half it is 29 to 22 inches,[9] decreasing in each case from east to west. Average precipitation figures, however, do not tell one much about this zone or about the Great Plains as a whole because records for all stations throughout the region show that there are significant annual fluctuations in precipitation. What the records do not show, and perhaps this is of greater significance, is the variability of rainfall within the year.[10] It is this element of rainfall which determines if a particular year will have a suitable growing season.

In the Great Plains, the bulk of the year's rainfall normally comes during the growing season, from spring through summer. This moisture

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[8]Bates, "Climatic Characteristics of the Plains Region," 89.

[9]F. A. Hayes, "The Shelterbelt Zone: A Brief Geographic Description," Possibilities of Shelterbelt Planting in the Plains Region (Washington, D.C.: Government Printing Office, 1935), p. 11.

[10]Great Plains Committee, Report of the Great Plains Committee, The Future of the Great Plains (Washington, D.C.: Government Printing Office, 1936), p. 28.

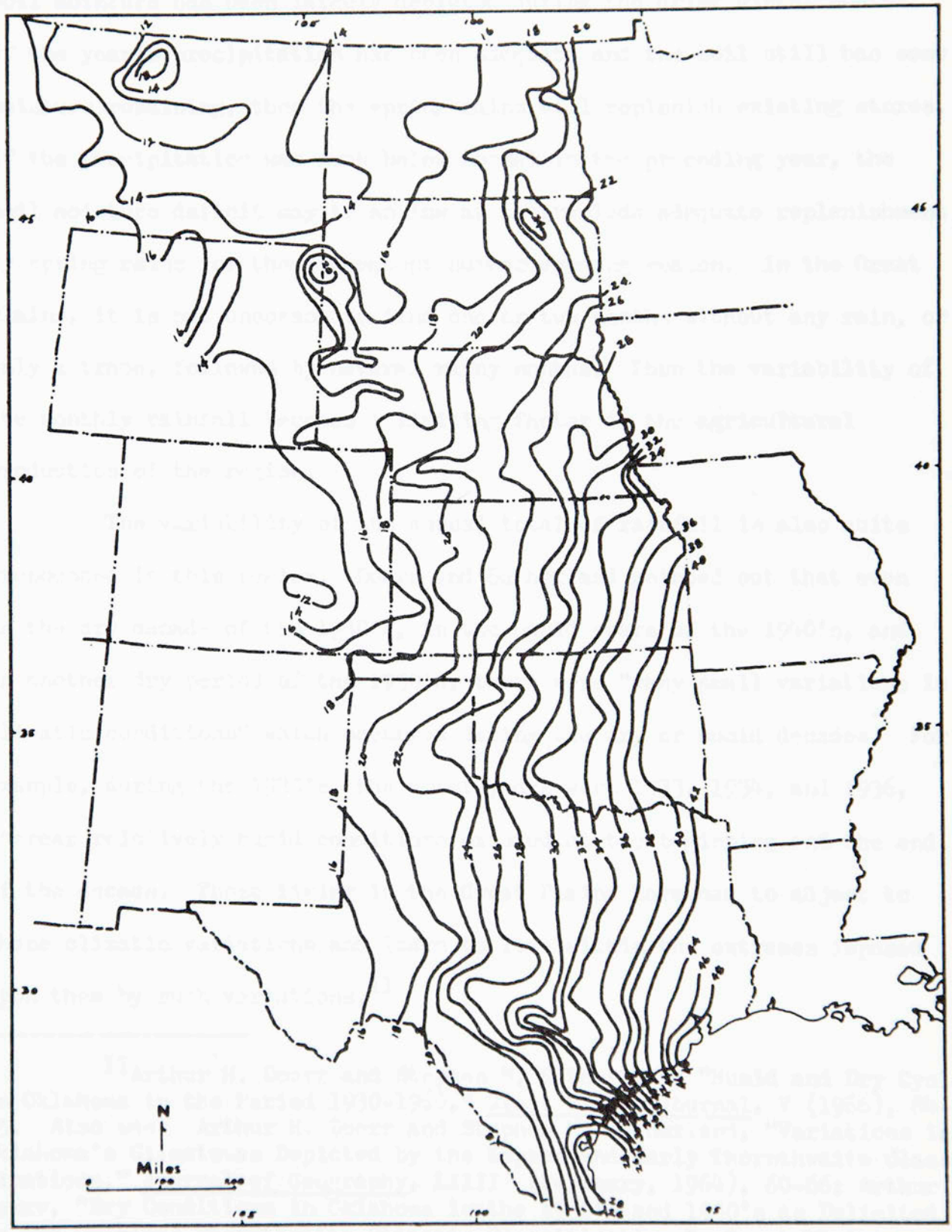


Figure 1. Average annual precipitation in inches for the 40-year period 1895-1934.

arrives at a critical period in the scheme of life on the Plains, because soil moisture has been largely depleted during the drier winter months. If the year's precipitation has been adequate and the soil still has some moisture remaining, then the spring rains will replenish existing stores. If the precipitation was much below normal in the preceding year, the soil moisture deficit may be so low as to preclude adequate replenishment by spring rains for the subsequent summer growing season. In the Great Plains, it is not uncommon to find one or two months without any rain, or only a trace, followed by several rainy months. Then the variability of the monthly rainfall becomes a limiting factor in the agricultural production of the region.

The variability of the annual total of rainfall is also quite pronounced in this region. Doerr and Sutherland pointed out that even in the dry decade of the 1930's, in the humid years of the 1940's, and in another dry period of the 1950's, there were "many small variations in climatic conditions" which occurred during the dry or humid decades. For example, during the 1930's, the worst years were 1933, 1934, and 1936, whereas relatively humid conditions existed at the beginning and the end of the decade. Those living in the Great Plains have had to adjust to these climatic variations and learn to live within the extremes imposed upon them by such variations.[11]

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[11]Arthur H. Doerr and Stephen M. Sutherland, "Humid and Dry Cycles in Oklahoma in the Period 1930-1960," Great Plains Journal, V (1966), 84-85. Also see: Arthur H. Doerr and Stephen M. Sutherland, "Variations in Oklahoma's Climate as Depicted by the Koppen and Early Thornthwaite Classifications," Journal of Geography, LXIII (February, 1964), 60-66; Arthur H. Doerr, "Dry Conditions in Oklahoma in the 1930's and 1950's as Delimited by the Original Thornthwaite Climatic Classification," Great Plains Journal, II (1963), 67-76; and Arthur H. Doerr, "Oklahoma's Climate--The Dirty Thirties vs The Filthy Fifties," Proceedings of the Oklahoma Academy of Science, XLI (1961), 169-172.

The warm season concentration of precipitation becomes especially important in the northern section of the Great Plains where the growing season is shorter than in the southern half and in the western part where the total annual rainfall is less. In both the northern and western areas a "high degree of coincidence between rainfall and the growing season is essential."[12]

Another important factor of rainfall is intensity. As Thornthwaite puts it:

> The higher the intensity of the rainfall, the lower is its effectiveness. For stations in the area where records of excessive rainfall exist, we find that the rainfall of a single hour has brought 12 to 16 per cent of the moisture of the entire year. Three inches of rain in one hour, when the year's total is only 18 inches, is clearly not a satisfactory distribution.[13]

The intensity of the rainfall varies with the season and the type of storm, from slow drizzling rains to heavy torrential thunderstorms.

Although a rain's effectiveness is lowered by a high intensity rainfall, there are also other factors to be considered. Rumney lists the following circumstances which influence the amount of moisture in the soil available for plant use, after evaporation and run off:

> ...the kind and condition of the vegetative cover, depth, and porosity of the soil, temperature of the soil, temperature of rain as it falls, speed and persistence of the wind, duration and intensity of solar radiation, saturation deficit of the atmosphere, and air temperature, before, during, and after precipitation.[14]

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[12]Glenn T. Trewartha, "Climate and Settlement of the Subhumid Lands," Climate and Man, Yearbook of Agriculture, 1941 (Washington, D.C.: Government Printing Office, 1941), p. 170.

[13]C. Warren Thornthwaite, "Climate and Settlement in the Great Plains," Climate and Man, Yearbook of Agriculture, 1941 (Washington, D.C.: Government Printing Office, 1941), p. 205.

[14]Rumney, Climatology and the World's Climates, 350.

## Temperature

Another of the major elements in the unique climate of the Plains, and one which has a direct bearing on the effectiveness of the rainfall, is temperature. Anyone familiar with the Great Plains region is well aware of the great extremes in temperature found here. The winters are relatively cold, and the temperature range between the northern and southern portions can be as much as 50°F.[15] Conditions become increasingly colder northward, with January being the coldest month throughout the entire region. Temperatures at the freezing point or below persist for from more than half the year in eastern Montana and most of North Dakota to less than ten days in the Plains' extreme southern limit.

During the summer, the mean monthly Fahrenheit temperatures range from the 60's in the north to the 80's in the south. Extremes of heat prevail though, especially in the southern section, where the daytime temperature may remain above 100° for days, especially in Texas and Oklahoma. The duirnal range is quite large, ranging from 25° or less in the eastern prairies to 30° or more in the western plains.

It is the wide fluctuation in seasonal temperature, along with the extremes and the always uncertain rainfall, which creates problems for the human inhabitants and their land-use practices. The temperature range between the extreme summer maximum and the winter minimum at a given place can be as much as 100° and in some cases even larger. Rumney attributes this wide variation in temperature to the great severity of the winter cold, especially in the northern sections. Using official

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[15] Trewartha, "Climate and Settlement of the Subhumid Lands," 169; Kincer, "The Climate of the Great Plains as a Factor in Their Utilization," 74.

data, he reports that:

> The lowest recorded temperature reading in North Dakota is -60°, in central Nebraska -47°, and in central Texas -23°, whereas the highest July temperatures of record are nearly the same from North Dakota to Texas, being 121° in the former and 120° in the latter, and at most points between the values range from 118° to 121°.[16]

As mentioned before, temperature plays an important role in rainfall effectiveness. This is reflected in the length of the growing season, which ranges from 200 to 230 days in Texas and Oklahoma to only 100 to 120 days in the northern states. Since the growing season is shorter in the north, the moisture supplied to it is used more effectively, mainly because of cooler temperatures and less evaporation. In Texas and Oklahoma, the higher temperatures and consequent higher evaporation rates tend to decrease the effectiveness of whatever rainfall comes.

## Evaporation

Temperature and rainfall do not alone contribute to the distinctiveness of the Plains' climate. Another important element in this regional pattern is evaporation. However, like all of the elements of weather, evaporation cannot alone contribute to the region's unusual weather. The rate of evaporation reflects not only the temperature, the relative humidity of the atmosphere, and the prevailing rate of wind movement, but also the condition of the soil and the amount of moisture present there. As with the pattern of the other climatic factors in the Great Plains, the rate of evaporation during the warm season increases from a little more than 30 inches per year in the north to about 60 inches in the south. The actual difference in available moisture supply between

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[16] Kenney, Climatology and the World's Climates, 355.

north and south has been estimated to equal about 10 inches of annual rainfall. Evaporation decreases the effectiveness of precipitation from north to south. It is because of this factor that the necessary requirements for soil moisture to support either tall or short grass development, as well as crops, are met in spite of the distinctive decrease in normal precipitation northward.

## Winds

The Great Plains region is well-known for its windiness, and this condition is probably due only in a small measure to local factors (the exception, being during the summer, when many storms are of local origin). The high winds are due more to the fact that the Plains are made up of primarily unbroken topography and are relatively free of obstacles which might tend to impede the free sweep of the wind. The velocity of the wind here averages higher than in other parts of the United States, with the average being between 10 and 12 miles per hour over most of the Plains. (Figure 2[17]).

The prevailing wind direction for most of the region is from the northwest in the winter and from the south or southeast during the summer. Occasionally a southwest wind will occur and prove to be quite damaging, mainly because of its dryness and its heat.

The persistent wind, combined with the other factors of temperature, precipitation, and evaporation, often causes trouble for the Great Plains farmer. The difficulties may begin in the winter season when soil moisture

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[17]C. Warren Thornthwaite, "The Great Plains," in Migration and Economic Opportunity, Carter Goodrich, ed., (Philadelphia: University of Pennsylvania Press, 1936), p. 238; also Great Plains Committee, The Future of the Great Plains, 29.

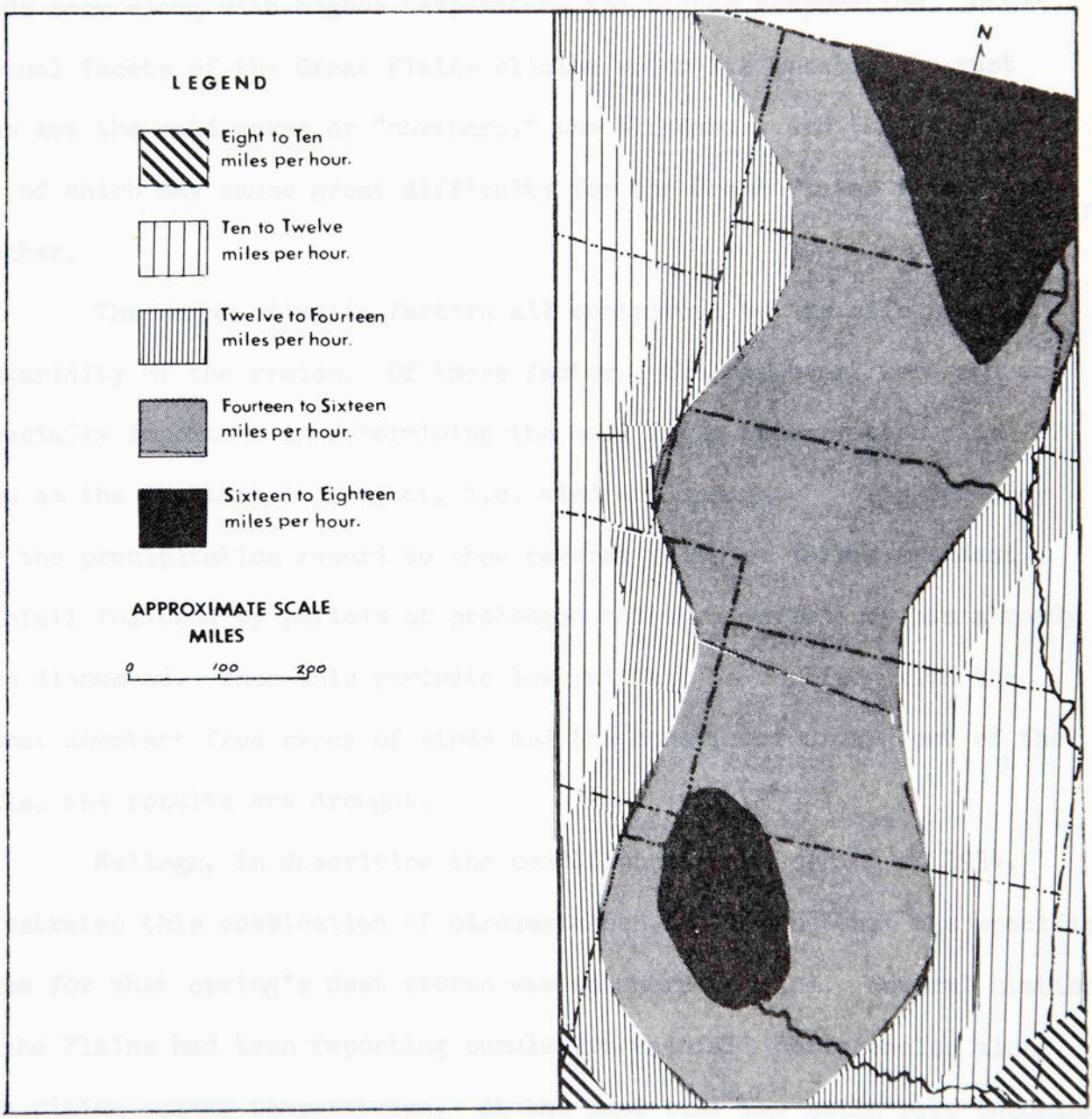


Figure 2. Average wind velocity in the Great Plains.

deficits have been carried over longer than usual and the fall-sown crops must depend on the immediate supply of moisture available. This moisture supply becomes crucial immediately but may prove fatal if the spring rains do not come in time to replenish the moisture supply before the spring winds come along with higher temperature and higher evaporation. Other unusual facets of the Great Plains climate which its inhabitants must face are the cold waves or "northers," the blizzards, and the chinooks, all of which may cause great difficulty for the Great Plains farmer and rancher.

The major climatic factors all contribute to the effective semiaridity of the region. Of these factors, two, however, were and are especially important in determining the need for a conservation plan such as the Shelterbelt Project, i.e. wind and drought.[18] The tendency for the precipitation record to show several years of fairly abundant rainfall followed by periods of prolonged moisture deficiency has already been discussed. When this periodic low rainfall is combined with the almost constant free sweep of winds and the consequent drying out of the soils, the results are drought.

Kellogg, in describing the conditions in the spring of 1934, illustrates this combination of circumstances, by saying that the specific cause for that spring's dust storms was not hard to find. Several stations in the Plains had been reporting cumulative rainfall deficiencies along with rising summer temperatures. At the same time the soils were becoming increasingly dry to the point of using up the subsoil reserves. This

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[18] Hayes, "The Shelterbelt Zone: A Brief Geographic Description," 12.

general condition was intensified the following spring by continued rainfall deficiency. As a result, those soils susceptible to blowing were in a loose, dry state, and as a further result of the drought had little or no protective covering.[19]

## Soils

Soils of the Great Plains are potentially quite productive, but they must be protected from the ravages of erosion. Bennett said of them that they have a "superficial appearance of uniformity, particularly on the more level lands." Their productivity, however, varies widely even within a small area. They are generally considered fertile, although they exhibit wide diversity in their texture, depth, and water holding capacity. In wet years, almost any of them will produce fairly good crops, but in dry years, only those that "absorb and hold large quantities of water and resist wind erosion can be farmed successfully."[20]

Figure 3[21] shows the various types of soil that are found throughout the Great Plains region. Although the soils appear to be somewhat uniform, their productivity varies in relation to crops. This aspect created problems for tree planting also. However, this situation will be

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[19]Charles E. Kellogg, Soil Blowing and Dust Storms, U. S. Department of Agriculture, Miscellaneous Publication No. 221 (Washington, D.C.: Government Printing Office, 1935), p. 1.

[20]John B. Bennett, F. R. Kenney, and W. R. Chapline, "The Problem: Subhumid Areas," Soils and Men, Yearbook of Agriculture, 1938 (Washington, D.C.: Government Printing Office, 1938), p. 69.

[21]Kraenzel, The Great Plains in Transition, 26-27; Arthur N. Strahler, Introduction to Physical Geography (New York: John Wiley & Sons, Inc., 1965), p. 180; Roy L. Donohue, Soils: An Introduction to Soils and Plant Growth (Englewood Cliffs, N. J., Prentice-Hall., 1958), pp. 46-47.

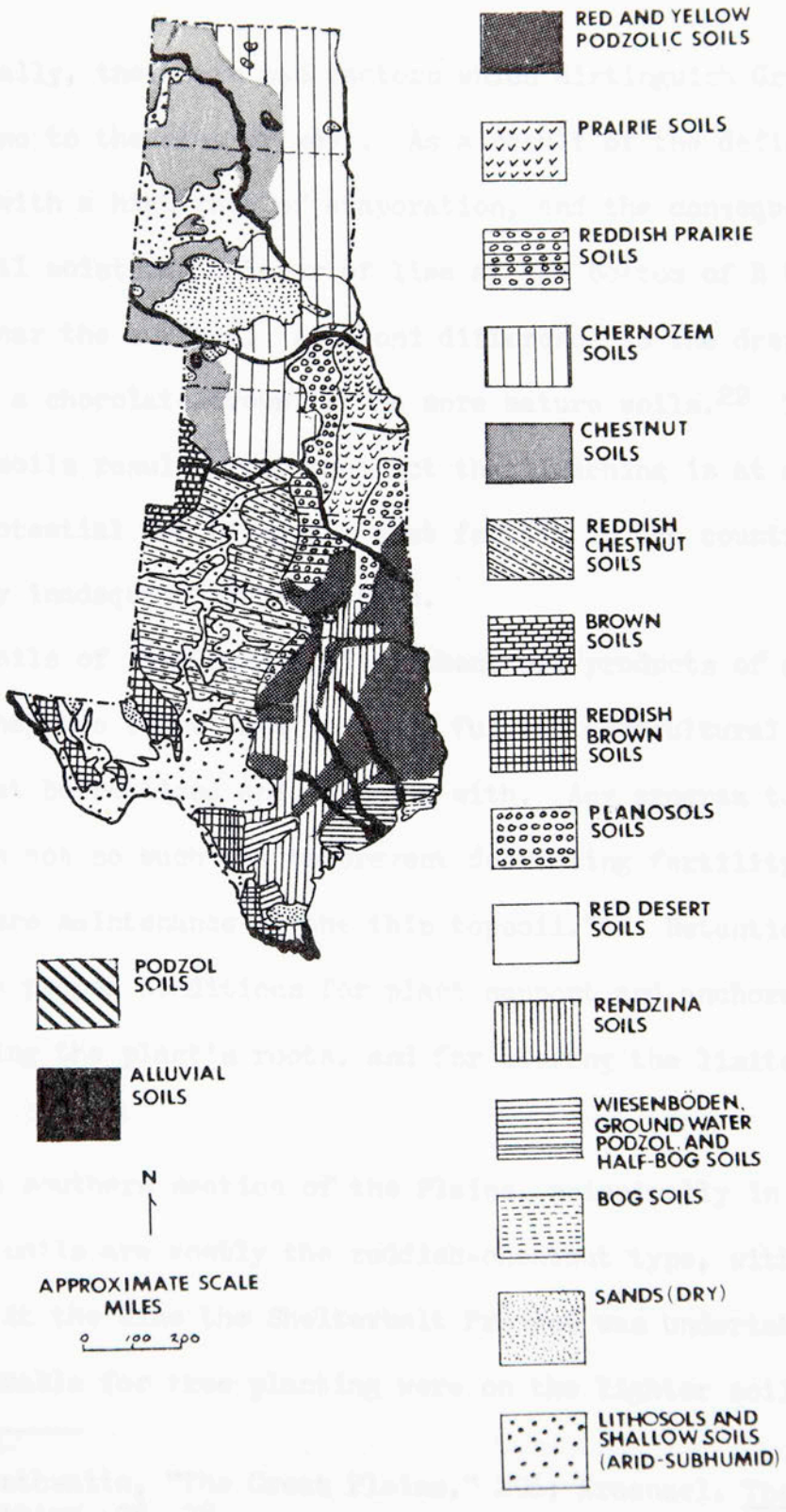


Figure 3. Soil types in the Great Plains.

discussed in a later section on the shelterbelt plantings and their problems.

Basically, there are two factors which distinguish Great Plains soils from those to the east or west. As a result of the deficient rainfall combined with a high rate of evaporation, and the consequent upward movement of soil moisture, a layer of lime at the bottom of B horizon is concentrated near the surface. A second difference is the deep, dark color, usually a chocolate-brown in the more mature soils.[22] The fertility of the soils results from the fact that leaching is at a minimum here. Their potential for being the most fertile in the country is limited only by inadequate precipitation.

The soils of the Great Plains, then, are products of a semiarid climate. If they are to be used to their fullest agricultural extent, this factor must be realized and reckoned with. Any program to control soil blowing is not so much one to prevent decreasing fertility, but rather to "insure maintenance of the thin topsoil."[23] Retention of the topsoil insures proper conditions for plant support and anchorage, a means for holding the plant's roots, and for storing the limited available moisture.

In the southern section of the Plains, principally in Oklahoma and Texas, the soils are mostly the reddish-chestnut type, with some areas of lithosols. At the time the Shelterbelt Project was undertaken, the areas most favorable for tree planting were on the lighter soils ranging

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[22]Thornthwaite, "The Great Plains," 206; Kraenzel, The Great Plains in Transition, 26, 28.

[23]Kraenzel, The Great Plains in Transition, 28.

from sands to sandy loams. The plantings on heavier soils were subject to failure or to only partial success, and usually had only stunted growth.

## Terrain

The general surface upon which the soils of the Great Plains developed is best described as a broad, nearly level to somewhat hilly plain which slopes gently eastward from the Rocky Mountains. The slope is a gradual one, descending from altitudes of 5,000 or 6,000 feet in the west to about 1,500 feet along the eastern margin. This slope averages about 10 feet per mile. Most of the mantle covering the Plains was laid down in the past by the action of either glaciers, wind, or water. The Plains are dissected by a number of major streams flowing in an easterly or southerly direction, including the Missouri, James, Niobrara, Platte, Arkansas, and Canadian rivers. All of these rivers have carved rather deep valleys. Together with their tributaries, the rivers have left many areas of rough land. The widely held view that the Great Plains is monotonously flat is not borne out in fact on the surface.

In the southern section of the Great Plains, the topography of the Shelterbelt Zone differs little from the general picture of the Plains as a whole. The High Plains of Texas were not included in the zone; however, the area known as the rolling plains, lying several thousand feet below the High Plains and to the east of them, was included. The High Plains and rolling plains are separated by a steeply sloping and extremely gullied escarpment, known as "the breaks." East of the escarpment the land is marked by numerous drainage ways. Here the surface is best described as rolling to hilly, with the same gradual slope eastward. In most places, prolonged erosion has removed the thick Tertiary deposits and their

underlying formations down to the "Red Beds" of Triassic and Permian age. These consist mainly of red, limey, soft sandstones and sandy shales, in some places containing thick gypsum beds. The Red Beds lie at such shallow depths over a large area that they give the land a characteristic reddish color. In many places, the finer materials have been removed from the surface of the Red Beds by wind and water, and the "residual sands have been piled by the wind into hills and ridges," thus creating a topography similar to the sand hills of Nebraska but lesser in extent.[24]

## Natural Vegetation

When the first white man reached the central part of this new-found continent, he found a vast land of tall waving grass extending from Texas northward into Manitoba. To this grassland, with its wide assortment of grasses and wild flowers, he ascribed the name "prairie." Further to the west and beyond this grassland was "an even more extensive but drier and sparser grassland" which reached to the Rocky Mountains. This drier land became known as the Great Plains.[25]

As with the other elements of the physical environment of the Plains region, the natural vegetation has had to adapt to its semiaridity in order to survive. Within this vast expanse of grassland, two principal plant associations dominate: along its eastern margin is the tall-grass prairie, and along its western edge is the short-grass plains, with a

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[24]Hayes, "The Shelterbelt Zone: A Brief Geographic Description," 13.

[25]J. E. Weaver, North American Prairie (Lincoln, Nebraska: Johnsen Publishing Company, 1954), p. 3.

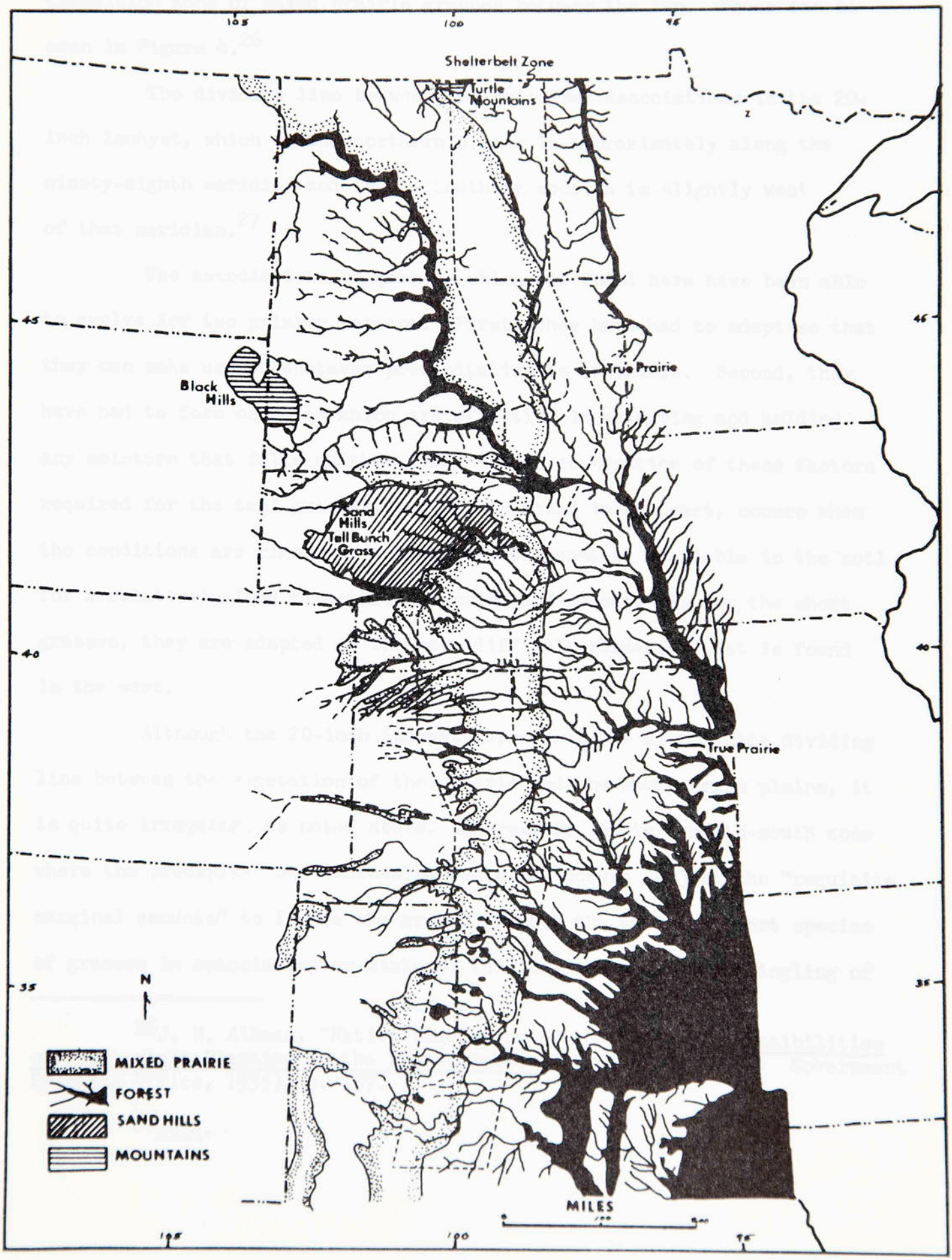


Figure 4. Principal vegetative zones of the prairie-plains region.

transition zone of mixed prairie grasses between the two. These can be seen in Figure 4.[26]

The dividing line between the principal associations is the 20-inch isohyet, which in the northern plains is approximately along the ninety-eighth meridian and in the southern section is slightly west of that meridian.[27]

The associations of grasses which are found here have been able to evolve for two primary reasons. First, they have had to adapt so that they can make use of whatever precipitation is available. Second, they have had to form on soils which are effective in absorbing and holding any moisture that falls on them. The proper combination of these factors required for the tall grasses, such as is found in the east, occurs when the conditions are right for a high moisture content available in the soil for a relatively long time through spring and summer. As for the short grasses, they are adapted to the more difficult situation that is found in the west.

