THE BUR OAK OPENINGS IN SOUTHERN WISCONSIN

A. B. STOUT

The New York Botanical Garden

A Typical Oak Opening.—Bur oak openings were the principal timbered lands over a considerable part of southern Wisconsin when this region was homesteaded about one hundred years ago. Today only a few remnants of these once numerous natural parks still survive. One of these, about 50 acres in extent and still in good preservation, is situated a few miles to the north of the village of Albion in Dane County. A similar grove now of smaller area is located about a mile to the southwest. The illustrations (Plates 1 and 2), from photographs taken in this grove in 1941, show the stately grandeur and the rugged beauty of natural stands of this type of tree growth.

In this particular oak opening the trees are, I believe, all bur oaks (Quercus macrocarpa Michaux); but in some of the other oak openings of the area and especially on the belt of moraines there were trees of the white oak (Quercus alba L.). These oaks are all broad-topped and so spaced that seldom are the branches of two trees interlocked. Also they are rather uniform in size. There are no young trees or shrub growth anywhere in this grove nor has there been such growth here for at least one hundred years. Between the trees there is the firm turf of native grasses that has never been disturbed by cultivation. The entire area of this grove is almost level, as are the reaches of formerly prairie land that lie adjacent to the grove and which continue for some distance immediately to the east and the northeast. But many of the openings of the region were on the more rolling and undulating uplands. A small, shallow, and rather sluggish stream (Saunders Creek) flows close to the south of this oak opening and along its banks, both above and below the grove, there are flat marshy grasslands that are often of considerable extent and occasionally there are areas of tamarack swamp. These lowlands and their water-table are, as a rule, only slightly below the general level of the uplands. Marshes are abundant
throughout much of the prairie-oak opening area that was glacial and on which the drainage is geologically still young.

It seems to the writer that the trees in this grove are scarcely any larger today than they were fifty years ago. The present owner, Mrs. D. L. Babcock, is the daughter of Jacob Langworthy who in the year 1842* became the owner of the farm which includes this grove. She has resided on this farm for 85 years and her recollection is that the character of this oak opening has remained unchanged during all this time. It is known that “prairie fires” burned over this area both before and for some time after the arrival of the early settlers. Storms have broken down or uprooted some of the trees; but except for the removal of such trees no wood has been cut in the grove. About 50 years ago nearly 100 of the trees were blown down at one time and during a storm in 1941 nearly 30 trees were uprooted. The counts that have been made of the annual rings of growth of these trees indicate that the present age of most of the trees is at least 200 years. The owners have taken an unusual and commendable pride in this grove that has prompted them to keep it intact. For about 90 years its area has been pastured by cattle and horses and for some of this time by sheep but never by swine.

Oak Openings in Wisconsin.—The Babcock Oak Opening as it stands today is typical of the groves which once covered a considerable part of an extensive area in Wisconsin. This region extended across the entire southern boundary of the state. Northward its width from east to west decreased, with irregular border limits, until it terminated near Rush Lake. Roughly the entire area in Wisconsin comprised about 5,000 square miles and it formed a broad-based wedge that projected northward into and almost through a wide belt of more dense forest growth in which oaks were, and still are, the dominant species.

Dane County, in the southeast corner of which is the township of Albion, is situated near the center of the area of oak openings. Rock County lies partly adjacent to Dane County and south of it. These two counties were quite typical of the best developments of the prairie-oak opening vegetation in Wisconsin.

* The first four white settlers in the town of Albion arrived during the summer and autumn of 1841.
Plate 1. View near the border of the Babcock Bur Oak Opening, looking eastward across an area of former prairie. In the distance a woodland of second growth is in sight. Photo in 1941 by the author.
PLATE 2. View looking westward across a section of the Babcock Bur Oak Opening near Albion, Wisconsin. Photo in 1941 by the author.
Early Records for Dane County.—The notations with the early land surveys of Dane County record that the areas of forest growth were mostly scattering oak trees which were referred to as oak openings. In describing "the face" of Dane County, Lapham in 1846 states that "there are no considerable portions that can be called timber land, it being almost entirely oak openings or prairie." A "History of Dane County" (5), published in 1880, makes both general statements regarding the entire county and rather definite statements for each township in respect to the character of the native vegetation. Some of these statements may be quoted here.

"The prevailing timber of Dane County is small oak, occurring in patches or groves, constituting what is known as oak openings" (p. 309).—"Bur Oak. This is perhaps the most ornamental of our oaks. Nothing can exceed the graceful beauty of these trees, when not crowded or cramped in their growth but left free to follow the laws of their development. Who has not admired these trees in our extensive bur oak openings" (p. 128).

