BUFFALO BEATS, A PRAIRIE REMNANT IN UNGlaciated SOUTHEASTERN OHIO, SUPPORTS TRANSEAU'S PRAIRIE PENINSULA CONCEPT

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The well known map of the Prairie Peninsula by Transeau (1935), later reproduced in part by Weaver (1955), shows that the extent of prairie vegetation in the Midwest and its range eastward into Ohio. Buffalo Beats, a prairie of 0.4 ha, is significant because it is an easternmost remnant of the Prairie Peninsula surrounded by forest vegetation within the Wayne National Forest, Athens County, Ohio. Floristic evidence and soil characteristics are summarized here and suggest that Buffalo Beats is a prairie relic which supports Transeau’s concept of a Prairie Peninsula. Extensive documentation has been presented by Wistendahl (1975).

DESCRIPTION

Perhaps one of the most significant facts of the Buffalo Beats prairie is that it is located on unglaciated terrain. The Wisconsinan glacial border lies approximately 40 km (25 miles) to the northwest (Ohio Div. Geol. Surv., 1965). The hilly topography of southeastern Ohio is strikingly apparent (Bier, 1956) with maximum elevation of approximately 335 m (1100 ft) and a relief of approximately 90 m (290 ft). The effect of nonglacial on plant distribution has been discussed, for example, by Braun (1928), Gordon (1969), and Forsyth (1970). Kingsley and Mayer (1970) published a map with Athens County having greater than 50 percent forest cover. Their tabulated data reveal that 68 percent of the county is in commercial and private forest. The original forests of the region prior to settlement by European man, as indicated from the records of the original surveyors, were primarily dominated by a mixture of oak (Gordon, 1966, 1969), but the secondary forest in the vicinity of Buffalo Beats is now commonly referred to as an oak—hickory forest climax or cover type. The existence of a small, 0.4 ha (1 acre), prairie surrounded by forest is, indeed, extremely unusual and raises numerous ecological and phytogeographical questions. The prairie, extant at this writing, appears much like a photograph in Jones (1944). Although no known photograph exists of the Buffalo Beats prairie at the time of Transeau, the prairie probably has changed very little in the intervening 40 or more years since Transeau first saw it.

FLORISTIC COMPOSITION

The floristic composition of the Buffalo Beats prairie is a true prairie and not merely an old field with some prairie species present. Andropogon gerardii (big bluestem) is the dominant and seasonally most conspicuous grass. Other species typical of true prairies in Ohio are A. scoparius (little bluestem), Carex tripteris (tall tassel), Eryngium yuccifolium (rattlesnake-master), Euphorbia cornuta (flowering spurge), Liatris aspera (rough blazing-star), L. cymocarpa (cylinder blazing-star), Phlox subulata (moss phlox), Quercus stellata (post oak), Silphium trifoliatum (wheeled rosinweed), Solidago rigidia (rough-leaved goldenrod), and Sorghastrum nutans (Indian grass). A few small, but relatively old, trees occur on the prairie; these are Quercus stellata (post oak) and Q. alba (white oak). The former is uncommon in the region, but the latter is codominant with other oaks in the adjacent forest. Although Crataegus spp. (hawthorns), Sassafras albidum (sassafras), Ceris canadensis (redbud), Cornus floridas (flowering dogwood), Fraxinus spp. (ash), and other species which invade open areas in the forests of southeastern Ohio (Barcus, McConnell, and Wistendahl, 1978) are present in the immediate vicinity of the prairie, they do not occur on the opening. The invasion of forest species is occurring slowly.

An attempt was made to determine if there were viable seeds of prairie species buried in the upper 10 cm (3.9 inches) of soil in three areas: prairie, transition, and forest. Although some differences were noted in the species composition of the seedlings which emerged, no evidence of residual prairie seed appeared in the forest adjacent to the prairie. Such negative results might be expected because of the slow rate of invasion of the prairie by the forest; however, the results of this preliminary study are inconclusive.

SOIL AND PLANT RELATIONSHIPS

Soil data from intervals along an 80-m transect line illustrates graphically that the prairie soil has a pH of 7.5, whereas the forest soil has a pH of 4.5 with the transitional soils intermediate (Wistendahl, 1975). The prairie species end abruptly at the prairie-transition. On the other hand, a continuous cover of forest occurs from the transition zone into the adjacent forest. Quadrat data reveal that the transition zone and the forest are 91 percent similar in species richness, but that they are only 39 percent similar if density values for tree stems per species are included in the calculations. The difference is because of the presence of a large number of individuals of Quercus alba (white oak) in the transition zone. Presumably, the prairie had extended to the limits of the calcareous soil including that portion now occupied by the trees in the transition zone. The locations, sizes, and ages of selected trees were determined on and adjacent to the prairie.

An example specimen, Quercus alba with a diameter of 51.8 cm (20.1 inches) and a height of 17 m (55.8 ft) located 2.4 m (7.9 ft) from the edge of the prairie, had 277 growth rings at breast height in 1960. Other trees were similarly old for their sizes. Resampling 17 trees for diametrical and vertical size after an interim of ten years revealed growth rates considerably less than 0.3 cm/yr (0.2 inch/yr) in diameter and 0.25 m/yr (0.82 ft/yr) in height. These data compare favorably with those of Geis and Bogess (1970) who estimated that it took 400-600 years for a grove to develop on an Illinois prairie.

