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Tree Succession in Pine Hollow State Forest and Its Implications

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Tree Succession in Pine Hollow State Forest and Its Implications

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Abstract: Acer saccharum and *Ostrya virginiana* are replacing *Pinus strobus* and *Quercus alba* on the upland ridges of Pine Hollow State Forest Preserve. Any further detailed studies of the history of the pine in the preserve require not only the preservation of the pine-dominated stands but all upland stands. Since some of these are being logged within the preserve, future management should be changed to insure the protection of all the plants in the preserve. This can only be accomplished by formal legal dedication of the area as a preserve.

INTRODUCTION

A little over thirty years ago a group of naturalists in Dubuque began acquiring 80 acres of woodland in the northwest corner of the county. The area was unusual for Iowa due to the presence of white pine (*Pinus strobus*) on the uplands and American yew (*Taxus canadensis*) on the north slopes. It was their desire that the area be set aside to be used by those who enjoy looking at nature without improving it. With this area as a nucleus, the Dubuque County Conservation Society and the State Conservation Commission continued to acquire land to form the present 640-acre area. In keeping with the wish to limit the recreational development of the area, it was set up as Pine Hollow State Forest Preserve rather than as a state park.

There is a great deal of interest in Iowa at the present time in the preserve concept; papers in recent Proceeding of the Academy (Ennis, 1962; Carter, 1962; Smith, 1963), the founding of the Iowa Chapter of the Nature Conservancy, and the report of the Governor's Committee on Outdoor Resources have all stressed the importance of the preservation of native vegetation.

Since Pine Hollow was the first woodland in Iowa in which an attempt at preservation was made, I would like to report on the successional relations in the pine stand and discuss the implications of a succession in the management of Pine Hollow and in preserves in general.

DESCRIPTION

Pine Hollow is a wooded area in the northwest corner of Dubuque county. It contains relict stands of white pine and yew. These northern species apparently have persisted in this site due to a favorable microclimate since the recession of Wisconsin glaciation. Similar areas have been studied in Indiana (Friesner

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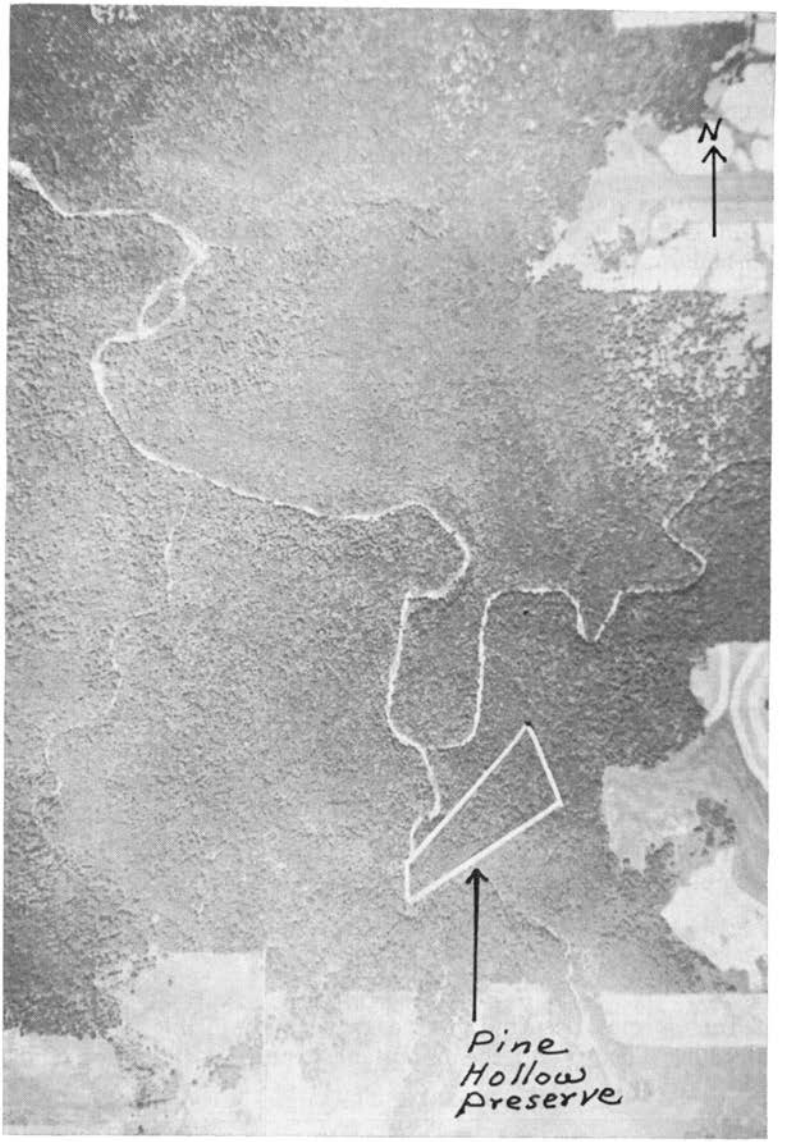

Figure 1. Photo of Pine Hollow Forest Preserve. (Taken from Stabilization Service, USDA, Aerial Photograph SV1IT-51.)

and Potzger, 1934) and in Wisconsin (McIntosh, 1950). Thorne (1964) has discussed the general habitat and environment of Pine Hollow and reviewed much of the literature.