The statements for several of the townships may be quoted. (For Albion (36 square miles): "The northeast part is mostly prairie; the southeast, oak openings; the northwest, openings and marsh; and the southwest are openings, except sections 19 and 30, which are marsh." — For Dunkirk Township adjacent at the west of Albion: "The lands in this town are diversified by oak openings, prairie and marsh." — For the township of Rutland next west of Dunkirk: "The larger part of the land is openings, while little, if any, may be termed prairie. The soil is rich and productive. There is a lake known as Island Lake which in early times was considered a curiosity. It has an island near the center of about three acres. This was once thickly wooded with good rock maple trees with no others within twenty miles." — For the township of Oregon, third to the west of Albion: "The surface in most places is beautifully undulating, while in other places it is called hilly. It is principally covered with bur oak, among which stood large white and red oaks, and occasionally a large shellbark hickory. The entire town was covered with a sweet and nutritious grass, called blue joint.* As this grass was burned every fall, and there was no underbrush of timber, a two-horse

* Evidently the name "blue joint" here refers to Andropogon furcatus Muhl. For this species Shantz and Zon (15) give the common name "bluestem" and later Shantz (30) gives the name "big bluejoint." The species Calamagrostis canadensis also known as "bluejoint" was abundant in the marsh meadows of Dane County.
wagon could be driven through these openings with ease. As these annual fires prevented the roots of the timber from growing near the surface, the land was broken for the same price for breaking prairie, hence it was claimed the oak openings combined all the advantages of prairie and timberland." — For Blue Mounds, second township from the south in the western tier of five townships and about 30 miles from Albion: "The timber supply of the town of Blue Mounds is perhaps as varied as can be found in any locality in the county, there is oak in variety, black walnut, butternut, hickory (bitter and sweet), poplar and other timbers." — For the town of York in the extreme northeastern corner of the county: "The land of this town is oak openings, with occasionally marsh, there being no prairie within its borders." — For Black Earth in the northwestern corner of the county and second township north of Blue Mounds: "Section 24 is mostly marshy land, the remainder of the town being oak openings, with little if any prairie." — For Berry Township which joins Black Earth: "This country, in its native condition was timbered principally with oak, there being heavy growths of white oak in the high lands, and bur oaks in the bottom lands." — For the township of Madison near the center of the county: "The land is undulating, generally covered with oak openings."

The native forest vegetation over the other 26 townships was quite like that of the nine townships for which the reports are quoted. The eastern and western boundaries of the county did not extend into the region of denser oak forest, but within the confines of the county there were somewhat isolated areas of such timber at the time when the areas were first settled. For several of the townships, however, there are statements in this publication of 1880 which refer to the changes in the character of the timber that had already occurred since the area was settled, and these will be noted later in this article.

*Early Records for Rock County.*—Of the native vegetation in Rock County, which lies to the south of Dane County, there are rather adequate statements in an early publication (2) that appeared in 1856. Some of the most pertinent of the statements will be quoted.

"This county is about equally divided between prairie and oak openings. The trees are so scattering that men frequently make farms without felling—only girdling them—besides the openings are annually burnt over, like the
prairies. On Rock River is a belt of timber and openings. Groves are interspersed through the prairies at intervals, besides which, points of openings jut into the prairie at different places, thus rendering the outlines of the prairie unequal, and at the same time bringing wood and timber within a short distance to all its settlers; in fact few men on the prairie live more than three miles from timber.”

The record for several of the townships may be given here. Of the five northern townships of Rock County, the middle one, Fulton, lies adjacent to and directly south of Albion. For this township:

“It has several small and beautiful prairies. The timber is of large growth, suitable for sawing and building purposes.” There are records of sawmills at the villages of Fulton, Newville and Edgerton in this township at this early date (1856). — For the township of Rock, the third directly below Albion: “That part upon the east side of the river is nearly all prairie, but that upon the west side is mostly timber, some of it being very good, though the greater part being oak openings.”

Records similar to these noted above could be quoted for the counties or portions of them which lie to the east and to the west of Rock County and to the immediate north of Dane County.

The Oak Openings in Relation to the Native Vegetation of Wisconsin.—A brief but very excellent description of the “classes” or “groups” of the main natural associations of plant life in Wisconsin together with a map of their extent and distribution was presented by Chamberlin (4). In discussing the “oak group” Chamberlin (pages 177-181) makes the following statement:

