

Report to: Roger Kelly

Date: April, 1965

From: James Schoenwetter

Title: Pollen Analysis at Arizona 1:15:18

ABSTRACT

Eight sediment samples from the Sinagua site Ariz 1:15:18 (also NA7449) were submitted to the Museum of New Mexico Research Laboratory for pollen analysis. The sample collected from the top of the trash mound, presumably illustrating the modern pinyon-juniper woodland vegetation, yields pollen frequencies similar to surface samples from pinyon-juniper woodlands elsewhere in the Southwest. The samples from the floors, fill immediately above floors, and artifact-bearing trash mound horizons contain pollen frequencies similar to those of surface samples from tree-less locations. It seems, then, that at the time of occupation the site was located some distance from the nearest juniper savanna, in open--probably grassland--country. The samples from the occupation level are correlative in their pollen statistics with samples from the Chuska Valley of northwestern New Mexico which date 1100-1175 on the basis of intrusive ceramics. This is in excellent accord with the estimate of AD 1120-1200 originally given the site.

The eight pollen samples submitted from Ariz 1:15:18 were processed and analyzed during March of 1965 by techniques in general use at this laboratory. The use of an adjusted pollen sum was employed in the analysis, as this has been found extremely useful in interpretation of vegetative patterns in northwestern New Mexico (Schoenwetter and Eddy, 1964, pp. 69-72). This type of analytic device has also been found to allow good correlation between pollen samples of known dates from the Colorado Plateau (Schoenwetter, 1962; Hevly, 1964) and northwestern New Mexico.

units

Unpublished studies by this laboratory have demonstrated that structural vegetation (~~sites~~) can be differentiated in the Southwest by the AP (arboresal pollen) values of surface sediment samples when an adjusted pollen sum is utilized. Dense woodlands yield AP values of 85 per cent or more; woodlands yield values of 60 to 80 per cent; savannas yield values of 50 to 60 per cent; and tree-less conditions between 10 and 35 per cent. There is no reason to suspect that similar AP frequencies of subsurface pollen samples are not representative of similar vegetation patterns.

The sample collected from the top of the trash mound (No. 5) can be considered representative of the present pollen rain in the area of

the site, and a response to the immediate vegetation pattern. It contains 75.5 per cent AP, which agrees with what we have come to expect in pinyon-juniper woodlands of the type growing at the locality.

The two samples from the cultural horizon in the trash mound (No's. 6 and 7) are essentially identical in all important palynological characteristics. They contain far lower AP values (18.0 and 16.5 per cent, respectively) and the interpretation of vegetative pattern would be one of a tree-less condition in which the nearest juniper savanna is rather distant. The dominant plants at the locality were probably species of grass well mixed with annual weeds, the latter responding to the disturbed soils of the site area.

The samples collected from floor levels (No's. 4 and 8) and those from early post-occupation horizons (No's. 1, 2 and 3) all evidence the same ecological condition. AP values range from a minimum of 15.0 to a maximum of 18.0 per cent in these pollen spectra. There is no essential variation between this group of pollen spectra and the spectra of the lower trash mound samples.

Maize pollen is infrequent in these samples, but the amount of maize pollen at a given site is not a reliable index to the amount of maize grown or utilized. Maize pollen, as well as the other parts of the maize plant, is culturally handled in a number of ways and each might account for the presence or absence of a quantity of maize pollen in a given sediment sample. The lack of squash and bean pollen is also no index to the number and types of cultigens grown or in use at the site. Pollen of Cleome (bee-weed) was observed in the samples from the trash mound and also in sample No. 4. This plant has a number of uses ethnobotanically and its pollen is probably present because of some economic value of the plant to the inhabitants of the site. Perhaps it was used as a vegetable green or as an organic pigment source for pottery.

Dating the site by pollen analysis involves correlation of the pollen spectra with those dated elsewhere. The work of Schoenwetter (1962) and Hevly (1964) in east-central Arizona and that of Schoenwetter and Eddy (1964) in northwestern New Mexico, can be correlated with that more recently done in the Chuska Valley (Schoenwetter, MS) by converting the pollen statistics of the earlier studies into comparable values by adjustment of the pollen sum. All of these studies, then, agree in illustrating tree-less conditions at certain specific dates between AD 500 and 1400. The combined pollen curve from these investigations shows tree-less conditions between AD 750 and 1000, AD 1100 and 1175, and AD 1300-1350. By pollen correlation alone, any one of these dates might be applied to the cultural horizon of Ariz 1:15:18.

