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PRELIMINARY INVESTIGATION OF A LARGE FLORA DEPOSIT FOUND IN PIT 11, PEABODY COAL COMPANY MINE

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ABSTRACT

A large number of carbon residue plant megafossils, characteristic of the middle Pennsylvanian Period, were discovered in a layer of Francis Creek Shale just above the Colchester (No. 2) Coal. In the over 600 specimens collected, ferns, pteridosperms, cordatales, and sphenopsids were identified, with an abundance of stems. Based on this data, a reconstruction of the paleoenvironment in which these flora were deposited suggests the terrestrial portion of a river delta.

INTRODUCTION

The Francis Creek Shale, a member of the Carbondale Formation, is exposed at several locations throughout western and north-central Illinois. This shale, as described by Smith (1970), overlies the Colchester (No. 2) Coal and varies in thickness from 0 to 80 feet. Its composition consists of fine grained sediment ranging in size from clay to fine sand with occasional mica present. Although in most locations the Francis Creek is generally considered a fossil-poor shale, the exposures at the Peabody Coal Company Mine near Braidwood, Illinois have produced some of the world's best specimens of middle Pennsylvanian flora and fauna. These famed Mazon Creek fossils are principally found within siderite concretions, but occasionally carbon residue fossils are found in layers within the shale. This carbon residue form of fossilization is considered relatively rare, although known to occur throughout the shale above the No. 2 Coal (Shabica, 1970).

In the present study, over 600 fragmented carbon residue plant fossils were collected from an area between ramps 2 and 3 directly across from the highwall in Pit 11 (fig. 1). The field collections were made in April, 1974 at a time when operations were in progress to fill in Pit 11 and eventually close down the mine. The specific location of find was in a spoil area recently uncovered by the shovel, and consequently the shale was very fresh and moist. This fact made preservation of the delicate fossil material possible. Subsequent return to the site revealed that it

had been buried beneath tons of spoil material, making future specimen discovery impossible.

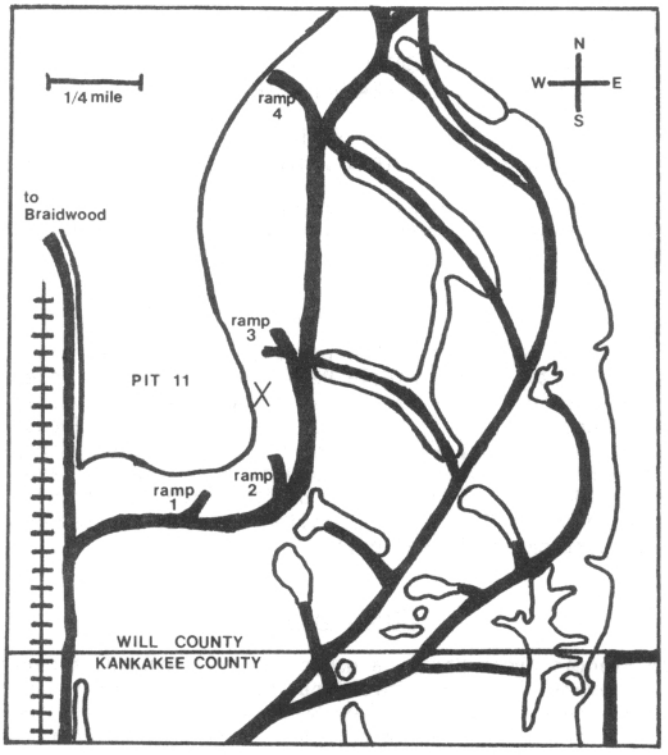

fig. 1. Location of Plant Megafossils Recovered in This Study.

RESULTS

In this preliminary investigation of the fossils found at this location, the predominant flora consist of ferns, pteridosperms, trees and their parts (Table 1). The ferns occur as fragments ranging from complete fronds to individual pinnules with an abundance of associated stems (fig. 2). Trees were primarily represented by leaves and fragments of branches (stems) and bark. Pinnularia was also found in abundance. The identification of the various genera was based on comparison to the descriptions of Darrah (1970), Janssen (1965), and Langford (1958, 1963). Noteably absent in this collection are faunal remains. Although early forms of insect and animal life were common at that time, no evidence of terrestrial or marine fauna was found.

