TRANSACTIONS, ILL. STATE ACAD. SCI.
Vol. 69, No. 2 (1976)

OCCUPATION AND NATURAL STRATIGRAPHY IN THE CENTRAL ILLINOIS RIVER VALLEY: THE BEARDSTOWN TERRACE COMPLEX

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ABSTRACT

Paleo-ecological parameters for Archaic site occupation in the Central Illinois Valley were the object of geo-archeological investigations conducted in the course of contract archeology along the Illinois Waterway. Preliminary survey and testing, undertaken by a University of Illinois (Chicago Circle) team, established associations between alluvial sedimentary environments and occupation contexts. Detailed sediment testing was focused on the Otter Creek and Richardson sites to determine natural stratigraphy and evolutionary history of the Beardstown Terrace Group, a series of meltwater formations that probably documents the terminal episode of major fluvial sedimentation in the Valley. Basal sand-gravel matrices and overlying pedomorphic units were analyzed to elucidate both the nature of deposition and the chronological framework within which sequential morphogenetic change took place. The terrace complex is tentatively correlated with shoreline fluctuations in the Lake Michigan Basin and glacio-fluvial events in the Mississippi Valley, to derive a measure of geo-archeological contemporaneity with known early Archaic sites. Post-Woodfordian fluvial activity may explain both the limited distribution and restricted intra-site assemblages of Archaic complexes in the alluvial terraces and bottoms. The author cautions against overly inductive paleo-anthropological interpretations of archeological survey data in the riverine micro-environment.

INTRODUCTION

Initial research into the sedimentology and paleo-geography of the Beardstown Terrace Group began in the summer of 1974 when the University of Illinois (Chicago Circle) was contracted by the U.S. Army Corps of Engineers to conduct an archeological survey along the Illinois River

from the confluence of the Kankakee-Des Plaines rivers to Beardstown, Illinois. The research strategy employed by the surveyors included a series of extensive geomorphological tests for purposes of establishing landform correlations with the prehistoric proveniences of artifacts. The results of these investigations are presented elsewhere (Hall, Schuldenrein et al., 1974). As the paleo-ecological studies progressed it was decided that intensive sedimentological research was warranted at the Otter Creek site, NW1/4 NE1/4 NE1/4 sec. 28 T3N R3E Chandlerville (15') Quadrangle in the Central Illinois Valley (Fig. 1) since

1) it contained a significant scatter of artifacts;
2) the primary archeological cluster was concentrated on a sand ridge rising ca. 7' above the alluvium; and
3) the site was situated in a critical terrace setting that had produced a wealth of archeological material.

Initial fieldwork was geared primarily at establishing environmental parameters for the morphology of this sand ridge, specifically to determine its depositional vs. erosional origin, and to distinguish it as a point bar, aeolian, or terrace component of the alluvial eco-zone. Preliminary fieldwork consisted of detailed landform description and articulation of the micro-environmental components (i.e. sedimentary basins, backswamp depressions) of the surrounding riverine area. Sedimentological testing involved the extraction of two 2" core samples to depths of 12' at optimal sand ridge locales. These samples were analyzed for sedimentary, pedological, and stratigraphic association by a battery of chemical and mechanical tests. The results strongly suggested that the formation conformed to the late-Wisconsin Beardstown (T-1) terrace as described by Wanless (1957).

The chronological isolation of this particular terrace outcrop prompted an examination of the archeological correlates of the Beardstown Terrace Group in the Central Illinois Valley. Information supplied by Alan Harn (personal communication) indicated that 19 Beardstown Terrace sites ranging in temporal occupation from Archaic to Mississippian span the distance from Liverpool to Anderson Lake (Fig. 1), and that 14 of them feature primary Archaic components. Of the 30 Archaic sites known within the valley (i.e. below the uplands) 46.7% are located on the Beardstown surface. A systematic survey conducted by Munson and Harn (1966) on three prominent Beardstown outcrops suggests that ca. 40% of the total diagnostic point assemblage consisted of Archaic artifacts. At the time, the authors reported that "Prior to modern drainage ... the terraces were virtual islands surrounded by shallow lakes, swamps and marshes ..." (Munson and Harn, 1966:150). Subsequent survey undertaken by the same researchers in the Mississippi Valley indicated a similar intensity of Archaic occupation and site settlement patterning along the flanks of the corresponding T-1 Festus/Wood River Terrace (Munson and Harn, 1971), in the American Bottoms. The next step in the geo-archeological research was an attempt to formulate a more precise association of the terrace by means of diagnostic artifact types and spatio-temporal correlations of corresponding landforms.