“This is most nearly related and most closely associated with the prairie group. The prairies are rarely contiguous to any other form of aboreous vegetation. — The group as here constituted includes both the ‘oak openings’ or ‘oak orchards,’ and the denser oak forests. There are sufficient reasons, however, for separating them into two classes, as they indicate different, though allied, agricultural capabilities. The oak openings are most nearly related to the prairies, while the oak forests graduate to the following classes.” The “classes” here referred to are designated “The Oak and Maple Group,” “Maple Group,” “Maple and Beech Group,” and “The Hardwood and Conifer Group,” which are, in part at least, included in the northern arm of what is now termed the northeastern hardwood forest.
Thus the bur oak openings comprised almost pure stands of the one species, *Quercus macrocarpa* (with a sprinkling of Q. *alba* especially on the higher lands) and they constituted the most characteristic arboreal association that was in direct contact with the prairie. The belt of oak openings extended between the prairies and the denser deciduous forests, in which there was, and still is, a mixture of various species of trees, especially red oak (*Quercus rubra*), shellbark hickory (*Carya glabra*), large-toothed aspen (*Populus grandidentata*) and such shrubby underbrush as hazel nut (*Corylus americana*) and panicked cornel (*Cornus paniculata*). The transition from oak openings to the denser oak forest involved interpolations, intergradations, and some intermingling of the two types of timber.

It may be noted that both the oak openings and the denser oak forest of the oak group as described by Chamberlin combine to form in Wisconsin and Minnesota the northern element of what has more recently been termed the “oak-hickory association” and that this constitutes the western margin or zone of the still more extensive “oak or southern hardwood forest.” It has been stated that this entire oak forest “is probably the largest hardwood forest in the Temperate Zones of the World” (15). Of the character, location, migration and extent of this forest there are numerous publications, especially those by Shantz and Zon (15) and Shantz (20).

*The Vanishing of the Prairies and the Oak Openings in Wisconsin.*—The fertile prairie lands were ready for the plow of the settlers. But on many of the homesteads in Dane County and in neighboring counties the acreage was mostly oak openings and many of the trees were removed or at first merely killed by girdling to provide land for cultivation. For a time some of the oak openings were utilized as pasture lands for cattle, horses, and sheep, especially if there were no lowland meadows in a farm. Between the scattered trees of the oak openings the native grasses flourished and provided excellent grazing land.

Previous to 1900 many public gatherings, on such holidays as Decoration Day and Fourth of July, and community picnics were held in an oak opening where the checkered shade of the trees contributed much to the comfort of all. But the extension of cultivated farmland steadily reduced the area of the oak open-
nings. To some extent the needs for timber for building homes, for the construction of rail fences, and for firewood contributed to the removal of the grand old trees of bur oak and white oak.

Natural Reforestation by Second Growth.—While the bur oaks were rapidly being decimated and the areas of oak openings were disappearing in the region about Albion, as elsewhere in southern Wisconsin, there was a most remarkable spread and increase of new or “second growth” stands of “black oaks.” This noteworthy and conspicuous natural reforestation entirely changed the character of the arboreal population in this particular area during the years between 1850 and 1890. Here this second growth was almost entirely composed of *Quercus rubra* L. and *Q. coccinea* Muench. Thus a survey of the flora of Madison and vicinity (7) published in 1892 at a time when the second growth forests were well advanced contains the following statements:

“*Quercus rubra* L. forms a considerable element in the older forests of the region” and “*Q. coccinea* Wang. forms the chief element in the oak forests of the region.” *Quercus alba* was reported to be present in “all woodlands of the county” and to be next to *Q. coccinea* in abundance. *Quercus macrocarpa* was reported to be “represented in all parts of the region by small clumps or single individuals of medium sized trees.” These authors mention the presence of only one other species of oak (*Q. bicolor*, Willd.) in Dane County and they make no mention of the oak openings which had formerly been abundant about Madison.

This second growth of timber appeared as seedlings which were often in such numbers that they formed thickets over many upland areas that were not cultivated or heavily pastured. Often the second growth invaded oak openings and filled in about the old trees of bur oak and white oak. As a result, in a span of some 40 years, nearly every large farm in the area about Albion possessed at least one “woodlot” of close-standing “black oaks” of which many were no more than 12 inches in diameter at the level of the ground. Some of these woods covered an acreage in which there had previously been no, or at least few, black oaks to serve as parent seed trees. But scattering trees of these oaks and areas of rather dense woods which contained black oaks were interpolated within the area dominated by oak openings, especially near certain streams and lakes.
Thus the second-growth oak forest composed of the so-called black oaks became the principal natural association of tree growth about Albion where the oak openings had formerly been abundant. Perhaps the largest acreage of this second growth was in existence here about 1880-1890. It was the rule that the trees stood close together with no growth of grass between them. Especially after 1890 many of these woodlands were cut over for firewood or were entirely cleared. But fine stands of this timber still exist. One such woodlot is shown against the horizon in the middle of the view of Plate 1.