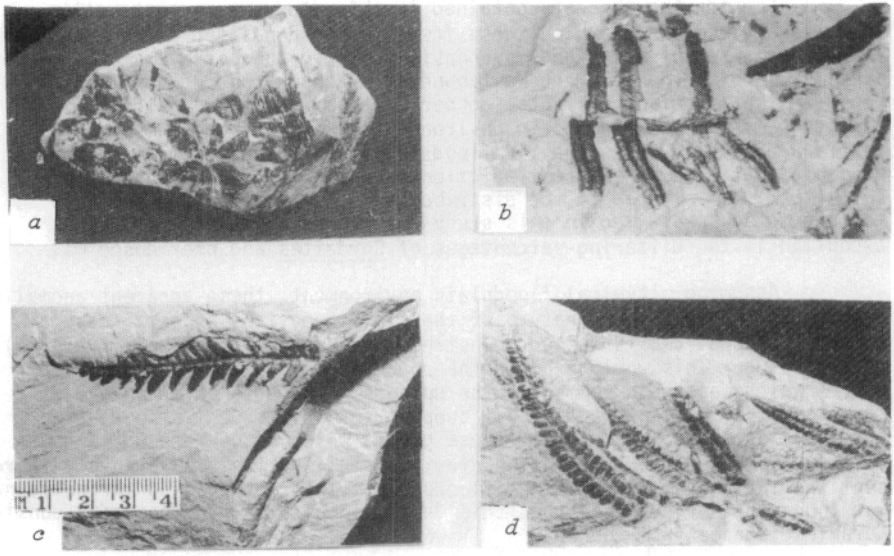

fig. 2. *(a)* Sphenophylum majus *(center) with a* Calamites *stem (right); (b) fragment of* Asterotheca*; (c) frond of* Pecopteris*, genera* Sentenbergea pennaeformis*; (d) several fronds of* Pecopteris*, genera* Asterotheca arborescens.

Statistically, ferns in general account for more than half the total number of specimens identified in this study, and they were classified according to their generic names within the Filicinae and pteridosperm. The most abundant and representative of the Filicinae are the specimens of Pecopteris and its varying species. Alethopteris and its related species are the dominant pteridosperm, accounting for nearly twenty percent of the total number of identified specimens. The remaining fossils that were identified are the various forms of trees and related parts. Evidence for lycopsids was found in several small fragments of bark from Lepidodendron, with the characteristic diamond-shaped leaf scars clearly visible. Calamites, Annularia, and Sphenophyllum were the only species of Sphenopsids identified. The presence of Cordaites in large numbers is somewhat surprising, considering that they are usually associated with upland areas.

DISCUSSION

Considering the data obtained in this study, a reconstruction of the paleoenvironment in which these fossils were deposited is made possible. The large number of ferns and sphenopsids clearly suggest a swampy lowland area where this type of flora was abundant. Peppers and Pfefferkorn (1970) consider the association of pteridosperm, ferns, and sphenopsids as representative of a levee-floodplain environment. Based on the numbers of each genera reported in this study, a floodplain type of environment seems most probable, but an apparent contradiction is evident in the abundance of Cordaites. As compared to the distribution of flora reported in Table 2, the percentages obtained in this study correspond quite well. Obvious exception is the differing percentages of Cordaites and pteridosperms.

Assuming a typical floodplain environment, these apparent anomalies, combined with the layered nature of the flora deposits, suggest seasonal accumulations of debris washed downstream during periods of heavy rainfall and flooding. This would explain the abundance of Cordaites and pteridosperms which were both common to the uplands. The fragmented nature of the fossils also offers additional support for extensive transportation and a distant point of origin. Those genera which do correspond to the distribution data reported in the previous studies (Table 2) probably represent the indigenous flora of the floodplain. The fact that no marine fauna was found further suggests that this depositional area was located a considerable distance from the sea.

Table 1. Distribution of specimens according to form genera.

LYCOPSIDS		FILICINAE	
Lepidodendron	9	Asterotheca	27
Lepidophyllum	11	Caulopteris	1 (?)
Sigillaria	2	Crossotheca	1
		Dactylotheca	1
		Dicksonites	1
SPHENOPSIDS		Pecopteris	47
Annularia	18	Ptychocarpus	6
Calamites	17	Renaultia	12
Sphenophyllum	17	Senftenbergia	13
PTERIDOSPERMS		CORDAITES	
		Cordaites	72
Alethopteris	101		
Diplothmama	1		
Mariopteris	3	PINULARIA & STEMS	Abundant
Neuropteris	41		

Table 2. Distribution in percent of the flora of the Francis Creek Shale. (Modification of Peppers and Pfefferkorn, 1970)

Plant Group	Plant Megafossils (Francis Creek Shale)				
	1 Janssen 1946 (%)	2 Stewart 1950 (%)	3 ISGS Collection (%)	AVG. (1, 2, 3) (%)	Sipiera and Korbus, 1976 (%)
Lycopsids	6	7	14	9	5
Sphenospsids	20	11	17	16	22
Ferns	26	48	24	32.7	27
Pteridosperms	44	34	44	40.7	36
Cordaites	2	0.3	0.5	0.9	18
Others	2	-	0.5	-	-

CONCLUSION

During the Pennsylvanian Period, the paleoenvironment of the Coal Region of Illinois was characterized by regular transgressions of the sea which would inundate the lowland areas and bury all traces of life beneath layers of silt, sand, and mud. The Braidwood area in particular resembled a typical deltaic environment with a river flowing in from the northeast. For the particular site where the fossils of this study were found, the depositional environment suggested by the distribution of flora, corresponds well to the terrestrial portion of a delta plain as described by Shabica (1970).

ACKNOWLEDGEMENT

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