

# PRESETTLEMENT VEGETATION OF COLES COUNTY, ILLINOIS

John E. Ebinger  
Botany Department  
Eastern Illinois University  
Charleston, Illinois 61920

## ABSTRACT

Forest and prairie vegetation of Coles County, Illinois in presettlement times is mapped using the General Land Office survey notes of 1821 and 1822. Prairie was the most extensive vegetation type covering 60% of the county. Twenty-one tree species and three species groups (hickories, elms, and ashes) were listed in the original survey as witness trees. White oak, with an importance value of 85.5 was the leading dominant, followed by black oak, hickories, red oak, and elms.

## INTRODUCTION

Knowledge of presettlement vegetation is necessary for the study of long term ecological processes and as base line data for the study of present day plant communities. In general, trends in forest succession and the shift of plant community boundaries occur over a period of time and are usually not detectable in short-term studies. Therefore, a comparison of presettlement vegetation with that existing at the present time allows an estimation of the degree and direction of vegetation changes during the last 150 years or so in central Illinois.

The General Land Office survey notes are occasionally being used to reconstruct presettlement vegetation, and when used in conjunction with non-survey sources of information provide a reasonable picture of the vegetation prior to settlement (Bourdo, 1956). In Illinois the extent of prairie was determined using this material (Anderson, 1970), as well as the presettlement vegetation of Lake County (Moran, 1976), Kane County (Kilburn, 1959), and Douglas County (Ebinger, 1986a). In surrounding states this technique was used extensively to study the presettlement vegetation of various areas in Wisconsin by Barnes (1974), Cottam (1949), Ellarson (1949), Goder (1956), Neuenschwander (1956), and Stroessner and Habeck (1956), as well as occasionally in Michigan (Kenoyer, 1933), and Indiana (Patzger and Patzger, 1950).

In the present study, the presettlement vegetation of Coles County, Illinois was reconstructed using the General Land Office survey notes. Coles County is located in east-central Illinois (88° 15' W, 39° 30' N) in the extreme southern part of the Grand Prairie Division (Schwegman, 1973). The county has an area of 509 square miles. In the northern half of the county the topography is, for the most part, flat to gently rolling due to ground moraine deposits resulting from Wisconsin glaciation. The southern half is broken and rolling due to the terminal moraine of Wisconsin glaciation and extensive down-cutting of the Embarras River. Two river systems traverse the county, the Kaskaskia River in the northwest corner of the county, and the Embarras River which runs north/south in the eastern part of the county. The Kaskaskia River has a relatively shallow valley, while the Embarras River is deeply entrenched as it was a major water course during parts of the Wisconsin glaciation. The first settlers entered Coles County in 1824 and the first settlement was established in 1826 (Anonymus, 1879). Thus the vegetation present when the county was surveyed in 1821 and 1822 was not greatly changed by European man.

## METHODS AND MATERIALS

Microfilms of the General Land Office survey were examined as were the original survey notes and plats at the Illinois State Archives, Springfield, Illinois. These survey notes may be used to obtain historical ecological data since the surveyors generally marked the corners of their survey by blazing one to several trees, and listed the species, distance and direction from the corners, as well as the trees dbh.

From the surveyor's notes all information about witness, corner, and line trees were recorded, along with any mention of prairie or other natural features. From these data the total individuals, total basal area (sq. ft.), average diameter, average distance to corner posts, relative density, relative dominance, and importance value (IV) were calculated for all woody species. Frequency was computed by considering the witness trees at each corner post as comparable to a quadrat in which only two trees are present (Cottam and Curtis, 1949). The calculation of the IV follows the procedure outlined by McIntosh (1957) in which the IV is the sum of the relative density and relative dominance. Also the surveyor's notes and plat maps, along with soil (Smith *et al.*, 1929) and topographic maps were then used to determine the extent of prairie and forests in the county (Figure 1). This was possible since the surveyors noted the point along the section line where they entered another vegetation type, and also noted if the corner posts were located in forest or prairie. Since the interior of sections were not surveyed, small prairie inclusions, ponds, and other natural features may not have been recorded.