Scattered through many of the second-growth woods there were, and still are, towering monarchs of white oak and somewhat lower trees of the bur oak whose knarled trunks were usually from three to four feet in diameter. These had existed here when the site was an oak opening. In these trees the red-tailed hawks build their nests. The larger branches and trunks are often hollow and in such cavities the screech owls nest, and the abundant fox squirrels and the less frequent and more secretive flying squirrels make their homes.

The writer can attest that in these woods near the village of Albion, as well as in the oak openings, he has rarely observed, about one of the bur oak trees, any younger trees that could have grown from its acorns. However when second-growth woods were cut over and not severely pastured a "third-growth" reproduction often contained some seedling reproduction of both white oak and bur oak.

There has been some seed reproduction of both bur oak and white oak during the period of second growth in localities where conditions favored such reproduction. One such area recently studied by Chavannes (21) is located in the northwestern corner of Dane County a few miles distant from the townships of Black Earth and Barry in an area of the early oak openings. This particular woodland covers sixty acres. The timber surrounds several small areas of hillside prairie the largest of which (Beech's prairie) covers only one half of the area. Bur oak trees surround this island of relic prairie, and next to them is a stand of white oak in a part of which there is a recent growth of linden. Of both the bur oak and the white oak there are old wide-spreading trees as much as 250 years old which once formed an oak opening. Now younger trees of the bur oak stand in a concentric
distribution about the plot of prairie and there are also younger
trees of the white oak. The study reveals that the growth of the
other arboreous species, such as linden, aspen and sumac, is an
invasion during the past one hundred years. No doubt there are
now many areas of second growth in the region of the oak open-
ings in which there have been recent reproductions from the
seed of Quercus macrocarpa and Q. alba. But it is certain that
such reproduction has been relatively much less over the entire
area than the reproduction of other woody species, especially of
the so-called black oaks now found in the area.

Records of the Second Growth.—Mention of this develop-
ment of second growth was made in some of the publications
already quoted. In the History of Dane County (5) in the report
of the township of Blooming Grove (second in the diagonal
northwest from Albion) there are the following statements:

“In an early day there was but little timber in this town
in common with localities adjacent and what there was
was used with the utmost prudence. Some of the farmers
sowed locust seed to raise timber, but nature soon sup-
plied the want and now there is enough and to spare of
white, black, and red oak and other kinds.”

Another record for the town of Perry in the southwest corner
of Dane County and the sixth township directly to the west of
Albion is of special interest:

“Largely rolling prairie, northeast part is principally roll-
ing prairie. The southern part on the other hand, being
made up more of bluffs and low-lying bottoms. The town
in its native state was covered with brush and grubs,
there being scarcely enough timber to supply the wants of
the farmers, but now there is an abundance of young tim-
ber, the growth of the last thirty-five years. It consists of
white, black, and red oak, including other kinds indige-
 nous to this part of the country.”
The development of second growth in the prairie-oak open-
ing area in Wisconsin has been noted in numerous technical
publications of which one by Sargent (6) will here be quoted:

“The forest area has somewhat increased in the prairie
regions of the state since its first settlement and the con-
sequent decrease of destructive prairie fires. The growth
of trees has gradually spread from the bottom lands of
the streams to the hills, and the oak forests on the up-
lands have gradually encroached upon the prairie, losing
their open, park-like character by the appearance of a young growth which has sprung up among the old trees."

That this increase of forest involved the spread and to some extent the introduction of black oaks rather than the reproduction of the original species of bur oak and white oak was later recognized by Sargent (9) in the following statements which refer to a wide area of the Mississippi basin as well as of Wisconsin:

"Forests of oaks, too, have spread over regions in the basin of the Mississippi where prairies existed before the white man checked the Indian fires which year after year had swept them bare of trees. The oak forests of the middle and southern states, although increasing in area, are deteriorating, however, in composition, the white oaks being gradually overpowered by the less valuable black oaks, whose bitter acorns are left to germinate by hogs which pasture in the forest and devour the sweet acorns of the white oaks."

This statement of the fact that there was a rapid and selective reproduction of the black oaks applies to the developments in Dane County noted above, but here the selective feeding on acorns by hogs was never more than a most rare and incidental occurrence.

Considerable attention has been given to the factors involved in the reproduction and migration of species of Quercus. Gleason (13, p. 120) discusses these matters but decides that the determination of these factors is not sufficient to explain the distribution and migration of the oaks in Illinois. More recently Korrstian (17) has determined many of the factors which affect the production and the germination of the acorns and the survival of the seedlings of several important species of oak, and he has made application of this data to silvicultural methods. But it is not fully evident how such factors operate in natural selective and adaptive reproduction in which the inherent characters of various species of oaks are involved.