Although the 20-inch isohyet represents the approximate dividing line between the vegetation of the prairie and the short grass plains, it is quite irregular, as noted above. In reality, it is a north-south zone where the precipitation, decreasing westward, occurs in just the "requisite marginal amounts" to insure the growth of both the tall and short species of grasses in association or mixture; this may occur as a "commingling of

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[26] J. M. Aikman, "Native Vegetation of the Region," Possibilities of Shelterbelt Planting in the Plains Region (Washington, D.C.: Government Printing Office, 1935), p. 157.

[27] Ibid.

individuals or of limited tracts or patches, as determined by local variations of soil."[28]

Within the confines of this irregular mixed-prairie zone, the soils vary from "clay or silt through a series of loams to pure sand, either fine or coarse, with the silt or loams predominating;" along its western border, the exclusively short-grass country, there are extensions of the more continuous heavy western soils. Its eastern border becomes a little more regular because soil differences are somewhat equalized as climatic factors become more favorable.[29]

In the final location of the shelterbelt zone, the determination of the boundaries of the mixed prairie zone was an important factor because the shelterbelts had to be placed far enough west to protect those predominantly agricultural areas, and "yet not too far to insure success in growing trees." East of the mixed prairie, there is a higher percentage of farm land, but this zone represents the "westward extent in the central region of land which may be considered predominantly actual or potential farm land...." Also the presence of well-established tall grasses in the grassland cover indicates a more favorable depth of water penetration than the shallow depth found in the short-grass plains along the zone's western margin.[30]

For the most part, trees are absent from the prairie-plains except along the waterways of both the large and small streams. Wherever trees are found in places other than these areas, it is because the early settlers transplanted them on their farmsteads. It was also found at an

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[28] Ibid., 155

[29] Ibid.

[30] Ibid.

early date that trees could be planted in other areas on the prairie-plains if they were grown from seeds and if proper care was administered to insure survival. Maybe it was the work involved which caused many landowners not to plant trees. Possibly, it took all of their energy to produce a living from this fickle land, and they just did not have the time to give proper care to the trees. Whatever the case may have been, early critics of the project were quick to point out that trees could not be grown on the plains, not really investigating the matter as closely as they should have.

Briefly, then, this is a look at the Great Plains' physical environment and some of its peculiar problems which helped to bring on the Dust Bowl conditions of the 1930's. The problem which faced the region during this era was soon to be taken over by the National Government in an attempt to alleviate suffering. Some program was needed to help control the terrible soil blowing taking place in the Great Plains. The President had an idea, and it was left to the Forest Service to come up with a plan of action.[31] Over a vast area of over 500,000 square miles, Forest Service personnel were to pick a strip 100 miles wide and 1,150 miles long for the new tree plantings. Relating the story of the implementation and development of the Shelterbelt Project is one of the purposes of this study.

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[31]Interview with Mr. Paul H. Roberts, former Director of the Prairie States Forestry Project. Prescott, Arizona, September, 1969.

# CHAPTER III

## SOCIAL ENVIRONMENT

### Pattern of Settlement

The Great Plains region has always occupied a special place in the history of the United States, and its settlement is no less unique. For many years after the United States acquired this territory in the Louisiana Purchase, explorers were telling their contemporaries that the area now known as the Great Plains was unfit for those seeking to make a living in agriculture. One such explorer, Major Stephen H. Long, sent back such a report, and on the accompanying map, he designated the Plains area as "The Great American Desert."[1] This label had the effect of retarding settlement for decades to come.

In a sense, the productivity, or potential productivity, of the Plains region was discovered accidentally. The Prairie-Plains, in the minds of most early adventurers, was only an area to be crossed so that they could achieve fame and fortune in the areas beyond the great mountain barrier. The Prairie-Plains were only for the Indians or the brave-hearted loners, the mountain-plainsmen. It was eventually through the activities of these groups, however, that the potential of the region came to light.

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[1]Kraenzel, The Great Plains in Transition, 61; Walter P. Webb, The Great Plains, Grosset's Universal Library (New York: Grosset & Dunlap, 1931), p. 147.

Because of the Indians, troops sent out to protect the westward-bound settlers established forts. The furs and hides which took the mountainsmen into the area created the need for trading posts. These establishments, along with the stage stations, became the first hints of permanent white settlement. So it was that, while many supplies could be transported in, the few residents present began to raise crops in an attempt to become somewhat more self-sufficient. The settlement of the Plains had begun.

However, permanent settlement as it was known in the East was still a long way off for the Plains. The primary difference was, as Kraenzel suggests, that the Plains, being a "frontier beyond a humid area," were settled as the result of "individual initiative."[2] The lone trader or trapper moved further from the humid area, thus extending the frontier westward, later to be followed by one or two pioneering families, and finally a rising tide of settlers.

Another factor which retarded settlement of the Great Plains was the attitude of the early settlers. Besides being from humid areas and not really knowing how to cope with the rigors of this vast semiarid land, they felt that the cleared forest areas were more fertile than those treeless prairie-plains. Webb said of these people, "They were bound for the land where the simple plow, the scythe, the ox, and the horse could be used according to the tradition that had been worked out in two centuries of pioneering in a wooded country."[3] They preferred the familiar and shunned the unfamiliar, in this case the Prairie-Plains.

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[2]Kraenzel, The Great Plains in Transition, 70.

[3]Webb, The Great Plains, 149.

When settlement reached westward beyond the forest, it was first into that zone of transition between the forest and prairie. Trewartha has called it the area of the "oak openings." Here the timber "not only surrounded these local prairies," but there were "excellent trees" which "dotted the openings," thereby giving the area the "appearance of an orchard." Thus there was timber to meet the settlers' needs, and the prairie sod was not as hard to plow as further out on the prairie.[4] Still the open prairie remained unsettled. After 1850, however, settlement began to move out onto the open grassland, but only by way of the region's river valleys. Later settlers spread out between these valleys on the open, grassy areas. It is at this juncture that they began to encounter the problems which would cause them to have to change their farming practices and modes of living. Some of these problems were the lack of timber and water, the heavy prairie sod, and the difficult lines of transportation and communication. Of course, there were others such as low precipitation, winds, blizzards, and grasshoppers, to mention only a few.

However, using a bit of "Yankee ingenuity," the hardy settlers endured the hardships the Prairie-Plains placed upon them. Several inventions helped life become somewhat more tolerable in this region. Among these were barbed wire, the windmill, the sod house, and the steel plow. The railroads also had their part in opening the Prairie-Plains to settlement. However, this story is too familiar to be repeated here.

The first agricultural pursuit in the Great Plains was not the production of crops but rather that of raising cattle and later sheep.

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[4] Trewartha, "Climate and Settlement of the Subhumid Lands," 173.

The exploits of the cattleman and sheep-herder are well-known, as much has already been written about them, so they will not be discussed here except to say that many of the lessons learned by these men in their struggle with the Plains environment helped farmers who would later follow them. First of all, if a living were to be made from this area, the land unit would have to be quite large. Second, the plainsman-farmer or rancher would have to develop a flexibility in agricultural endeavor, thereby allowing him to be able to carry on through the periods of hard times as well as prosperous times. These lessons would not be learned all at once; most came only with experience.

By the 1860's and 1870's, agricultural settlement had been extended into the Prairie-Plains region, only to stop east of the ninety-eighth meridian where rainfall was still fairly abundant and the land was quite productive. It was during this period of gradual occupance that the Government enacted legislation to encourage settlement. Under the Homestead Act of 1862, settlers could acquire holdings of 160 acres "free of all charges" except for a minor filing fee. In order to insure permanent settlement, the law stated that before title to the land was given to the settler he had to reside on the claim for five years.[5] It was the Homestead Act which furnished the prime impetus to what may be called "a mass movement of westward settlement."[6] At the close of the Civil War, many veterans moved into the region to claim land given them as bounties for their military service. The timing and progress of settlement is

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[5]Benjamin H. Hibbard, A History of the Public Land Policies. (New York: Macmillan Company, 1924), p. 385.

[6]M. L. Wilson, "Economic and Social Aspects of Agriculture in the Plains Region," Possibilities of Shelterbelt Planting in the Plains Region (Washington, D.C.: Government Printing Office, 1935), p. 78.

indicated by the dates of the creation of territories, the admission of territories as states, and the organization of counties.[7]

Within the Great Plains region, one plan of settlement has persisted down to the present. When a farmer or a rancher was unable to make a living on his land, either because it was too small or because of drought, the land was absorbed into a larger unit owned by a more prosperous farmer. Such acquisitions added insurance to the latter's own operation.

## Early Tree Planting

Following the Homestead Act, in 1873, the Federal Government embarked on a plan to encourage tree planting in this treeless land. The plan came about through the passage of what has been called "the most conspicuous act" in tree planting history.[8] It was recognized that what little timber there was in the region was being rapidly depleted, and the Timber Culture Act was passed in order to replenish the supply. Its most important provision was that title to a quarter section could be obtained for the planting of trees on forty acres of that quarter. Only one quarter in any section could be obtained in this way.[9] In 1874, the Timber Culture Act was amended to include smaller tracts and required only a "proportionate amount" of trees to be planted, "according to the acreage filed on." It was amended again in 1876 to permit planting in "four separate tracts,"

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[7]Paul H. Roberts, "History of the Shelterbelt Project," (Unpublished manuscript), p. 5.

[8]John H. Hatten, "A Review of Early Tree-Planting Activities in the Plains Region," Possibilities of Shelterbelt Planting in the Plains Region (Washington, D.C.: Government Printing Office, 1935), p. 51.

[9]Hibbard, A History of the Public Land Policies, 414.

and the amendment required replanting if the trees failed to grow or if they were destroyed by grasshoppers.[10]

In 1878, new provisions were added to the Timber Culture Act which called for planting "not less than 2,700 trees per acre." Final ownership certificates would be issued on the showing of "675 living and thrifty trees" on each acre. Most of the timber-entry planting done during this period was carried out under those newest provisions, which were in effect during the settlement boom of the seventies and eighties.[11]

Already between 1862 and 1873, the pioneers moving into the Plains region had planted a considerable number of trees in the form of groves and shelterbelts in an effort to break the force of the wind, and to provide themselves with much needed wood products. In some areas, they planted Osage-orange (Toxylon pomiferum Raf.) hedges to serve as fences. It was not until the passage of the Timber Culture Act (known also as the Timber Claim Act) that tree planting became more widespread. This act, repealed in 1891, was not considered to have been successful. However, it did have the effect of bringing to the public mind the importance and value of trees on the Plains. Because of the new awareness of trees, commercial nurseries in the Great Plains began to obtain proper planting stock for the region.

Following the Homestead Act and the Timber Culture Act, along with their various amendments and revisions, were several other federal acts which, although not dealing specifically with tree planting, were

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[10] Hatton, "A Review of Early Tree-Planting Activities in the Plains Region," 51.

[11] Ibid.

important in showing that the Government realized that this vast area could not be farmed or settled like the more humid regions. Among the more important ones were: the Desert Land Act of 1877, allowing title to 640 acres per settler, with the possibility of irrigating some or all of it later; the Enlarged Homestead Act of 1909 ("Dry Farming Act"), giving 320 acres as a homestead and stipulating that one-fourth of it would be cultivated; the Stock Raising Act of 1916 and the Kincaid Act which recognized the "transitional nature of the Plains between a strictly agricultural status and more extensive forms of use;" and the Taylor Act of 1934 which recognized the difficulty of prescribing homestead acreages as a basis of land use on the more arid plains and pointed out the need for the regulation of such uses in the interests of the western grazing industry.[12] These acts were to be effective in parts or all of the states and territories in the western section of the United States.

While the above acts were being enacted, certain other measures were being carried out to put more trees on the Prairie-Plains. The first of these occurred in 1902 when Theodore Roosevelt established the Nebraska National Forest as "the largest demonstration of sand-hill planting of conifers" in a western state. The following year a similar tree-planting experiment was made in a somewhat similar area in southwestern Kansas, where it was hoped that another national forest could be established, but that effort was abandoned in 1915.[13]

In 1913 Congress, in its appropriations for the Department of Agriculture, granted to the Bureau of Plant Industry permission to

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[12]Wilson, "Economic and Social Aspects of Agriculture in the Plains Region," 78.

[13]Hatton, "A Review of Early Tree-Planting Activities in the Plains Region," 52.

establish the Northern Great Plains Field Station at Mandan, North Dakota. Part of the field station's responsibility was "growing, distributing, and experimenting with trees suitable to that region." Between the years of 1916 and 1934, this station distributed over 6,000,000 trees,[14] which represented more than 2,700 demonstration shelterbelts.[15] When in later years the Forest Service was trying to establish a workable plan for its Shelterbelt Project, it depended quite heavily upon the records of this station for information on species, methods, and conditions for planting.[16] The Bureau of Plant Industry also established field stations at Woodward, Oklahoma, and Cheyenne, Wyoming, for the southern Great Plains and the central Great Plains respectively.

On June 7, 1924, Congress passed the Clark-McNary Act, which provided for cooperation between the federal government and state governments, and the landowners in promoting Plains forestry. It provided for: 1) the protection of forest land from fire, 2) the study of existing tax laws and the devising of new tax laws to promote forest conservation, 3) the procurement and distribution of the forest-tree seed and planting stock, 4) the establishment and renewal of wood lots, shelterbelts, and other forms of forest growth, and 5) the development and improvement of timbered and denuded forest land through acquisition and control by the federal government. Of these provisions, Section 4 was to become quite

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[14] Ibid.

[15] U. S. Forest Service, Prairie States Forestry Project, Forestry for the Great Plains (Typewritten Report, Lincoln, Nebraska, September 15, 1937), p. 5.

[16] Ibid.; Interview with Paul H. Roberts, September, 1969.

important in the region where the Prairie States Forestry Project was to be initiated.[17] Under this section, the farmer could receive nursery stock for the purpose of planting windbreaks or wood lots, usually at a flat rate charge. The responsibility for the planting and caring for the trees was assumed by the farmer.

Along with the federal government, the Plains States had encouraged tree planting, some before the Timber Culture Act was passed and some after its passage. Many state laws were later superseded by the Clarke-McNary program. Some of the more important programs were the establishment in Nebraska of Arbor Day on April 10, 1872, and the proclamation of the Nebraska National Forest on April 16, 1902; the passage of a Tree Bounty law in South Dakota in 1919 and its revision in 1920; and the adoption of a forestry law allowing some adjustments in taxes for tree planting in Kansas in 1887.

The results under these acts were varied. For example, there were numerous cases of fraudulent attempts to claim free land under the Timber Culture Act. On the whole, though, these attempts represented only a small fraction of those applying. In the case of the great majority of the applicants, the settlers wanted trees and were willing to comply with the letter of the law to get them. However, minimal compliance with the laws and desire were often not enough; the actual growing of the trees presented many difficulties. Many times the trees selected for planting were chosen more by reason of the individual's personal preference than for the hardiness of the species. The stock was often purchased from

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[17] Hatton, "A Review of Early Tree-Planting Activities in the Plains Region," 52; U. S. Forest Service, Prairie States Forestry Project, Handbook of the Division of Timber Management for the Prairie States Forestry Project (Mimeographed, Lincoln, Nebraska, 1939), p. 2.

commercial nurseries outside the Plains, and many species were not adaptable to the region's environment. Likewise, the planting sites were not always compatible with the growth of trees. As things worked out, the experience of growing trees had to come from the farmer himself, and much time was lost in the process of gaining this experience.

In the fall of 1934 the Forest Service embarked on what has been called the most talked-about program of the New Deal era--the Shelterbelt Project. Some felt that the reputation of the Forest Service was being placed on the line, but there was a growing optimism among a small group of government foresters, who were to become the Plains foresters, that trees could be made to grow in the Great Plains. The basis of their optimism was that some trees had been grown there successfully, and with proper selection of species and proper care, it was felt, they could be grown in large numbers. So as the fall of 1934 became winter, they began to gather information to prove their point. Considerable supporting information was to come from the Bureau of Plant Industry's Field Station at Mandan, North Dakota, which had carried out much experimentation in the area of shelterbelt planting. In addition, the results of the various Plains States' own experiment stations were used. At the same time, seeds were being collected within the region so that by spring the actual planting could begin. The result of the first season's work was published in a report, early in 1935, called Possibilities of Shelterbelt Planting in the Plains Region. The scope of the report is found on its title page:

> A study of tree planting for protective and ameliorative purposes as recently begun in the Shelterbelt Zone of North and South Dakota, Nebraska, Kansas, Oklahoma, and Texas by the Forest Service; together with information as to climate, soils, and other conditions affecting land use and tree growth in the Region.

Armed with this technical knowledge and the past experience of growing trees in the Plains, the Forest Service was ready to begin planting in the spring of 1935. However, before getting into the actual workings of the project, there are additional matters of immediate concern.

## Willingness of the Farmers to Cooperate

First, the attitude of the farmers and their willingness to cooperate with the program had to be accurately assessed. Although many of the earlier settlers had attempted tree plantings, about as many failed as succeeded. The failures caused many of them to give up the idea and become accustomed to a treeless environment. Marginal environmental conditions and defeatist attitudes at the beginning of the Shelterbelt Project, along with the accompanying criticism of some of the foresters, the general lack of endorsement from the agricultural colleges, and the widespread unfavorable publicity of the newspapers and magazines, provided the intellectual milieu within which the farmers had to make their decision to support or fight the project. Many farmers believed that the amount of land to be taken up by the belts and the efforts to be expended in establishing and maintaining them did not justify the benefits, and, as a result, they would not and did not cooperate. Others took the belts "merely because they liked trees rather than because they felt the belts would be of economic importance to them."[18] Nevertheless, there were farmers who were willing to try the program because they were tired of seeing their crops being blown out before they were well established. Whatever the reasons, there were many who were willing to cooperate

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[18] E. L. Perry, "History of the Prairie States Forestry Project," (Typewritten report for the U. S. Forest Service, Lincoln, Nebraska, 1942), p. 9.

with the program, and at the end of the first planting season there were over 129 miles of shelterbelts planted on 263 farms.[19] This may have been a small start, but it represented the beginning, and support from the farmers would come.

## Land Use Near the Shelterbelts

Another matter of importance to the success of the program was that of existing land use practices. At the time that the Forest Service proposed to put the Shelterbelt Project into effect, there were large areas which had been abused either through the cropping of short grassland which should have remained in sod, or by over-grazing. In such places as these, shelterbelts were intended to help control the blowing soil and to return the land to some useful purpose. If in certain areas land was too far gone for cropping, it was considered a good policy to return it to pasture and let it recuperate under the cover of grass.

As far as the shelterbelts affecting the land use of a particular area--either past or present--by their presence, this was not to be the case. The various sections of the Great Plains were pretty much set in their agricultural use before the belts were planted. The belts did help the farmer, especially, because he could plant his crop without fear of its blowing out of the ground before it had time to germinate. They did allow for some diversification, such as orchards and kitchen gardens, which had been difficult to establish prior to the planting of the belts. The fuller discussion of the benefits of shelterbelts, however, will be reserved for the next chapter. At this particular point in the history

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[19] U. S. Forest Service, Prairie States Forestry Project, 1942 Annual Planting Accomplishment Report, (Mimeographed Report, Lincoln, Nebraska, June, 1942), p. 2.

of the Plains, with the drought and the depression, a farmer might have to turn a plot of ground for one or two crops in hopes of surviving until times got better. Such a farmer might not be able to practice conservation farming, even if he wanted to. Wilson said it was for this reason that "controlled land use was unavoidable."[20] It was during the era of the 1930's that the Government attempted programs which would control speculative farming within the region. One such program was that of the Agricultural Adjustment Administration, which paid allotments to farmers for keeping 15 per cent of their total average acreage out of production.[21] Thus shelterbelts were meant to help hold the soil blowing and make the land more useful for the crops already there and not necessarily to introduce new uses for the land.

An attempt has been made in Chapters II and III to show the need for some sort of conservation program for the Great Plains, given the physical and social environment prevailing there in the mid-1930's. One of the programs chosen for this particular time was the Shelterbelt Project with its immediate and long term plans for relief.

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[20]Wilson, "Economics and Social Aspects of Agriculture in the Plains Region," 82.

[21]Lawrence Svobida, An Empire of Dust (Caldwell, Idaho: The Caxton Printers, Ltd., 1940), p. 45; John D. Hicks, George E. Mowry, Robert E. Burke, The American Nation (Boston: Houghton Mifflin Company, 1963), pp. 578-79.

## CHAPTER IV

## THE HISTORY OF THE SHELTERBELT PROJECT

### The Scope and Philosophy Behind the Project

Late in 1932, while campaigning for the Presidency, Roosevelt's train had been halted by a wreck near Butte, Montana. All along this stretch of the journey the train had been buffeted by winds. Now because of the heat and lack of air conditioning as he disembarked and observed the barren countryside, the candidate remarked that he would plant areas such as these in trees if elected. There were those in his entourage who felt it was a joke or possibly another campaign promise to be forgotten once in office.[1] Thus the idea was born which would eventually develop into the Shelterbelt Project.

To Roosevelt, however, it was neither a joke nor a to-be-forgotten promise. While serving as Governor of New York, he had urged afforestation as a soil erosion measure and saw no reason why trees could not perform the same function in the open Plains area.[2] Once in office, he contacted the Forest Service as to the possibility of establishing a tree planting scheme for the region. Through a series of conferences between FDR and the Forest Service, and in various memoranda, the idea was tossed about

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[1] Roberts, "History of the Shelterbelt Project," 1.

[2] "Roosevelt and the Great Plains Shelterbelt" (Draft for an Article), p. 2. From Files of Prairie States Forestry Project, Lincoln, Nebraska, n.d.

to find out exactly what the President had in mind. It seems that some other types of planting, such as block planting, were discussed at first before the forest strips were finally decided upon.[3] Once the shelterbelt idea became prominent, the President asked for an estimate of the cost of such a program; evidently the estimate was more than he wanted to spend. This, plus the pressures of other matters, temporarily postponed the tree planting program.[4]

During the interim, however, the Forest Service continued to investigate tree planting possibilities in the Plains and to gather information on windbreak plantings in this country and foreign countries.[5] This preliminary work was to lay the groundwork for the research to be carried out during the fall and winter of 1934. As work continued, though, the conditions in the Great Plains became steadily worse, and relief was needed immediately. Various programs were being devised by the government for this relief and among those, the scheme for tree planting was being reconsidered.

On July 11, 1934, the President signed the Executive Order which authorized the release of funds from the U. S. Treasury to the Secretary of Agriculture to implement a project for the planting of protective forest strips in the Great Plains region.[6] News of this authorization was not

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[3]Roberts, "History of the Shelterbelt Project," 16; Edgar B. Nixon, ed., Franklin D. Roosevelt and Conservation, 1911-45, I, (New York: General Services Administration, National Archives and Records Service, Franklin D. Roosevelt Library, 1957), p. 199.

[4]"Roosevelt and the Great Plains Shelterbelt," 2; Nixon, Franklin D. Roosevelt and Conservation, 1911-45, I, 199-200, 205-206.

[5]Interview with Paul H. Roberts, September, 1969.

[6]Perry, "History of the Prairie States Forestry Project, 12; See Appendix I for text of Executive Order.

released until July 21, 1934, at which time a great stir resulted, not only in the public ranks, but among the professional foresters as well. The stated objectives of the newly proposed Shelterbelt Project were to stabilize the Great Plains by means of planting a series of windbreaks to break the force of the wind, thereby reducing evaporation and conserving moisture, and to provide employment for the Plains people.[7] It was felt that through this program it would be possible not only to stabilize the physical environment but assure the region's social and economic welfare as well. Although these were the Project's main objectives, it had other purposes which were also important. Some of these were to prevent crop losses through "burning" or seeds being blown out of the ground prior to germination, to provide a haven for wildlife, to provide the region with trees for utility purposes as well as for their aesthetic values, to prevent soil erosion, and to trap snow to keep it off the roads and add it to the overall moisture supply.

The idea of planting continuous windbreaks, 100 feet wide, through Texas, Oklahoma, Kansas, and Nebraska originated with the President. As proposed by Roosevelt, these belts would be located approximately five miles apart and would consist of six parallel belts. The suggestion had been carefully considered by the Forest Service, and a plan gradually evolved which called for extensive planting of windbreaks not only for the permanent benefit and protection of the Great Plains, but also for its

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[7]Jerome Dahl, "Progress and Development of the Prairie States Forestry Project," Journal of Forestry, XXXVIII (April, 1940), 306; U. S. Forest Service, Handbook of the Division of Timber Management For the Prairie States Forestry Project, Lincoln, Nebraska, 4; Jim Roe, "The Wind Meets Its Master," Successful Farming, August, 1946, p. 49; Raphael Zon, "Shelterbelts--Futile Dream or Workable Plan," Science, LXXXI (April 26, 1935), p. 392; Perry, "History of the Prairie States Forestry Project, 14-15.

immediate drought relief.[8]

The salient points of this tentative plan were: 1) a belt 100 miles wide extending from Canada to Mexico would be planted in windbreaks; 2) the windbreaks would run north and south along the quarter-line fence of a section, each break 7 rods wide, making 14 acres per section; 3) within the 100-mile belt, there would be about 100 parallel windbreaks a mile apart; 4) in all, some 1,820,000 acres of windbreaks would be planted in the six Great Plains states; 5) the land was to be purchased or leased for 99 years, with the purchase price employed as drought relief; 6) the costs would be: for land--purchase or lease, $9,100,000 and for preparing ground, planting, fencing, $61,880,000, with a total of $70,980,000 or $39.00 per acre; 7) over 90 percent of this cost would go to the farmer for purchase of land and for the labor expended in the establishment and care of the plantation. The remaining 10 per cent would go for technical supervision. It was estimated that about 25 per cent of the entire expenditure would be made in the course of the next 12 to 18 months, with the whole area being planted in the next 10 years or about 180,000 acres per year.[9] As can be seen from this plan, the area originally suggested by the President was expanded to include the two northern Great Plains states. According to Roberts, the author of this plan was optimistic because the zone of planting was still tentative, and the plan itself had little resemblance to the final program developed during the latter part of 1934. However, its importance lay in that it

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[8]Perry, "History of the Prairie States Forestry Project," 10-11; Nixon, Franklin D. Roosevelt and Conservation, 1911-45, I, 198-99; Roberts, "History of the Shelterbelt Project," 23.

[9]Perry, "History of the Prairie States Forestry Project," 11.

provided as a basis for the Executive Order issued on July 11, 1934.[10] The program to be proposed was indeed envisioned for the immediate relief of the drought-stricken Great Plains and for its long range relief as well. This can be seen in the fact that the Forest Service had already started preparations for the planting to start in the spring of 1935 and from its estimate of the total cost of the project---$75,000,000 to be spent over a ten-year period.[11]

## The Initiation and Development of the Project

As soon as the announcement was released, the lines were drawn, and both professional people and private citizens began to choose sides in their relation to the project. The wording of the press release had been carefully worked out, yet there were those who picked out key words or phrases upon which they could base their criticism of the undertaking.[12]

Roberts said that the program stirred up so much debate partly because of its boldness to plant so many trees under such adverse conditions[13] and in a region where trees were alleged not to be able to grow. Perry said, in regards to this initial criticism, that much of it was based on misconception of one or more features of the program, not necessarily the type of publicity released by the Forest Service.[14] However, he felt that since it was advanced as a "project" rather than

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[10]Roberts, "History of the Shelterbelt Project," 25.

[11]Perry, "History of the Prairie States Forestry Project," 15; Wilmon H. Droze, "The New Deal's Shelterbelt Project, 1934-42," in Essays on the New Deal, ed. by Harold M. Hollingsworth and William F. Holmes (Austin, Texas: The University of Texas Press, 1969), p. 23.

[12]See Appendix II for text of press release.

[13]Roberts, "History of the Shelterbelt Project," 2.

[14]Perry, "History of the Prairie States Forestry Project," 21.

as a "program," it had greater significance because what the public saw was a proposal to spend $75,000,000 at a time when the nation's economy was already on rock bottom, rather than a conservation program designed to rehabilitate the Great Plains.[15] Whatever the reasons, the tree planting scheme was subjected to much early criticism.

It seems obvious now that the Forest Service was never fully committed to a series of rigidly regimented belts running north and south, as outlined in the early plan, but rather were more interested in fitting a feasible plan to the President's suggestion.[16] Chief Forester Silcox stated that one big Shelterbelt was neither planned nor started. That idea was "the fantasy of over-active imaginations." The problem facing the Forest Service was not as simple as "planting a solid wall of trees."[17] Even earlier than this statement was a memorandum for the Forester, dated October, 1933, which stated the position of the Forest Service in regard to strip planting:

> (1) The Forest Service should make a sincere attempt to follow the President's wishes, looking upon the proposed strip planting as a relief measure to a region where there are available only limited forms of other Federal aid, and as a large experiment.
>
> (2) That the program be so handled that planting can be done by any feasible method using any available method such as woodlots in some places, windbreaks in others, shelterbelts about farmsteads where that only is possible, but attempting insofar as possible to follow the broad idea of strip planting.[18]

Another memorandum dated September 4, 1934, further stated that

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[15] Ibid., 9.

[16] Ibid., 21; Dahl, "Progress and Development of the Prairie States Forestry Project, 301.

[17] F. A. Silcox, "What's Happened to the Shelterbelt?" (Radio address delivered over National Broadcasting Company network, October 12, 1938), pp. 1-2.