The two stands studied are located on a ridge running from the southeast branch of Pine Hollow Creek to the cleared up-

lands to the west (Figure 1). Stand one is located to the west and is dominated by white pine. Stand two, further east toward the cleared uplands, is dominated by white oak and white pine.

Methods

The trees and saplings were sampled using the quarter method (Cottam and Curtis, 1956). The data were tabulated and importance values and stand density was calculated. Diameter size classes were set up and the density per acre for each class was obtained for each species. The sampling was done by students in the plant ecology courses during 1963-64.

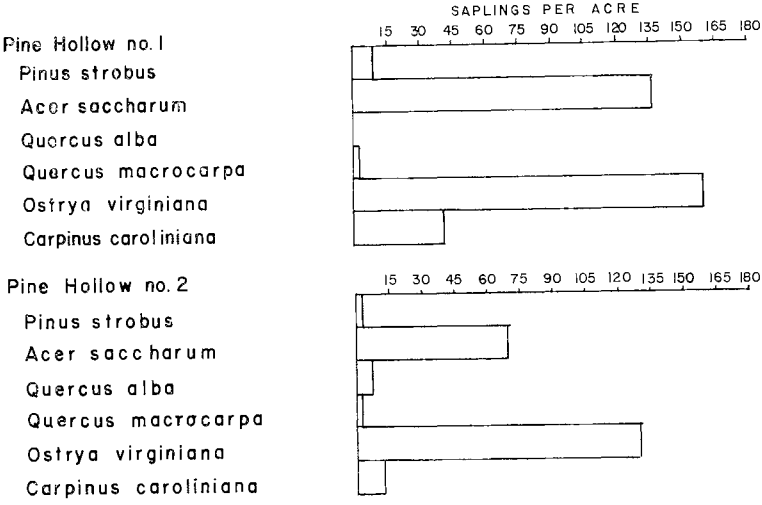

Figure 2. Sapling density in the two stands in the study.

Results

Ten species occurred in the two stands. Table 1 lists the absolute density and the importance value of the trees. Only

Table 1. Absolute density and importance value of trees.

Species	Stand one Density trees/acre	Stand one Importance value	Stand two Density trees/acre	Stand two Importance value
Pinus strobus	193	200	57	98
Acer saccharum	8	27	31	28
Quercus alba	5	5	89	117
Quercus macrocarpa	16	30	6	22
Ostrya virginiana	20	33	12	15
Carya ovata	4	5	19	16
Prunus serotina			5	3
Juglans cinerea	1	1	1	1
Carpinus caroliniana	0	0	0	0

six species were present in the sapling layer (Figure 2). Saplings were defined as trees between 1 and 4 inches in diameter. Six species of trees occurred with absolute densities greater than ten trees per acre. Only these have been listed according to size class (Fig. 3 and 4).