## RESULTS AND DISCUSSION

The surveyors recorded 1780 corners in the original survey of Coles County, Illinois. Of this total 1065 corners are listed as being prairie, while 715 corners are listed as being in forest. Of the corners in the forest, 563 have two witness trees listed, 126 have only one tree listed, and 26 have no trees listed. These data indicates that prairie was the most widespread community type, covering approximately 60% of the county, while forest, which was generally restricted to the region associated with the Embarras and Kaskaskia Rivers, accounts for the remaining 40% (Figure 1).

Though prairie vegetation was common in the county, very little information concerning this community type is available in the surveyor's notes. No prairie species are listed, and only general comments concerning soil moisture conditions and topography are given. The most common comments are "land rich and rolling, fit for agriculture", "land rich and rolling prairie", "land gently rolling prairie", or "level wet prairie". This latter comment is used to describe the prairie in the extreme northwest and northeast parts of the county where numerous shallow ponds and lakes are reported by the surveyors (Figure 1). The surveyors also listed an extensive hazel thicket on the prairie (Sect 17 T12N R14W), a region where numerous rocks were exposed (Sect 17 T14N R9E), a region where scattered trees occurred on the prairie (T14N R10E), and a region where scattered hickories occurred on the prairie (T14N R14W). Also, a few small prairie areas were recorded in the upland forests along the Embarras River, as well as one extensive prairie inclusion in the south-central part of the county (T11N R9E).

More information is available in the surveyor's notes concerning the original forest vegetation of Coles County, Illinois. Not only did the surveyors give the names and diameters of the witness and line trees, but they usually listed the common forest trees found, as well as some of the woody understory vegetation. The most common surveyor's comments of the forested areas near the Embarras River are "timberland poor, hilly and broken, unfit for agriculture", or "timberland mostly hill and poor", while near the prairie-forest border the most common comments are "timberland gently rolling", "timberland rich and level to gently rolling, thinly covered with B(lack) oak, understory hazel and vines", "timberland mostly rich and rolling to flat", or "gently rolling, good soil, about 1/2 level and wet soil". The surveyors also listed hazel as the common understory forest species, though sassafras, spice bush, brush, briars, and vines are common entries. An area of scattered trees, called a "glade", is listed by the surveyors (T13N R10E), as is a flat "barren" for the forested areas of Sections 23, 24, and 26 T14N R10E. Both terms probably refer to upland forest areas where the trees are scattered and stunted. No information is available in the surveyor's notes concerning the few prairie groves recorded.

The surveyors listed a total of 21 species of witness trees in their survey notes (Table 1). They also used the collective names of hickory, elm, and ash, which undoubtedly refer to two or more species. Furthermore, the surveyors listed only the common names, so some care was taken in assigning scientific names. For most entries little or no difficulty was encountered since the same common names are presently used, and the species are still common in woodlots throughout the county. The only names which presented a problem are overcup oak, spanish oak, and willow oak which probably refer to *Quercus macrocarpa*, *Q. palustris*, and *Q. imbricaria* (Kilburn, 1959; Moran, 1976; Ebinger 1986a).

Of the 1252 witness trees recorded by the surveyors white oak is by far the most important. This species has an importance value (IV) of 85.5, an average diameter of 19.8 inches, and a frequency of 50% (Table 1). Black oak is the second most important species with an IV of 36.3, and average diameter of 19.2 inches, and a frequency of 23%. The hickories are third in importance (IV of 26.9), followed by red oak (IV of 13.0) and the elms (IV of 10.3). The remaining species all have importance values of less than 10, indicating their minor contribution to the presettlement forest (Table 1).

Most of the witness trees listed by the surveyors were between 8 and 31 inches dbh. Of these species, white and black oaks are well represented in most diameter classes (Table 2), indicating their continued and high importance in the presettlement forest. Hickories, red oak, and elms are also well represented in the lower and medium diameter classes, indicating their continued importance in the forest. The remaining species are poorly represented in most diameter classes which also indicates their minor importance in the presettlement forest. These data, though it does give some information as to the structure of the presettlement forest, should be used with caution. Surveyors commonly did not select smaller individuals as witness trees since the surface area to inscribe the blaze was too small, nor did they select large veteran trees due to their high mortality. Also, the species selected was not always random (Lutz, 1930).