[18] Perry, "History of the Prairie States Forestry Project," 21.

the purpose of planting shelterbelts along arbitrary straight lines was merely an idealized scheme simply to illustrate the idea of continuous and evenly spaced windbreaks. Administratively, its main value was to avoid as much as possible the complications of property division and segregations. It was realized that to have the greatest physical effectiveness, the scheme would be modified and in some locales, the belts' placements would be governed largely by topography.[19] In fact, there was never any attempt to plant any long north-south belts.

Also the Forest Service's main concern was with the individual farm unit and the system of windbreaks developed was based on obtaining the maximum benefits for these units,[20] but only in its relation to the over-all plan for the whole community. The planners were not interested in a string of isolated farmsteads surrounded by windbreaks, but rather in a more economical and more effective plan to control wind erosion and to secure crop protection.[21] Thus, they developed the concentration area, of which more will be said later. The Forest Service knew that commercial forestry had little place in the Great Plains because the land is too valuable for agricultural purposes and growing timber would be too costly. However, farm forestry is of prime importance as a conservation and an agricultural improvement measure, and is a factor in making the Plains a more livable region.[22] It was never the intent of the Forest Service or

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[19] Ibid.

[20] Dahl, "Progress and Development of the Prairie States Forestry Project," 301.

[21] "Shelterbelts," Handbook of the Division of Timber Management for the Prairie States Forestry Project, 13.

[22] Dahl, "Progress and Development of the Prairie States Forestry Project," 302.

the project to withdraw any considerable portion of the Plains area from agriculture or to transform it into a forest region. The sole purpose was to plant shelterbelts in such a manner that "they will contribute to the increased productivity of the land so protected."[23]

The debate continued until the populace had a better understanding of the policies and aims of the project.[24] This understanding came about by the leading proponents of the project going out to the people to explain, mostly in the form of speeches, exactly what the program hoped to accomplish. Others used the written word to accomplish the same thing. One of the best articles on the Shelterbelt appeared in the December, 1934, issue of the Journal of Forestry.[25] Carlos Bates, of the Lake States Forest Experiment Station, answered the professional foresters' criticism found in the November issue of the same journal, by describing completely the plan of action to be followed. The details of their criticism can be found in the following references and will not be discussed within this study.[26]

After the President had given an indication of what he wanted and where he wanted the program, in the Forest Service, in a memorandum

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[23]U. S. Forest Service, "Forestry for the Great Plains," 3.

[24]Interview with Paul H. Roberts, September, 1969.

[25]Carlos G. Bates, "The Plains Shelterbelt Project," Journal of Forestry, XXXII (December, 1934), 978-91.

[26]See: H. H. Chapman, "The Shelterbelt Tree Planting Project," Journal of Forestry, XXXII (November, 1934), 801-03; H. H. Chapman, "Digest of Opinions Received on the Shelterbelt Project," Journal of Forestry, XXXII (November, 1934), 952-72; William L. Hall, "The Grand Shelterbelt Project," Journal of Forestry, XXXII (November, 1934), 973-74; and Elisworth Huntington, "Marginal Land and the Shelterbelt," Journal of Forestry, XXXII (November, 1934), 804-12.

prepared for Roosevelt (in 1933) by E. N. Munns,[27] indicated the program needed to carry out an effective windbreak plan. This early concept is quite similar to the actual program developed for the Shelterbelt Project. Munns stated that to be most effective in protecting crops, the strips should be at least 100 feet wide, with 10 to 20 rows of trees. This width and spacing would permit the development of forest conditions under the belts. By use of slow growing, shrubby trees on the outside and of taller, more rapidly growing trees in the center, the foliage could develop to maximum density and the greatest possible height could be attained.

He goes on to say that for the purposes outlined, the strips should be not more than a mile apart in either direction and for maximum benefits, they should be about half a mile apart. Since the local roads in this area ordinarily follow section lines and are usually a mile apart, it appeared that widening their rights-of-way across a "broad belt of country would make possible the development of a well-spaced system of forest strips that would furnish protection benefits to a large section." If the right-of-way could be doubled, these strips could be developed as part of a highway plan.

According to the Munns plan, trees planted in 100-foot strips along the section lines, either north and south or east and west, in a belt 75 miles wide across the plains would approximate in total area a 3-mile wide solid forest block. Such a plan for planting and caring for the strips would cost more than the solid block, but there would be certain advantages, such as easier replacement of trees and ready fire-protection

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[27] Roberts, "History of the Shelterbelt Project," 16; Perry, "History of the Prairie States Forestry Project," 9a.

by road-maintenance crews. Any necessary additional work could be handled by local personnel. Also other operations, i.e., nursery, planting, and management, could be handled in the local area.

Besides all of the above purposes, the belts were foreseen to have certain aesthetic values, such as providing shade for any highway traveler and could be so planned as to constitute forest parks in an area where their occurrence is rare. The trees would increase the bird and small game population. There were also expected certain climatic effects in and around the strips' immediate vicinity.

Munns further stated that "a forest planting such as originally proposed would take a large area of farm land out of cultivation." It was estimated that the 3-mile wide and 1,500 miles long forest block would require nearly three million acres. The cost of such a plan would be high, but the farm land lost could be tied into the general plan to reduce crop acreage. On marginal lands, a program of forest strips might help diversify farming somewhat, because with protection and more available moisture, a greater variety of crops could be grown. Shelterbelts might make some crop production possible on poorer lands so exposed to the desiccating winds that crop losses were greater than yields.[28]

Once the Forest Service had a plan, tentative though it was for the time being, the next step was the selection of those to direct the project. The Chief Forester and some of his aides had worked with the President in developing and seeking a feasible program, but in order for it to be successful, it had to have the best leadership available. This factor, according to Roberts, was one of the great strengths of the project.

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[28] Dixon, Franklin D. Roosevelt and Conservation, 1911-45, I, 202-03; Roberts, "History of the Shelterbelt Project," 17-18.

In this case, the best leadership meant experience as well. Those placed in charge of the project were all drawn from the Plains States--men who knew the conditions as they existed on the Plains.[29] The project represented to these foresters a unique challenge, and from it grew a great amount of enthusiasm for the whole program. There developed among them an "espirit de corps", which was carried throughout the life of the Shelterbelts.[30] The Regional Administrative office was established at Lincoln, Nebraska, and the Technical headquarters was set up at St. Paul, Minnesota. Each of the six Plains states involved had a State Director with his office located within or near the planting zone.

On September 29, 1934, a directive from the Chief of the Forest Service outlined his feelings regarding the conduct of the Shelterbelt Project. The letter stated, in part, that the one million dollars made available enabled the Forest Service to proceed rapidly with its project. It further said,

> The job is a new one and the Forest Service is entering a region where it is largely unknown and an informed, intelligent support for the Project is needed before it can be continued permanently. I want all members of the organization to approach this work enthusiastically, but with a thoroughly sane recognition that the Project represents a progressive experiment by man to ameliorate adverse natural conditions, the full results of which cannot now be definitely stated or ascertained.

The directive also set up some of the general objectives of the administrative phases of the project and made a tentative allocation of the one million dollars available to it.[31]

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[29]Interview with Paul H. Roberts, September, 1969; Dahl, "Progress and Development of Prairie States Forestry Project," 301.

[30]Interview with Paul H. Roberts, September, 1969; Interview with Sid Burton, September, 1969.

[31]Roberts, "History of the Shelterbelt Project," 19.

Carlos Bates in his November, 1934 article describing the project said:

> It is not an undertaking in which slip-shod methods will succeed: it represents a challenge to the technical skill of the profession and will require that our coming foresters develop the technical skill and a love for the soil which has not been much in evidence in the past.

He went on to say that there was not a single job in the undertaking of any importance which would not require a fairly comprehensive knowledge of the entire physical problem and the steps necessary to meet the problem.[32] This understanding of the peculiar problem of the Great Plains region made it absolutely necessary that the project recruit its leaders from within that area. The misunderstanding of the same problem was the basis of much of the professional criticism among non-Plains foresters in regard to the Shelterbelt. As seen by the work accomplished during late 1934, the Forest Service did not mean to employ "slip-shod" methods with its Shelterbelt Project.

Once the organizational work was completed, the active work was begun. The remainder of the fall and winter of 1934 was spent in continuing the investigations started earlier. The exploratory and investigative task was assigned to the Lake States Forest Experiment Station. Together with the Bureau of Chemistry and Soils and the Bureau of Plant Industry, this Station conducted soil surveys, studied weather records, examined many earlier windbreaks to learn more of the factors which spelled success or failure for them, initiated studies on the effect of the wind barriers on wind velocity, and continued crop-influence studies.[33] At the same time,

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[32]Carlos G. Bates, "The Plains Shelterbelt Project," p. 978.

[33]"Field Office for the Shelterbelt Project," Science, LXXX (August 24, 1934), 180; Dahl, "Progress and Development of the Prairie States Forestry Project," 302.

the Project's administrative personnel began investigative and administrative studies. From these studies, information was obtained that would furnish the additional technical and basic information to be used for guidelines on which the project would build its policies and standards.[34]

The results of all their work was published in the reports, mentioned earlier, Possibilities of Shelterbelt Planting in the Plains Region. However, the research did not stop here. As the program progressed and more and more information became available, the workers compiled a guide for shelterbelt planting--the Handbook of the Division of Timber Management. This handbook was in a constant state of revision from the time it was first processed. Roberts said of all the New Deal relief programs, the Shelterbelt was the most researched, as evidenced by these two publications. This research, combined with the leadership and the spirit in which the whole Project was carried out, contributed to its ultimate success.[35] The fact that so much research was conducted on this program separated it from other relief schemes which were put into action strictly as make-work projects.

Besides carrying on its administrative studies, the administrative division was also doing its part to prepare for the 1935 spring planting season. Some of its more important work involved collecting its own seed, usually within a 100 miles or so radius of the proposed planting sites; negotiating for land for the belts; working out agreements with commercial nurseries for planting stock; and, in general, trying to sell the program to the people within the region whom it was designed to help.

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[34]Dahl, "Progress and Development of the Prairie States Forestry Project," 302.

[35]Interview with Paul H. Roberts, September, 1969.

During the first planting season, many of these tasks as well as others were to become problems to the project directors. Among the leading problems were the trouble over finances, the controversy over whether to plant the belts on privately-owned or government-owned lands, the farmers' cooperation, the physical problem--drought, the actual planting zone, and the trouble encountered with the region's commercial nurseries. An analysis in depth of these problems and the others encountered by the project is beyond the scope of this study, so they will just be mentioned briefly.

The first major crisis which faced the project was securing the necessary financial funds for its operation. The President had authorized the Secretary of the Treasury to release $15,000,000 from the Emergency Relief Act to the Secretary of Agriculture for the program. However, the Comptroller General, John R. McCarl, refused to release the funds because he said that such funds were to be used for immediate relief and not for a "project that at best can afford relief from drought conditions only years hence."[36] His objections also stemmed from the proposed purchase of lands which according to McCarl, called only for the possibility of leasing, not purchasing the lands for the project.[37] However, a compromise was reached, and the Comptroller General finally authorized the release of $1,000,000 to the Forest Service for its tree planting program for the

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[36]Perry, "History of the Prairie States Forestry Project," 13; Roberts, "History of the Shelterbelt Project, 5; Droze, "The New Deal's Shelterbelt Project, 1934-42," 29; Nixon, Franklin D. Roosevelt and Conservation, 1911-45, I, 324-29.

[37]"Roosevelt and the Great Plains Shelterbelt," p. 3; Roberts, "History of the Shelterbelt Project," 17.

1935 Fiscal Year.[38] The money was to be used for immediate relief in employing Great Plains farmers to do the spring planting and for the initial investigations for future planting.[39] According to Perry, this amount was all that the Forest Service could use advantageously during the 1935 planting season.[40]

This first year's financial difficulty was to continue throughout the life of the project. While there were some Congressmen who favored the project and its aims, it could never muster enough Congressional support to obtain the regular appropriations needed to carry out its objectives. Even after the Forest Service had completed its investigations and had the technical proof that trees could be grown in the Great Plains, the promoters were still unable to gain the Congressional support they needed. However, the President was not to be deterred, and in the project's second year, he again used funds from emergency relief appropriations, this time from the newly-created Works Progress Administration. From that time until the Project's termination in 1942, it was funded from the WPA appropriations. Congress made only one direct outlay of funds for the project--that in 1937 for $170,000 to be used for its liquidation.[41] This money was never used by the Forest Service.

The relationship between the Forest Service and the WPA remained good throughout the Shelterbelt's existence mainly because they both found

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[38]Droze, "The New Deal's Shelterbelt Project, 1934-42," p. 29; Perry, "History of the Prairie States Forestry Project," 13.

[39]"Roosevelt and the Great Plains Shelterbelt," 3; Perry, "History of the Prairie States Forestry Project," 13.

[40]Droze, "The New Deal's Shelterbelt Project, 1934-42," 39.

[41]Ibid.

a need in each other. The project received the much-needed funds for its program, and the WPA had a work outlet for many unemployed. There were some minor irritations, though these mainly resulted from the WPA regulations which maintained that there had to be a 90 to 10 ratio in the expenditure of funds and in the hiring of laborers and supervisors. The majority was spent for labor and the remainder for the project's overhead costs. For the project leaders, this restriction meant that they had to make use of their present equipment or improvise if they needed some new equipment. Once the project caught on, many of the communities in the planting zone donated such things as trucks, office space, warehouses, and other things which the planters needed.[42]

It should be stated at this point that although the Shelterbelt Project was associated with the WPA and possibly suffered some rejection by the public because of this association, it was not just a work scheme devised by the government or WPA administrators.[43] The Forest Service, as has been noted, had a definite program in mind long before its association with the WPA. The two complemented each other mainly because of their common needs--the one, money and the other, work.

Another of the project's early problems, evident even in the planning stage, was whether to plant the belts on privately-owned or on government-owned lands. As seen above, there was strong opposition to the

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[42]Interview with Paul H. Roberts, September, 1969; Interview with Sid Burton, September, 1969; John D. Guthrie, "Trees, People, and Foresters," Journal of Forestry, XL (June, 1942), 478.

[43]Interview with Paul H. Roberts, September, 1969; Guthrie, "Trees, People, and Foresters," 478; Arthur H. Carhart, "Shelterbelts: A 'Failure' That Didn't Happen," Harper's Magazine, October, 1960, p. 76.

purchasing of lands. Many of the foresters, though, were in favor of such a proposal; they could, it was felt, better control the belts and insure the forest conditions they desired and also test the feasibility of the plan, thereby guaranteeing, at least, reasonable success of the plantations.[44] Various methods, besides purchasing, were proposed to acquire the needed lands, such as lease with option to buy, donation, and cooperative agreements. However, just as the purchasing of lands was impractical and costly, so were many of the other proposals. Since the funds available were to be used mainly for labor, there was little left for the necessary surveying needed to carry out the other methods.[45] Finally it was decided that the lands should be donated if they were to be planted in shelterbelts. This had long been Roosevelt's thinking on this subject since the planning days of the project.[46] The donation of lands came in the form of cooperative agreements between the farmers and the government, with the farmer retaining complete ownership of the land.

As the preliminary work was proceeding in preparation for the 1935 planting season, the project personnel encountered perhaps their biggest obstacle for that year--the farmer. From its studies, the Forest Service was convinced that trees, with proper species selection, could be grown in the region and that it had a feasible plan for carrying out the tree planting scheme. As was pointed out in an earlier chapter, the farmer still remained somewhat skeptical, in part because the program was new.

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[44]Interview with Paul H. Roberts, September, 1969; Dahl, "Progress and Development of the Prairie States Forestry Project," 301.

[45]Interview with Paul H. Roberts, September, 1969.

[46]Nixon, Franklin D. Roosevelt and Conservation, 1911-45, I, 205; Perry, "History of the Prairie States Forestry Project, 35.

It took some hard convincing to get enough farmers to cooperate that first year, even though there was only a small amount of planting stock available.

There were also physical difficulties involved. First of all the planting was not accomplished under the most ideal conditions the project leaders had hoped for.[47] The drought of 1934 had been quite severe, and available soil moisture was deficient in all of the states except North Dakota. The species planted had been picked because of their hardiness in withstanding extreme dry conditions, but because of the severity of the moisture deficiency, the trees in many states were watered for the first and last time.[48] Dust storms plagued the planters and, on those days, most planting operations ceased until the storms passed. The sites where the planting took place, while not classified as unfavorable to tree growth, were considered, in later appraisals, as more difficult than the project personnel considered desirable.[49]

Secondly, if the Shelterbelt were to accomplish its aims, it had to be placed properly. This element had been considered in the preliminary planning and was now imperative. The location and limits of the tree planting had to be established. The varying climatic and soil conditions greatly influenced tree growth in this region, and if the belts were placed too far to the east they would not be practical; too far to the west and the trees would not survive. Therefore, the planting zone's location was based on one critical test--the possibility of growing trees.

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[47]Interview with Paul H. Roberts, September, 1969.

[48]Perry, "History of the Prairie States Forestry Project," 41.

[49]Ibid., 40.

Hayes said:

> The adaptation of the project to a practicable geographic framework was therefore a matter of primary and urgent importance, involving intensive studies or special surveys of certain conditions--soil, climate, topography, ground water, vegetative growth, and others--throughout the general area in which shelterbelt planting was and is desirable; all to the end that the zone delimited for operations should present a satisfactory working balance between needs and possibilities, such as would insure optimum results for the undertaking as a whole.[50]

The zone initially selected extended from the Canadian border of North Dakota to a line just north of Abilene, Texas. (Figure 5.[51]) Its width was 100 miles and its length was approximately 1,150 miles. Within the proposed zone was 114,700 square miles of land; of which 57 per cent was favorable to trees, 39 per cent would be difficult to plant, and only 4 per cent was unfit.[52] This zone was to be the cause of a great deal of trouble and was to be abandoned later. From a practical and administrative standpoint, the idea was quite sound; however, two objections made its creation a mistake. It excluded a lot of land which needed and was adaptable to tree growth, and it had a bad public relations effect. Most of the planting which was carried on was done so within the original limits, but following its abandonment in 1937 the Forest Service was able to take advantage of utilizing locations "outside its boundaries which were adapted to the purpose, and also placed selection of specific planting sites on the basis of physical conditions rather than the accident of geographical location."[53]

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[50]F. A. Hayes, "The Shelterbelt Zone: A Brief Geographic Description," 11.

[51]Zon, "What the Study Discloses," 6.

[52]Zon, "Shelterbelts--Futile Dream or Workable Plan," 392.

[53]Perry, "History of the Prairie States Forestry Project," 35.

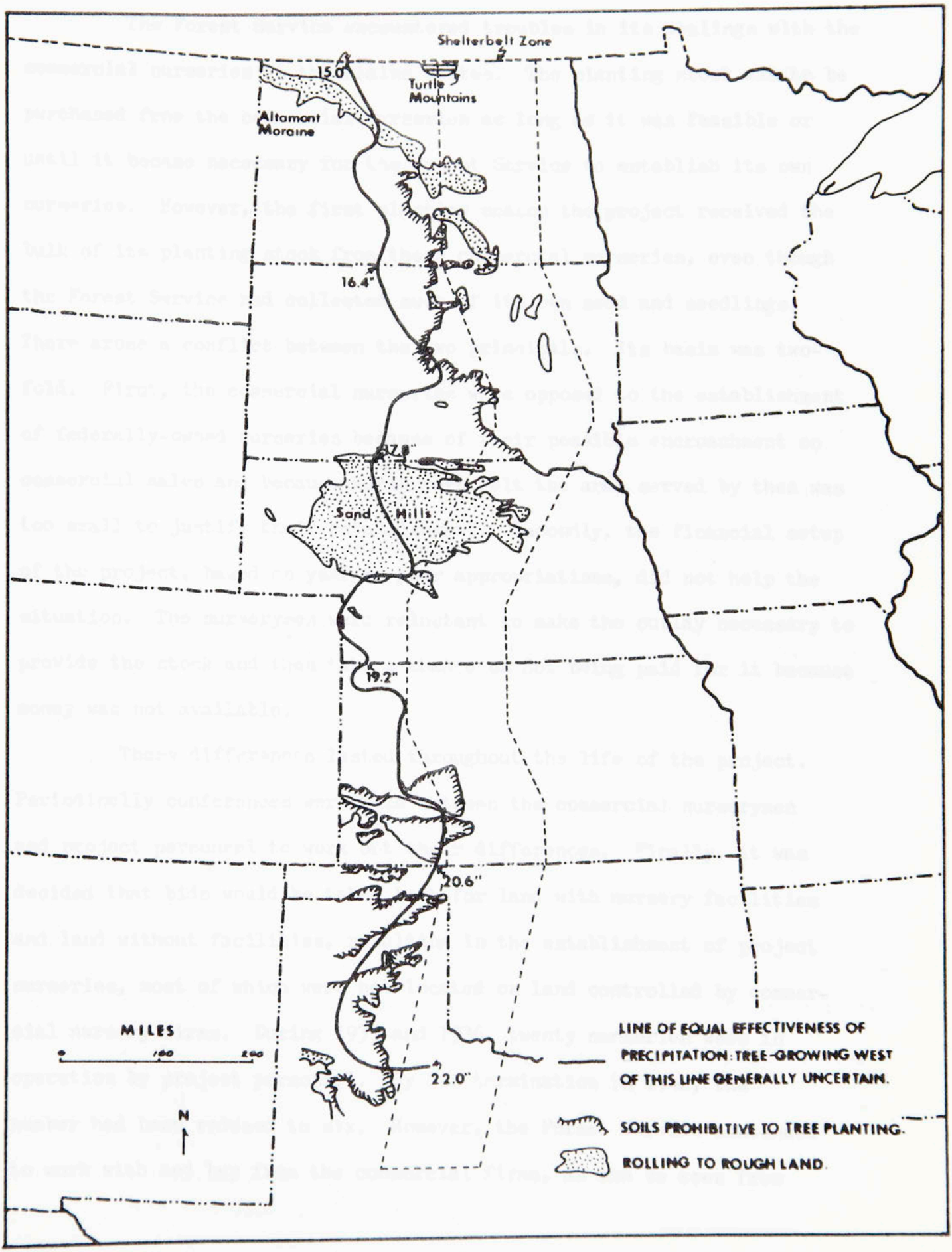


Figure 5. Location of the shelterbelt zone, with factors limiting its westward extension.

The Forest Service encountered troubles in its dealings with the commercial nurseries in the Plains states. The planting stock was to be purchased from the commercial nurseries as long as it was feasible or until it became necessary for the Forest Service to establish its own nurseries. However, the first planting season the project received the bulk of its planting stock from these commercial nurseries, even though the Forest Service had collected much of its own seed and seedlings. There arose a conflict between the two principals. Its basis was two-fold. First, the commercial nurseries were opposed to the establishment of federally-owned nurseries because of their possible encroachment on commercial sales and because nurserymen felt the area served by them was too small to justify their establishment. Secondly, the financial setup of the project, based on year-to-year appropriations, did not help the situation. The nurserymen were reluctant to make the outlay necessary to provide the stock and then take a chance on not being paid for it because money was not available.

These differences lasted throughout the life of the project. Periodically conferences were held between the commercial nurserymen and project personnel to work out their differences. Finally, it was decided that bids would be taken both for land with nursery facilities and land without facilities, resulting in the establishment of project nurseries, most of which were not located on land controlled by commercial nursery firms. During 1935 and 1936, twenty nurseries were in operation by project personnel. By its termination in 1942, the number had been reduced to six. However, the Forest Service continued to work with and buy from the commercial firms, as can be seen from

Table I,[54] but the number of trees bought and the money thereby put into the region's economy was not as much as it might have been when compared to the project's total cost and total number of trees planted.

TABLE I

STOCK PURCHASED FROM COMMERCIAL NURSERIES

1935 to 1942, Inclusive

| Year | Number of Trees | Total Cost | Cost per M |
|---|---|---|---|
| 1935 | 1,430,675 | $24,769.20 | $17.31 |
| 1936 | 2,539,599 | 19,873.08 | 7.83 |
| 1937 | 55,750 | 260.75 | 4.68 |
| 1938 | 1,198,760* | 7,818.84 | 6.52 |
| 1939 | 1,107,845** | 5,551.57 | 4.91 |
| 1940 | 75,000 | 400.00 | 5.33 |
| 1941 | 50,000 | 275.00 | 5.50 |
| 1942 | --- | --- | --- |
| Totals | 6,457,530 | $58,838.44 | $ 9.11 |

*Includes 304,510 trees purchased from S. W. McDarty, Vernon, Texas, on which the Forest Service had paid lease costs for one year and which were left in the nursery as property of the Lessor when the lease was abandoned.

**Includes 354,500 trees of plum purchased from Yaeger Nurseries, Fremont, Nebraska, which were purchased "in field" and on which the Forest Service paid the digging costs, etc.

These were not the only problems which the project directors had to face, but they were some of the more important ones. Some of the others which would be solved as the actual work began on the planting were the ideal width of shelterbelts, orientation and distribution of belts, practical spacing standards for the various species and regions, species most desirable for shelterbelt planting, methods of planting, seed and nursery practices, adaptability of various soils, and determination of effect of shelterbelts on wind and crops.

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[54] U. S. Forest Service, 1942 Annual Planting Accomplishment Report, Table 17.

So it was with the project's beginning--it had encountered uncertainty, unfavorable publicity, lack of cooperation from those it was designed to help, and unfavorable planting conditions. However, the trees had been planted and now, with some anxiety, the project leaders awaited the outcome of the first season's planting.

## The Program

Although the Shelterbelt Project personnel were interested in the total program of farm forestry within the Great Plains, their action program was restricted to the use of field shelterbelts. This specialized type of planting combined the values of demonstration and education; stimulating or reviving interest in trees; working out problems of tree establishment peculiar to the Plains Region, as well as contributing in various ways the multiple uses of trees for the farming area. The 1935 program of shelterbelt planting was intended to accomplish far more than these stated objectives. It represented a major direct action program designed to aid in the solution of national and local problems.[55] The Forest Service knew that the shelterbelts did not represent a panacea to these problems but just one step toward their solution, and the biggest problem of the moment in the Great Plains was to protect a natural resource--the soil.

The ultimate goal, as stated earlier, was adequate protection for the individual farm unit. But in 1934 and 1935, the general objective was the establishment of the basic pattern of shelterbelts, in hopes that once their value was realized the individual farmer would undertake, on his own initiative, the planting of more belts connecting with the basic belts to

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[55] "General Policies," Handbook of the Division of Timber Management for the Prairie States Forestry Project, 1.

give his farm additional protection.[56] The project leaders also hoped that he would be able to influence his neighbors to do the same thing, thereby developing a concentrated area of field shelterbelts which would eventually contribute to the general welfare of the whole farming community.

The aim of this basic shelterbelt pattern was to establish at least two mile-long, basic windbreaks with each square mile. These basic belts were to be parallel, at intervals on one-half mile, and were to be located on land survey lines.[57] The Forest Service's primary interest lay in providing protection for those large areas within the planting zone of each state, where the deep, sandy soils with high water tables were the most susceptible to erosion when placed in cultivation. Fortunately these same areas were also the most favorable for the establishment of trees. Most of these belts were oriented in an east-west direction to give protection from the spring winds from the south and the winter winds from the north-northwest.

From their studies and field investigations, the Forest Service realized that a project covering 15 degrees of latitude, with its varying climatic and soil conditions, could not have a rigid scheme applicable to all areas and all situations. Therefore, the final program had built into it a flexibility which could be adapted to a particular situation in light of new evidence from the earlier plantings or from the past season's

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[56] Ibid.; "Forestry for the Great Plains," 6.

[57] "General Policies," Handbook of the Division of Timber Management For the Prairie States Forestry Project, 2; Ralph A Read, The Great Plains Shelterbelt in 1954 (Publication No. 16 of the Great Plains Agricultural Council, Lincoln, Nebraska, 1958), p. 12.

planting. This flexibility insured that the next season's plantations would profit from the total accumulated knowledge.

The basic design of the field shelterbelt was of utmost importance because the effectiveness of its influence depended upon the structure's capacity to diffuse and divert air currents.[58] If this design served its purpose, the results would be the mechanical retardation of the wind velocity. Contrary to public opinion at the time, the reduction of the velocity of the wind would have only local effect and not have a broad region-wide effect. This fact is supported by scientific records as well as everyday experience in working with shelterbelts. Also the shelterbelts were not designed to change the climate of the Great Plains, another popular misconception. This particular idea received much more attention from many news writers than other important aspects of the program.

Therefore, in late 1934, the Forest Service in a joint press release with the U. S. Weather Bureau issued the following statement to clarify the influence which the shelterbelts would have on the region's climate:

> Meteorologists agree that the physical conditions of the air and the earth, which cannot be altered appreciably by human agencies, basically control the climates of the various regions of the world. Extensive climatic controls are changed only through the slow processes of nature operating leisurely through many centuries. The shelterbelt will not appreciably change the climate of the Great Plains Region.
>
> No claim has been made by the sponsors of the project that the planting of trees will change the climatic conditions as a whole, but rather that many unfavorable features of existing conditions, such as dust storms during periods of severe drought, will be alleviated or

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[58]Dahl, "Progress and Development of the Prairie States Forestry Project," 304.

modified, principally through the diminution of the surface velocity of the wind by the successive forested strips.[59]

The mechanical retardation of the wind velocity results in a whole series of effects or benefits. Zon summed them up by saying that the evaporation from the soil immediately adjoining the shelterbelts is lessened, the transpiration from crops growing under their protection is reduced, the soil blowing is prevented, and snow is kept from being blown off the fields into gullies. He went on to say, "The aggregate effect is the more complete utilization of the precipitation."[60] It must be remembered that such modifications of the existing conditions are the primary results sought rather than any appreciable change in the climate as measured by the conditions of temperature, sunshine, rainfall, or other such factors.[61] The amount and extent of wind reduction so that these modifications can be brought about, depends upon several characteristics of the shelterbelts. These will be discussed below.

In order to insure the above mentioned maximum effectiveness, the Forest Service planted the belts, in most cases, as follows: the outside rows were of low-growing shrubs, the next rows were of slower-growing trees of intermediate height, and the center rows of faster-growing tall trees. In the belts, the composition of the species was

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[59]U. S. Forest Service, Weather Bureau Press Release, "Climatic Effect of the Great Plains Shelterbelt," October 22, 1934, 1 page. (From files of Prairie States Forestry Project, Lincoln, Nebraska).

