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Primeval Forest Types in Iowa¹

By WILLIAM A. DICK-PEDDIE

The vegetation in Iowa has changed greatly since the advent of the settlers. The prairie in Iowa has been virtually destroyed and there has been an advance of forest in all parts of Iowa (6). This study was made in order that a clearer understanding might be obtained of the primeval forest complex and its relation to prairie.

Prairie made up about eighty-five per cent of the total vegetation in Iowa at the time of settlement (4). The forested area was completely cleared, hence, a study of the original forest as a link to yesterday is exceedingly difficult. It is doubtful if any of the trees representing the primeval forest still stand. Under these conditions, one of the best and most satisfactory methods of studying the forests of the past has been to utilize the original territory survey records. This was the method used for this study. Workers in Indiana, Wisconsin, Ohio and Michigan have made similar studies using this method (2) (5) (8) (9).

METHODS

Three Iowa counties, Allamakee, Jackson and Lee were the areas studied in this investigation (Fig. 1). Allamakee county is in the northeastern corner of Iowa. Lee county is in the southeastern corner of Iowa. Jackson county is on the Mississippi River about halfway between Allamakee and Lee.

The investigator was able to obtain a surprisingly accurate and detailed sampling of the trees in existence before settlement by referring to the original surveyors' notes, found in the Secretary of State's Office in Des Moines, Iowa. The survey was begun in 1836 and completed in 1859.

The survey included the placing of a post, stake or other mark at each quarter section and each section corner. In order to facilitate finding or relocating the corners the surveyors were instructed to cite trees, wherever possible, near each corner post giving the name and size of the tree plus the bearing and distance of the tree from said corner post (7). These trees were called witness trees. The surveyors were to choose any healthy tree, usually not less than five inches in diameter (7). All through the prairie and prairie peninsula states the surveyors seemed to be remarkably consistent in their naming of the trees as attested by Sears (9). The surveyors

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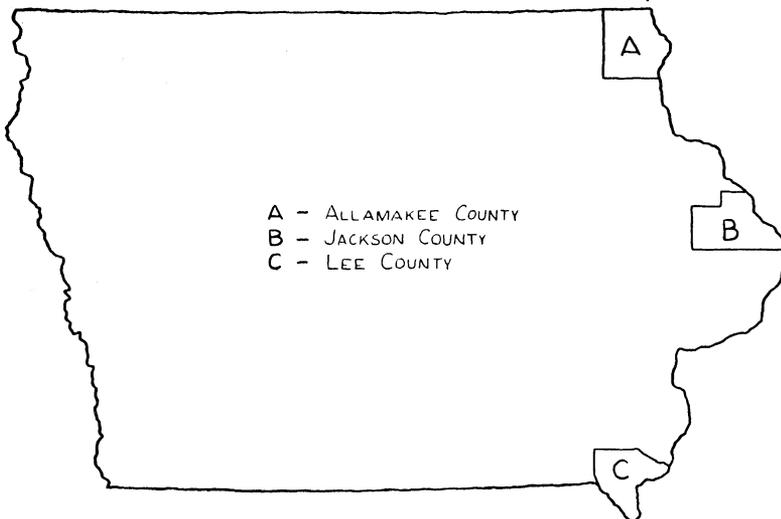


Figure 1. Areas used for this study.

also indicated the points at which they entered prairie or left prairie. This practice enables the investigator to reconstruct the forest-prairie ecotone.

OBSERVATIONS

Some trees were named in such a manner as to leave some doubt as to species. For example only the term Hickory was used by the surveyors when there must have been both *Carya ovata* and *C. cordiformis*. In some cases the surveyor would name specifically and again not. For example in Allamakee county the surveyor recorded 2 black ash, 3 white ash and 156 by the word ash alone. The word ash alone could have referred to *Fraxinus nigra* or *F. americana* mentioned above or to *F. pennsylvanica*, *F. penn.* var. *lanceolata* and in Lee county even *F. quadrangulata*. In such cases where only the general names were used or some doubt as to what species was intended, the investigator grouped the trees collectively into one genus. Two examples are: *Carya* spp. and *Fraxinus* spp.

Some common names have changed since the survey. By checking known ranges, sites and similar work done in other states the following changes were noted.

<u>Surveyors' Name</u>	<u>Present Common Name</u>
Jack Oak	Northern Pin Oak
Yellow Oak	Chinquapin Oak
Spanish Oak	Scarlet Oak
Swamp Oak	Swamp White Oak
Butternut	White Walnut
Coffeenut	Kentucky Coffee Tree
Pecan	Pecan Hickory

Table 1

Average distance in links from the corners to the trees in oak-hickory and oak-maple-linden communities.