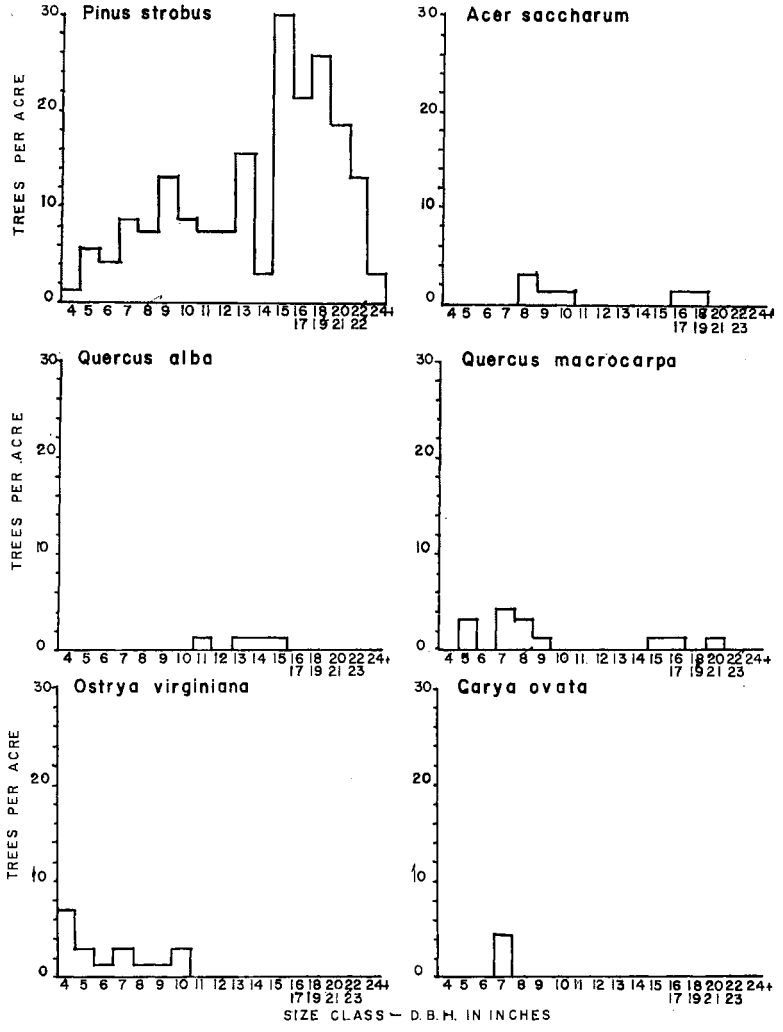

Figure 3. Tree density by diameter size class in stand one. Only those species with a total density exceeding 15 trees per acre in either stand are included.

The dominance of white pine in stand one is clearly shown in Fig. 3. It attains its maximum density in size classes from 15-21 inches dbh. Fifty per cent of the pine occurs in these three

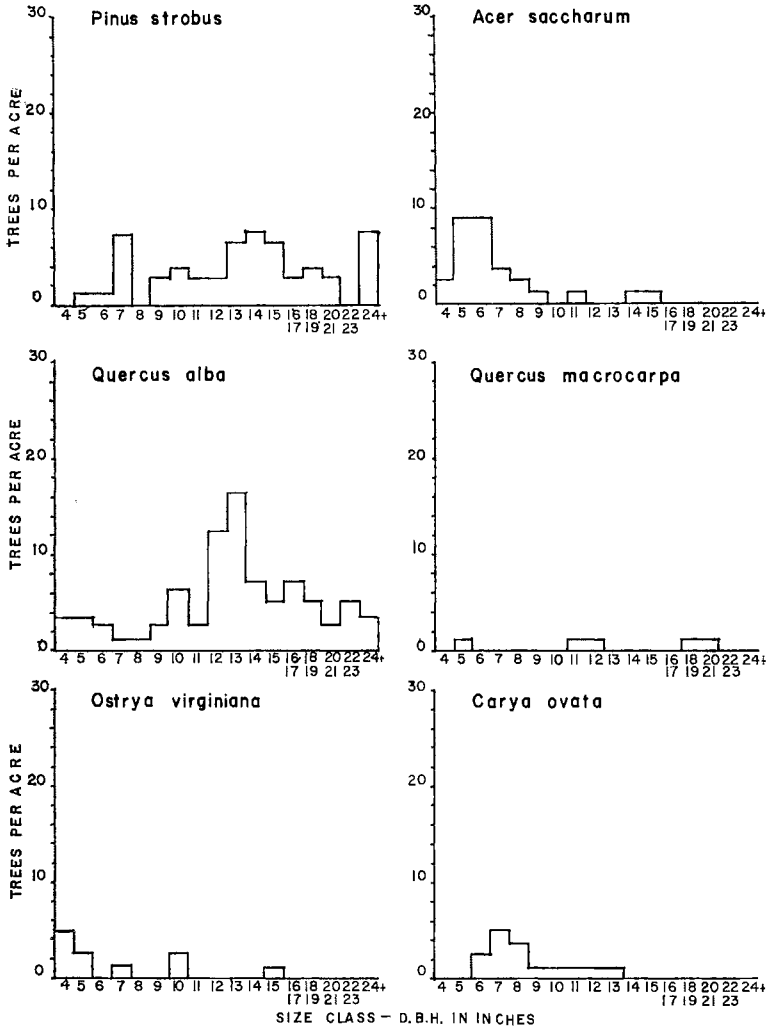

Figure 4. Tree density by diameter size class in stand two.

classes. Only ironwood (*Ostrya virginiana*) has a higher density than pine in any of the size classes. In stand two, white oak (*Quercus alba*) has the highest density followed by pine and then sugar maple (*Acer saccharum*). Pine does not show a definite peak in this stand, but three other species show peaks: white oak at 12-17 inches dbh, sugar maple at 5-6 inches dbh, and ironwood at 4-5 inches dbh.

The data on saplings (Fig. 2) shows two species, maple and ironwood, with highest density in both stands.

Discussion

The presence of pine and other nothern flora in the Hollow (Thorne, 1964) can be explained by favorable microclimate and steep slopes which allowed the shade-intolerant species to persist since the glacial recession. This does not explain the presence of these species on the uplands.