[60]Zon, "Shelterbelts--Futile Dream or Workable Plan," 393; also see Ralph A. Read, Tree Windbreaks for the Central Great Plains (Agriculture Handbook No. 250 of the U. S. Department of Agriculture, Washington, D.C.: 1964), pp. 3-10 for more on how windbreaks effect the environment.

[61]"Climatic Effect of the Great Plains Shelterbelt."

designed to serve a multiple purpose, that is to have the fast growing tall trees for early effectiveness, species of longer life for permanence, conifers for year-round protection, and species of special value for wood products. Most of the belts contained at least six to eight different species of trees and shrubs. The belts were not made up of every species found in each state, but only those that had been extensively planted and found satisfactory in earlier shelterbelt plantings. Although some species were found throughout all six states, many of the trees were selected because of their adaptability to the varying soil types and site conditions found in a particular area of the planting zone within the individual states.

During the first two planting seasons, the number of rows within these basic belts varied from 17 to 21, differing from north to south, primarily with the wider belts in the north. The purpose of the wide belt was not that it would necessarily offer better protection than a narrow one, but that width was necessary for proper growth and permanence.[62] The spacing varied with the species and region. The project personnel, however, found it desirable to use a uniform spacing and later, where possible, to narrow the belts. The width of a 21-row belt was 165 feet from fence to fence, and its length varied from a quarter-mile to one mile. (Figure 6.[63]) Thus, for a belt of this width and a length of one mile, 20 acres of land was taken out of production and put into trees. To many farmers, this recommended acreage represented too much of a loss from their crop production and they refused to have belts put on their land.

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[62]"Forestry for the Great Plains," 6.

[63]U. S. Department of Agriculture, Forest, Service, The Benefits of Shelterbelts (Mimeographed report, Lincoln, Nebraska, October, 1935), p. 14.

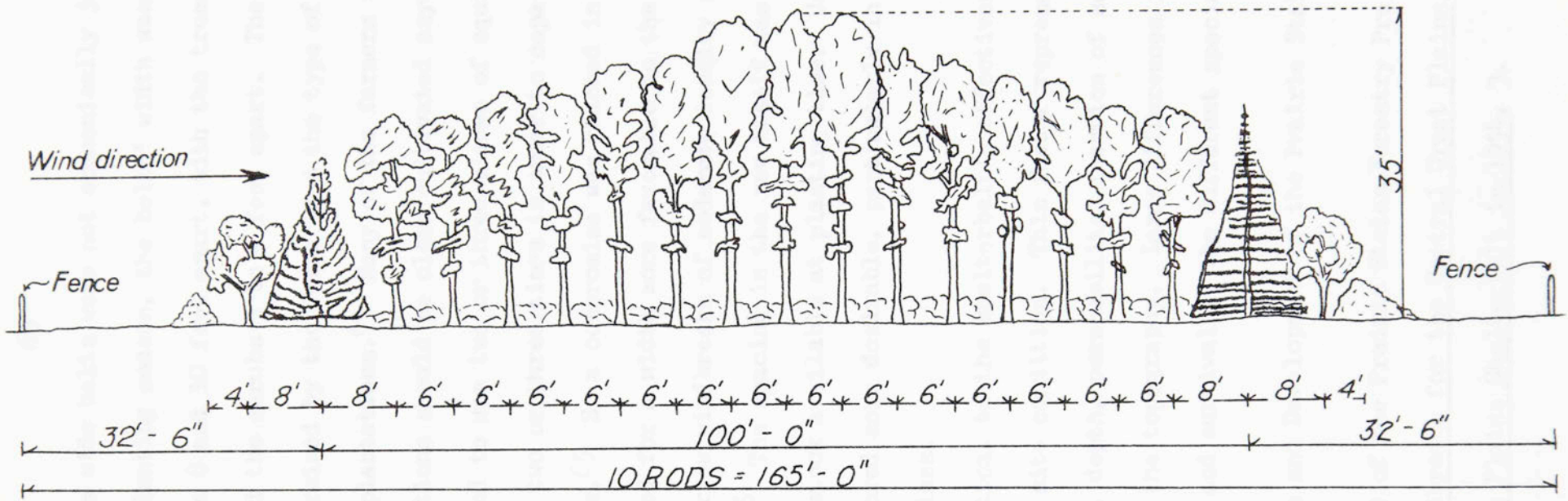


Figure 6. Cross Section of Typical Shelterbelt on 10-Rod Strip.

There were cases where the wide belts were not economically justifiable.

After the 1936 planting season, the belts' width was reduced to 10 rows, spaced between 8 and 10 feet apart, with the trees in each row spaced 6 to 8 feet and the shrubs 3 to 4 feet apart. The spacing between the rows was determined by the farmer and the type of equipment he used to cultivate the plantations.[64] Many of the farmers were not convinced that the plantations should be clean cultivated anyway and therefore could not be convinced to use two or three pieces of equipment or to rearrange an implement two or three times in order to cope with the varying widths of the rows.[65] So a compromise was reached in which the ideal spacing was abandoned for a width more favorable to the farmer. Also it was found that narrow windbreaks of moderate density were as effective as wider ones.[66] The spacing in the row itself was dependent upon the species and the stock available at planting time. Usually the closer spacing was considered more desirable, particularly in the north where the growth rate is less.

Perhaps more critical to the shelterbelt's effectiveness than spacing and width was the site condition. This factor represented the variations in the texture, depth, permeability, reaction of soils, the depth to water table, and the topography. Large differences in any of these affected the growth and survival of the different species.[67]

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[64]Dahl, "Progress and Development of the Prairie States Forestry Project," 304.

[65]Perry, "History of the Prairie States Forestry Project," 47.

[66]Read, Tree Windbreaks for the Central Great Plains, 4.

[67]Read, The Great Plains Shelterbelt in 1954, 3.

Therefore, it was necessary for the project directors to select those sites which had a favorable combination of all these factors to insure the maximum growth, effectiveness, and survival. Occasionally shelterbelts were planted on unfavorable sites, resulting in poor belts with stunted trees of uneven height or with numerous gaps where the trees had failed to survive. Shelterbelts such as these were effective to a certain extent, but in reality failed to meet the full requirements for which they were designed. Therefore, when applications were made for the belts, the project workers wanted to make sure the belts would be planted on the proper sites, if at all possible.

There were other technical aspects of the project plantings which should be mentioned, such as height, length, density, and frequency.[68] Of these, height (H) is probably the most important because the distance that protection is extended leeward is proportional to the height of the belt. If the belt is properly constructed and the wind is uplifted on the windward side, then the area of reduced wind velocity leeward may be up to 50 times the H of the trees. However, the actual area protected from wind erosion and crop damage usually lies between the belt and 10 to 20H out on the lee side. For example, the amount of wind reduction differs at leeward distances of 4, 10, or 20 times the average height of the belt, but the per cent reduction at 4H, is the same regardless of barrier height (Figure 7). There is also some protection on the windward side of the belt. The backwash of the air currents which develop here effectively reduces wind velocity from 2 to 5H from the belt.

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[68] Read, Tree Windbreaks for the Central Great Plains, 3-10; "Shelterbelts," Handbook of the Division of Timber Management for the Prairie States Forestry Project, 2-3.

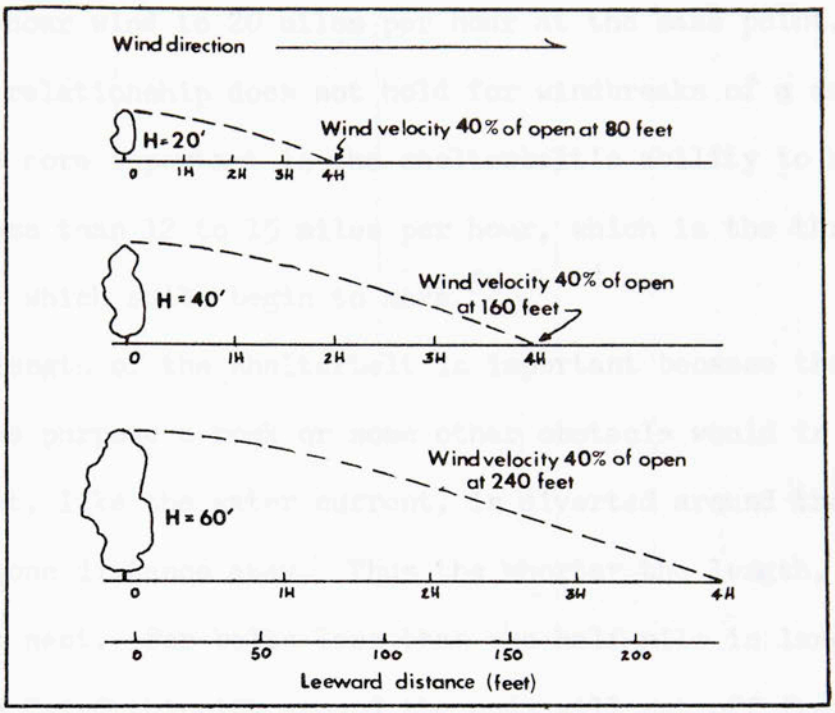


Figure 7. Leeward distance of wind protection is proportional to height of barrier. (After Read, 1964.)

The percentage of reduction in wind velocity at any particular H distance from a dense windbreak is relatively constant and does not depend upon how hard the wind blows. For example, a windbreak that reduces a 20-mile-per-hour wind to 10 miles per hour at 8H, will reduce a 40-mile-per-hour wind to 20 miles per hour at the same point. (Figure 8.) However, this relationship does not hold for windbreaks of a more permeable type. What is more important is the shelterbelt's ability to reduce wind velocity to less than 12 to 15 miles per hour, which is the threshold velocity above which soils begin to move.[69]

The length of the shelterbelt is important because the belt itself serves the same purpose a rock or some other obstacle would in a stream. The air current, like the water current, is diverted around the obstacle and reunites some distance away. Thus the shorter the length, the quicker these currents meet. For belts less than one-half mile in length, it was found that the "wind whipping around the ends will cut off from the sides the air that would otherwise be affected by the height of the barrier." Belts over one-half mile were found to give better protection because their greater length reduced proportionately the protected area lost by the wind whipping around the ends.[70]

When gaps allow the wind to pour through the shelterbelts, it has the same general effect as shortening the belts. There are times, however, when gaps are necessary, i.e., at roadways, livestock lanes, and farm equipment crossings. In these cases, the gaps should be angled so that the wind does not have a free sweep through the lane onto the field.

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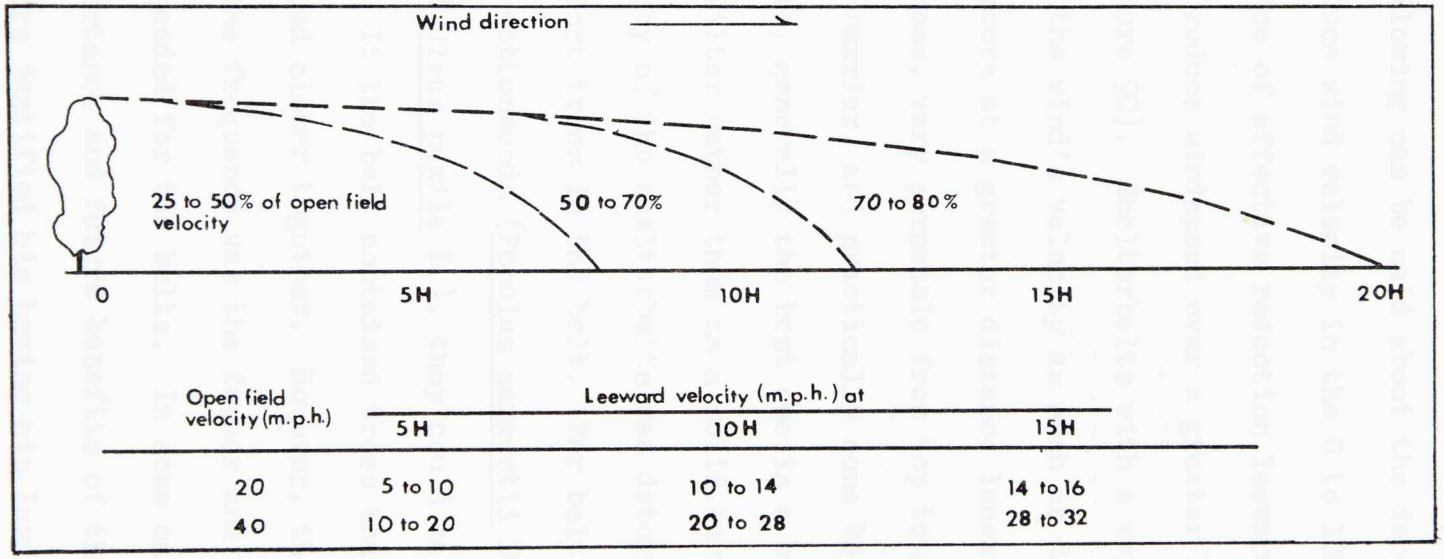
[69]Read, Tree Windbreaks for the Central Great Plains, 3.

[70]"Shelterbelts," Handbook of the Division of Timber Management for the Prairie States Forestry Project, 3.




| Open field velocity (m.p.h.) | Leeward velocity (m.p.h.) at 5H | 10H | 15H |
|---|---|---|---|
| 20 | 5 to 10 | 10 to 14 | 14 to 16 |
| 40 | 10 to 20 | 20 to 28 | 28 to 32 |

Figure 8. Zones of reduced wind velocity leeward of barrier as percentage of open field velocity. Examples of actual leeward velocities with open field winds of 20 and 40 m.p.m. Vertical scale exaggerated. (After Read, 1964).

Therefore, except for these access gaps, density from the standpoint of the shelterbelt's ability to infiltrate as well as lift the air currents is important. Through the use of wind tunnel models and actual field experiments, the following can be said about the density of a shelterbelt. Very dense belts reduce wind velocity in the 0 to 10H zone more than open ones, but the distance of effective reduction leeward is limited. Barriers of moderate density reduce windspeed over a greater leeward distance than very dense ones (Figure 9C). Shelterbelts with a very permeable lower level do not reduce the wind's velocity as much as dense ones, but the maximum reduction occurs at a greater distance leeward (Figure 9B). Belts which are open or loose, very permeable from top to ground, offer small reductions near the barrier, and practically none beyond 10H (Figure 9A). Of all of these types, generally the best one is a belt of moderate density which can act as a filter rather than as a solid barrier.

The frequency of the shelterbelts was determined by the height attained by the tallest trees in the belt. For belts with some of the taller trees, i.e., cottonwoods (Populus sargentii Dode) or elms (Ulmus parvifolia Jacq. and Ulmus pumila L.), they could be placed up to a quarter-mile apart. If the belt contained trees that attained less height, they were to be placed closer together. However, the most critical factor determining the frequency was the farmer and his willingness to devote the acreage needed for the belts. In some cases, the farmer could see the present importance and future benefits of the belts; therefore, to him, these two factors justified his having his land crossed and criss-crossed with shelterbelts. In others, the farmer could not justify removing the acreage from crops for trees, so he refused to have more than the basic belts or wanted none at all planted.

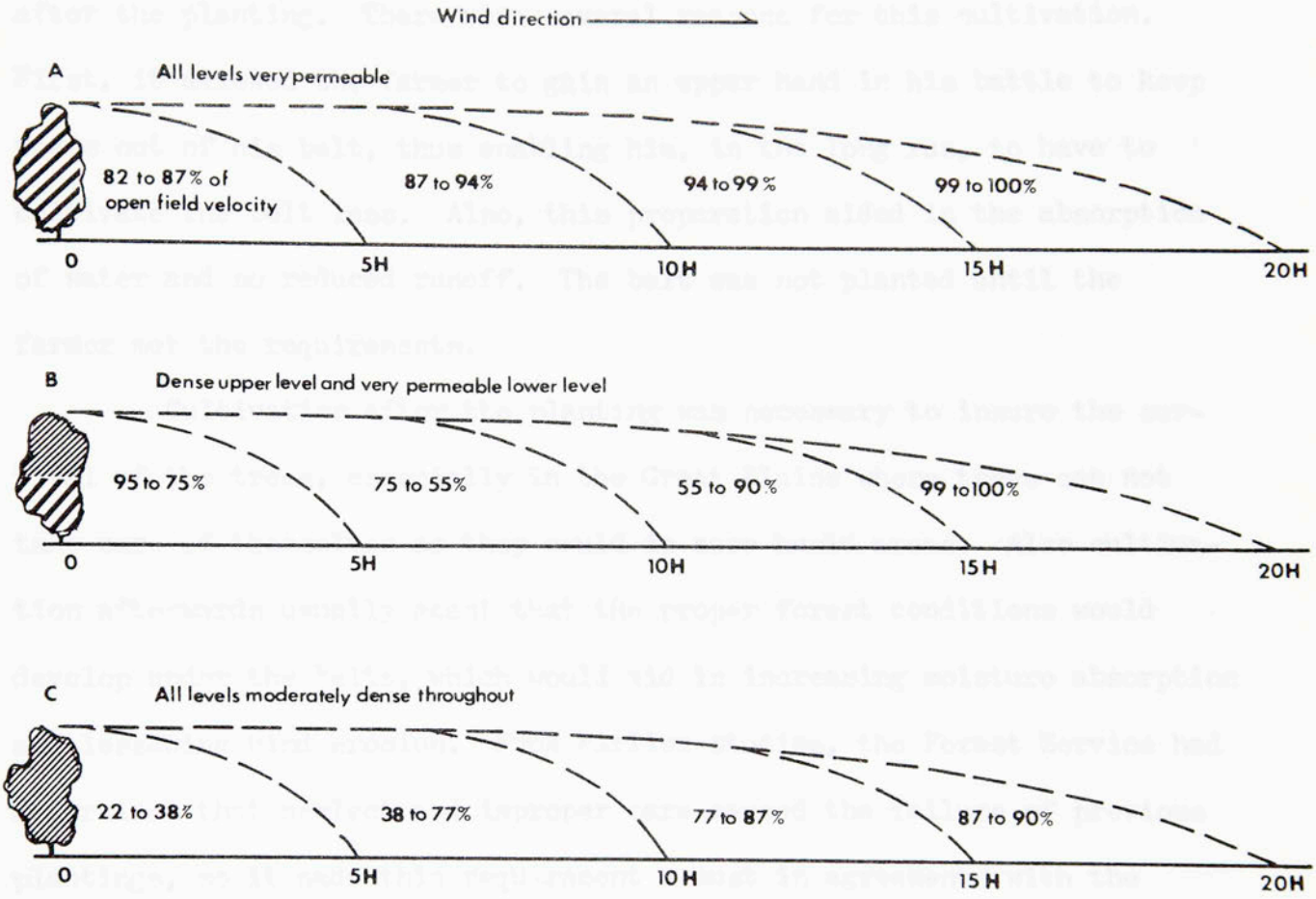



Figure 9. Zones of reduced wind velocity as percentage of open field wind (5 feet above soil) leeward of barriers of various density. Vertical scale exaggerated. (After Soegaard, 1954 and after Read, 1964).

While these technical aspects were being worked out, some of the project personnel were busy trying to recruit sites for the plantings. In order to receive a belt, the farmer had to agree to certain requirements. One of the first requirements was the cultivation of the site before and after the planting. There were several reasons for this cultivation. First, it allowed the farmer to gain an upper hand in his battle to keep weeds out of his belt, thus enabling him, in the long run, to have to cultivate the belt less. Also, this preparation aided in the absorption of water and so reduced runoff. The belt was not planted until the farmer met the requirements.

Cultivation after the planting was necessary to insure the survival of the trees, especially in the Great Plains where trees can not take care of themselves as they could in more humid areas. Also cultivation afterwards usually meant that the proper forest conditions would develop under the belts, which would aid in increasing moisture absorption and lessening wind erosion. From earlier studies, the Forest Service had determined that neglect and improper care caused the failure of previous plantings, so it made this requirement a must in agreements with the farmers. However, like their predecessors, some of them failed to carry out their contract, and some of the shelterbelts failed.

When the Shelterbelt Project was first proposed, the popular belief was that it was to be oriented in a strict north-south direction; however, in the thinking of the project leaders the belts were to be oriented in such a way that they could benefit the area most. In other words, in attempting to break or lessen the force of the wind, the belts were laid out so they would be approximately at right angles with the

direction of prevailing winds. Therefore, most of the belts were planted with an east-west orientation. However, some of the belts were planted with a north-south orientation, usually along the west side of the farm to protect it from the west wind.

While the Forest Service preferred to remain with its basic plan of orienting and locating the shelterbelts where they would give the maximum protection to the individual farm and the whole area as well, the project workers did allow the farmers to place them where they wanted if they could reasonably justify their choice. The sites picked by the Forest Service were based on surveys of each planting site as to prevailing conditions, tree growing feasibility, and in accordance with the project's standards. Generally the farmers followed the Forest Service's recommendations. Usually the farmers preferred to have the belts located on the cadastral survey land lines, and their justification was that they simply wanted the belts out of the way of their farming operations. There were those among the shelterbelt workers who felt that the placement of the belts should not rest with the farmer in the first place.[71] Their reasoning was that it was their job to know where the belt would grow best and do the most good.

Another point which the project directors were strongly in favor of was the fencing of the shelterbelts. Fencing would serve two primary purposes: 1) to keep down the damage from grazing livestock and 2) to avoid damage from the farmer's planting crops too close to the belts. If grazing were allowed within the belts, cattle would not only damage or destroy the young trees, but also pack the soil in the belts to the

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[71] Interview with Sid Burton, September, 1969.

point where it would lose some of its capacity to absorb moisture. Cropping too close could damage the trees' root systems or inadvertently knock out some of the outside rows. Although these factors were realized by project personnel and many of the farmers, the question of fencing remained a problem. It was the project personnel who had to recede somewhat from their fencing requirement, in part because the farmer had to provide all of the fencing materials and partly because, in some areas of severe soil blowing, the fences tended to catch the soil and to pile it into great drifts. As the belts grew older, there was plenty of evidence to show that the belts which were fenced did much better than the unfenced belts but, in order to gain community interest and support, a compromise usually had to be made--in favor of the community.[72] Later, though, with or without community interest, large numbers of belts, fenced and unfenced, were grazed out.

While the various aspects mentioned here were not the only concerns of the total program, they were certainly among the more important as the Forest Service attempted to carry out its Shelterbelt Project. However, before concluding this report with a discussion of the various participating agencies, a brief summary of the project's planting seasons will be given.

## Summary of Project's Planting Seasons

After the somewhat shaky beginnings, during which the project had gone through its early developmental and organizational stages, had overcome negative criticism with the first year's positive results, and had suffered from lack of Congressional support, resulting in inadequate funding, it had planted its first tree belts. These belts were limited in extent

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[72]Perry, "History of the Prairie States Forestry Project," 47-48.

not only by the number of cooperators, but by the availability of planting stock as well. The amount of stock available was small, so the planting operations of 1935 were carried out with greater ease than would be experienced in later seasons because what stock there was then had to be spread over the six Great Plains states.

As the year 1935 progressed, the trees began to establish themselves, thus proving that even under the severe drought conditions of the 1934-35 planting season, trees could be made to grow in the Great Plains region. Skepticism began to lessen. Gradual public acceptance of the program was brought about as misconceptions were clarified, as the news media gave it more favorable support, and as the farmers themselves started to accept it. The latter point was demonstrated by the large number of shelterbelt applications received by the regional offices in the six states after the 1935 season. In the majority of the cases, it was found easier to secure cooperation in the northern states than in the southern states, primarily because of the more severe climatic conditions found there. Since early settlement, trees have been looked on in the North to provide protection from the elements.[73] Table II gives a concise picture of the project's work within each state for the life of the project.[74]

Following the 1935 planting season, the actual planting operations were not the main problem faced by the project workers. In most cases, they had more than enough applications for shelterbelts, often exceeding the amount of planting stock. The amount of planting stock also increased as

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[73]Perry, "History of the Prairie States Forestry Project," 68.

[74]U. S. Forest Service, 1942 Annual Planting Accomplishment Report, Table 1.

TABLE IIa

RECORD OF PLANTINGS BY STATES

| States | Miles | Acres | Farms | Trees* |
|---|---|---|---|---|
| North Dakota | 2,644.9 | 34,711 | 3,954 | 38,080,012 |
| South Dakota | 3,206.4 | 44,227 | 5,820 | 41,599,770 |
| Nebraska | 4,168.8 | 51,621 | 6,944 | 45,416,610 |
| Kansas | 3,540.8 | 44,483 | 5,960 | 39,864,221 |
| Oklahoma | 2,995.7 | 37,117 | 5,092 | 29,077,292 |
| Texas | 2,042.6 | 26,053 | 2,453 | 23,340,447 |
| Totals | 18,599.2 | 238,212 | 30,223 | 217,378,352 |

*Including Replacements

TABLE IIb

ACCUMULATIVE TOTAL OF ANNUAL SHELTERBELT PLANTING
(Includes basic and intermediate field shelterbelts)

| State & Year | Miles | Acres | Farms | Trees | Total Trees |
|---|---|---|---|---|---|
| NORTH DAKOTA | | | | | |
| 1935 | 40.25 | 776 | 69 | 632,600 | 632,600 |
| 1936 | 222.50 | 4,297 | 327 | 3,378,616 | 3,577,820 |
| 1937 | 82.00 | 890 | 94 | 604,448 | 3,922,932 |
| 1938 | 318.50 | 4,495 | 460 | 4,064,887 | 4,911,923 |
| 1939 | 551.13 | 7,328 | 798 | 5,107,683 | 6,437,456 |
| 1940 | 511.75 | 6,763 | 790 | 4,344,336 | 6,441,903 |
| 1941 | 447.75 | 5,373 | 737 | 3,811,007 | 6,134,108 |
| 1942 | 471.00 | 4,789 | 679 | 4,877,470 | 6,021,270 |
| Total | 2,644.88 | 34,711 | 3,954 | 26,901,047 | 38,080,012 |
| SOUTH DAKOTA | | | | | |
| 1935 | 28.12 | 554 | 54 | 498,250 | 498,250 |
| 1936 | 235.88 | 4,467 | 445 | 4,484,000 | 3,544,310 |
| 1937 | 148.00 | 1,788 | 251 | 1,537,635 | 4,048,895 |
| 1938 | 431.75 | 6,041 | 805 | 4,522,762 | 5,998,139 |
| 1939 | 801.00 | 11,213 | 1,448 | 6,342,933 | 7,814,834 |
| 1940 | 659.25 | 9,229 | 1,226 | 4,715,510 | 7,523,400 |
| 1941 | 593.88 | 7,333 | 1,075 | 3,815,600 | 6,627,651 |
| 1942 | 308.50 | 3,602 | 516 | 1,865,290 | 4,544,291 |
| Total | 3,206.38 | 44,227 | 5,820 | 27,781,980 | 41,599,770 |
| NEBRASKA | | | | | |
| 1935 | 21.00 | 417 | 47 | 307,500 | 307,500 |
| 1936 | 150.50 | 3,009 | 241 | 2,217,633 | 2,331,575 |
| 1937 | 338.50 | 4,086 | 459 | 2,050,587 | 3,372,307 |
| 1938 | 1,006.62 | 12,759 | 1,588 | 6,555,050 | 7,981,238 |
| 1939 | 1,009.75 | 12,751 | 1,733 | 7,363,300 | 10,327,523 |
| 1940 | 679.38 | 8,591 | 1,183 | 4,298,687 | 8,614,858 |
| 1941 | 590.75 | 6,294 | 1,064 | 3,996,436 | 8,247,360 |
| 1942 | 372.25 | 3,714 | 629 | 2,629,843 | 4,234,249 |
| Total | 4,168.75 | 51,621 | 6,944 | 29,419,036 | 49,416,610 |
| KANSAS | | | | | |
| 1935 | 24.75 | 474 | 53 | 200,000 | 200,000 |
| 1936 | 215.25 | 4,304 | 367 | 3,287,700 | 3,442,900 |
| 1937 | 202.38 | 2,358 | 311 | 1,340,992 | 3,445,821 |
| 1938 | 696.50 | 8,879 | 952 | 4,156,472 | 5,567,919 |
| 1939 | 781.00 | 10,425 | 1,286 | 6,493,340 | 8,789,318 |
| 1940 | 599.50 | 7,673 | 1,123 | 4,518,934 | 7,684,885 |
| 1941 | 569.37 | 5,859 | 1,074 | 3,517,872 | 6,361,376 |
| 1942 | 452.00 | 4,521 | 794 | 2,968,674 | 4,372,002 |
| Total | 3,540.75 | 44,483 | 5,960 | 26,483,984 | 39,864,221 |

| State & Year | Miles | Acres | Farms | Trees | Total Trees |
|---|---|---|---|---|---|
| OKLAHOMA | | | | | |
| 1935 | 14.00 | 273 | 38 | 187,495 | 187,495 |
| 1936 | 157.25 | 3,293 | 281 | 1,281,694 | 1,378,900 |
| 1937 | 325.38 | 3,698 | 540 | 1,849,220 | 3,063,616 |
| 1938 | 1,044.50 | 14,381 | 1,664 | 7,489,898 | 8,693,209 |
| 1939 | 508.87 | 6,816 | 899 | 3,524,370 | 6,803,560 |
| 1940 | 498.87 | 4,917 | 903 | 2,981,350 | 5,144,160 |
| 1941 | 360.13 | 2,900 | 603 | 1,625,843 | 3,078,279 |
| 1942 | 94.75 | 839 | 164 | 467,739 | 728,073 |
| Total | 2,995.73 | 37,117 | 5,092 | 19,407,609 | 29,077,292 |
| TEXAS | | | | | |
| 1935 | 1.00 | 20 | 2 | 13,880 | 13,880 |
| 1936 | 171.00 | 3,083 | 275 | 1,766,808 | 1,770,756 |
| 1937 | 225.50 | 2,561 | 306 | 1,340,033 | 2,622,313 |
| 1938 | 768.00 | 10,439 | 813 | 5,191,200 | 6,119,610 |
| 1939 | 434.00 | 5,628 | 568 | 3,582,200 | 6,350,600 |
| 1940 | 250.87 | 2,636 | 292 | 1,477,973 | 3,382,079 |
| 1941 | 141.00 | 1,246 | 143 | 740,570 | 2,536,330 |
| 1942 | 51.25 | 440 | 54 | 256,061 | 544,879 |
| Total | 2,042.62 | 26,053 | 2,453 | 14,368,725 | 23,340,447 |
| PROJECT TOTALS | | | | | |
| 1935 | 129.12 | 2,514 | 263 | 1,839,725 | 1,839,725 |
| 1936 | 1,152.38 | 22,453 | 1,936 | 16,416,451 | 17,046,261 |
| 1937 | 1,321.76 | 15,381 | 1,961 | 8,802,915 | 20,475,884 |
| 1938 | 4,265.87 | 56,995 | 6,282 | 31,980,269 | 39,272,038 |
| 1939 | 4,085.75 | 54,161 | 6,732 | 32,413,826 | 46,523,291 |
| 1940 | 3,191.62 | 39,809 | 5,517 | 22,336,790 | 38,791,285 |
| 1941 | 2,702.88 | 28,995 | 4,696 | 17,507,328 | 32,985,104 |
| 1942 | 1,749.75 | 17,905 | 2,836 | 13,065,077 | 20,444,764 |
| Total | 18,599.13 | 238,212 | 30,223 | 144,362,381 | 271,378,352 |

In addition to shelterbelt plantings shown on the pervious pages, other types of plantings were carried out as follows:

| | Farms | Trees |
|---|---|---|
| Farmstead plantings in 1935-36 | 2,798 | 4,885,075 |
| Highway plantings, 1942 | 8 | 36,011 |
| Other types of plantings, 1942 | 156 | 525,782 |
| | 2,962 | 5,446,868 |
| Totals | 30,223 | 217,378,352 |
| Grand Total (includes shelterbelt plantings listed above) | 33,183 | 22,825,220 |

*Livestock plantings included in this tabulation to and including 1941.

the Forest Service made use of its newly established nurseries as well as commerical nurseries. There was an abundance of labor available, mainly the Great Plains farmers and their sons. However, the Project's biggest problem still remained the lack of Congressional recognition and more adequate financing. The project had received the support of some Congressmen, both Democrats and Republicans, but these few individuals could not convince the whole Congress of its merits. Therefore, the Shelterbelt Project, as previously mentioned, was dependent upon WPA funds throughout its lifetime.