Since the selection of line trees is probably more random than the selection of witness trees, it is probable that line tree data may be more reliable in determining the composition and structure of the presettlement forest. In the present survey, however, the witness tree and line tree data are very similar. The importance values in both cases is very similar (Tables 1 and 3), and except for the decrease of red oak to fifth and the increase of elms to fourth in IV the arrangement of the most important species remain the same. However, the average diameters for the most important line tree species is slightly higher than for most witness tree species, indicating that the average diameters of most species is higher than that suggested by the witness tree data.

From the original survey data it was not possible to distinguish different forest types. The distribution and presence of certain species, however, indicates that different forest types did exist. The presence of silver maple, cottonwood, black willow, sycamore, and honey locust indicates that floodplain and terrace forests did occur along the Embarras and Kaskaskia River systems. Also bur oak, blackjack oak, pin oak, red oak, and sometimes black oak were mostly reported at section corners near the prairie-forest border. In these areas the witness trees tended to average a greater distance from the corner posts than in most other forested areas (Table 1), probably indicating a trend toward a more open, savanna type vegetation.

The composition of the presettlement forest is, for the most part, similar to that which presently exists in Coles County, Illinois. Presently white and black oaks are common codominants in the upland forests (Ebinger, 1968, 1973, 1985), with various species of hickory, elm, and red oak being common subordinants. One distinct difference does occur in forest composition since sugar maple is presently an important component of most upland forests of the county. This extremely aggressive species was probably suppressed during presettlement time by fire, as only 16 individuals were recorded by the surveyors (IV of 2.3). With the decrease in fires, sugar maple with its high gap-phase-replacement-potential, was able to take advantage of canopy openings when veteran trees died (Ebinger, 1986b).

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Table 1. Total individuals, total basal areas, relative values, importance values, average diameters, average distance to corners, and frequencies for witness trees listed in the original land survey records for Coles County, Illinois.

Species	Common Name	Total Individuals	Total Basal Area (sq. ft.)	Relative Density	Relative Dominance	Importance Value	Average Diameter (inches)	Average Distance to Corner (feet)	Frequency (%)
<i>Quercus alba</i> L.	White Oak	492	1160.633	39.3	46.2	85.5	19.8	29.97	50
<i>Quercus velutina</i> Lam.	Black Oak	206	500.596	16.5	19.8	36.3	19.2	46.23	23
<i>Carya</i> spp.	Hickory	214	246.480	17.1	9.8	26.9	13.8	39.55	25
<i>Quercus rubra</i> L.	Red Oak	65	196.187	5.2	7.8	13.0	22.0	67.28	8
<i>Ulmus</i> spp.	Elm	78	102.071	6.2	4.1	10.3	14.0	33.63	9
<i>Juglans nigra</i> L.	Black Walnut	45	63.704	3.6	2.5	6.1	15.0	33.43	6
<i>Quercus palustris</i> Muenchh.	Pin Oak	39	50.407	3.1	2.0	5.1	14.4	63.16	5
<i>Fraxinus</i> spp.	Ash	21	33.119	1.7	1.3	3.0	14.9	27.56	3
<i>Acer saccharum</i> Marsh.	Sugar Maple	16	25.808	1.3	1.0	2.3	16.1	25.82	3
<i>Gleditsia triacanthos</i> L.	Honey Locust	12	28.012	1.0	1.1	2.1	19.7	38.94	2
<i>Platanus occidentalis</i> L.	Sycamore	9	27.275	.7	1.1	1.8	22.7	51.19	2

Table 1. — continued.

<i>Quercus macrocarpa</i> Michx.	Bur Oak	8	24.831	.6	1.0	1.6	22.0	72.52	1
<i>Celtis occidentalis</i> L.	Hackberry	7	17.312	.6	.7	1.3	20.1	25.55	1
<i>Tilia americana</i> L.	Linden	8	13.073	.6	.5	1.1	16.1	22.52	1
<i>Acer saccharinum</i> L.	Silver Maple	6	7.133	.4	.3	.7	13.7	29.26	1
<i>Aesculus glabra</i> Willd.	Buckeye	6	4.122	.4	.2	.6	11.0	17.49	1
<i>Prunus serotina</i> Ehrh.	Black Cherry	4	2.251	.3	.1	.4	9.8	23.43	1
<i>Quercus marilandica</i> Muenchh.	Blackjack Oak	4	1.582	.3	.1	.4	8.5	146.19	1
<i>Populus deltoides</i> Marsh.	Cottonwood	2	4.235	.2	.2	.4	18.0	21.12	1
<i>Morus rubra</i> L.	Red Mulberry	4	2.028	.3	.1	.4	9.5	13.53	1
<i>Cercis canadensis</i> L.	Redbud	2	.698	.2	—	.2	8.0	27.06	1
<i>Quercus imbricaria</i> Michx.	Shingle Oak	2	.545	.2	—	.2	7.0	25.08	1
<i>Quercus stellata</i> Wangh.	Post Oak	1	1.767	.1	.1	.2	18.0	25.74	1
<i>Salix nigra</i> Marsh.	Black Willow	1	.545	.1	—	.1	10.0	50.82	1
Totals		1252	2514.414	100.0	100.0	200.0			