The artifact content of the site can also be used for dating, and in this case the estimated age on the basis of ceramics and house pattern is between AD 1120 and 1200. The agreement between this estimate and independent pollen date of 1100-1175 is an excellent one, and not likely to be due to chance. If both dating techniques are correct, the time period of site occupation must have been sometime between AD 1120 and 1175.

This study has been particularly valuable to the paleoecologist as well as the archaeologist, because the data available yield very interesting insights into the nature of variations in pollen statistics, and also because they illustrate a point of paleoecological comparison which previous work has little investigated. In the first study of pollen from archaeological sites on the Colorado Plateau, Schoenwetter (1962) proposed that variations through time in the frequency of Compositae pollen, or variations in the Chenopodiaceae/Compositae ratio, were related to variations in rainfall periodicity patterns through time. Hevly (1964), working in the same area, recognized rainfall periodicity variations also, but on a different basis. Rather than utilizing Chenopodiaceae/Compositae ratios, he utilized variations in the proportions of *Q. pinyon* and *Q. ponderosa* pollen and also came to the conclusion that a summer precipitation pattern existed between AD 1100 and 1300 but not before or after.

This site, however, contains high values of Compositae pollen and must date within the period when both geological and palynological evidence in other areas of the southwest clearly illustrate a summer-dominant precipitation pattern. This would indicate that the use of Compositae values, or Chenopodiaceae/Compositae ratios, is not a reliable technique for determining regional rainfall periodicity patterns in the Southwest. Schoenwetter (1962) apparently happened to be correct in his conclusions, but the evidence on which those conclusions was based is not as reliable as was thought.

It may be of interest to note that all of the pine pollen of the cultural horizon at this site was of the pinyon type, correlating with Hevly's (1964) analyses and indicating a predominance of summer rainfall at the time of occupation. The effects of summer-dominant storm pattern conditions on prehistoric agriculture have been discussed in the archaeological literature (Schoenwetter, 1962; Schoenwetter and Eddy, 1964).

The second point of paleoecological interest derives from the fact that other Southwestern pollen studies have been undertaken basically at sites where the present vegetation pattern is one of a tree-less or savanna condition, while this site is located within the woodland vegetation pattern. The other sites which show tree-less conditions between AD 1100 and 1175 in the Chuska Valley (Schoenwetter, MS), Hay Hollow Wash (Hevly, 1964) and the Vernon area (Schoenwetter, 1962)

now also are tree-less. Thus, there was no indication from these sites that effective moisture values had been any lower in the Southwest between AD 1100 and 1175 than they are now. But, at Ariz 1:15:18, tree-less conditions also occur between 1100 and 1175. Since this site is now in woodland, effective moisture values at the time of occupation are clearly indicated to have been substantially lower than they are at present.

REFERENCES CITED

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POLLEN STATISTICS FROM ARIZ 1:15:18

	Sample							
	5	6	7	1	2	3	4	8
AP	75.5	18.0	16.5	15.8	18.0	18.0	15.0	16.0
<u>Pinus edulis</u>	33.0	4.5	3.0	4.4	6.0	4.0	4.0	4.0
All <u>Pinus</u>	62.5	7.5	4.0	6.8	7.0	8.0	7.0	6.0
<u>Juniperus</u>	13.0	10.5	12.5	9.0	11.0	10.0	8.0	10.0
Chenopodiaceae	9.5	48.0	61.5	55.5	58.0	59.0	59.0	66.0
<u>Artemisia</u>	1.5	2.5	2.0		3.0			
Other Compositae		2.5	0.5			2.0	1.0	2.0
Gramineae	13.5	25.0	18.5	24.4	20.0	18.0	25.0	16.0
<u>Ephedra</u>		1.5	0.5		1.0	1.0		
Malvaceae		0.6		2.2				
Onagraceae						1.0		
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Ambrosiaceae	25.0	53.0	56.0	93.5	81.0	78.0	89.0	100.0
<u>Zea</u>		0.5				1.0	2.0	
<u>Cleome</u>		2.0	0.5				2.0	

% on basis of pollen sum

% of grains not included in pollen sum