In 1936, a name change from the Shelterbelt Project to the Prairie States Forestry Project was implemented in hopes that by putting a greater emphasis on its relationship with the WPA, the project could receive the desired Congressional recognition. Mainly because Congress refused to accept the tree-planting scheme as a major conservation program, instead of making a direct appropriation for its continuation for fiscal year 1937, it made the aforementioned appropriation of $170,000 for its liquidation. Even the use of its new name, the Prairie States Forestry Project, which was meant to imply not only a change of name, but also a change of program, failed to convince Congress of its importance to the region. However, from 1936 until its termination, the Shelterbelt Project remained known as the Prairie States Forestry Project.

The decision was made in 1937 not to seek a direct appropriation from Congress and rely on WPA funds for the fiscal year 1938 operations. Even though, the project did not seek a congressional appropriation, one congressman and one senator were looking for a way by which the Congress would finance it. The results of their efforts were in the Norris-Doxey

Act, also known as the Cooperative Farm Forestry Act. Although not mentioning the P.S.F.P. by name, the Act's provisions were broad enough to include the shelterbelt plantings on farms of the Plains farmer. This legislative attempt failed because as soon as its proponents sought funds under the Act, Congress again failed to provide the necessary money on the grounds that no emergency existed in connection with the project's tree-planting scheme. Therefore, the project resigned itself to being a WPA project instead of an independent program with its own budgeting status.[75]

For its last three years, the project had to be content with planting trees on a cooperative basis with the farmers, with the latter bearing about 50 per cent of the cost. Previous to this cooperative agreement, the project had borne the brunt of the cost with the farmer receiving everything and giving little in return. Although the program now meant that the farmer would bear equal cost, there was no let up in applications for the belts. By now, some benefits of the young shelterbelts could be seen and the applications kept pouring in.

By 1940, the problem of funding had reached a critical point, and the Secretary of Agriculture advised the President that abandonment of the project was the only solution. The basis for his recommendation was that the WPA rules were too restrictive for the project's many facets to be carried on under these inflexible regulations. For example, ninety per cent of the funds had to be expended for labor, leaving ten per cent for the supervisory, technical, and research operations, a fraction inadequate for such operations. These matters were further complicated by

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[75]Droze, "The New Deal's Shelterbelt Project, 1934-42," 43.

the fact that the labor was only seasonal.[76]

When the project sought funds for 1941, the Secretary of Agriculture, then Henry Wallace, again sought for it the status of an independent agency with its own budget. This idea was deemed to be unwise by the President who advised the Secretary to begin transfer of the project to the Soil Conservation Service, which had organized numerous conservation districts in the Great Plains states. The money to carry on its operation was again received from the WPA.

However, neither the Secretary of Agriculture nor the Forest Service made any effort to implement the President's suggestion to merge the project with the Soil Conservation Service. In 1941, the attempt was again made to seek independent status for the project; this too failed. The feeling now, especially on the part of the Director of the Budget, was that there was no further need for the Forest Service and the Soil Conservation Service to engage in duplication and overlapping of functions.[77] Although money was received to continue operations for the remainder of that season, the end of the P.S.F.P. as a Forest Service program was near.

Many factors contributed to the final decision of the new Secretary of Agriculture, C. R. Wickard, to transfer the Prairie States Forestry Project from the Forest Service to the Soil Conservation Service. Chief among these factors were the uncertainty over future funding, resistance from the Bureau of the Budget, inattention from a President busy with foreign affairs, and an expanding program of the SCS in the Great Plains.[78]

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[76] Ibid.

[77] Ibid., 44.

[78] Ibid., 45.

So, on July 1, 1942, with Presidential approval, the Prairie States Forestry Project (Shelterbelt Project) ceased to exist as a separate program and was merged into a larger scheme to conserve the soils of the Great Plains region from wind and water erosion.[79]

Among the Forest Service personnel and proponents of the project, this transfer meant that the tree planting program would suffer, as other measures would be substituted for tree planting. When the project was transferred, many of its personnel went along with it, partially in hopes of seeing to it that their work would not be wasted, and partly to try to keep tree planting an important aspect of the over-all conservation program for the Great Plains. Those project workers who did not transfer to the SCS were given other jobs within the Forest Service.

If the Shelterbelt Project (Prairie States Forestry Project) were said to accomplish but one thing in its brief eight-year life, it would be that it proved beyond any doubt that trees, if properly selected and properly cared for, can grow in the once treeless Great Plains area. However, it proved that and much more. In 1944, a Forest Service team made a survey of the project's belts and found that "in terms of meeting the main purpose for which the belts were established, that of protection against wind, the project was a success."[80] They put the survival rate for the area as a whole at 78 per cent. The growth rate of the trees during their first ten years was striking. Although the belts were only

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[79] Ibid.; Perry, "History of the Prairie States Forestry Project," 69; Nixon, Franklin D. Roosevelt and Conservation, 1911-45, II, 535-38.

[80] E. N. Munns and Joseph H. Stoeckeler, "How Are the Great Plains Shelterbelts?" Journal of Forestry, XLIV (April, 1946), p. 257.

a decade old, their owners were receiving numerous benefits. Among them were landscape improvement, control of wind erosion, increased cover for wildlife, creation of snow traps along the highways, and many others.[81]

During the summer of 1954, another Forest Service team was sent out to re-examine the tree belts, as it had been twenty years since the first trees had been planted. Their evaluation revealed that over 220,000,000 trees had been planted on 30,000 farms, creating a total of 18,600 linear miles of shelterbelts during the life of the project. This team was somewhat more critical of the tree planting program than their predecessors. They contended that the belts planted in the 1930's would have been more effective if the design of the windbreaks, their species compositions, and the spacing and arrangement of the trees within the belts had been changed. Other criticisms included the charge that the early planters failed to adhere to the primary goal--that of planting to produce effective wind barriers. Some were planted to obtain wood products or fruit and even for aesthetic values. They also pointed out that the early belts were too wide, lacked enough evergreen stock, and in many cases, planted too close to roads. Farmers were criticized for allowing livestock to graze in the belts, which resulted in their destruction, especially in Texas and Oklahoma. The trees were continuing to grow, and in 1954 their survival rate was judged at 70 to 80 per cent.[82] However, the team's report was not restricted to criticism; the investigators felt that more research was needed in some areas to insure that future plantings would be more successful.

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[81] Ibid.

[82] Read, The Great Plains Shelterbelt in 1954, 8-10, 77-81, 87-90, 116-125; Droze, "The New Deal's Shelterbelt Project, 1934-42," 46-47.

Although the Shelterbelt Project has been over for nearly thirty-five years now, there are still numerous field shelterbelts left throughout the six Great Plains States, with more in the northern states. Of course, one determined to drive until he found all these belts would be in for a lot of driving unless that individual had instructions as to where to go. Table III shows the number of field shelterbelts planted in the region from 1935-1966.[83] This table bears out an earlier statement that shelterbelts are considered of greater importance in the northern states than in the southern states.

The Shelterbelt Project was conceived in a period of immediate danger as far as the Great Plains economy was concerned, and although it was only one of several programs designed to help relieve that danger, its relative success is a tribute to the various organizations which helped put it together. Of course, the Forest Service was charged with the responsibility of initiating and developing the program and then with carrying out that program. This branch of the Department of Agriculture was aided by several other branches of the same department. Among them were the Bureau of Plant Industry and the Bureau of Chemistry and Soils. These groups also had the cooperation of the various state forestry organizations with their experiment stations, and state agricultural colleges.

During the last years of the project, it was necessary to make use of Civilian Conservation Corps personnel, due mainly to the labor shortage caused by the war. The Forest Service had made extensive use of this organization in other areas, but had not used the CCC boys

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[83] A. E. Ferber & Ralph A. Read, "Field Windbreaks Planted in Great Plains States," and "Farmstead & Livestock Windbreaks in Great Plains States" (Compiled in Lincoln, Nebraska, July 1967).

TABLE III

Field Windbreaks Planted in Great Plains States. Units: Miles of all types (widths range from 1 to 20 rows) -: No record available from S.C.S. or F.S. (Modified)

| Year | ND | SD | Nebr. | Kans. | Okla. | Texas | Total* Miles |
|---|---|---|---|---|---|---|---|
| 1935 | 40 | 28 | 21 | 25 | 14 | 1 | 129 |
| 1936 | 222 | 236 | 151 | 215 | 157 | 171 | 1152 |
| 1937 | 82 | 148 | 338 | 202 | 325 | 225 | 1322 |
| 1938 | 319 | 432 | 1007 | 697 | 1045 | 768 | 4266 |
| 1939 | 551 | 801 | 1010 | 781 | 509 | 434 | 4086 |
| 1940 | 512 | 659 | 679 | 600 | 491 | 251 | 3192 |
| 1941 | 448 | 594 | 591 | 569 | 360 | 141 | 2703 |
| 1942 | 471 | 308 | 373 | 452 | 95 | 51 | 1750 |
| 1943 | 50 | 15 | - | - | - | - | 65 |
| 1944 | 46 | 27 | 62 | 27 | 95 | 1 | 264 |
| 1945 | 40 | 8 | 47 | 14 | - | 20 | 130 |
| 1946 | 81 | 44 | 115 | 26 | 31 | 14 | 331 |
| 1947 | 151 | 61 | 152 | 43 | 49 | 12 | 527 |
| 1948 | 207 | 77 | 165 | 58 | 5 | 5 | 694 |
| 1949 | 255 | 69 | 151 | 59 | 40 | 3 | 636 |
| 1950 | 437 | 98 | 133 | 78 | 49 | 27 | 863 |
| 1951 | 373 | 126 | 169 | 77 | 88 | 15 | 888 |
| 1952 | 411 | 131 | 137 | 54 | 93 | 6 | 867 |
| 1953 | 502 | 168 | 124 | 48 | 35 | 19 | 1006 |
| 1954 | 496 | 146 | 85 | 39 | 159 | 3 | 949 |
| 1955 | 418 | 129 | 48 | 21 | 44 | 4 | 676 |
| 1956 | 591 | 184 | 267 | 118 | 39 | 8 | 1221 |
| 1957 | 813 | 248 | 206 | 33 | 37 | 2 | 1391 |
| 1958 | 1217 | 234 | 119 | 45 | 14 | 16 | 1804 |
| 1959 | 3051 | 235 | 140 | 21 | 19 | 3 | 3315 |
| 1960 | 2953 | 275 | 332 | 23 | 13 | 1 | 3774 |
| 1961 | 2147 | 273 | 131 | 24 | 55 | 10 | 2812 |
| 1962 | 2580 | 229 | 146 | 10 | - | 30 | 3060 |
| 1963 | 3060 | 290 | 160 | 8 | 2 | - | 3664 |
| 1964 | 2620 | 410 | 140 | 12 | 3 | - | 3379 |
| 1965 | 2768 | 408 | 141 | 11 | 4 | 1 | 3469 |
| 1966 | 2356 | 480 | 109 | 11 | 4 | 1 | 3146 |
| Total | 30,068 | 7571 | 7449 | 4401 | 3874 | 2244 | 57,531 |

*Includes Total Miles for New Mexico, Colorado, Wyoming, and Montana.

much on the Shelterbelt Project.[84] Their limited use was in part due to the widespread nature of the work, and in part because of the local relief situation. However, in fiscal year 1942, when the labor situation became acute, two camps were established, one in North Dakota and the other in Oklahoma. When the CCC was shifted from conservation to defense work in 1942, these camps were disbanded. The CCC did an excellent job and filled a real need for that spring's planting.[85]

As mentioned earlier, the Forest Service had to relinquish control of its shelterbelt program in 1942. The agency assigned the responsibility of continuing the program was the Soil Conservation Service. In the final chapter of this study, its work will be discussed to show what happened to the Shelterbelt Project, to see if the original objectives of the project changed, and to see how the project was carried out in Oklahoma and Texas.

Much more could be said about the work of the personnel on this project as well as about the project itself. The real proof of its success is not in how much one writes about the program; it is in driving through those areas in the "treeless Plains" where the shelterbelts were planted and letting them speak of the success of those workers and their tree-planting program.

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[84]"A CCC Symposium," Journal of Forestry, XXXIV (December, 1934), pp. 930-51; Darrel Miller, "The Heritage of the Old CCC," Oklahoma's Orbit, November 9, 1969, pp. 26, 28-29.

[85]Perry, "History of the Prairie States Forestry Project," 58a.

## CHAPTER V

## THE SHELTERBELT PROJECT - A VIEW FROM 35 YEARS AFTERWARD

### The Work of the Soil Conservation Service

After eight years, 1934-1941, during which the Forest Service had planned, implemented, and carried out its tree-planting scheme, another agency was to take over the program, once considered to be one of the most controversial of all the New Deal programs. Actually the change-over had started as far back as 1938, when the Secretary of Agriculture had placed the responsibility for developing and coordinating farm forestry activities upon the Soil Conservation Service. The action was taken because "farm forestry and other agricultural problems are intimately related; farm forestry is, first, a farm problem, and second, a forestry problem." The assignment of this responsibility to the Soil Conservation Service did not exclude other interested agencies from working with farm forestry.[1] It will be remembered that the Forest Service had implemented its tree-planting project as an emergency measure, and now the crisis had passed. Also, it is important to note that while the Forest Service was interested in all aspects of plains forestry, the sole concern of its Shelterbelt Project had been the planting of field shelterbelts.

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[1] U. S. Department of Agriculture. Soil Conservation Service. "Policies and Procedure for the Farm Forestry Program of the Department of Agriculture Under the Cooperative Farm Forestry Act," Washington, D.C., May 9, 1939, p. 2. (Mimeographed.)

For these reasons and those mentioned in the previous chapter, in late 1941, the Forest Service started the transfer of the program to the Soil Conservation Service. The project personnel had learned much about plains forestry and how to use it to benefit not only the individual farmer but also the whole region. These lessons would be quite valuable to the Soil Conservation Service as that organization attempted to carry on the program. Not only did the Forest Service transfer the program but any project staff member who desired to make the move. These men were in a position to be of important service to their new organization. But, as Perry stated:

> The only remaining danger lies in whether or not the Soil Conservation Service will want to develop tree planting, and particularly shelterbelt planting, as a necessary part of the rehabilitation and stabilization program of the Great Plains Region. At this time the Soil Conservation Service is largely dominated by agronomists who, by and large, have a tendency to believe that any conservation end that can be achieved with trees can be better and more cheaply done by agronomic methods.[2]

Foresters, by their own admission, felt that they would be badly outweighed by the agronomists and agricultural engineers in the new organization, and therein was a danger, for even with the best intentions, the Plains forester might be gradually diverted to other work. It had happened to other foresters in the SCS in the past.[3] This situation would be repeated now, especially if there were insufficient funds to carry on the present program.

As the Soil Conservation Service began to take over the project where the Forest Service had left off, it must be pointed out that the Shelterbelt Project was not the SCS's first attempt at tree planting.

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[2]Perry, "History of the Prairie States Forestry Project," 71

[3]Ibid.

It had been using tree planting as a practical erosion control measure since 1933. SCS technicians had assisted farmers in the six Plains states in planting more than 51,000 acres up until 1947. They had used this practice, along with "fifty to sixty other conservation measures, according to the capability and needs of each area."[4]

It is possible that the Soil Conservation Service would have planted more shelterbelts, since by 1942, the project's value had been firmly established in the minds of many of the plainsmen, and the SCS had plenty of applications for the belts. However, when the transfer was made, it was wartime, and since there was no transfer of funds, the whole procedure was "an empty gesture."[5] So the Prairie States Forestry Project (The Shelterbelt Project) was officially terminated, but the idea and value of the shelterbelts continued. Some plantings were made during the war years, but labor shortages and limited amounts of planting stock restricted these operations.

Since 1942 the planting and management of windbreaks has been integrated with other soil and water conservation practices "in connection with the planning and application of a coordinated farm conservation program in the soil conservation program" of the soil conservation districts. Realizing the mistakes and shortcomings made in the planting of many millions of trees in so short a period of time, the Soil Conservation Service was able to correlate these successes and failures with recognized land use capabilities and to arrive at a practical program whereby it

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[4]Morris L. Cooke, "Shelterbelts - For Dustbowl Control," Survey Graphic, September, 1947, p. 499.

[5]Letter from A. E. Ferber, Regional Forester, Soil Conservation Service, Lincoln, Nebraska, April 29, 1969.

could make routine use of tree windbreaks "to alleviate wind damage to soil and crops and to protect farmsteads from wind and drifting sand."[6] It was at this juncture that the objectives of the old Shelterbelt Project began to change, just as the project personnel had feared. The sole purpose of the Forest Service program was the planting of trees for wind erosion control. Now with this responsibility shifted to the Soil Conservation Service, the tree planting was incorporated into the overall land conservation program as stated above. Whenever trees were planted by the SCS, they were in the form of farmstead and livestock windbreaks rather than field shelterbelts. Read says that this difference in outlook between the two agricultural agencies was due to the fact that the SCS had few foresters to undertake the jobs which many foresters in the Forest Service had previously handled.[7] The few shelterbelt foresters who transferred to the SCS tried to keep field shelterbelts as the primary type of tree planting, but they fought a losing battle.[8] In the final analysis, the agronomists and agricultural engineers won out because they were not convinced of the belts' benefits.[9] As one former Shelterbelt

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[6]U. S. Department of Agriculture, Soil Conservation Service, Regional Forestry Division. "Tree Windbreaks for the Southern Plains," Fort Worth, Texas, September, 1947, p. 1. (Mimeographed.)

[7]Letter from Ralph A. Read, Research Forester, Rocky Mountain Forest and Range Experiment Station, Lincoln, Nebraska, July 1, 1969.

[8]Interviews with Sid Burton, September, 1969; Howard Carleton, Jr., former Shelterbelt Assistant, P.S.F.P., Perkins, Oklahoma, July, 1969; Ralph A. Read, Research Forester, Lincoln, Nebraska, September, 1969; Paul H. Roberts, September, 1969.

[9]Letter from Ralph A. Read, July 1, 1969; Interview with Albert Engstrom, Director, State Forestry Division, Oklahoma City, Oklahoma, August, 1969.

Assistant stated, they were only interested in "terracing and grasses."[10]

As a result of this shift in emphasis from exclusive attention to tree planting to a plan of subordinated tree planting, the care of the existing belts dropped off, particularly in the Southern Great Plains. At the same time, in the Northern Great Plains, especially in the Dakotas, the planting of windbreaks was greatly accelerated and has remained at a high level since that time.[11] Engstrom attributes this difference to the differing viewpoints of the SCS workers in the Northern and Southern Great Plains. He says that in the north there is more interest in the belts and also that it is a well planned operation--complete with good advance publicity of the planting schedule, equipment movements, and species available. Here also all of the concerned agencies work together to accomplish the desired goal.[12]

It seems here that those SCS workers who are interested come from those areas where shelterbelts have been most beneficial. They tend to be the older men who have experienced the dust storms of the 1930's. But it is as Carleton said about his shelterbelt experience, "One man in one district can not convince everyone of the benefits of the belts,"[13] especially if they did not experience the "black blizzards" of the 1930's. Even today, those few individuals can not convince the many either. All they can do is work in their respective districts

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[10]Interview with Howard Carleton, Jr., July, 1969.

[11]Interview with Elmer Worthington, Soil Conservation Service Woodland Specialist, conducted for this researcher by Charles A. Evans, State Conservationist, Bismarck, North Dakota. Information transmitted in letter, April 16, 1969.

[12]Interview with Albert Engstrom, August, 1969.

[13]Interview with Howard Carleton, Jr., July, 1969.

and try by action to demonstrate the usefulness of shelterbelts.

Rowley, in further explaining this regional difference, says that another reason why the project did not catch on as well in the South, and even now why Oklahoma and Texas are so slow in keeping up with their northern counterparts' planting accomplishments, is that in the North the shelterbelts offer protection not only from the wind but act as snow traps as well.[14] The snow, when it melts in the spring, is an additional source of moisture. He also said that in the early 1940's the SCS perfected methods of harvesting and planting native grasses in this shelterbelt area of Oklahoma. For example, the SCS harvested one million pounds of grass seed and distributed it through its soil conservation districts in the upper end of the Washita. Rowley added, "This did much to alleviate the blowing problem and was generally accepted by the farmers of the area than were the shelterbelts."[15]

A comparison of Tables III and IV showing the mileage of field shelterbelts and the acreage of farmstead and livestock windbreaks from 1935 to 1966 is a graphic demonstration of this difference between the two sections of the Great Plains.

Since 1956, those Great Plains farmers or ranchers who desire windbreaks of any kind have been able to receive assistance from the Great Plains Conservation Program. The program's major emphasis is "to bring about the conversion to permanent vegetation of cropland unsuitable for sustained cultivation" under the peculiar climatic conditions of the Plains.[16]

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[14]Interview with N. E. Rowley, State Resource Conservationist, Soil Conservation Service, Stillwater, Oklahoma, July, 1969.

[15]Letter from N. E. Rowley, June 30, 1970.

[16]"Summary of Progress, Fiscal Year 1968," Soil Conservation, XXXIV (February, 1969), 162.

TABLE IV

Farmstead & Livestock Windbreaks Planted in Great Plains States.
Units: Acres of all types.-: no record available from SCS or FS.
(Modified).

| Year | ND | SD | Nebr. | Kans. | Okla. | Texas | Total* Acres |
|---|---|---|---|---|---|---|---|
| 1935 | - | - | - | - | - | - | - |
| 1936 | - | - | - | - | - | - | - |
| 1937 | - | - | - | - | - | - | - |
| 1938 | - | - | - | - | - | - | - |
| 1939 | - | - | - | - | - | - | - |
| 1940 | - | - | - | - | - | - | - |
| 1941 | - | - | - | - | - | - | - |
| 1942 | 63 | 170 | 556 | 57 | 18 | 15 | 879 |
| 1943 | - | 253 | - | - | - | - | 253 |
| 1944 | 488 | 434 | 436 | 292 | - | 5 | 1723 |
| 1945 | 572 | 554 | 300 | 335 | - | 125 | 2140 |
| 1946 | 994 | 900 | 500 | 345 | - | 96 | 3167 |
| 1947 | 1995 | 1853 | 939 | 841 | - | 105 | 6380 |
| 1948 | 2167 | 1953 | 912 | 847 | - | 15 | 6611 |
| 1949 | 3052 | 2898 | 1296 | 1359 | - | - | 9359 |
| 1950 | 3462 | 3683 | 1754 | 1464 | - | - | 11082 |
| 1951 | 4092 | 4067 | 1897 | 1679 | - | - | 12411 |
| 1952 | 4664 | 3614 | 1834 | 1386 | - | - | 12356 |
| 1953 | 4398 | 4237 | 1940 | 1359 | - | - | 12819 |
| 1954 | 4028 | 2937 | 1643 | 1213 | - | - | 9976 |
| 1955 | 3196 | 2586 | 1616 | 824 | - | - | 9201 |
| 1956 | 3104 | 3156 | 955 | 849 | - | 31 | 8377 |
| 1957 | 2932 | 3138 | 1031 | 800 | - | 175 | 9265 |
| 1958 | 2713 | 3565 | 1503 | 1171 | - | 405 | 10683 |
| 1959 | 3127 | 3675 | 2175 | 1053 | - | 381 | 11555 |
| 1960 | 3630 | 4407 | 6537 | 1181 | - | 113 | 17598 |
| 1961 | 3315 | 4115 | 2730 | 920 | 40 | 200 | 12770 |
| 1962 | 4070 | 4435 | 3000 | 815 | - | 68 | 12940 |
| 1963 | 3200 | 4252 | 3742 | 600 | 214 | 52 | 13147 |
| 1964 | 4814 | 4142 | 3659 | 505 | 114 | 233 | 13195 |
| 1965 | 2365 | 3809 | 2051 | 579 | 15 | 28 | 9512 |
| 1966 | 2322 | 4168 | 3057 | 509 | 21 | 25 | 10615 |
| Total | 68763 | 73001 | 45052 | 20983 | 422 | 2072 | 228014 |

*Includes Total Acreage for New Mexico, Colorado, Wyoming, and Montana.

Source: A. E. Ferber & Ralph A. Read, "Field Windbreaks Planted In Great Plains States," and "Farmstead & Livestock Windbreaks In Great Plains States" (Compiled in Lincoln, Nebraska, July, 1967).

The landowner is provided with long-term assistance and shares the cost for the installation of conservation measures that help control wind and water erosion and improve the land. Again, windbreaks are just another conservation measure. From 1956 to 1968, this organization planted 22,660 acres to windbreaks within the ten states participating in the program.[17] The Great Plains Conservation Program has paid up to 80 per cent of the cost of installing the windbreaks.[18]

Even though the old Shelterbelt Project has long been terminated, the Soil Conservation Service, while changing that program's objectives, is still carrying on its own tree planting program. In its "Summary of Progress, Fiscal Year 1969," the SCS reported 43,058 acres of farmstead and feedlot windbreaks with a total of 593,206 acres as of June 30, 1969, and 3,950 miles of field windbreaks with a total of 90,303 miles as of the same date.[19] According to Mergen, one published SCS report, "Soil and Water Conservation Needs Inventory," calls for an additional 1.1 million acres of new shelterbelts and windbreaks by 1975, mainly in the Northern Plains and Lake States.[20] Many of these acres could be effectively used in the Southern Great Plains States as well.

## Shelterbelts in Oklahoma and Texas

When the Shelterbelt Project finally got its planting season under way in 1935, Oklahoma had the distinction of having the first

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[17]Letter from Katharine Mergen, Educational Relations, Information Division, Washington, D.C., July 23, 1969.

[18]Interview with Frank L. Duncan, District Conservationist, Vernon, Texas, August, 1969.

[19]"Summary of Progress, FiscalYear, 1969," Soil Conservation, XXXV (January, 1970), 139.

[20]Letter from Katharine Mergen, July 23, 1969.

shelterbelt planted in the United States. It was established on March 18 on the H. E. Curtis farm near Granite, in Greer County. The belt is still there, but it is in rather poor condition today. The Chamber of Commerce of Mangum has placed a sign commemorating the event on the main highway, U.S. 283. For anyone looking for the belt, it is not the one located behind the sign, but rather one five miles east and one mile north of where the sign was placed.

Generally speaking, the shelterbelts that remain in Oklahoma and Texas, particularly those observed for this study, are in rather poor condition. The main reason for this deterioration is the general lack of care. More will be said on this subject later in this chapter. However, first a brief description of the general area and climate of the two states will be given.

As previously mentioned in an earlier chapter, the shelterbelt planting zone in Oklahoma and Texas was concentrated in the western part of Oklahoma, a narrow sector of the Texas Panhandle, and a portion of the northwestern section of Texas known as the rolling plains. The High Plains of Oklahoma and Texas are generally unsuited for field shelterbelts because of low annual precipitation and generally unfavorable soils. However, in the southern portion of the High Plains, there are areas with soils somewhat favorable to tree growth. With the rainfall so low, however, it was considered too hazardous to plant the shelterbelts there. So, the High Plains area was excluded from the planting zone of Oklahoma and Texas. The western boundary of that zone approximates the 21-inch isohyet and runs in a line just east of the following cities: Lipscomb to Pampa to Floydada. The eastern boundary of the area in Oklahoma is Highway 81.

The climate of Western Oklahoma and Western Texas can be described as middle-latitude continental. In these states, their lower latitude and proximity to the Gulf of Mexico causes the temperature range between summer and winter to be less pronounced than in their northern counterparts. Erratic temperature changes are common, though, particularly during the winter, when "northers" may cause fluctuations of as much as 50° or 60° within a few hours. The mean annual precipitation decreases westward from 29 to 22 inches. The mean annual temperature is about 60°F, and during the summer, the free-water evaporation is approximately 53 inches. The soil freezes intermittently during the winter, but only for short periods and usually to a depth of not more than about one foot. The soils of Oklahoma and Texas in the planting area are described in Table V in their relation to tree growth.