Species	Average Distance	
<i>Quercus macrocarpa</i>	104.45	
<i>Q. alba</i>	78.89	
<i>Q. velutina</i>	88.37	
<i>Carya</i> spp.	79.82	
Average of oak hickory		88.88
<i>Quercus rubra</i>	36.12	
<i>Acer saccharum</i>	29.06	
<i>Tilia americana</i>	28.88	
Average of oak-maple-linden		30.50

Thirty-six species or genera were recorded in the three counties. The number of species, thirty-four, recorded in Lee county is a good sample of those found in that county today (3). The number of species per county diminishes to the north even though the total amount of forest per square mile per county does not diminish in that direction.

A total of 8866 trees was recorded for the three counties of which *Quercus* spp. made up about 68 per cent. The trees comprising an oak-hickory community (3), *Quercus* spp., *Carya* spp., *Ostrya virginiana* and *Prunus serotina*, made up 81 per cent of the primeval forest cover in the counties studied. The total number of trees per square mile per county also diminished to the north.

Quercus macrocarpa made up 7 per cent of the forest cover in Lee county, 18 per cent in Jackson county and 30 per cent in Allamakee county. The percentage of *Carya* spp. in Lee county was three times that in either Jackson or Allamakee counties.

The distance of the trees from the corners is another indicator of density of forest cover. The distance was recorded in links (1 link = 7.92 inches). Table 1 shows the average distance from the corners, in links, of the dominant species of both oak-hickory and oak-maple-linden communities. The oak referred to in the latter communities is *Quercus borealis*. The average distance for oak-hickory is approximately three times that of the oak-maple-linden.

Tree diameters ranged from 4 inches to 85 inches. The diameters diminish to the north as did the number of species per county and the total number of trees per county (Table 2).

Oak-maple-linden communities were found in limited areas in all three counties.

In forested lowlands along rivers and streams the typical upper flood plain species, *Fraxinus* spp., *Ulmus* spp., *Juglans cinerea*,

Table 2

Average diameter in inches of each species comprising 2% or more of the trees recorded for each county taken from the original surveyors' notes.

	Allamakee	Jackson	Lee
<i>Quercus alba</i>	13.581	16.633	18.788
<i>Quercus macrocarpa</i>	9.978	11.093	16.352
<i>Quercus velutina</i>	12.391	14.539	16.726
<i>Quercus rubra</i>	12.400	15.971	17.932
<i>Carya</i> spp.	9.722	9.161	12.019
<i>Tilia americana</i>	11.147	15.231	16.039
<i>Acer saccharum</i>	13.018	13.819	20.977
<i>Fraxinus</i> spp.	10.806	12.600	14.167
<i>Ulmus</i> spp.	15.237	14.398	13.637

Celtis occidentalis and the lower flood plain species, *Salix* spp., *Betula* spp., *Populus deltoides* and *Platanus occidentalis* (3) were found.

A wide ecotone, often referred to in the literature as oak barrens (3), was found in some areas, particularly in the north. These areas of oak barrens could be recognized by the investigator when a witness tree was recorded from an area which the surveyor had called prairie.

DISCUSSION

The study indicated that forest invasion was definitely from the south. The evidence is summarized as follows:

1. The greatest number of species was reported in Lee county with the next largest number reported in Jackson county.
2. Lee county had the greatest total number of trees, followed again by Jackson county, indicating a more closed condition to the south.
3. The percentage of the prairie invader, *Quercus macrocarpa* (3), in Allamakee county was approximately two times that in Jackson county and four times that in Lee county indicating a relatively stable condition in Lee county. *Carya* spp. indicates a well developed oak-hickory community; hence the prominence of *Carya* spp. in Lee county shows a greater age of the forest in that area.
4. The greater average diameter of the dominant species in Lee county gives evidence of an older stand in that county.
5. Further indication of invasion from the south was the relatively open nature of the forest in Allamakee county indicated by the greater average distances of trees from the corners.

This study was not designed to determine whether or not the invasion was also from the east.

It appears in the counties studied that one hundred years ago the

forest was on the move and advancing from a southerly direction. The forest was made up for the most part of oaks and their community associates. The water courses had the typical flood plain trees and where conditions were right some oak-maple-linden stands existed. The transition areas between prairie and forest in the north were often rather extensive oak barrens.

The picture of Lee county vegetation one hundred years ago was one of well developed stands of forest which were dense and with considerable species variation. The prairie-forest ecotone was abrupt and well defined. Allamakee county forests on the other hand had fewer species and had a great predominance of bur oaks which were scattered and relatively small. Sometimes the bur oaks were so scattered as to make the prairie-forest ecotone difficult to establish. The vegetative picture of Jackson county was somewhat between that of the other two counties.

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