It may be stated (a) that this extension of the forest was the latest period in the general western advance of the oak forest which had long been in progress in the Mississippi Valley; (b) that this was at first favored by the cessation of prairie fires; and (c) that the natural advance of the forest was then checked and the area of the natural oak-hickory belt of timber
much reduced by the extension of agriculture. An excellent dis-
cussion of "The Vegetational History of the Middle West" to-
gether with a bibliography has been presented by Gleason (14).

The Natural Range and Variations of the Bur Oak.—The
species *Quercus macrocarpa* is distributed over a wide area of
the United States and Canada and in its population there are
noteworthy diversities in botanical characters, in habits of
growth that exhibit adaptations to habitats, and in associations
with other species of plants.

Trees of the bur oak are found over the entire range of the
southern hardwood forest and also over a considerable part of
the northeastern hardwood forest as these are mapped in the
Atlas of American Agriculture (15). The climax in the stature
of trees of this species is reached in the rich bottomlands of
southern Indiana and Illinois in the southern hardwood forest
where individual trees reach a height of 170 feet and a trunk
diameter of 6-7 feet (9).

Throughout most of their range the trees of the bur oak are
scattered among trees of other species and the associations in-
volve a considerable number of species. So general is this habit
that one writer (22) makes the following statements:

"Bur oak never grows in dense stands, but as individuals
or in groups associated with other bottomland trees such as
pin oak, white oak, basswood, willow, cottonwood, black
walnut, the hickories, elms and soft maples. It grows well on
rich, moist bottomlands and on lower slopes, preferring areas
where water is available but not excessive. Of relatively slow
growth, it reaches great ages and is not considered mature before
200 to 300 years."

In its mid-western range the bur oak reaches the western
limits of the tall grass prairies in western Nebraska—about 600
miles directly to the west of the bur oak openings of Dane
County, Wisconsin. Pound and Clements (10, p. 148) report on
the bur oak in this region as follows:

"*Quercus macrocarpa* is the sole species of oak which
grows over the entire state. It extends from the bluffs of
the Missouri to the canyon sides of the foothills. The indi-
viduals exhibit the greatest variation in different habi-
tats. In the deep forests of I and II* "Quercus macro-

* Refers to the "Wooded Bluff" and the "Prairie" regions in Nebraska.
carpa' is a tall commanding tree, which is usually the principal element in the formation. Northward along the Missouri the bur oak steadily decreases in size in forest formation and becomes a conspicuous object along the tops of the high dry bluffs. The front of the bluffs of both the Niobrara and the Republican is covered almost exclusively with individuals of this species. At the base of the bluffs they are usually small trees, 3-5 meters high. But toward the top they decrease regularly in size, and become diffusely branched, so that the tops of the bluffs are covered with a dense thicket of low straggling bushes, 5-10 decimeters high.

It is evident from these statements that in 1898 the stands of bur oaks in Nebraska were quite different from those of the oak openings in Wisconsin. They were much more diverse in habits of growth and there was much greater natural reproduction. Weaver and Kramer (19) report in 1932 that in Nebraska "in many places the bur oak is invading the grassland" and that "most of this migration and invasion has occurred in the 70 years since the early settlement of eastern Nebraska and the cessation of prairie fires." They describe and illustrate (see their Figure 2) as typical of the "forest margin in eastern Nebraska" a "pure open stand" of bur oaks mostly 50 to 65 years old that were rather widely spaced (10 to 40 feet) but yet standing somewhat closer together than are the trees of the Babcock grove at Albion, Wisconsin. These authors report for the root system characteristic of the bur oaks in Nebraska that (a) there is a rapid growth and deep penetration (as much as 3-5 feet the first summer) of the roots of seedlings; (b) that as trees mature the skeleton of larger roots is wide spreading, and much branched, and hence occupies a very large volume of soil; and (c) that fine much-branched rootlets clothe this framework. It is noted that this widely spreading, well-branched root system compensates for the low water content of the soil, provides a means of successful competition against grasses and shrubs, and contributes to a competition between trees of the bur oak that results in the somewhat wide spacing noted even in pure stands.

Further to the north of Nebraska the bur oak extends into the area of the short grass prairie and here in the cold dry areas of Dakota and eastern Montana plants that are classed as Quercus macrocarpa become merely low shrubs, and in the most
northern range of this species at Berens River in Canada the members are described as bushes.

*Oak Barrens.*—Trees of the bur oak occasionally form the chief arboreous vegetation on sandy areas where the soil is much less fertile than the soils of the bur oak openings of Dane County. In the volume of Minnesota Plant Life, MacMillan (11) makes the following statement:

“The bur oaks in Minnesota, together with the black oaks, form oak barrens. These wastes, covered with grotesquely branching trunks, form picturesque forests in the central part of the state.”