During the period of the early 1930's, when the Shelterbelt Project was trying to start its program, the personnel experienced some of the worst weather conditions possible for tree planting. In 1934, Oklahoma and Texas, as well as the other Plains states, were going through one of the worst droughts in years. Moisture deficiency, combining with high winds, had left the land without any vegetative cover and, as a result, dust storms roared through the states. The storms, usually described as "black blizzards," brought everything to a standstill including the shelterbelt planting. Somehow, though, the planting got underway in Oklahoma early in March, and by April it had been completed. However, there were periods of one or two days when all planting operations had to cease, mainly because of the poor visibility and the general discomfort of the planters. Damage to planting stock by the dust storms was difficult

TABLE V - GENERAL CHARACTERISTICS OF SOILS OF THE SOUTHERN SECTION OF THE SHELTERBELT ZONE
(Texas and Oklahoma)

| Soil | Principal occurrence | Approximate percentage of area in States of southern section |
|---|---|---|
| Abilene (fine-textured types) | Rolling plains of Texas and Oklahoma. | Oklahoma, 10.00; Texas, 6.00. |
| Abilene (sandy types) | Rolling plains of Texas and Oklahoma. | Oklahoma, 2.04; Texas, 0.57. |
| Amarillo (fine-textured types) | High plains of southern Panhandle of Texas. | Not stated. |
| Amarillo (sandy types) | High plains of southern Panhandle of Texas. | Not stated. |
| Calumet | Rolling plains of Texas and Oklahoma. | Not stated. |
| Enterprise (dune phase) | Chiefly rolling plains of Texas and Oklahoma. | Oklahoma, 7.65; Texas, 3.71. |
| Foard | Rolling plains of Texas and Oklahoma. | Oklahoma, 5.00; Texas, 3.00. |
| Hollister | Rolling plains of Texas and Oklahoma. | Oklahoma, 2.26; Texas, 1.65. |
| Lincoln | Texas and Oklahoma. | Oklahoma, 2.00; Texas, 0.01. |
| Miles Enterprise (sandy types) | Rolling plains of Texas and Oklahoma. | Oklahoma, 8.59; Texas, 28.58. |
| Miller | Texas and Oklahoma. | Oklahoma, 1.00; Texas, 0.01. |
| Mutual (Provisional correlation) | Rolling plains of Texas and Oklahoma. | Oklahoma, 7.00; Texas, 1.40. |
| Potter | High plains and margins in Texas and Oklahoma. | Oklahoma, 3.00; Texas, 1.50. |

| Soil | Principal occurrence | Approximate percentage of area in States of southern section |
|---|---|---|
| Pratt | Oklahoma and Kansas. | Oklahoma, 3.96. |
| Pullman | High plains of Texas, Oklahoma, and Kansas. | Oklahoma, Not stated. Texas, 0.15. |
| Randall | High plains of Texas and Oklahoma. | Oklahoma, Not stated. Texas, 0.02. |
| Richfield (fine-textured types) | High plains of Texas, Oklahoma, and Kansas. | Oklahoma, 0.05; Texas, Not stated. |
| Rough broken land | Texas and Oklahoma. | Oklahoma, 15.72; Texas, 21.22. |
| Spur | Texas. | Texas, 0.02. |
| St. Paul | Rolling plains of Texas and Oklahoma. | Oklahoma, Not stated. Texas, 1.00. |
| Summit | Rolling plains of Oklahoma and Kansas. | Oklahoma, Not stated. |
| Tillman | Rolling plains of Texas and Oklahoma. | Oklahoma, 4.00; Texas, 2.00. |
| Vernon | Rolling plains of Texas, Oklahoma, and Kansas. | Oklahoma, 19.81; Texas, 28.00. |
| Woodward (Provisional correlation) | Rolling plains of Oklahoma and Kansas. | Oklahoma, 6.00. |
| Yahola | Texas and Oklahoma. | Oklahoma, 0.59; Texas, 0.01. |
| Zita | High plains and margins in Texas and Oklahoma. | Oklahoma, 1.93; Texas, 0.55. |

| Soil | Physiography and drainage | Native Vegetation | Approximate minimum depth of water table<br>Feet |
|---|---|---|---|
| Abilene | Nearly level to undulating well-drained upland. | Short grasses. | 100 |
| Abilene | Nearly level to rolling well-drained upland. | Bunch, short, and mixed grasses; mesquite, shin oak, shrubs. | 100 |
| Amarillo | Undulating to rolling well-drained upland. | Short grasses and smaller bunch grasses. | 100 |
| Amarillo | Rolling to hummocky well-drained upland. | Bunch, short, and mixed grasses; mesquite, catclaw, shrubs. | 100 |
| Calumet | Nearly level terrace; surface drainage and under-drainage slow. | Short and salt grasses. | 50-100 |
| Enterprise | Hilly; underdrainage good to excessive. | Bunch grasses; shin oak, sand sage, yucca. | 15-50 |
| Foard | Nearly level upland; slow surface drainage and under-drainage. | Short grasses. | 100 |
| Hollister | Nearly level to undulating upland; slow surface drainage and under-drainage. | Short grasses. | 100 |
| Lincoln | Nearly level bottom lands; drainage variable. | Tall grasses; trees and shrubs. | 5-15 |
| Miles Enterprise | Rolling to strongly rolling, well-drained upland. | Bunch, short, and mixed grasses, shin oak, sand sage. | 50-100 |

| Soil | Physiography and drainage | Native Vegetation | Approximate minimum depth of water table |
|---|---|---|---|
| | | | Feet |
| Miller | Nearly level bottom lands; drainage variable. | Tall grasses; trees and shrubs. | 5-15 |
| Mutual | Nearly level to undulating well-drained upland. | Bunch and short grasses. | 100 |
| Potter | Rolling to steeply sloping upland; surface drainage excessive. | Bunch, short, and mixed grasses. | 100 |
| Pratt | Nearly level to hummocky or dune-like upland; under-drainage good. | Bunch, short, and mixed grasses. | 5-130 |
| Pullman | Nearly level to gently undulating uplands; surface drainage good to slow. | Short grasses. | 30-100 |
| Randall | Poorly drained hard land basins. | Short grasses. | 100 |
| Richfield | Nearly level or slightly depressed to gently rolling lands; surface drainage good to slow. | Bunch and short grasses. | 30-100 |
| Rough broken land | Severely eroded upland. | Bunch and short grasses; some shrubs. | 30-100 |
| Spur | Nearly level bottom lands; drainage variable. | Tall grasses; trees and shrubs. | 5-150 |
| St. Paul | Undulating to rolling well-drained upland. | Short grasses. | 100 |
| Summit | Nearly level to hilly, well to excessively drained upland. | Tall and mixed grasses | 50-100 |

| Soil | Physiography and drainage | Native Vegetation | Approximate minimum depth of water table |
|---|---|---|---|
| Tillman | Undulating to rolling upland; slow underdrainage. | Short grasses. | 100 |
| Vernon | Rolling to hilly, well to excessively drained upland. | Bunch and short grasses. | 100 |
| Woodward | Nearly level to undulating well-drained upland. | Bunch and short grasses. | 100 |
| Yahola | Nearly level bottom lands; drainage variable. | Tall grasses; trees and shrubs. | 5-115 |
| Zita | Undulating to rolling upland; surface drainage good to excessive. | Bunch and short grasses. | 100 |

| Soil | Upper portion of soil profile | Lower portion of soil profile |
|---|---|---|
| Abilene | Brown to chocolate brown; friable, loamy to sandy, 8 to 14" thick. | Brown to pale reddish brown; friable, loamy to clayey, 20 to 30" thick. |
| Abilene | Brown to chocolate brown; coherent to moderately loose, sandy, 10 to 16" thick. | Yellowish to pale reddish brown; friable, loamy to sandy, 22 to 36" thick. |
| Amarillo | Chocolate to reddish brown; friable, loamy to clayey, 4 to 10" thick. | Red; crumbly, clayey, 10 to 20" thick. |
| Amarillo | Reddish brown; friable to moderately loose, loamy to clayey, 10 to 18" thick. | Red or reddish brown; friable sandy clay, 15 to 25" thick. |
| Calumet | Light-brown; moderately compact, silty to clayey, 4 to 10" thick. | Brown to very dark brown; dense clay (claypan), 15 to 25" thick. |
| Enterprise | Light-brown incoherent sand, 1/2 to 5" thick. | Yellowish brown or reddish yellow incoherent sand, 10 to 15" thick. |
| Foard | Dark to very dark brown compact clay, 6 to 8" thick. | Very dark brown to nearly black dense clay (claypan) 20 to 25" thick. |
| Lincoln | Brown; coherent to moderately loose, loamy to sandy, 10 to 15" thick. | Light gray brown; moderately loose to coherent, sandy, 24 to 30" thick. |
| Miles Enterprise | Grayish brown to reddish brown; coherent to moderately loose, loamy to sandy, 10 to 15" thick. | Red to reddish brown; friable sandy clay, 25 to 40" thick. |
| Miller | Dark chocolate red; friable to moderately compact; texture and thickness variable. | Chocolate red; moderately compact, loamy to sandy, 20 to 30" thick. |
| Mutual | Brown; friable, loamy to sandy, 10 to 16" thick. | Dark brown; friable, clayey, 10 to 40" thick. |

| Soil | Upper portion of soil profile | Lower portion of soil profile |
|---|---|---|
| Potter | Brown to grayish brown; friable, loamy to clayey, 4 to 8" thick. | Grayish brown to light yellowish brown; friable, clayey, 6 to 12" thick. |
| Pratt | Brown; loose to moderately coherent, loamy to sandy, 10 to 18" thick. | Light brown to reddish or yellowish brown; friable, loamy to sandy, 18 to 24" thick. |
| Pullman | Brown; friable, loamy to clayey, 10 to 18" thick. | Dark brown to brown crumbly clay over reddish-brown crumbly clay; 18 to 40" thick. |
| Randall | Dark brown to black compact clay, 4 to 10" thick. | Gray to bluish-gray dense clay (clay-pay), 30 to 48" thick. |
| Richfield | Brown to dark brown; friable, loamy to clayey, 10 to 18" thick. | Dark brown to brown crumbly clay to loam, 18 to 40" thick. |
| Rough broken land | Not stated. | Not stated. |
| Spur | Light brown to dark, chocolate brown; friable; texture and thickness variable. | Light brown to light chocolate brown; friable; texture and thickness variable. |
| St. Paul | Brown; friable, silty to clayey, 10 to 14" thick. | Brown; moderately compact, clayey, 35 to 40" thick. |
| Summit | Black; silty to clayey, friable, 10 to 14" thick. | Very dark grayish-brown to black moderately compact clay, underlain by yellowish-brown firable clay; 20 to 36" thick. |
| Tillman | Brown; friable, silty to loamy, 8 to 12" thick. | Reddish brown; moderately compact, clayey, 30 to 35" thick. |
| Vernon | Red to reddish brown; friable, loamy to sandy, 2 to 10" thick. | Red; friable, loamy to sandy clay, 10 to 14" thick. |

| Soil | Upper portion of soil profile | Lower portion of soil profile |
|---|---|---|
| Woodward | Red to reddish brown; friable, loamy to sandy, 8 to 12" thick. | Red to brown red; loamy, 14 to 20" thick. |
| Yahola | Chocolate red to red; friable, loamy to sandy; thickness variable. | Red; moderately loose to incoherent, sandy 20 to 30" thick. |
| Zita | Brown; friable, loamy to sandy, 7 to 12" thick. | Brown to yellowish brown; friable, clayey, 12 to 18" thick. |

| Soil | Parent Material | General Feasibility for Trees |
|---|---|---|
| Abilene | Tertiary and Quaternary silts and clays. | Fair to difficult. |
| Abilene | Tertiary and Quaternary sands. | Fair to good. |
| Amarillo | Tertiary and Quaternary silts and clays. | Difficult. |
| Amarillo | Tertiary and Quaternary sands. | Fair to difficult. |
| Calumet | Reworked silts and clays. | Difficult to unsuited. |
| Enterprise | Wind-blown sand. | Fair to difficult. |
| Foard | Permian and Triassic "Red Beds." | Difficult. |
| Lincoln | Recent sands and sand-silt mixtures. | Good. |
| Miles Enterprise | Tertiary and Quaternary sands and sandy clays. | Good. |
| Miller | Recent "Red Beds" sediments. | Good. |
| Mutual | Permian and Triassic "Red Beds." | Good. |
| Potter | Tertiary silts and clays. | Difficult. |
| Pratt | Tertiary and Quaternary sands and gravels. | Fair to Good. |
| Pullman | Tertiary silts and clays. | Difficult. |
| Randall | Silts and clays (lacustrine). | Unsuited. |
| Richfield | Tertiary silts and clays. | Fair to difficult. |
| Rough broken land | Variable. | Variable. |

| Soil | Parent Material | General Feasibility for Trees |
|---|---|---|
| Spur | Recent sand, silt, and clay sediments. | Good. |
| St. Paul | Permian and Triassic clays and sandy clays. | Fair to good. |
| Summit | Limestone. | Good. |
| Tillman | Permian and Triassic clays, and sandy clays ("Red Beds"). | Fair to difficult. |
| Vernon | Permian and Triassic clays, and sandy clays ("Red Beds"). | Good to difficult. |
| Woodward | Permian and Triassic clays, and sandy clays ("Red Beds"). | Good. |
| Yahola | Recent "Red Beds" sediments. | Good. |
| Zita | Tertiary silts and clays. | Fair to difficult. |

Source: Possibilities of Shelterbelt Planting in the Plains Region, 146-147.

to determine at the time, but after a few weeks it was observed that there was some cutting at the base of the red cedars (Juniperus virginiana L.) and Austrian pines (Pinus nigra austriaca Schneid.); also, particularly in the northern counties, there was damage to the leaves of catalpas (Catalpa speciosa Warder) and Chinese elms (Ulmus parvifolia Jacq.) caused by wind whipping.[21] However, by the end of the season, fourteen miles of shelterbelts had been planted in Oklahoma. These belts averaged a half mile in length, were about 132 feet wide, and contained seventeen to twenty-one rows of trees, ranging in height from eighteen inches to two feet. Eight to ten different species of trees were used in each belt, with the fast, tall-growing trees being placed in the center rows. Evergreens were placed on each side of these hardwoods, and the slower growing shrubs were planted to aid in starting the lift of the wind over the belt and to prevent the loss of forest litter by the wind, once the belts were firmly established. The majority of these belts were oriented in an east-west direction for protection against the hot summer winds from the south and the cold winter winds from the north.[22]

Meanwhile the first planting season in Texas was not having as much success, mainly because those responsible were slow in organizing the planting program. However, there were planted two one-half mile belts in the state by Oklahoma Shelterbelt personnel.[23]

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[21] U. S. Forest Service. Historical Files of Prairie States Forestry Project. "Oklahoma Planting Report, 1935," Lincoln, Nebraska, 1935, p. 4. (Mimeographed.)

[22] Droze, "The New Deal's Shelterbelt Project, 1934-42," 34.

[23] Perry, "History of the Prairie States Forestry Project," 41.

Besides having a limited amount of planting stock, Carleton attributes the lack of more plantings in Oklahoma and Texas to minimal farmer acceptance of the program. In his work as Shelterbelt Assistant for the Mangum district, he says that he would get the farmer lined up for a shelterbelt and tell him to come in to his office to sign the agreement the next time the farmer was in town. Many times, he relates, the farmer would not come in, mainly because in the interim he might have talked to too many opponents of the program or had read too much of the adverse publicity in the newspapers and magazines. To combat this problem, Carleton persuaded his planting foreman's wife to become a notary public and accompany them on these recruiting tours. Then, once the farmer agreed to plant a shelterbelt, she would notarize the agreement on the spot.[24]

Texas supervisors had a similar problem, and to solve it they recruited farmers, usually prominent members of the community who had planted shelterbelts and who were convinced of their values, to help solicit new applicants.[25] Both procedures apparently worked because with them and more favorable publicity as the project progressed, the applicants increased in the two states.

To carry out the planting operations, the states were divided into districts, each administered by a Shelterbelt Assistant, his foreman, and planting crews. Oklahoma had four districts and Texas had three (Figure 10.[26]). The map only shows two for Texas but the northern district as shown was

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[24]Interview with Howard Carleton, Jr., July, 1969.

[25]Records on Plantings in Texas, Prairie States Forestry Project, Vernon, Texas.

[26]"The Shelterbelt Comes True," Business Week, April 6, 1940, p. 24.

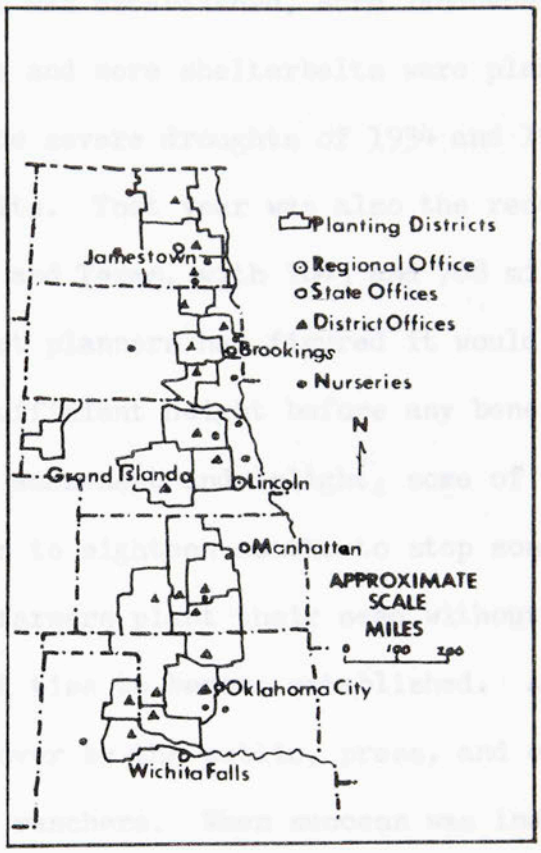


Figure 10. Where the Shelterbelts Were Planted.

divided into the Shamrock district and the High Plains district. In both states, regional offices were established outside of the actual planting zone. Oklahoma City served as the regional office for Oklahoma and Wichita Falls for Texas.

Once the project was established, more landowners became interested in it and more and more shelterbelts were planted. By 1938 the trees had survived the severe droughts of 1934 and 1936, and some value was seen in the belts. That year was also the record planting season for both Oklahoma and Texas, with 1045 and 768 miles planted, respectively. The project planners had figured it would take five years for the trees to reach sufficient height before any benefits could be realized. But, to their amazement and delight, some of the belts were tall enough after fifteen to eighteen months to stop some of the soil drifting and to let the farmers plant their seed without fear of its blowing out before it had time to become established. All of these activities were watched over by the public, press, and especially the Great Plains farmers and ranchers. When success was indicated, it resulted in the aforementioned greater interest of the landowners, and then more belts were planted.

Ultimately, the P.S.F.P. personnel planted nearly 3000 miles of shelterbelts in Oklahoma and over 2000 miles in Texas (Table VIa-c.[27]). Unfortunately, not all of the belts survived--some failed because of physical reasons, such as poor site conditions, poor planting stock, or adverse climatic factors, while others were lost through abandonment. It is the

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27U. S. Forest Service. Prairie States Forestry Project. Record of Plantings By Counties and Accumulative Total of Annual Shelterbelt Planting, Lincoln, Nebraska, 1942.

TABLE VIa - RECORD OF PLANTING BY COUNTIES: OKLAHOMA

*Denotes Counties Visited in this Study. Miles

| County | 1935 | 1936 | 1937 | 1938 | 1939 | 1940 | 1941 | 1942 | Total |
|---|---|---|---|---|---|---|---|---|---|
| *Alfalfa | -- | -- | -- | -- | -- | 27.87 | 10.13 | 14.87 | 52.87 |
| Beaver | -- | .50 | -- | -- | 6.38 | 2.00 | .12 | -- | 9.00 |
| *Beckham | 1.50 | 31.00 | 29.75 | 136.62 | 34.25 | 20.00 | 23.88 | 3.88 | 280.88 |
| *Blaine | -- | -- | -- | 12.62 | 30.25 | 29.00 | 22.13 | 5.50 | 99.50 |
| *Caddo | -- | -- | -- | 91.25 | 59.87 | 37.13 | 46.12 | 16.62 | 250.99 |
| *Canadian | -- | -- | -- | -- | 1.50 | 13.63 | 6.62 | 3.25 | 25.00 |
| Comanche | -- | -- | -- | 1.25 | 1.75 | -- | -- | -- | 3.00 |
| Cotton | -- | -- | -- | -- | -- | 4.37 | 4.88 | -- | 9.25 |
| Custer | 1.50 | -- | 3.00 | 5.00 | 31.63 | 56.25 | 20.00 | 5.50 | 122.88 |
| Dewey | 1.25 | -- | .75 | .25 | 56.63 | 39.87 | 10.62 | .75 | 110.12 |
| Ellis | 1.87 | 2.88 | 3.88 | 36.00 | 8.37 | 8.63 | 7.25 | .50 | 69.38 |
| Garfield | -- | -- | -- | -- | .88 | 4.87 | 1.50 | 1.63 | 8.88 |
| Grady | -- | -- | -- | -- | -- | 2.75 | 1.00 | .87 | 4.62 |
| *Greer | 1.25 | 61.62 | 39.88 | 51.13 | 50.37 | 36.25 | 28.75 | 2.38 | 271.63 |
| Grant | -- | -- | -- | -- | -- | 22.13 | 26.50 | 8.75 | 57.38 |
| Harmon | -- | 1.50 | 53.62 | 102.25 | 9.25 | 4.38 | 5.50 | .25 | 176.75 |
| Harper | -- | -- | 3.50 | .62 | 9.75 | 4.00 | 8.63 | 1.87 | 28.37 |
| *Jackson | 1.50 | 10.50 | 12.13 | 52.25 | 21.50 | 20.62 | 15.87 | 2.63 | 137.00 |
| Jefferson | -- | -- | -- | -- | -- | 2.00 | -- | -- | 2.00 |
| Kay | -- | -- | -- | -- | 7.38 | -- | -- | 1.38 | 8.75 |
| *Kingfisher | -- | -- | -- | -- | 10.37 | 23.75 | 15.88 | 9.00 | 59.00 |
| Kiowa | .75 | .25 | 15.00 | 77.38 | 28.62 | -- | 2.25 | 1.25 | 125.50 |
| Major | .38 | -- | -- | -- | -- | 2.12 | 2.00 | .50 | 5.00 |
| Oklahoma | -- | -- | -- | -- | -- | .75 | -- | -- | .75 |
| Noble | -- | -- | -- | -- | 4.37 | -- | -- | -- | 4.37 |
| *Roger Mills | 1.50 | 22.63 | 54.62 | 320.00 | 88.00 | 49.13 | 16.62 | .87 | 553.37 |
| Tillman | -- | -- | 3.25 | 19.88 | 2.50 | 2.00 | 9.75 | 2.25 | 39.63 |
| *Washita | 1.50 | 10.00 | 85.75 | 124.40 | 35.50 | 45.75 | 36.12 | 2.88 | 342.00 |
| *Woods | -- | .50 | -- | -- | -- | 11.87 | 25.63 | 5.00 | 43.00 |
| *Woodward | 1.00 | 15.87 | 20.25 | 13.50 | 9.75 | 19.75 | 12.38 | 2.37 | 94.87 |
| Totals | 14.00 | 157.25 | 325.38 | 1044.50 | 508.87 | 490.87 | 360.13 | 94.75 | 2995.75 |

TABLE VIb - RECORD OF PLANTINGS BY COUNTIES: TEXAS

*Denotes Counties Visited in this Study.

Miles

| County | 1935 | 1936 | 1937 | 1938 | 1939 | 1940 | 1941 | 1942 | Total |
|---|---|---|---|---|---|---|---|---|---|
| Bailey | -- | -- | -- | 2.12 | 1.25 | 1.00 | 1.00 | -- | 5.37 |
| Baylor | -- | -- | -- | -- | 1.00 | -- | -- | -- | 1.00 |
| *Briscoe | -- | -- | 3.00 | 55.50 | .50 | .75 | -- | -- | 59.75 |
| *Childress | .50 | 25.50 | 18.00 | 36.50 | 21.12 | 8.38 | 5.88 | 6.37 | 122.25 |
| Clay | -- | -- | -- | -- | 2.37 | .13 | .50 | 1.00 | 4.00 |
| Cochran | -- | -- | -- | 1.88 | 2.00 | 2.25 | -- | -- | 6.13 |
| *Collingsworth | -- | 54.00 | 17.50 | 50.00 | 18.50 | 21.38 | 10.12 | 3.63 | 175.13 |
| *Cottle | -- | -- | 22.50 | 141.75 | 18.38 | 8.62 | 2.25 | 1.50 | 195.00 |
| Dickens | -- | -- | -- | -- | 7.75 | 12.50 | 1.75 | -- | 22.00 |
| *Donley | -- | -- | -- | 3.50 | 79.75 | 25.00 | 17.62 | 1.00 | 126.87 |
| Floyd | -- | -- | -- | 17.25 | 4.88 | -- | .75 | -- | 22.88 |
| *Foard | -- | 5.50 | 7.00 | 3.25 | 13.25 | 5.87 | 2.88 | -- | 37.75 |
| Gray | -- | -- | -- | 13.75 | 29.75 | 8.13 | 3.25 | .75 | 55.63 |
| Hale | -- | -- | -- | 2.50 | 7.25 | .75 | -- | -- | 10.50 |
| *Hall | -- | 31.25 | 64.50 | 30.50 | 66.50 | 12.00 | 3.87 | 6.00 | 214.62 |
| Hardeman | -- | 23.50 | 15.00 | 16.50 | 17.12 | 28.88 | 20.50 | 3.00 | 124.50 |
| Haskell | -- | -- | -- | -- | -- | .62 | 2.25 | -- | 2.87 |
| *Hemphill | -- | -- | -- | 25.25 | 22.25 | 32.12 | 3.75 | 1.25 | 84.62 |
| Hockley | -- | -- | -- | 2.00 | 2.25 | 1.87 | -- | -- | 6.12 |
| King | -- | -- | -- | 3.25 | 8.75 | 1.62 | -- | -- | 13.62 |
| Knox | -- | -- | -- | -- | .50 | 9.87 | 4.63 | 1.00 | 16.00 |
| Lamb | -- | -- | -- | 1.00 | 1.25 | 2.63 | .50 | 2.00 | 7.38 |
| Lipscomb | -- | -- | -- | -- | 1.00 | .75 | -- | -- | 1.75 |
| Lubbock | -- | -- | -- | .50 | 5.37 | 1.50 | -- | -- | 7.37 |
| Lynn | -- | -- | -- | 2.00 | 1.00 | .50 | -- | -- | 3.50 |
| *Motley | -- | -- | .50 | 123.00 | 2.13 | 5.25 | 4.88 | .50 | 136.25 |
| Ochiltree | -- | -- | -- | -- | 4.25 | -- | -- | -- | 4.25 |
| Swisher | -- | -- | -- | -- | 1.50 | -- | -- | -- | 1.50 |
| Terry | -- | -- | -- | 2.00 | 1.50 | 4.50 | 5.00 | -- | 13.00 |
| *Wheeler | .50 | -- | 68.50 | 206.00 | 55.25 | 39.13 | 23.87 | 16.62 | 409.87 |
| Wichita | -- | -- | -- | 2.50 | .88 | -- | -- | -- | 3.38 |
| *Wilbarger | -- | 31.65 | 9.00 | 25.50 | 34.75 | 14.12 | 25.75 | 6.63 | 147.00 |
| Yoakum | -- | -- | -- | -- | -- | .75 | -- | -- | .75 |
| Totals | 1.00 | 171.00 | 225.00 | 768.00 | 434.00 | 250.87 | 141.00 | 51.25 | 2042.62 |

TABLE VIc

ACCUMULATIVE TOTAL OF ANNUAL SHELTERBELT PLANTING: OKLAHOMA

| State &Year | Miles | Acres | Farms | Trees | Replacements | Total Trees |
|---|---|---|---|---|---|---|
| 1935 | 14.00 | 273 | 38 | 187,495 | -- | 187,495 |
| 1936 | 157.25 | 3,293 | 281 | 1,281,694 | 97,206 | 1,378,900 |
| 1937 | 325.38 | 3,698 | 540 | 1,849,220 | 1,214,396 | 3,063,616 |
| 1938 | 1,044.50 | 14,381 | 1,664 | 7,489,898 | 1,203,311 | 8,693,209 |
| 1939 | 508.87 | 6,816 | 899 | 3,524,370 | 3,279,190 | 6,803,560 |
| 1940 | 490.87 | 4,917 | 903 | 2,981,350 | 2,162,810 | 5,144,160 |
| 1941 | 360.13 | 2,900 | 603 | 1,625,843 | 1,452,436 | 3,078,279 |
| 1942 | 94.75 | 839 | 164 | 467,739 | 260,334 | 728,073 |
| Total | 2,995.75 | 37,117 | 5,092 | 19,407,609 | 9,669,683 | 29,077,292 |

ACCUMULATIVE TOTAL OF ANNUAL SHELTERBELT PLANTING: TEXAS

| State &Year | Miles | Acres | Farms | Trees | Replacements | Total Trees |
|---|---|---|---|---|---|---|
| 1935 | 1.00 | 20 | 2 | 13,880 | -- | 13,880 |
| 1936 | 171.00 | 3,083 | 275 | 1,766,808 | 3,948 | 1,770,756 |
| 1937 | 225.50 | 2,561 | 306 | 1,340,033 | 1,282,280 | 2,622,313 |
| 1938 | 768.00 | 10,439 | 813 | 5,191,200 | 928,410 | 6,119,610 |
| 1939 | 434.00 | 5,628 | 568 | 3,582,200 | 2,768,400 | 6,350,600 |
| 1940 | 250.87 | 2,636 | 292 | 1,477,973 | 1,904,106 | 3,382,079 |
| 1941 | 141.00 | 1,246 | 143 | 740,570 | 1,795,760 | 2,536,330 |
| 1942 | 51.25 | 440 | 54 | 256,061 | 288,818 | 544,879 |
| Total | 2,042.62 | 26,053 | 2,453 | 14,368,725 | 8,971,722 | 23,340,447 |

contention of some that the Forest Service planted belts only where it could find cooperation, especially in the early years of the project, and well it might be, because each Shelterbelt Assistant had a quota to be filled for his district. To a certain extent, the fact is borne out by the failures of belts in these districts due especially to poor site conditions, i.e., belts planted in areas of frequent flooding, on sand ridges which could not be cultivated, in root rot areas, or in shinnery. However, once the project's importance was realized, its success encouraged farmers to apply for the belts, and from these applications better sites could be and were chosen.