Preliminary geomorphologic and morphostratigraphic correlations obtained through the analysis of the Otter Creek soil cores implied that a potentially productive interpretive parameter might be obtained by

studying the morphogenetic evolution of the late Wisconsinian Beardstown surfaces. A second set of investigations was therefore directed towards

1) ascertaining the stratigraphic position of the Beardstown within the alluvial micro-environment, and
2) establishing a relative chronology of sedimentary activity which would attest to the stabilization of depositional environments, as evidenced by the progression of Archaic cultural activity.

Fieldwork resumed in August, 1975, and involved the exposure of a north-south face of a gravel pit at the Richardson Site (Fv 1111) (Munson and Harn, 1966), 2 miles upstream from Otter Creek, in SE1/4 SE1/4 NW1/4 sec. 10 T3N R3E Havana (15') Quadrangle. The pit was profiled to a depth of 14' and we obtained a clear lateral exposure of horizontal sedimentary bedding that permitted reconstruction of the geomorphic sequence. Larger soil samples were taken here and were submitted to a wider variety of tests than the Otter Creek cores. The results of the two field seasons follow a brief synopsis of the evolution of the Beardstown Terrace group and its position in the Illinois River terrace chronology.

DEPOSITIONAL HISTORY OF THE BEARDSTOWN TERRACE

Wanless (1957) describes the Central Valley topography in terms of a glacial terrace sequence to the east and upland bluffs (Illinoian Till Plain) to the west. Four regional non-slackwater terraces have been identified and consist of outwash deposits of the Woodfordian-age Bloomington Moraine (Fig. 2). Wanless (1957) has not recorded detailed stratigraphic sections representative of either Manito, Havana, Bath, or Beardstown levels, but has postulated a two-stage, late Woodfordian degradational suite for the erosional surfaces of the higher downsloping Manito (550-490') and Havana (485-465') terraces. This was the result of turbulent Kankakee Torrent activity. The lower surfaces of the Bath (465-445') and the Beardstown (445-436') substages are attributed to separate episodes in the complex Lake Chicago sequence, with the downsloping Bath associated with erosion and the Beardstown a product of deposition, as documented by numerous meander scars on its surfaces. The following basic chronology is suggested (Willman and Frye, 1970, Willman, 1973):

Substage	Event	Occurrence	Terraces
Woodfordian	Kankakee Flood	c. 15,000-14,000 B.P.	Manito, Havana
Woodfordian-Valderan	Lake Chicago Activity	c. 14,000-9,000 B.P.	Bath, Beardstown

Precise dating for both the Kankakee Flood and Lake Chicago remains problematic, with the best information for the Flood deriving from a correlation with Thebes Gorge (Willman and Frye, 1970:35), and data pertaining to Lake Chicago levels obscured by arguments keying on the fluctuating stages and drainage patterns of the Lake Michigan Basin (Hough, 1958, 1966; Bretz, 1951, 1966), and the changing limit of the Valderan ice margin (Evenson, 1973) during the Woodfordian-Valderan interval.

With respect to the Beardstown, Root (1936: 214 ff.) offers an alternative evolutionary explanation, preferring a locational model to

unless' sequential one. He refers to the Beardstown group as a series of bar-like sand-gravel depositions associated with various post-Kankakee Flood levels. In such a scheme, those surfaces immediately north of the Sangamaon River are Bath manifestations, while those farther upstream are Havana outcrops -- erosional -- and subject to significant episodes of lateral migration by the river in response to an unstable equilibrium engendered by variability in the Kankakee and Lake Chicago discharge regimes (Root, 1936: 220).

Most recent evidence (Butzer, personal communication, Schuldenrein, this paper) suggests that the general morphology of the Beardstown Terrace had been established by the onset of Two-Creekan times. Such a hypothesis assumes that the large proglacial lake basins at the Illinois River headwaters trapped most of the coarse bedload sediment and, in default of demonstrable major flood surges during the Valderan (post-Kankakee Torrent), must have resulted in a predominant regime of suspended load transport and sedimentation by about 12,500 B.P. This would correspond to a readjustment of the river channel from a braided to a meandering stream and favored a narrower, steeper floodplain gradient promoting incision. Butzer (personal communication) has argued on the basis of evidence from the Koster site that at least forty feet of downcutting is verified prior to the onset of a new aggradation cycle in the Lower Illinois Valley ca. 9000 B.P. In the Central Valley minor and localized periods of sedimentary activity, associated with the gentle relief of the Beardstown Terrace with respect to the floodplain have resulted in certain modifications of the uppermost stratigraphic units into Recent times.