But MacMillan (8, 11) makes no mention of any remnants of the oak openings in Minnesota in the zone of the hardwood belt that was in contact with the prairies.

In his “Notes on the Big Woods” of Minnesota, published in 1875, Winchell (3) states that the western boundary of this forest

“is not well marked, the trees gradually becoming thinner and smaller, and more and more restricted to the valleys of the streams, till the country is changed to a treeless prairie. Around the outskirts of the woods small oaks and aspens constitute almost the only arboreal vegetation.”

His only mention of oak openings is in the statement that

“There is a species of oak that appears like red oak (*Quercus rubra* L.) that frequents the outskirts of the Big Woods. It is sometimes associated with the bur oak in the openings.”

In his studies of the vegetation of the inland sand deposits of Illinois, Gleason (13) also describes a bur oak association which occupied the depressions between sand ridges. The bur oak was the principal tree, but trees of white oak and shellbark hickory were also present. The stand of trees was somewhat close and the trees were rather young (see his Figure 1, Plate XVI). In this sand area Gleason found in 1910 that the trees which were invading the prairies were black oaks, chiefly of the species *Quercus velutina*. There were in this area no oak openings of the type of the Babcock grove in Wisconsin. In the discussion of the Barrens of Illinois, Indiana and Iowa, Gleason (13) notes that these areas are characterized by a sparse low growth of scrub oak (*Quercus velutina*), hazel and wild plums.

It should be noted here that the “oak openings” near Toledo,
Ohio, which were described by Moseley (18) also occupy a sandy area partly covered with low sand dunes, that although several species of Quercus were found on the area the bur oak was not present, and that this particular association is more like the oak barrens than the bur oak openings in Wisconsin.

The Ecological Status of the Bur Oak Openings.—Several features of the oak openings in Wisconsin are characteristic and conspicuous: (a) the trees are of nearly the same age and of good tree-like stature; (b) the trees were scattered or separated in a park or orchard-like disposition with dense sod of grasses between them; and (c) there had been for many years no reproduction from seed of the trees and no invasion by other woody species.

The trees in these bur oak openings, judging from those now in the Babcock grove, date back to about 200-250 years ago, a rather short and recent period of time when the entire interval of the post-glacial history of the area is considered.

Various writers have supported the view frequently expressed from an early date and already referred to in this article, that the prairie fires of the Indians were an important factor in destroying tree growth in the belt adjacent to the prairies and that one result of this was the development of the oak openings. Gleason (14) has supported this view and described the probable process as follows:

"The fires destroyed seedling trees at the west margin of the forest, preventing further advance in that direction. It is doubtful if they penetrated far into the forest, but by destroying the undergrowth and killing the more susceptible species, they gradually reduced the forest to the park-like condition known as oak openings" (14, pp. 80-81).

According to this view the oak openings in Wisconsin and in neighboring states were remnants of an earlier and more dense marginal forest of which the older of the bur oaks and white oaks withstood destruction by fires.

But in the Babcock grove the character of the grove has remained quite unchanged since the last prairie fires swept the area. During this time in the area of this grove there continued to be no seed reproduction of the bur oaks already there; but there was also relatively little reproduction of bur oaks and white oaks over the entire area.
What became of all the acorns produced in this Babcock grove during the past one hundred years? From the general evidence at hand, especially summarized and presented by Korstian (17), large numbers were eaten by rodents and weevils; perhaps few germinated and had even a chance to live in competition with the sod; and finally it may be that seedlings of the bur oaks and of any invading woody species were destroyed in the browsings of cattle, horses and sheep. It would seem that the facts in this situation, as well as those for the decided selective reproduction of black oaks over white oaks, could yet be determined by direct observation and experimentation, and also that the matters of reforestation warrant such study.

It may be noted that the association of a dense sod of grasses with a scattering distribution of trees is a somewhat unstable and obligate relationship. An increase in the stand of the trees will eliminate the grass beneath the canopy of the branches. But the dense sod of grass roots and rhizomes make it difficult for seedlings of hardwoods to become established.

The rather robust growth of the bur oaks in the oak openings of Wisconsin is no doubt due to the fact that the trees have developed on rich fertile land that has received adequate rainfall for tree growth. The area of the tall grass prairies bulges eastward into southern Wisconsin and over most of Illinois. Over a considerable part of this area the amount of rainfall has in recent time become favorable to forest growth and the oak forests which were advancing to the west had in 1850 already become a belt of considerable width. The oak-hickory portion of the oak forest belt covered (a) much of the fine farm land of Ohio and Indiana, (b) portions of southern Michigan and southern Wisconsin, (c) parts of Minnesota, Iowa and Illinois, and (d) portions of other states to the southwest.