Yet, some of these same enthusiastic farmers were the cause of the second factor of loss--abandonment. It was the policy of the project not to abandon a planting unless there was absolutely no way of saving it. The biggest reason for abandonment was lack of care of the belt--both in preparation prior to planting and afterwards. It has been stated beforehand that if trees are to survive in the Great Plains, particularly in the Southern Plains, where greater evaporation tends to offset the effect of precipitation, they must be cultivated for as much as five years in order to insure the proper establishment of the planting. In Oklahoma and Texas, many of the farmers were willing to carry out this operation, as long as it was feasible, so they would have a successful planting, but some did not. Table VII[28] shows the total abandonment of shelterbelts in Oklahoma and Texas as of June 1942.

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[28]P.S.F.P. Records of Texas Plantings, Soil Conservation Service Office, Vernon, Texas; P.S.F.P. Records of Oklahoma Plantings, Soil Conservation Regional Office, Fort Worth, Texas.

TABLE VII

| Oklahoma: | Miles | Farms |
|---|---|---|
| Total abandoned previously | 112 1/8 | 178 |
| Total abandoned this fiscal year | 151 6/8 | 238 |
| Total to date | 263 7/8 | 416 |
| **Texas:** | | |
| Total abandoned previously | 297 4/8 | 307 |
| Total abandoned this fiscal year | 8 2/8 | 18 |
| Total to date | 306 6/8 | 325 |

These figures represent only a small fraction of the totals for these states, but the reasons for the abandonment of the belts are important because they reflect the attitudes of the owners, and also these indirectly affected the condition of those belts remaining today. The attitudes of the owners and/or tenants were not the sole reason for abandonment. There were also physical factors, namely those mentioned above. From the records of the P.S.F.P., the following samples reflect the concern of the landowner after the plantings were made:

"Useless to replant as he (owner) is old and tenants won't care for belts."

"Tenant has belt fenced in, using it for pasture. Says he intends to plow it up this fall (1938) as it has been stunted through lack of cultivation during first two years...."

"Tenant was afraid of poison blocks." (for rodents, provided free of charge by P.S.F.P.)

"Neighbor farmer lets his farm blow. Neighbor is stubborn individual who doesn't like trees."

"Tenant says he doesn't have time to take care of trees. Owner trying to replace him."

"Cooperator going out of tree business."

"Hostile attitude of tenant toward shelterbelt. Landlord doesn't care either."

"Poor condition due to change in tenant and absence of landlord."[29]

Other examples cited were belt destroyed by owner, lack of cooperation and ownership changed. These were only a few of the problems the Forest Service had to face in Oklahoma and Texas as well as the other Plains states as it carried out the tree planting program.

For many of the landowners, though, the shelterbelts were serving their purpose in the late thirties and early forties, and they did what was necessary to see that they continued in the same vein. However, as conditions improved and the economy became atuned to the war, the shelterbelts began to be neglected. There were more important things to do--crops to plant and to harvest--and, after all, the trees were established now and they could take care of themselves. Then came the drought of the fifties, and the landowners saw just how well the trees were established. In Oklahoma and Texas, belts that had been planted during the severe drought of the thirties now failed. It was during this period also that many belts were being taken out in these two states. One reason for this move was, of course, the drought. Another reason, and probably more important, was a change in attitude--the belts were planted during a time of crisis and now that it had passed, there was no further need for the belts. The result was the plowing up of many of the shelterbelts in Oklahoma and Texas.

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[29] Ibid. Parenthesis provided by writer for clarification.

In attempting to analyze this change in attitude, several factors begin to emerge. The first of these usually given, particularly by the landowners, is the changing methods of farming. The farmers say that because of the equipment they have now, they can cover larger areas in shorter time than before and still hold the land when it starts to blow. They point to improved farming techniques, i.e., deep plowing, crop residue, strip plowing, and others as being better in holding the land than methods used in the thirties which brought on the "Dust Bowl" days. Therefore, to these farmers the shelterbelts have served their purpose and they are not needed anymore.

A second factor is the failure to follow up the project with a program of education and selling the landowners on the benefits of the shelterbelts.[30] This may have been the fault of the agencies involved, but it must also be remembered that at the time of the project's official termination and transfer to the Soil Conservation Service, the nation had gone to war and all efforts were concentrated in winning it. However, after the war, it appears little effort was made to start such a program. The farmer could have a shelterbelt if he wanted it and could have help in planting it, but usually he was the one who had to initiate the action.

Thirdly, farmers and ranchers like to see a return on their work and, to many of those who took out their belts (or would like to take them out), the land planted to trees could best be used for cropland or some more profitable use. As a result of this way of thinking, the

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[30]Interview with Thomas E. Perryman, District Conservationist, Soil Conservation Service, Cheyenne, Roger Mills County, Oklahoma, September, 1969.

belts usually came out. As one conservationist put it, if the farmer has not seen any benefits after 10 or 15 years, he is not going to. So, he said, the SCS does not try to dissuade him from removing the belts.[31]

The fourth factor is that of not having lived through the "black blizzards" of the thirties, one can not imagine just how bad they really were and how any method which could bring relief was a blessing to the suffering landowner. In order to alleviate their problems, the landowners at that time were willing to experiment with strip plowing, listing, shelterbelts, and anything else, in order to hold their land. Now these landowners have turned over their farms to their sons and grandsons. Since these have not gone through the "black blizzards" and are not really understanding or being able to see the benefits of the shelterbelts, they want them out. So, while the older men want to keep them, the younger continue to seek to take them out, until they win.[32]

Another reason is with both state and federal programs, i.e., grass seeding programs or the Soil Bank program, designed to remove submarginal lands from cultivation and return them to grass, many feel there is not any need for shelterbelts. If belts remain on these lands, when they are removed from such programs, they are usually used as shade areas for livestock.

Also, there is a difference in regional attitude, not just landowner's attitude. As previously mentioned, in the Central and

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[31]Interview with Chester Hufstedler, District Conservationist, Soil Conservation Service, Childress, Childress County, Texas, October, 1969.

[32]Interview with James B. McBride, District Conservationist, Soil Conservation Service, Greer County, Oklahoma, July, 1969.

Northern Great Plains states, the belts served a dual purpose, for reducing wind velocity and for acting as snow traps, in other words, as an extra source of moisture. There is snow in the Southern Plains, but not to the extent and duration as in the north. Therefore, the feeling is that the belts use moisture necessary for crops, particularly along the western limit of what was the shelterbelt zone. In these regions, for example, Roger Mills, Ellis, and Harper counties in Oklahoma, and Hemphill and Lipscomb counties in Texas, belts were hard to establish and many died because of lack of moisture and care. However, where belts were able to be established in these areas, they have been of great benefit in protecting livestock from the northers that invade the area.

Another factor mentioned is that shelterbelts harbor insects which are injurious to crops, especially cotton. Studies were conducted in Wilbarger and Foard counties, Texas and from them it was determined that boll weevil populations were heaviest in shelterbelts, chinaberry, and plum thickets.[33] The district conservationist said this caused quite a stir among landowners with shelterbelts, resulting in the removal of numerous belts.[34] However, one entomologist with the Oklahoma Department of Agriculture said that the boll weevil population may be a significant

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[33]Interview with Frank L. Duncan, District Conservationist, Soil Conservation Service, Vernon, Wilbarger County, Texas, August, 1969; Interview with N. T. Drake, County Agent, Vernon, Wilbarger County, Texas, August, 1969; E. P. Boring, III, N. T. Drake, and H. P. Hill, "Over-wintering Boll Weevil Survey in Wilbarger and Foard Counties--1969" (Mimeographed report, 1969), p. 2.

[34]Interview with Frank L. Duncan, August, 1969.

factor in those counties but that the weevils would be there regardless of the presence of the shelterbelts. He further stated, "he would hate to say that is sufficient reason for their removal."[35]

Along the same vein, some landowners object to the presence of shelterbelts because of the wildlife found in them. For example, one Greer County, Oklahoma, resident did not like the belts because they made it easier for coyotes to kill her ducks, geese, and chickens.[36] Another resident in Roger Mills County, Oklahoma, was in the process of removing her belts because deer used them to move from one area to another. The results were that hunters on the road would shoot at the deer and, at various times, had killed several of her cows. Another of her objections was that some of her cattle had eaten the fruit of the Osage-orange and had died.[37]

Finally, another factor which is important in analyzing the landowner's attitude is that of the moisture sapping and shading effect that the belts have on the area adjacent to them. (Figure 11.) This problem is especially noticeable as one goes from north to south. There are several conditions that influence the spread of a tree's root system, but some of the more important are: 1) species of trees, 2) lack of rainfall, 3) light and infertile soils, and 4) competition from other

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[35]Interview with Clyde Bower, Chief of Regulatory Service, State Department of Agriculture, Oklahoma City, Oklahoma, August, 1969.

[36]Interview with Mrs. Frank Babek, Greer County, Oklahoma, resident, July, 1969.

[37]Interview with Mrs. W. Taylor, Roger Mills County, Oklahoma, resident, September, 1969.

Figure 11. Crop sapping effect of a shelterbelt can be seen as the strip between the belt and the plants where there are not any plants or growth is stunted.

trees competing for soil moisture.[38] The seriousness of crop sapping is small, Plainswide,[39] but to the farmer who can see as much as 10 to 12 rows of his crop sapped, it is indeed a serious problem. And, in some cases, this is enough of a reason to remove the belt. Several remedies have been suggested to, at least, control sapping; among the more important ones are chiseling (deep plowing designed to cut the extended roots), planting of grasses over the sapped area, usually rye (Secale cereale), alfalfa, (Medicago sativa), and sand love grass (Eragrotis trichodes), or using the area for a road or turn around for farming equipment. One conservationist felt that the area taken up by the belt was better occupied by "a useful tree crop than by the usual stand of weeds or brush."[40] It should also be stated at this point that there are some farmers who feel that the benefits received from the shelterbelts more than offset the loss due to sapping or shading, primarily in greater yields over the remaining crop land.

So, whatever the reason, whether it is newer and better methods of farming, failure to have a follow-up education program, failure of farmers to see a return from their shelterbelts, not having lived through the "black blizzards," removal of land from cultivation and put to grass, difference in regional viewpoint, harboring of undesirable insects or wildlife, or sapping and shading effect of the shelterbelt,

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[38]Carlos G. Bates, "Windbreaks: Their Influence and Value." USDA Forest Service Bulletin 86, 1911, p. 35.

[39]R. E. Ramig, "Windbreak Crop Sapping" (Typewritten report from Files of Prairie States Forest Project, Lincoln, Nebraska, n.d.), p. 3.

[40]J. H. Stoeckeler, "Shelterbelt Planting Reduces Wind Erosion Damage in Western Oklahoma," Journal of the American Society of Agronomy, XXX (November, 1938), 928.

if the landowner wants the belt taken out, he will. He will even be willing to pay the $50 to $100 an acre it costs to have the trees bulldozed out. This is particularly evident in Oklahoma and Texas.

The above analysis was not meant to show that all farmers and ranchers want the belts removed, because they do not. Several of the landowners and conservation workers interviewed for this study stated this fact. To them the belts were still beneficial, and they would not remove them if they could. Among their reasons for leaving their shelterbelts were that the belts still kept their topsoil from blowing, kept the wind from blowing out their newly planted seeds, that the trees break the monotony of the Plains area, provide a habitat for insect-eating birds as well as game birds, and in some cases, increase the crop yields. Some of the landowners allow hunting in their belts and are investigating the possibility of charging a fee to hunt in them, thus gaining for themselves a small monetary return from their belts. The urban hunter is usually willing to pay for his hunting if he is assured of getting his quarry. While these farmers still see the benefits of their belts, they have one major objection: the belts are too wide and, as a result, many have taken out several rows, not reducing their effectiveness, just their width. One conservationist suggested another reason why many landowners might not remove their belts. With the region's history of drought, even though farming techniques have improved and climatic conditions are better now, in the mind of the older farmers particularly, they might feel that "dust bowl" conditions could return.[41] While the tree belts will not prevent such conditions if they return, together with other practices the belts could help prevent the severe loss of the soil.

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[41] Interview with James B. McBride, July, 1969.

## Success (or Failure) of Shelterbelts

During the late summer and early fall of 1969, fieldwork was conducted in 23 counties in Oklahoma (12) and Texas (11) to determine the status of those shelterbelts remaining in the two states. (Figure 12.) From this survey, several general conclusions were drawn about the condition of the belts examined, which led to the statement at the beginning of this chapter in regard to their generally poor condition. Also, as important to the survey as the actual examination of the shelterbelts were the interviews conducted. When it was feasible, these interviews were made with the original owner or a tenant who had lived in the area during the thirties. Attempts were made to interview conservation personnel who had lived through the same period. The younger conservationists did not know what it was like during the "Dust Bowl" days, and they could not know how beneficial the belts were in retarding wind velocity and slowing up the soil blowing. However, a number of younger owners and conservation workers were also interviewed to see how opinions of the belts had changed over the 30 or so years since the initiation of the project.

In addition to the tools and methods mentioned in the introductory chapter, two other tools proved to be invaluable. The first of these was county maps for Oklahoma and Texas used by the Forest Service investigative team in 1954. They were color coded so at a glance one could determine the time each belt was planted. The other tool was the printed soil surveys for many of the counties used in this study. The aerial photographs in them proved to be of great help in locating the presence of belts not found on the 1954 maps. These two tools complemented each other quite well.

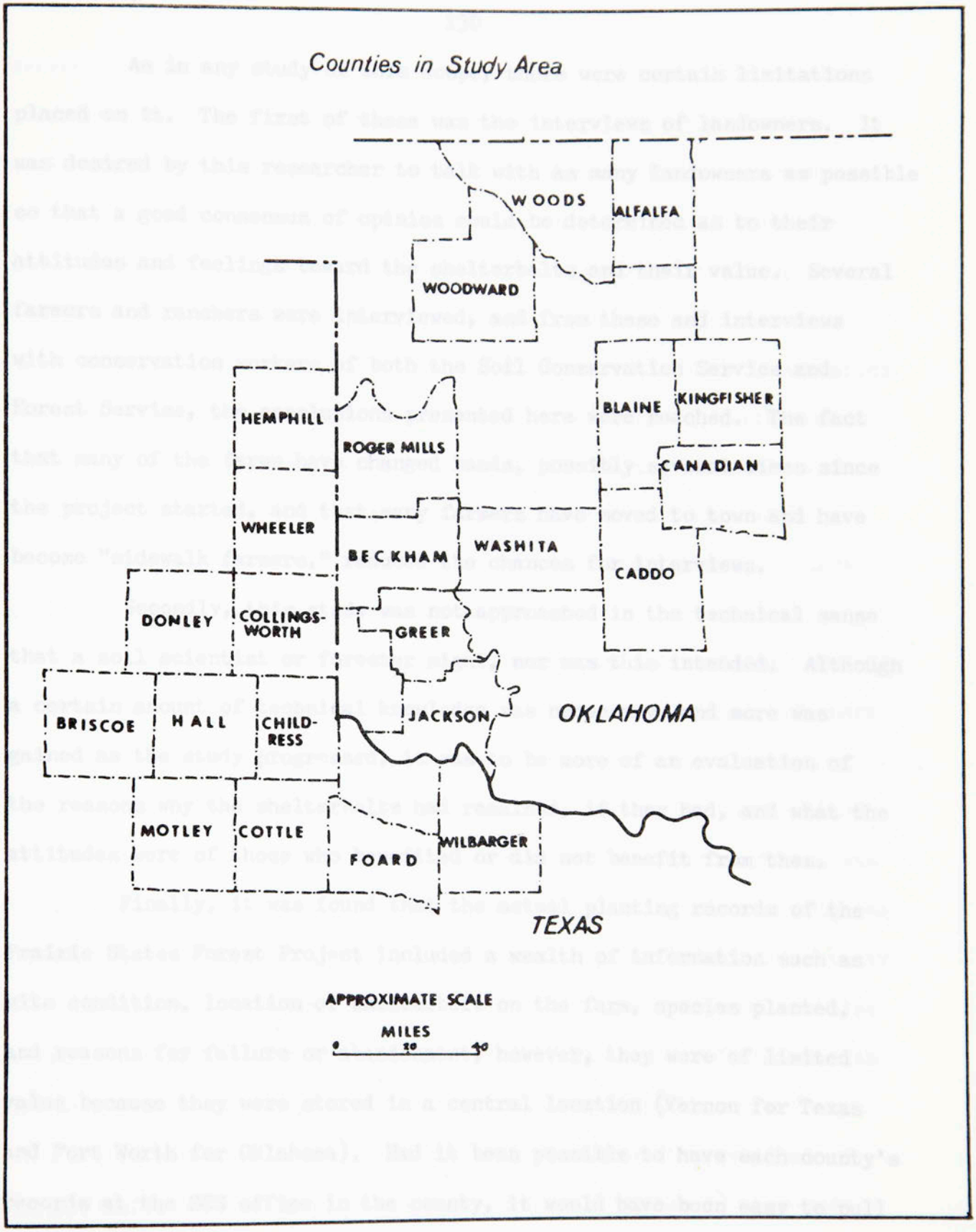
Counties in Study Area
WOODS
ALFALFA
WOODWARD
HEMPHILL
ROGER MILLS
BLAINE
KINGFISHER
CANADIAN
WHEELER
BECKHAM
WASHITA
CADDO
DONLEY
COLLINGS-
WORTH
GREER
BRISCOE
HALL
CHILD-
RESS
JACKSON
OKLAHOMA
MOTLEY
COTTLE
FOARD
WILBARGER
TEXAS
APPROXIMATE SCALE
MILES
0
20
40

Figure 12.

As in any study of this scope, there were certain limitations placed on it. The first of these was the interviews of landowners. It was desired by this researcher to talk with as many landowners as possible so that a good consensus of opinion could be determined as to their attitudes and feelings toward the shelterbelts and their value. Several farmers and ranchers were interviewed, and from these and interviews with conservation workers of both the Soil Conservation Service and Forest Service, the conclusions presented here were reached. The fact that many of the farms have changed hands, possibly several times since the project started, and that many farmers have moved to town and have become "sidewalk farmers," reduced the chances for interviews.

Secondly, this study was not approached in the technical sense that a soil scientist or forester might, nor was this intended. Although a certain amount of technical knowledge was necessary, and more was gained as the study progressed, it was to be more of an evaluation of the reasons why the shelterbelts had remained, if they had, and what the attitudes were of those who benefited or did not benefit from them.

Finally, it was found that the actual planting records of the Prairie States Forest Project included a wealth of information such as site condition, location of shelterbelt on the farm, species planted, and reasons for failure or abandonment; however, they were of limited value because they were stored in a central location (Vernon for Texas and Fort Worth for Oklahoma). Had it been possible to have each county's records at the SCS office in the county, it would have been easy to pull the records for farmers still living on their farms for interviews. This was done in the case of Wilbarger County (Vernon), Texas and it

proved to be a successful method. However, it was impossible to pick a random number of farmers' names from the records and hope that they would still be there when the fieldwork was done in the home county.

Prior to beginning the necessary fieldwork to determine the above stated objectives and those outlined in the first chapter, some method of determining the condition of the shelterbelt was needed. After talking with personnel of the Forest Service and Soil Conservation Service, it was decided that for this study the following items would be looked for: 1) density and continuity of the belts, 2) height (if possible to determine), 3) condition of the interior of the belts (have or have no forest litter, have or have not been grazed, or have or have no weeds), and 4) species of the trees.

Most of the conclusions reached about the shelterbelts remaining in Oklahoma and Texas are applicable to all counties visited. If there are any exceptions, these will be especially noted in the discussion.

One of the first things that is quite noticeable about all of the shelterbelts seen even in the belts that were in good condition was the general lack of care and the consequent run-down condition. (Figures 13 and 14.) The amount of cultivation received prior to and after their planting appears to be very important. Those farmers who took the time to carry out this operation have the better belts today. Those who did not have reaped the benefit of their labor--poor belts.

In those belts where all but two, three, or four rows out of ten are left, several factors are quite evident. Either 1) they had never been planted (occasionally this happened and the rows were to be planted later but for one reason or another, they never were);

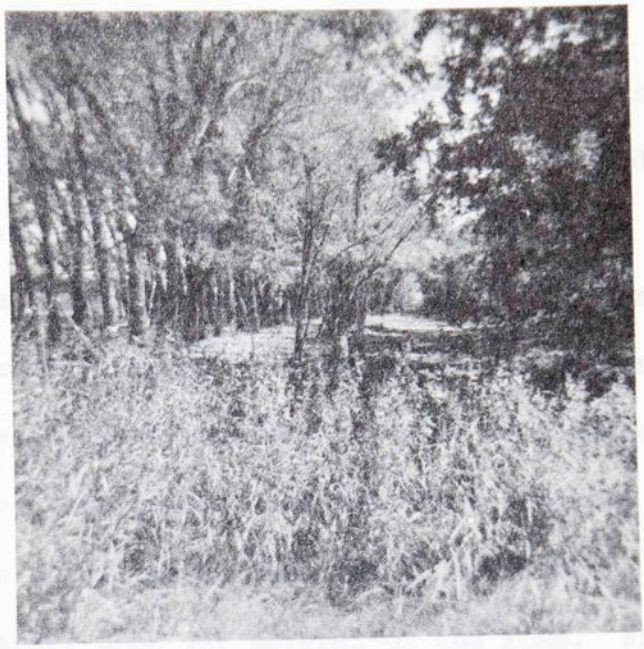

Figure 13.

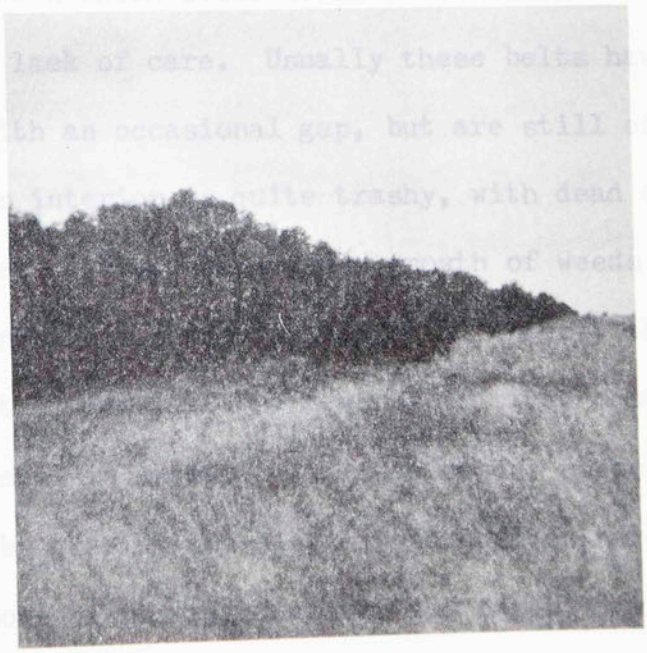

Figure 14.

Shelterbelts showing lack of care and general run-down condition. (Upper: Jackson County and lower: Greer County, Oklahoma.)

2) they had failed to survive because of adverse weather, rodents, poor stock, or weed competition; or 3) they had been grazed out (usually this reason was most prevalent, especially in Oklahoma and Texas). The most conspicuous feature in these belts was the lack of any evidence that the rows had been cut down. These facts were confirmed by the planters' reports at the time or later surveys of the plantings. Generally, if these belts were located in areas of cultivation and grazing was not allowed, the belts were heavily weeded. If they were adjacent to pastures, usually they were grazed down and sometimes were heavily weeded.

However, one other factor must not be overlooked. There were instances when the farmer took out several of the rows. From interviews, it was found that their reasons varied; often they did not like a particular species, usually Chinese elm and sand plum, or because of the sapping effect, or they wanted to return the area to cropland.

Even those belts which could still be considered in good condition now reflect a general lack of care. Usually these belts have all or most of their rows left, with an occasional gap, but are still effective. Most of the time their interior is quite trashy, with dead or dying trees, fallen or standing, dead limbs, and a dense growth of weeds. If the belts had not been grazed and their shrub row was still intact, then there is a good layer of forest litter. If the reverse is true, most of this cover is gone and the bare soil is exposed. In such cases, especially where the soil has been packed by grazing animals, little gullies have formed because the ground has lost some of its rapid absorption capability.

Another feature of the belts, which even the untrained person can detect, is the soil texture. On the sandy soils, the belts are generally

more numerous and have taller, more vigorous trees. (Figure 15.) Conversely, those belts planted on the tighter, more finely textured soils have belts usually stunted, with the larger percentage of the trees gone. (Figure 16.) For example, in Greer County, Oklahoma, those belts in the northeastern portion of the county reflect the former condition and those in the southern part the latter. The soils in the southern part of the county have never been fully developed and have a more salty nature than those in the northeast.[42]

In most of the counties, the tall-growing species, particularly elm and cottonwood, have begun to die out, and in some areas are completely absent from the belts. Where they remain, the tall trees usually have outgrown the intermediate trees and there appear gaps at this level. Figure 17 demonstrates this feature. Belts which still have some of the tallest trees in them (some 40 to 50 feet tall) can still be found in Kingfisher County and Washita County, Oklahoma and Cottle County, Texas.

One of the most common features in belts which have been heavily grazed is the lack of shrub rows, thus exposing the lower level to the sweeping action of the wind, resulting in the above mentioned loss of forest litter. In these belts, where the cattle have browsed through them, they have eaten the leaves off the low hanging limbs, causing them to die. Later the cattle break them off. So, when the shrub row is removed and these branches are broken, the gap at the lower level is as much as four feet. This gap, of course, reduces the effectiveness of the belt.

In those belts which have a good stand of red cedar (Juniperus virginiana L.), Osage-orange (Toxylon pomiferum Raf.), or mulberry

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[42]Interview with James B. McBride, October, 1969.

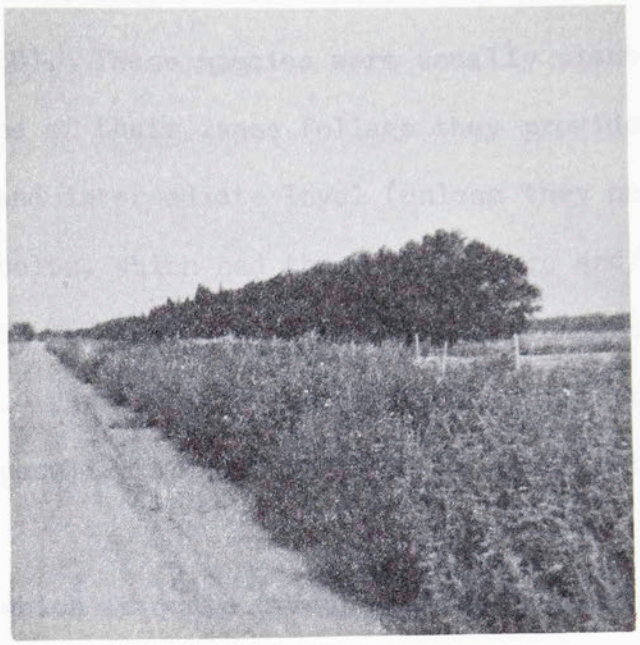

Figure 15. Shelterbelt planted on sandy soil in Blaine County, Oklahoma.

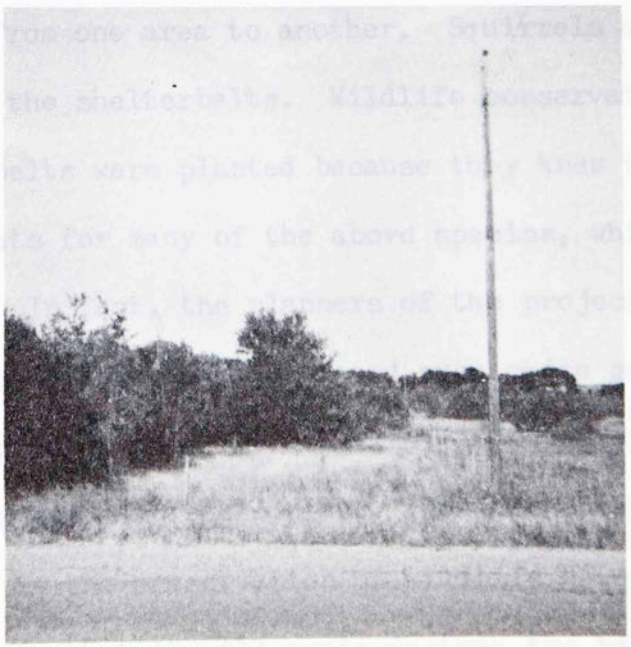

Figure 16. Shelterbelt planted on tighter, more finely textured soils. (Greer County, Oklahoma.)

(Morus rubra L. and Morus alba tatarica L.), and in some cases, catalpa (Catalpa speciosa Warder), they remained in fair to good condition. (Figures 18, 19, and 20). These species were usually planted in the outer rows, and because of their dense foliage they provided good density at the lower and intermediate level (unless they have been heavily grazed). In belts, which had the Osage-orange and/or mulberry and had been planted in reasonably good sites, their height is usually between 25 to 30 feet. The mulberry is particularly effective at this level because of its peculiar ability to fill the gaps left by the taller trees.

One feature which is quite evident as one approaches or walks through the shelterbelts in all of the counties in both states is the abundance of wildlife. There are numerous species of songbirds, hawks, and game birds, especially quail and dove. Some observers have reported the presence of turkeys and pheasants. Deer also use the protection of the belts as they go from one area to another. Squirrels and cottontails make extensive use of the shelterbelts. Wildlife conservationists were glad when the shelterbelts were planted because they knew they would provide natural habitats for many of the above species, which were non-existent at the time. In fact, the planners of the project had this idea in mind when they undertook the operation and even chose several species of trees which would provide food for wildlife. This objective was to help make the Plains a more habitable place. Now these same conservationists and others interested in the preservation of wildlife hate to see the belts being taken out for fear that it will again destroy the habitat of some of these species.[43]

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[43]Interview with Jerome F. Sykora, Biologist, Soil Conservation Service State Office, Stillwater, Oklahoma, July, 1969.

Figure 17. Gaps appear at upper level because the taller trees are dead or dying out. (Blaine County, Oklahoma).

Figure 18. Shelterbelt with a good stand of cedar. (Alfalfa County, Oklahoma).