Regardless of which interpretation is preferred, evidence documenting absolute chronologies in the Chicago Outlet region remains inadequate and controversial. The following presentation of the local stratigraphic data is offered against this backdrop of relative sequences and comparative correlations.

THE 1974 FIELD SEASON: AN OVERVIEW

Without the benefit of geomorphological maps for the Otter Creek site region all initial environmental information was gathered from U.S. Army 1' contour maps and direct site observations. Core samples were taken at three locations on the basis of distinctive features of the micro-environment as follows (Fig. 3):

1) on a known spoil bank to establish a control and meaningful datum (443.2');
2) at the peak of the ridge (444.3'); and
3) on a northeastern backswamp depression (444.1').

After preliminary descriptions of the colour, texture, consistence, and structure of the pedogenic and sedimentary units, the samples were submitted to a variety of tests.

A) X-Ray Diffraction, to identify the rock-stratigraphic units of the cores, the approximate origin of their channel sand distribution, and the clay mineral composition of the samples for sequence and continuity through the profile. The underlying principle of this analysis is that vertical grain size variation results from solution of carbonates, clay eluviation

and illuviation, disaggregation,and silicate decomposition (Willman et al., 1966). The test was of limited utility to the Otter Creek samples, which undoubtedly represented outwash deposits that were not as diagnostic as in situ, weathered sediments with stratigraphic implications (see Hall, Schuldenrein et al., 1974 for tables). The existing clay fraction did correspond chemically to weathered tills showing that:

1) Otter Creek cores 2 and 3 were related outwash redepositions as gauged by overall similarity in both percentage of clay expandables and constituent minerology.
2) the channel sands were derived from northeastern tills that were washed out and drained through the Illinois Valley; this is suggested by the relative predominance of illite.
3) extensive reworking and mineral composition ratios establish the outwash as Woodfordian.

On this basis the Illinois State Geological Survey, which kindly carried out the analyses, classifies the undisturbed Otter Creek sediments as Modern Soils of the Cahokia Alluvium or the Henry Formation, favoring the former (McKay, personal communication).

B) Chemical Tests, consisting of i) pH, to document the nature of local pedogenesis subsequent to initial deposition. This is a means of tracing the progression of soil processes and gauges the degree of geomorphic stability with the environment as indicated by the systematic evolution of the Modern Soil. ii) Chittick Carbonates - i.e. total carbonate determination - for examining the degree of leaching of calcareous sediments.

Summarily, the tests show that Otter Creek 2 displays a modified ABC profile characteristic of that outlined for regionally typical Gray-Brown Podzolics. The profile becomes more diagnostically zonal away from the river channel as both distance to areas of active flooding and elevation with respect to water table increases. From these data it appears that Otter Creek 3 is essentially a podzolic soil subject to a degree of seasonal inundation. It contains a transitional soil periodically affected by the hydromorphism of high groundwater conditions at times of high river level or accelerated local rainfall. The development of an enriched B-horizon, the key to sustained pedogenesis along the alluvium, would be augmented by a long-term lowering of the water table in drier periods associated with restricted lateral migration of floodwaters. This would favor deepening of the A-horizon as well as accelerate formation of a more characteristic B-horizon by preventing translocated minerals from filtering through the coarser sands into the groundwater.

DESCRIPTION OF THE SEDIMENTARY SEQUENCE AT RICHARDSON

In August, 1975, we returned to the field and examined a clean face of a gravel pit measuring 14' deep by 8' long at the Richardson site (Fv 1111), the largest of the Beardstown terraces reported by Munson and Harn in the 1966 survey. The open lateral exposures provided necessary stratigraphic and bedding information to corroborate preliminary identification of the Otter Creek site as a Beardstown Terrace outcrop. It also enabled the investigators to distinguish at what levels active sedimentation gave way to sustained pedogenesis.

Samples taken at Richardson were submitted to the following analyses: 1) pH; 2) X-Ray Diffraction; 3) Total and organic vs. inorganic carbon assay. These tests were run to compare the sedimentary suites at Richardson with those at Otter Creek. Additionally, the textural compositions of the strata were determined according to particle size grades by both wet sieve (for size grades > 37u) and hydrometer (for silts and clays) methods. On the basis of the individual unit grade size distributions, statistal parameters of sorting, skewing and kurtosis were calculated to assist in the identification of the sedimentary origins of the horizons (see Folk and Ward, 1957, Folk, 1974). The Richardson profile and graphic results are shown in Figs. 4 and 5.