Northward in Minnesota the entire oak belt became a narrow strip along the western edge of the Big Woods and in its marginal contacts with the prairie there was rapid decrease in the size of the trees (3). This decrease in the stature of the tree growth was quite general and continuous along the entire western fringes of forest in the Mississippi Valley and northward in Canada. Here several hundred miles to the west of the Wisconsin oak openings there was not only sparse and scattered distribution of woody species but also much reduction in stature.
That other species besides bur oak and white oak may dominate "openings" is to be recognized. Sargent writing in 1882 and 1883 (6), states that the original forests of the oak belt in Ohio and Indiana had already been "largely removed in the developments of agriculture." For Illinois he reported that the forest growth of the prairie region "was confined to the narrow river bottoms and occasional open park-like groves of bur, scarlet, red, black jack or post oaks, known as 'oak openings'". While many areas of this timber in Illinois have now disappeared, as elsewhere in the Mississippi Valley, some areas of them still exist. In his report on the flora of the Chicago area published in 1927, Pepoon (16, p. 47) shows a photograph of a typical bur oak opening and states that this type of association was at that date characteristic of the bur oaks on the ancient lake benches of the area.

Although trees of the bur oak are found as far south as central Texas, it seems that in that region other species of oak are most frequent in the "open forests" and "cross-timbers" which are adjacent to the dry prairies [Sargent (6), p. 540]. Also in Indiana territory the timberlands that are interspersed with the prairies are mostly post oak (Quercus stellata Wang.: Quercus obtusifolia Michaux.) and black jack oak (Quercus marylandica Muench.) and in their most western range there is the stunted growth of these species which is characteristic of the "cross-timbers." But these species disappear to the north near the Cimarron River [Sargent (6), p. 543] and in Kansas and Nebraska the bur oak becomes the most abundant species of tree. Several hundred miles to the eastward the black jack oak (Quercus marylandica) reaches its northern limit on the sand prairies of central Illinois on areas where the bur oak is not present (12).

The Matter of Terminology.—Under the term "opening" Webster’s New International Dictionary, Second Edition, 1842, gives the following definition: "A thinly wooded space, without underbrush, in the midst of a forest, or grove; as oak-openings." But the bur oak openings in Wisconsin were not in the midst of a forest; they were most often surrounded by or bordering on prairie grassland.

In the Century Dictionary and Cyclopedia (1900) there is the following definition:
“Opening. 5. A clear, unobstructed or unoccupied space or place; specifically, in the United States, a tract over which there is a deficiency of forest, trees being not entirely wanting, but thinly scattered over the surface, as compared with their abundance in an adjacent region. The word is most frequently used with this meaning in Wisconsin and neighboring states on the west and as the scattered trees are frequently oaks (*Quercus nigra,* jack-oak, and *Q. obtusifolia,* post oak, are the most common species) such openings are often designated as *oak openings.* Similar tracts in the more southern states, especially in Kentucky, are called *barrens and oak barrens.*”

There follows a quotation from Cooper’s novel, *The Oak Openings,* in which there is mention of the bur oak. The two species of *Quercus* mentioned in the quotation above are the principal oaks of the Cross-Timbers area in Texas and Oklahoma, but neither was present in the extensive oak openings in Wisconsin nor is now found in the state.

It appears that the term “oak orchard” employed by Chamberlin (4) has had rather limited use in the literature of oak openings, and that the terms “park” and “grove” have rather wide applications which include other types of tree growth. The term, chaparral (15, especially Figures 6 and 7), is especially applied to broad-leaved woodlands of the southwest which range from “an impenetrable thicket of low shrubs to open oak stands” some of which may somewhat resemble the oak openings of Wisconsin but are entirely composed of different species.

Since the oak openings of Wisconsin constituted a somewhat definite type of prairie grassland and oak forest association in which the bur oak was more abundant than the white oak it seems suitable to apply the term “bur oak openings.”

*A Commemoration of the Oak Opening in Literature.*—The bur oak openings received special mention and distinction in the historical novel *The Oak Openings* which was written by James Fenimore Cooper in 1848. The scene of the beginning of the story in the year 1812 was in a bur oak opening on the banks of the Kalamazoo River in Michigan. The description is as follows:

“The country was what is termed ‘rolling,’ from some fancied resemblance to the surface of the ocean, when it

* = *Quercus* *marylandica* Muench.
** = *Quercus* *stellata* Wang.
is just undulating with a long 'ground-swell.' Although wooded, it was not, as the American forest is wont to grow, with tall straight trees towering toward the light, but with intervals between the low oaks that were scattered profusely over the view, and with much of that air of negligence that one is apt to see in grounds, where art is made to assume the character of nature. The trees, with very few exceptions, were what is called the 'burr-oak,' a small variety of a very extensive genus; and the spaces between them, always irregular, and often of singular beauty, have obtained the name of 'openings,' the two terms combined giving their appellation to this particular species of native forest, under the name of 'Oak Openings.'