The existence of the Buffalo Beats prairie appears to be strongly correlated with the characteristics of the soils. The results of soil analyses reveal that the prairie and transitional soils are similar in clay content (ca 60 percent) and calcium levels (18.8 meq/100 g) which result in higher water-holding capacities and pH values than soil of the surrounding forest (Wistendahl, 1975). A feature of the calcareous soils is the presence of calcareous nodules in the B horizon, similar in appearance to those illustrated by Evers (1955). The prairie soils are dark reddish brown in color in contrast to the light buff color of those derived from shale under the adjacent forest. Soils of the transitional area are variable and appear to be modified in color to that between those of the prairie and forest. Severson and Armman (1973) report similar changes in soil in a forest-prairie transition in Minnesota.

SUMMARY

The eastern location of Buffalo Beats prairie appears to support Transeau’s concept from several viewpoints. Floristically, Buffalo Beats is a prairie and not merely an old field. The prairie, perhaps since Pleistocene times and at least over the past 200-300 years, indicates a relatively stable vegetation with an abrupt transition from prairie to forest. Additionally, the soil has features characteristic of those of mature prairie soils such as the presence of calcareous nodules. Although small in area, Buffalo Beats may be considered to be an element of Transeau’s Prairie Peninsula rather than a component of the eastern deciduous forest or a distinct vegetational type itself.

LITERATURE CITED


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STARK-CASE PRAIRIE, A SIGNIFICANT REMNANT IN NORTHEASTERN OHIO

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In July 1977, Freda Case, an active amateur botanist, brought attention to this site with an inquiry about prairie-dock (Silphium terebinthinaceum). Several observing and collecting excursions to the site resulted in the recognition of a large number of prairie species. This site, 3.25 ha (8.1 acres), is in the SW¼, NW¼, Section 13 and the SE¼, NE¼, Section 16 of Perry Township, T10N, R9W, Stark County, Ohio longitude 81°29' and latitude 40°47'14", being about 81 km (50 miles) south of the east side of Cleveland. This paper is a preliminary floristic study of this prairie remnant.

CLIMATE

The climate of Stark County is influenced by the presence of Lake Erie to the north. Lake Erie moderates cold air masses during the late fall and winter, contributes to brief, heavy snow squalls in autumn, and delays the arrival of spring. The average date of the first frost is 22 October and the last freeze is 30 April. The growing season varies in duration from 120 to 211 days with an average of 160 days. The average high temperature for June, July, and August is 27.3°C (81.1°F). The average low temperature for December, January, and February is -6.6°C (20.1°F). The normal precipitation in May, June, and July is 28.4 cm (11.17 inches) or about 52 percent of the average precipitation of 89.3 cm (35.13 inches) for the year. Normally no month receives less than 5 cm (2 inches) of precipitation. About 13.5 percent of total precipitation is snow (U.S. Dept. Commerce, Natl. Weather Serv. Office, Akron-Canton Airport, Akron, Ohio, 1978, personal communication).

HISTORY

Most of Stark County has been glaciated several times. About 20 m (66 ft) of Navarre Till lies under the remnant. The Navarre Till is composed of ground and end moraines from the Killbuck Lobe of late Wisconsinan Age. The till is calcareous, sandy, and moderately pebbly with numerous cobbles and boulders. The composition of the matrix averages 47 percent sand, 37 percent silt, and 16 percent clay.

Several historical sources confirm the existence of natural openings in western Stark County. "In the spring of 1807 two young men, with a horse and a cart loaded with provisions, blankets and rifles followed the Indian trail over the plains west of Canton to the Tuscarawas River..." (Everts, 1875). Thomas Rotch, a founder of Massillon, in a letter to his brother described the area as "A handsome plain about a mile from the Tuscarawas branch of the Muskingum River..." (Kane, 1976). Sears (1926) noted "there seem to have been no less than five regions in Ohio in which the prairies were of considerable size..." (Sears, 1926). The sandy region of oak openings in Wayne and Stark counties.

The remnant has undoubtedly been pastured in recent times, but presently it is ungrazed. The small Wetmore Creek near the south side of the remnant has been channelized in an area mapped as being floodplain and kettlehole (DeLong and White, 1963). Evidence of old ditches persist in the remnant. The single most important event was the construction of the railroad through the area. The original railroad was constructed sometime between 1847 and before the arrival of the first train in Massillon on 11 March 1852 (Kane, 1976). Before the railroad converted to diesel locomotives the area burned frequently (Mary Perry, 1978, personal communication).

METHODS

Seven distinct plant communities are apparent at the site (Fig. 1). These communities are described individually in the discussion. The remnant was visited several times in the fall of 1977 to map and assemble a list of the prairie species (Table 1). The prairie species selected were determined from the studies of Curtis (1955), Sears (1926), Scharrer (1971, Table 9), and Schulenberg (1970). An approximate abundance value for each species was estimated for the entire area covered by each community. The abundance is designated as rare (R) for one plant, uncommon (U) for two to five plants, common (C) for six to twenty-five plants, or abundant (A) for more than twenty-five plants in an area of 3 m × 3 m.

Voucher specimens of distinctive species were collected for this site. These vouchers are in the herbarium of The Wilderness Center, Inc. In some cases, the numbers of these plants were too small to justify their collection, for example, prairie coneflower (Ratibida pinnata) and grass-of-Parnassus (Parnassia glauca). Photographs vouchers were obtained for these species.