Table 2. Witness tree diameter classes listed in the original land survey records for Coles County, Illinois.

Species	Diameter Classes (inches)																	
	4-5	6-7	8-9	10-11	12-13	14-15	16-17	18-19	20-21	22-23	24-25	26-27	28-29	30-31	32-33	34-35	36-37	38+
White Oak	—	4	5	19	52	41	31	94	81	14	77	13	9	34	2	1	10	5
Black Oak	4	2	15	22	18	24	6	21	22	2	24	6	2	22	1	—	11	4
Hickory	—	7	28	19	59	29	8	41	13	2	6	1	1	—	—	—	—	—
Red Oak	—	3	2	4	2	6	1	4	7	2	12	1	2	16	—	—	2	1
Elm	—	6	12	14	15	6	2	8	4	2	3	1	1	3	—	—	1	—
Black Walnut	—	1	6	6	8	7	—	7	4	—	4	1	—	—	1	—	—	—
Pin Oak	3	4	—	3	9	—	4	7	5	2	2	—	—	—	—	—	—	—
Ash	1	—	5	—	5	4	—	2	2	—	—	—	—	1	—	—	—	1
Sugar Maple	—	—	—	5	2	1	2	1	2	—	2	—	—	1	—	—	—	—
Honey Locust	—	—	1	—	—	1	1	3	3	—	2	—	—	—	—	—	1	—
Sycamore	—	—	—	—	1	1	—	1	—	1	2	—	—	3	—	—	—	—
Bur Oak	—	—	—	1	1	—	1	—	1	—	2	—	—	1	—	—	—	1
Hackberry	—	—	—	1	—	2	—	—	1	—	—	2	—	1	—	—	—	—
Linden	—	—	1	—	2	2	—	1	1	—	—	—	—	1	—	—	—	—
Silver Maple	—	1	1	—	1	—	1	1	—	1	—	—	—	—	—	—	—	—
Others (9 spp.)	1	1	11	4	6	1	—	1	—	—	—	—	—	—	—	—	—	—
Totals	9	29	87	98	181	125	57	192	146	26	136	26	15	83	4	1	25	12

Table 3. Total individuals, total basal areas, relative values, importance values, and average diameters of line trees listed in the original land survey records for Coles County, Illinois.

Species	Total Individuals	Total Basal Area (Sq. ft.)	Relative Density	Relative Dominance	Importance Value	Average Diameter (inches)
White Oak	71	158.538	37.4	37.3	74.7	19.0
Black Oak	30	102.410	15.8	24.1	39.9	23.8
Hickory	43	63.490	22.6	14.9	37.5	15.4
Elm	14	22.929	7.4	5.4	12.8	16.1
Red Oak	7	22.523	3.7	5.3	9.0	22.4
Black Walnut	7	13.721	3.7	3.2	6.9	18.6
Honey Locust	4	17.750	2.0	4.2	6.2	28.5
Linden	2	7.091	1.0	1.8	2.8	25.0
Sugar Maple	3	3.970	1.6	.9	2.5	14.6
Pin Oak	3	3.174	1.6	.7	2.3	12.0
Others (6 spp.)	6	9.497	3.2	2.2	5.4	—
Totals	190	425.093	100.0	100.0	200.0	

FIGURE 1. PRESETTLEMENT VEGETATION OF COLES COUNTY, ILLINOIS SHOWING PRAIRIE [ ] , FOREST [ ] , AND LAKES [ ] , RECORDED IN THE ORIGINAL SURVEY.