"These woods, so peculiar to certain districts of country, are not altogether without some variety, though possessing a general character of sameness. The trees were of very uniform size, being little taller than pear-trees, which they resemble a good deal in form; and having trunks that rarely attain two feet in diameter. The variety is produced by their distribution. In places they stand with a regularity resembling that of an orchard; then, again, they are more scattered and less formal, while wide breadths of the land are occasionally seen in which they stand in copses, with vacant spaces, that bear no small affinity to artificial lawns, being covered with verdure. The grasses are supposed to be owing to the fires lighted periodically by the Indians in order to clear their hunting-grounds."

This excellent description of an oak opening was based entirely "on the evidence of documents" furnished to Cooper by the "bee hunter" who was an important character of the novel, and later a well-known citizen of Michigan, General Benjamin Boden.

In the concluding chapter of the novel The Oak Openings, Cooper tells of his journey during the summer of 1848 from his home near Cooperstown, N. Y., to Kalamazoo. This, he states, was "an occasion which offered to verify the truth of some of our pictures, at least by personal observation." The portion of this journey from Detroit to Kalamazoo was by railroad and of the natural scenery Cooper makes comment as follows:

"The whole country was a wheat-field, and we now began to understand how America could feed the world. Our road lay among the 'Openings' much of the way, and we found them undergoing the changes which are incident to
the passage of civilised men. As the periodical fires had now ceased for many years, underbrush was growing in lieu of the natural grass, and in so much those groves are less attractive than formerly; but one easily comprehends the reason, and can picture to himself the aspect that these pleasant woods must have worn in times of old."

At Kalamazoo, Cooper found that "Those who had laid out this village, some fifteen years since, had the taste to preserve most of the trees" and that the houses and grounds were "pleasant to the eye, on account of the shade, and the rural features they present." But in this year of 1848 Cooper evidently saw few surviving trees of the bur oak openings that existed in the area about the Château au Miel 36 years earlier and evidently he did not find any sizable area of the oak openings still in a natural condition. But at this time there were thousands of acres of such oak openings in Wisconsin.

In regard to the present status of bur oak trees in the area about Kalamazoo the writer has received the following statement from the Forestry Department of the City of Kalamazoo: "The Forestry Department reports no real stand of bur oaks in this vicinity. Scattered trees are found throughout the city, perhaps the largest group being that of eight or ten in Bronson Park. Formerly groves of bur oaks were found near Kalamazoo including a large stand near Oshtemo on route U. S. 12."

The total area of the prairies and of the oak openings in southern Michigan was relatively small in comparison to the area in southern Wisconsin but evidently the character of the bur oak openings was quite the same in both regions.

Concluding Remarks.—The early records are particularly complete and accurate for the main facts regarding the character, location, and extent of the bur oak openings in Wisconsin. Their relations and ecological status in the so-called oak-hickory belt which constitutes the western margin of the extensive eastern forests of North America are now well recognized.

For perhaps a hundred years before the advent of the white settlers into southern Wisconsin the oak opening prairie association was a somewhat static feature in the midst of a region where there had been dynamic changes in post-glacial plant migrations. Both the prairie and the forest are decidedly static and self-sustaining and the two tend to be mutually exclusive. In the bur oak openings these two sharply contrasted types of
vegetation are combined in a somewhat balanced and static relationship that is indeed noteworthy and of special interest.

But the coming of the white man spelled the doom of the oak openings. The land they occupied was fertile, there was sufficient timber for the immediate needs of the settlers, yet the stands of the trees were so sparse that the clearing involved relatively little labor. Within fifty years most of the oak openings were converted into fields of corn, wheat, oats, and tobacco or were filled in by the second growth which was mostly of invading black oaks. At the present time, after another fifty years, there exist only few scattered remnants of the once numerous bur oak openings. Of these the Babcock grove now occupies about fifty acres and is still in an excellent state of preservation. It is the memory of the grandeur and the beauty of the extensive groves, of which this is a remnant, that has prompted this epitome which perhaps may be considered an obituary of the bur oak openings in Wisconsin.

**LITERATURE CITED**

2. 1856. *History of Rock County*. Edited and compiled by Orrin Guernsey and Josiah F. Willard. Published by the Rock County Agricultural Society and Mechanics' Institute, Janesville.


21. 1940. The steep prairies of southern Wisconsin and their invasion by forest. By Elizabeth Anna Chavannes. An unpublished thesis in the records of the University of Wisconsin, loaned to the writer by Prof. N. C. Fassett. The investigation was financed by the Alumni Research Foundation of the University of Wisconsin.