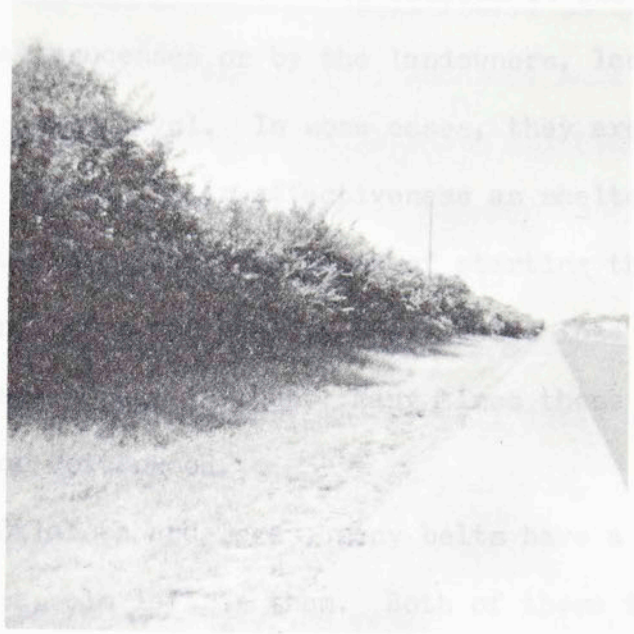

Figure 19.

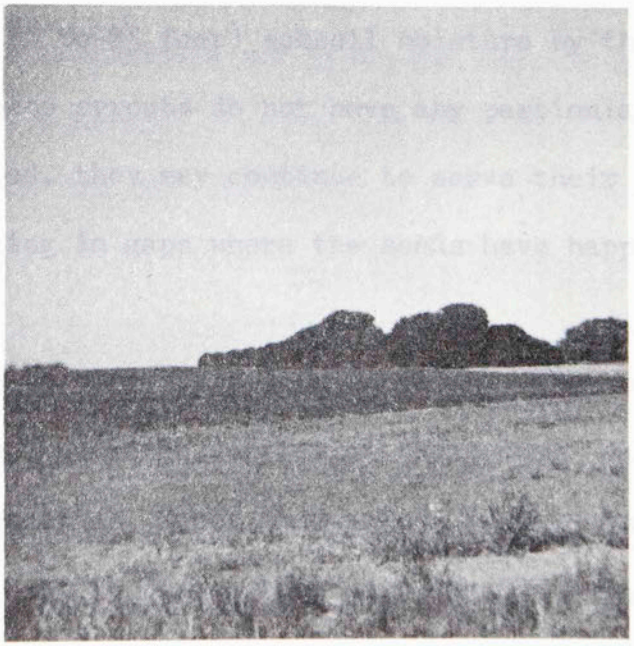

Figure 20.

Shelterbelts showing good density at lower level because of Osage-orange. (Upper: Wheeler County, Texas and lower: Hall County, Texas).

Some of the belts which have been reduced to one or two rows, either through natural processes or by the landowners, lack any worthwhile density at the lower level. In some cases, they are no more than just a row or two of trees. Their effectiveness as shelterbelts is greatly reduced because they lack the means of starting the wind up and over. In Oklahoma and Texas especially, these belts lose more of their effectiveness when gaps appear in them. Many times these belts were made up of only elm or cottonwood.

Throughout Oklahoma and Texas, many belts have a great amount of locust and, in some, elm left in them. Both of these trees are aggressive and, as a result, they are trying to regenerate themselves. At this time, there can be found numerous sprouts of both species of various ages and heights. It is doubtful that this regeneration will attain the height or longevity of the first crop because of "exhaustion of the deeply stored (6 to 25 feet) subsoil moisture by the first tree crop."[44] Although these sprouts do not have any particular pattern, which is to be expected, they may continue to serve their present purpose, that of filling in gaps where the seeds have happened to fall and started to grow.

Where the belts were planted on rangeland, they encountered another problem--shinnery (range vegetation where dwarf oaks are dominant). In many counties, Greer and Jackson in Oklahoma and Cottle, Motley, Wheeler, and Hall in Texas, they were invaded by and sometimes killed out by shinnery. Also in those areas where mesquite is predominant, the shelterbelts also suffered.

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[44]Stoeckeler, "Shelterbelt Planting Reduces Wind Erosion Damage in Western Oklahoma," 931.

One of the disappointing aspects of this study was the inability to gather information on the effects of shelterbelts on crop yields. There were studies conducted in the 1940's, and some work is continuing today, but it is a costly operation. In Oklahoma and Texas, most farmers have not kept records to show the difference between lands protected by belts and those which are not protected. In areas where the land is not protected by shelterbelts, they have used several methods of holding the land; chief among them is strip planting. Usually these areas show some topsoil loss from blowing. In some cases the plants do not seem to be as tall as those planted behind shelterbelts.

One other observation about the remaining shelterbelts in Oklahoma and Texas is that large numbers of them are planted around and in pastures. Some were originally planted there, but with the present trend of returning cropland to grass, many are there for that reason.

These,then, are the findings of this study as to why the shelterbelts are still in Oklahoma and Texas and why the majority of those remaining are in a general run-down and poor condition. There are times when it seems that the shelterbelts are just there and have become an accepted part of the environment until someone asks "why are they there?" Before concluding this section, a word should be said about the predominant species left in the shelterbelts.

Most of the species planted in the shelterbelts were originally picked because of their hardiness to withstand the drier climate in the western part of Oklahoma and the adjacent part of Texas. (Table VIII) Today the trees which are left have had to survive the droughts of the 1930's and the 1950's. Some of those which survived the former could

TABLE VIII - RECOMMENDED TREE AND SHRUB SPECIES,

THEIR ARRANGEMENT IN SHELTERBELTS, AND THEIR ADAPTATION TO SOILS

Texas and Oklahoma

| Group and Species | Seq. of rows[1] | Approximate height and position in shelterbelt | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | -15 ft. | 10-25' | 20-40' | 30-50' | + 50' | 30-50' | 20-40' | 10-25' | -15 ft. |
| Hardwoods: | | | | | | | | | | |
| Cottonwood (Populus sp.) | 1 | - | - | - | - | x | - | - | - | - |
| Sycamore (Plantanus occidentalis L.) | 2 | - | - | - | x | - | x | - | - | - |
| Dwarf Asiatic elm (Ulmus pumila L.) | 3 | - | - | - | x | - | x | - | - | - |
| Honey locust (Gleditsia triacanthos L.) | 4 | - | - | - | x | - | x | - | - | - |
| American elm (Ulmus americana L.) | 5 | - | - | - | x | - | x | - | - | - |
| Russian mulberry (Morus alba tataeria (L.) Loud.) | 6 | - | - | - | x | - | x | - | - | - |
| Paloblanco (Celtis reticulata Torr.) | 7 | - | - | - | x | - | x | - | - | - |
| Osage-orange (Toxylon pomiferum Raf.) | 8 | - | - | - | x | - | x | - | - | - |
| Black locust (Robinia pseudoacacia L.) | 9 | - | - | x | - | - | - | x | - | - |
| Hardy catalpa (Catalpa speciosa Warder) | 10 | - | - | x | - | - | - | x | - | - |
| Chinese elm (Ulmus parvifolia Jacqu.) | 11 | - | - | x | - | - | - | x | - | - |
| Black walnut (Juglans nigra L.) | 12 | - | - | x | - | - | - | x | - | - |
| Little walnut (Juglans rupestris Engelm) | 13 | - | - | x | - | - | - | x | - | - |
| Green ash (Fraxinum pennsylvanica lanceolata (Borkh.) Sarg.) | 14 | - | - | x | - | - | - | x | - | - |
| Ailanthus (Ailanthus altissima (Mill.) Swingle) | 15 | - | - | x | - | - | - | x | - | - |
| Coffee tree (Gymnocladus dioicus (L.) Koch) | 16 | - | - | x | - | - | - | x | - | - |
| Pecan (Hicoria pecan (March.) Britt.) | 17 | - | - | x | - | - | - | x | - | - |
| Post oak (Quercus stellala Wang.) | 18 | - | - | x | - | - | - | x | - | - |
| Conifers: | | | | | | | | | | |
| Austrian pine (Pinus nigra austriaca Schneid.) | 19 | - | - | x | - | - | - | x | - | - |
| Ponderosa pine (Pinus ponderosa Laws.) | 20 | - | - | x | - | - | - | x | - | - |
| Scotch pine (Pinus sylvestris L.) | 21 | - | - | x | - | - | - | x | - | - |

| Group and Species | Seq. of rows | Approximate height and position in shelterbelt | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | -15 ft. | 10-25' | 20-40' | 30-50' | + 50' | 30-50' | 20-40' | 10-25' | -15 ft. |
| Arizona cypress (Cypressusarizonica Greene) | 22 | - | - | x | - | - | - | x | - | - |
| Eastern red cedar (Juniperus virginiana L.) | 23 | - | - | x | - | - | - | x | - | - |
| Rocky Mountain red cedar (Juniperus scopulorum Sarg.) | 24 | - | - | x | - | - | - | x | - | - |
| One-seed Juniper (Juniperus monosperma (Engelm.) Sarg.) | 25 | - | - | x | - | - | - | x | - | - |
| Redberry juniper (Juniperus pinchofii Sudw.) | 26 | - | - | x | - | - | - | x | - | - |
| Oriental arborvitae (Thuja orientalis L.) | 27 | - | x | - | - | - | - | - | x | - |
| Tall shrubs: | | | | | | | | | | |
| Apricot (Prunus sp.) | 28 | - | x | - | - | - | - | - | x | - |
| Redbud (Cercis canadensis L.) | 29 | - | x | - | - | - | - | - | x | - |
| Western soapberry (Sapindus drummondii H. And A.) | 30 | - | x | - | - | - | - | - | x | - |
| Gum elastic (Bumelia lanuginosa (Michx.) Pers.) | 31 | - | x | - | - | - | - | - | x | - |
| Texas pistache (Pistacia texana Swingle) | 32 | - | x | - | - | - | - | - | x | - |
| Russian-olive (Elaeagnus angustifolia L.) | 33 | - | x | - | - | - | - | - | x | - |
| Roughleaf dogwood (Cornus asperifolia Michx.). | 34 | - | x | - | - | - | - | - | x | - |
| Low shrubs: | | | | | | | | | | |
| Desert willow (Chilopsis linearis (Cavanilles de Candolle). | 35 | x | - | - | - | - | - | - | - | x |
| Tamarisk (Tamarix gallica L.) | 36 | x | - | - | - | - | - | - | - | x |
| Lilac (Syringa sp.) | 37 | x | - | - | - | - | - | - | - | x |
| Hawthorn (Crataegus sp.) | 38 | x | - | - | - | - | - | - | - | x |
| Chickasaw plum (Prunus angustifolia Marsh.) | 39 | x | - | - | - | - | - | - | - | x |
| Sumac (Rhus sp.) | 40 | x | - | - | - | - | - | - | - | x |
| Coralberry (Symphoricarpos orbiculatus Muench.) | 41 | x | - | - | - | - | - | - | - | x |
| | | North or east | | | Orientation | | | | | South or west |

| Group and Species | Adaptation to soil classes[2] | | | | | | |
|---|---|---|---|---|---|---|---|
| | Uplands | | | Terraces | | | |
| | A | B | C | A | B | C | D |
| Hardwoods: | | | | | | | |
| Cottonwood | Fa | Fa | - | F | G | G+ | G |
| Sycamore | - | F | F | F | F+ | F+ | F+ |
| Dwarf Asiatic elm | F | G | G | G | G | G | E |
| Honey locust | E | G | G | F+ | G | G | G |
| American elm | E | F+ | F+ | F+ | F+ | F+ | F+ |
| Rusian mulberry | F | G | G | F | G | G | F |
| Paloblanco | G | G | G | G | G | G | G |
| Osage-orange | F- | G | F+ | F+ | G | G | E |
| Black locust | a | a | - | F+ | G | F | F |
| Hardy catalpa | - | - | - | E | F+ | F+ | G |
| Chinese elm | G | G | G | G | G | G | E |
| Black walnut | - | F | F | - | F+ | F+ | E |
| Little walnut | - | F | F | - | F+ | F+ | E |
| Green ash | - | F+ | F | - | F+ | F+ | F+ |
| Ailanthus | E | F | E | F | F+ | F+ | E |
| Coffee tree | - | - | - | - | F+ | F+ | E |
| Pecan | - | E | E | - | E | E | E |
| Post oak | E | E | E | E | E | E | E |
| Conifers: | | | | | | | |
| Austrian pine | E | E | E | E | E | E | E |
| Ponderosa pine | F | F+ | F | F+ | F+ | F | - |
| Scotch pine | E | E | E | E | E | E | E |
| Arizona cypress | E | G | G | E | G | G | E |
| Eastern red cedar | G | G | G | G | G | G | E |
| Rocky Mountain red cedar | G | G | G | G | G | G | E |
| One-seed juniper | F+ | G | G | F+ | G | G | E |
| Redberry juniper | G | G | G | G | G | G | E |
| Oriental arborvitae | E | F | F | E | F | F | E |
| Tall shrubs: | | | | | | | |
| Arpicot | E | G | G | E | G | G | E |
| Redbud | E | F+ | F | F | G | G | E |

| Group and Species | Adaptation to soil classes | | | | | | |
|---|---|---|---|---|---|---|---|
| | Uplands | | | Terraces | | | |
| | A | B | C | A | B | C | D |
| Western soapberry | G | G | F+ | G | G | G | G |
| Gum elastic | - | - | - | F | F | F | E |
| Texas pistache | E | E | E | E | E | E | E |
| Russian-olive | F+ | G | G | G | G | G | G |
| Roughleaf dogwood | E | E | E | F+ | F+ | F+ | E |
| Low shrubs: | | | | | | | |
| Desert willow | E | G | G | E | G | G | - |
| Tamarisk | G | G | G | G | G | G | G |
| Lilac | F+ | G | G | G | G | G | E |
| Hawthorn | E | E | E | E | E | E | E |
| Chickasaw | F- | F | F | F+ | F+ | F+ | E |
| Sumac | E | F | F- | G- | G+ | F+ | E |
| Coralberry | - | E | E | E | F+ | F+ | E |

Soil Classes

A - Sands, includes sands, loamy sands, and loamy fine sands.
B - Sandy loams, includes sandy loams and fine sandy loams.
C - Fine textures soils, includes all soils of finer texture than the above; i.e., very fine sandy loams, loams, silt loams, silty clay loams, clay loams, clays.
D - Low wet soils.

1 - From center line of shelterbelt outward, any species having a larger number in this column will be planted in 1 or more rows outside the row or rows of any species having a smaller number. Ordinarily one or more species will be selected from each of the 4 groups indicated in the first column.
2 - Meaning of symbols:
G - good adaptation to soil indicated
F - fair
E - experimental use in very small amount
- - poor, do not use
+ or - is somewhat better or poorer than letter rating.
Small letters refer to remarks.

It is assumed that the following soils will be avoided, except experimentally: Coarse gravel soils, undrained basins (buffalo wallows), shale-derived clays, alkaline basins, claypan soils.

Remarks:

Cottonwood: a - Use 3 rows throughout Oklahoma part of shelterbelt zone.
Dwarf Asiatic elm: Subject to cotton-root rot infection.
Russian mulberry: Subject to cotton-root rot infection.
Black locust: a - Can be used on uplands if water table is within 15 feet. Borer damage very prevalent.
Ailanthus: Suckering sometimes objectionable.
Ponderosa pine: Ordinarily use not over one row.
Eastern red cedar: Keep south of latitude of Wellington, Texas.
Texas pistache: Subject to cotton-root rot infection.
Lilac: Subject to cotton-root rot infection.

Source: Possibilities of Shelterbelt Planting in Plains Region, 22.

not live through the 1950's. Although this list is not complete nor is it meant to be, there are certain trees which can be found throughout both states, and many times these are all that is left in the belts. In others, they make up part of the belt while the remainder is made up of trees indigenous to that particular part of the state. Therefore, these species are Osage-orange, mulberry, honey locust (Gleditsia triacanthos L.), black locust (Robinia pseudoacacia L.), and if conditions are right, Chinese (Siberian) elm. In those counties in both states south of Highway 66, there is a predominance of hackberry (Celtis reticulata Torr.) and even some chinaberry (Melia azedarach L.). As for conifers remaining, the red cedar is about the only one left. In some belts, the red cedar is joined by oriental arborvitae (Thuja orientalis L.). Other conifers have failed. Briefly, some of those which have failed to survive in Oklahoma and Texas are green ash (Frazinus pennsylvanica lanceolate (Borkh.) Sarg.), desert willow (Chilopsis linearis (Cavanilles) D.C.) and Russian olive (Elaeagnus angustifolia L.).

Finally, earlier in this study, the question was asked, "To what extent has the land used for shelterbelts been removed from its original purposes?" Many of the landowners in Oklahoma and Texas, if they have not taken their belts out completely, have changed how they use them. One of the first new uses, one which has been mentioned previously, is for the protection of livestock. (Figures 21 and 22.) However, the planners of the project foresaw this as a benefit of the shelterbelts. They were thinking in terms of the livestock remaining outside the belt, however, not in them.

Another use made of shelterbelts today is in swine production. This use is particularly in evidence in Wilbarger County, Texas.

Figure 21.

Figure 22.

Shelterbelts showing effects of livestock grazing. (Upper: Greer County, Oklahoma and lower: Wilbarger County, Texas).

Here the swine producer removes the interior rows of his belt and leaves the two outer rows on each side. The crown spread is overlapped in such a way that the swine have ample shade and also have a large area in which to move.

Some conservationists have tried to get the landowners to leave their belts in for the benefit of wildlife and for their esthetic effect in providing a break in the monotony of the Plains landscape. Other uses include storage areas for farming equipment. One belt was even used as a trash dump. So, for good or bad, many of those shelterbelts remaining in Oklahoma and Texas have been removed from their original purposes and have assumed other roles. (Figures 23 and 24.)

Figure 23.

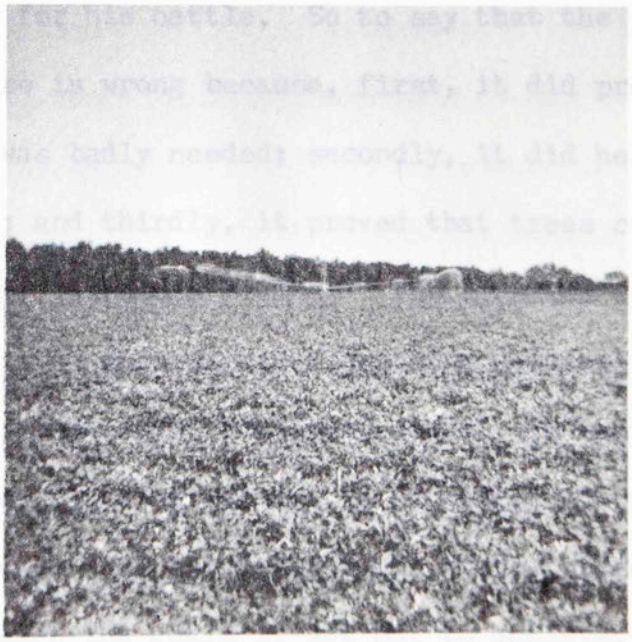

Figure 24.

Shelterbelts can still be used to help irrigation farmers. (Upper: Greer County, Oklahoma and lower: Motley County, Texas).

## CHAPTER VI

## PROSPECTS AND RECOMMENDATIONS FOR THE FUTURE

This, then, has been an evaluation of the Shelterbelt Project, its goals, its successes, and its failures. It has been looked at from a historical viewpoint in a general way and from a geographic standpoint in Oklahoma and Texas. To those who worked on the project it was a success; to those who came later it failed to measure up to its expectations. To the older farmer on the land it meant he could plant his crops without fear of their blowing out; to the younger farmer, however, it has often meant land which could best be used another way. To the rancher, it means shade for his cattle. So to say that the project was essentially a failure is wrong because, first, it did provide employment at a time when it was badly needed; secondly, it did help solve the problem of soil blowing; and thirdly, it proved that trees could be planted in the heretofore "treeless Plains." The agencies concerned made many mistakes, but with each mistake something was learned and improvements were made for the next plantings. What was learned during those eight years of tree planting was and is of benefit to the later tree planters. So it seems that the Shelterbelt Project (Prairie States Forestry Project) did reach the goals it set out to achieve.

The Forest Service knew when it started the program it was not a panacea for all that was wrong with farming in the Great Plains

region, rather, it saw it as one of many remedies offered which could solve the particular problems of that time. Since the project ended, the Soil Conservation Service has integrated the shelterbelts into an overall conservation program. Herein lies the key to the use of shelterbelts and other types of windbreaks--they are and should be used with other conservation practices to hold and control the arable land within the Great Plains region.

Shelterbelts alone cannot do the job, as seen from the experience in Oklahoma and Texas. Here once the people thought they had become established, they left the trees to their own designs to survive in an environment that has always been inhospitable to the growth of trees. The shelterbelts still have a place in these two states because no one can be sure if or when a drought will return to this area where the farmers need all the crop insurance found in good conservation practices they can get. Many still believe that if treatment of the land is carried out properly, there is no need for trees, and well it may be. But, there are farmers today in Oklahoma and Texas who remove their belts to practice better methods,they say, only to find out too late that they still need the belts too.

So, what seems to be needed is a program whereby farmers can be shown that shelterbelts still have a place in the conservation program of the Great Plains--in particular in Oklahoma and Texas. When asked if he thought the Forest Service would be interested in handling another project such as the Shelterbelt, Roberts answered "No." He went on to say that the project had been an emergency program carried out under somewhat adverse conditions, but if a program could be devised where the

Forest Service could take applications and then do nothing but tree planting, then it might be interested.[1] However, the old problem of the "Dust Bowl" era again arises--the overlapping of two agricultural agencies in the same area. Thus to carry out the planting of new shelterbelts in Oklahoma and Texas, the two would have to work together.

A program which might fit the situation in the Southern Plains would be designed at first to educate and demonstrate the value and benefits of shelterbelts.[2] Such a program could make use of those shelterbelts already on the land. Belts which are considered in good condition and located in an easily accessible location in each county, so that other landowners can observe them, should be chosen. These demonstration belts should be cleaned up, with all weeds, dead trees, and limbs removed. Probably the best idea would be to reduce the number of rows to three; in this way the belts would take up less land and would still be effective.

Once the demonstration belts were established, then a program of educating the younger landowners as to their values and proper care could be set up and handled jointly by the Soil Conservation Service and the Forest Service. With a coordinated effort such as this, the new program would benefit from more careful planning, and newer and better supervised techniques could be established. Such techniques would include the need to look more closely at the soils and species to be planted. Each of the two services could greatly profit from the knowledge the other service has in this area of tree planting, and as

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[1]Interview with Paul H. Roberts, September, 1969.

[2]Interview with Albert Engstrom, August, 1969.

a result a better program could be devised to benefit the Southern Plains.

Of course, the biggest obstacle would be the same as it was during the Shelterbelt Project days--the farmer himself. He would have to be shown that the shelterbelt could be a part of the overall conservation program for his farm and not just a bunch of trees put on his land to sap the moisture from his crops. With the research being done today on the effect of shelterbelts on crop yields, the conservationist could show him that the yield is greater in areas out a ways from the belt, and that the sapped area could be planted in grass or used as a turn around or access road to his field. The farmer could also be instructed in the proper care of his belt--how to cultivate and how to thin it out when needed. It would be desirable to set up demonstration belts so he could see for himself how the belt would be beneficial on his own land, and so he could talk to the owner of the belt and get his opinions. If properly carried out, such a program could provide the necessary motivation for farmers to plant more shelterbelts.

If such a program or some alternative program is not devised, it seems assured that the shelterbelts remaining in Oklahoma and Texas will continue to deteriorate until there will be nothing left except shelterbelt remnants. And, those that are remnants today will be completely gone in the next decade or so. It is the considered opinion of many, not only in the Southern Plains, but throughout the whole region, that trees still have a place in the overall conservation program of the Great Plains. The Shelterbelt Project proved that trees could be made to grow here. Now it becomes the responsibility of this generation to see that the next

one does not have to go through the anguish of another "Dust Bowl." To achieve this it may possibly have to devise another program such as the Shelterbelt Project.

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APPENDIX I

E. L. Perry, "History of the Prairie States Forestry Project" (Typewritten manuscript, 1942), p. 12.

On July 11, 1934, the Plains Shelterbelt Project was formally authorized by the President and an Executive Order issued alloting $15,000,000 of drought relief money to carry it on during Fiscal Year 1935. The text of the Executive Order follows:

ALLOCATING FUNDS FROM THE APPROPRIATION TO MEET THE EMERGENCY AND NECESSITY FOR RELIEF IN STRICKEN AGRICULTURAL AREAS

"By virtue of, and pursuant to, the authority vested in me by the Emergency Appropriation Act, Fiscal Year 1935, approved June 19, 1934 (Public, No. 412, 73d Cong.), appropriating $525,000,000 to meet the emergency and necessity for relief in stricken agricultural areas, there is hereby allocated from the said appropriation the sum of $15,000,000 to the Secretary of Agriculture for the planting of forest protective strips in the Plains region as a means of ameliorating drought conditions."

"In carrying out this order the Secretary of Agriculture shall have authority to make all necessary expenditures in the District of Columbia and elsewhere, including but not limited to the employment of such officers, experts, and employees as he may find necessary, to prescribe their authorities, duties, responsibilities, and tenure, and to fix their compensation, for the procurement and/or production of seed and planting stock, for planting operations, for the purchase and/or leasing of the lands to be planted, for technical investigations, for fencing, and for rent."

"The moneys herein made available shall be expended through such agencies, including corporations, as the Secretary of Agriculture may designate; and, with the consent of the State, county, or municipality concerned, the Secretary of Agriculture may utilize such State and local officers and employees as it may deem necessary in carrying out this order."

FRANKLIN D. ROOSEVELT

THE WHITE HOUSE,
July 11, 1934

## APPENDIX II

### SHELTER BELT FROM CANADA TO TEXAS TO BE PLANTED IN DROUGHT AREA

President Allocated $15,000,000 to Initiate Forest Project Which Will Permanently Benefit Great Plains

Work on acquiring land and planting a forest shelter belt, one hundred miles wide, and extending more than 1,000 miles through the drought area from the Canadian Border to Texas, will be started at once by the U. S. Forest Service. This announcement was made today by Secretary Wallace and Chief Forester F. A. Silcox, immediately following the release by the White House of President Roosevelt's executive order of July 11, 1934, which allocated $15,000,000 of emergency funds to the Department of Agriculture to initiate the project.

By direction of the President, Secretary Wallace has authorized the Forest Service to make expenditures for the present of only $10,000,000 of the total sum provided in the executive order.

Beginning at the Canadian Border, this protection forest belt will stretch down through the Dakotas, Nebraska, Kansas, Oklahoma, and into the Panhandle of Texas.

The area immediately affected approximates 20 million acres. Of this, about 1,820,000 acres will be planted to trees. According to the plan of the project, windbreaks running north and south will be planted one mile apart, making approximately 100 parallel windbreaks in the 100-mile belt. Each windbreak will be 7 rods wide, covering 14 acres out of each square mile.

The western border of this belt will follow approximately the line of 18 inches annual rainfall.

"The Great Plains have been suffering acutely from prolonged drought. The economic and social consequences are extremely serious. The dust storm which recently blanketed the country from the Dakotas to the Atlantic seaboard is an ominous reminder of the incipient desert conditions in the Great Plains area."

"Man cannot change all the forces of weather, but he can modify his own surroundings. He can ameliorate the effects of weather on a large scale, just as he can around his own home. If the surface velocity of the wind over a wide area can be broken and decreased even slightly, soil will be held in place, the moisture of the soil will be conserved, and havens of shelter will be created for man, beast, and bird."

"This plan aims at permanent benefit and protection of the Great Plains belt and east of it."

Only the land planted to the shelter strips will be acquired by the Government through purchase, lease, or cooperative agreement, Mr. Silcox explained. The areas in between these shelter strips will remain in private ownership and, consequently, farmers on this land will be able to produce crops and livestock under the most ideal conditions.

Fencing of the windbreaks is essential for protection of the woodlands against cattle. In many cases, existing fences will be utilized.

This tremendous project, Silcox explained, is not without precedent. On the contrary, it is based upon the long-time experience of several European countries, notably Italy, Hungary, and Russia. In those countries, where shelter belts have been used over a period of many years and on an extensive scale, farming enterprises have been stabilized and have succeeded even in the worst seasons when farmers in other areas have suffered serious losses to their crops through adverse weather conditions.

"Furthermore, the planting of shelter belts in the Great Plains region is not an untried undertaking," Silcox added. "Since early settlement of the prairies, settlers have frequently planted strips of woods to protect their homes and fields from the blistering winds of summer and the cold blasts of winter. In more recent years, the Federal and State Governments have cooperated in encouraging windbreak planting by distributing trees from their nurseries. The protective influence of shelter belts has been amply proved both through research and practical demonstration. All of the shelter belt planting, however, even of recent years, has been of a scattered nature."

The ultimate cost of the project is estimated at approximately $75,000,000. Over 90 percent of this amount will go to farmers, largely for employment of labor for plowing, fencing, planting, and caring for the trees. It is expected that about 25 percent of the expenditure can be made in the next 12 to 18 months.

One of the first steps will be the establishment of a chain of nurseries where the seedlings will be grown for planting. Seed collection and a limited amount of planting will start this year. Large-scale planting of the windbreaks will be under way by 1936, and the entire area, it is expected, will be planted within the next ten years, at a rate of about 180,000 acres per year.

Trees of native origin will be used. One of the best and most adaptable trees of the region is green ash, and this will be supplemented by native forms of hackberry, elm, bur oak, etc., on heavier soils, and on the higher, lighter, and sandy soils, ponderosa pine, and red cedar may be employed. In some cases, Black Hills spruce and native cottonwoods may be utilized.

The Forest Service is preparing to establish a special field office in a central location for the conduct of the work. Existing field stations will also be utilized, especially the Lake States Forest Experiment Station, which maintains a branch station in North Dakota where experiments in planting in the semi-arid region have been going on for several years. Close cooperation with the States and with a number of other Federal agencies will be necessary in many phases of the project.

July 21, 1934

Source: Press release of unknown source quoted by E. L. Perry, "History of Prairie States Forestry Project" (Typewritten manuscript, 1942), pp. 13-16.