The results of the size class analysis of both stands, while indicating different past history, indicate the same successional sequence. This is most clearly shown by the sapling results, but it is also indicated by the tree data. In both stands, the pine and white oak are being replaced in the understory by the more shade-tolerant maple and ironwood. Since ironwood tends to be important only in the lower size classes (rarely obtaining large diameter in woodlands) we would expect maple to increase in importance with the ultimate result of a stand of mature maple with occasional longlived pine emergents. This is the general sequence which is common in the northern hardwoods (Curtis, 1959) where white pine is a semi-pioneer species. From this evidence it seems that the pine and oak are being replaced on the ridge tops by maple, and in time the pine and oak will be restricted to the edges and side slopes where sufficient light for reproduction is available.

Pine succession in the northern hardwoods of Wisconsin requires approximately 300 years to develop a complete deciduous canopy under the pines, and another 300 to 500 years is required for the emergent pines to die and leave the terminal maple forest (Curtis, 1959). While this is a long time, it is relatively short compared to the 12,000 years since the retreat of the Wisconsin glaciation in Iowa and Wisconsin. This would allow time for fifteen or twenty of these successional cycles to have occurred in the area. At present we cannot say if there has been a sequence of successional cycles in the past or if the present upland stand is of recent origin. The question of why pine is not also present on all the adjacent uplands rather than just on certain ridges is also unanswered. An investigation to answer these questions will require a study not only of the pine stands, but also a study of the stands of the surrounding area.

Since the area has been a forest reserve, it seems that the major management has been concerned with the white pine. The state halted removal of white pine logs, but in recent years they have carried out a series of logging operations in the oak woodland on the ridge between the south and southeastern branches of Pine Hollow Creek. This ridge was one of the major areas in the preserve without white pine; as a result

future studies may be hampered by the disturbance resulting from logging.

In setting up preserves, we must remember that it is not enough just to protect the particular plants of greatest interest; but we must also preserve the areas surrounding, not only to protect the plants but also to serve as an area for investigation of the distributional limits of the plants. We want to preserve not any one particular species but rather a dynamic vegetational community containing a particular species.

We must also carefully evaluate whether we should attempt to manage successional communities to maintain a pioneer stage. This decision is not one that can be made lightly since it requires careful study and evaluation to prevent destruction in the guise of managing.

Finally we must understand that any area can only be preserved through a formal system of dedication, and merely making it a park or a state forest does not guarantee anything.

A park or a forest is managed to suit the prevailing thinking in recreation or timber management. "Multiple use" and similar approaches to land management are useful guides to proper utilization of much of our unimproved land. However, when trying to preserve a vegetational community that has been preserved by nature 12,000 years, we cannot take it for granted that the next expansion of recreational facilities will be absorbed by some other area. Pine Hollow or any preserve must be removed from a status where future *improvements* could destroy what the climatic fluctuations of the past could not destroy. It is only by proper legal safeguards that areas such as Pine Hollow can be permanently removed from the pressures of public recreational utilization.

In speaking of Pine Hollow as a relict, Thorne (1964) states: "In a much larger sense, the whole Pine Hollow Forest is a relict. The obliteration or severe disturbance of favorable forest habitats, elsewhere in eastern Iowa by man, has of course greatly increased the apparent relictual nature of the reserve." Relicts such as Pine Hollow have been preserved by a favorable site from harmful climatic changes which killed off the surrounding vegetation and replaced it with a different type. It may well be that the purposeful act of preservation by man will be the only refugium for our native vegetation from the destructive environment of that same man.

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Pheasant Farms in Iowa[1]

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Abstract: An investigation of privately owned pheasant farms in Iowa was conducted from 1960 to 1963. The objectives of the study were to locate all pheasant farms in the state and to study the distribution, size, annual production and years of operation of these farms. The majority of pheasant breeding operations were located in the southern half of Iowa. A total of 254 individuals reared pheasants during the study, but only 31 pheasant farms operated continuously from 1960 to 1963. The average number of farms per year was 119. A total of 84,943 pheasants was produced during the study. Large pheasant farms (over 500 birds) comprised 5% of the total number of farms, but produced 82% of the pen-reared pheasants. Most pheasant farms (88%) produced fewer than 100 birds each year. An average of 43% of the operators reared pheasants for the first time in each of the years 1960 to 1963. Pheasant breeders in Iowa varied in level of education, background, and employment. No persons depended upon a pheasant farm to supply their entire livelihood. Most operators reared pheasants as a hobby, for local stocking, or for home food consumption. A few sold birds to food processors and to commercial shooting preserves.

INTRODUCTION

An investigation of pheasant farms in Iowa was conducted from 1960 to 1963. Little was known about pheasant farms under private ownership in Iowa previous to our investigation. This study attempted to locate all pheasant farms in the state, and to study their distribution, size, annual production and number of years of operation.

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