A tentative stratigraphic sequence is presented here, as based on a synthesis of field observations and results of detailed laboratory investigations:

III Primary cross-bedded gravels - This zone extends in depth from 432.5' to 438.3' . Bedded gravelly sands comprise the predominant size grade with coarser gravels displaying a high degree of rounding. Unit N features a comparatively high organic carbon content (1.16%), exceeding even that of the present surface, considering the coarse grade. The basal sand-gravel strata generally feature significantly higher organic and inorganic content than the overlying horizons. Sediments of Zone III are largely bimodal and the most poorly sorted in the profile, due to the prominence of coarse sands. Folk and Ward (1957) suggest that such platykurtic (i.e. kurtosis values of 1.00) and asymmetrically skewed deposits attest to systematic mixing of sediment populations. Particle size distributions do not vary significantly with depth and those textural variations occurring in levels S, T, U and V represent localized accumulations of finer sands.

The interface between zones III and II marks an abrupt transition from primarily fine to caorse grades accompanied by negative skewness measures.

II Riverine and Fine Textured Deposits - Zone II ranges from 432.5' to 441.5' and constitutes the most complex sedimentary interval as it records alternate phases of lower and higher energy sedimentation with intermittent humification and even pedogenesis. Fluvial deposit H demarcates 2 subunits within this zone, the strata below characterized by mineral breakdown and weathering, while those above are largely depositional. Of the latter, deposit E is most prominent and delimits the base for the modern profile.

Primary sediment textures in the lower subunit (below H) are in the medium-fine sand ranges with varying percentages reflecting both agencies of transport and degrees of weathering. Strata K and H exhibit the widest variation in textural composition as both are alluvial accumulations, the former featuring a coarse sand component while the latter is a sandy silt. H is the more poorly sorted deposit with boundaries clearly defined. It is differentiated from the underlying I level by the latter's more developed subangular blocky structure, sticky texture, and clay humus content. Higher pH is also associated with a major accumulation of leached carbonates. K's coarser composition is similar, in fact, to that of the Zone III strata.

Sediments above H are distinguished by high organic content, slight calcareous presence, and a moderately weathered basal alluvial soil, unit E, a medium-coarse water-laid sand. It is the best sorted horizon in the sequence. In the upper subunit organic versus inorganic ratios are fairly constant from deposits C through E. Levels A, C and F are ferruginous and may be the hydromorphic correlates of the Otter Creek 3 core, occurring at 440', 3' higher than they do downstream, perhaps due to structural differentiation in terrace morphology between the two regions (river gradient change is negligible).

I Modern Pedogenesis - From 441.5' to 446.0', 5' of well developed soil has formed in the uppermost alluvial horizons. Illuvial clay content increases upward through X2 and Y2, though precise percentages are not, unfortunately, available for the latter. Sorting is very poor and all horizons in the zone are very finely skewed. The B2 is Cambic on the basis of the well developed subangular blocky soil structure and clay content. Textures are largely within the loamy medium to fine sand range with some silt. Organic matter concentration is highest in Z2 and diminishes to a minimum at the interface with zone II. Calcareous presence is minimal and pH variability is negligible. The surface soil supported a mixed weed-grass cover.

INTERPRETATION OF THE LOCAL BEARDSTOWN ALLUVIAL SEQUENCE

The Richardson sequence, as outlined above, consists of 3 distinct sediment bodies that may be broadly interpreted as follows:

The cross-bedded gravels of Zone III alternate with coarse sand lenses suggesting that this sedimentary unit primarily represents periodic reworking of glacial outwash initially deposited in the Illinois Valley by the Bloomington Valley train, as Wanless (1957:143-44) argued. Cross-bedding, however, generally results from scour and fill alternations with changes of velocity or direction of movement. Thus while the original Bloomington outwash was a glacio-fluvial deposit seasonal erosion and redistribution of the Michigan ice lobe during the summer ablation period may well have combined with some primary outwash and resulted in regional reworking of deposits. Sedimentary activity was further affected by other a-periodic events in glacier regimen and evolution of the proglacial lakes. There is also the possibility that the gravels document a scour-fill cycle initiated by torrential waters of the Fox River or Kankakee Torrent, overriding the boulder-studded dam built by the Bloomington Moraine at glacial Lake Illinois (Willman and Payne, 1942; Willman and Frye, 1970:34). At Richardson, then, the precise sedimentary origins of the cross-bedded levels could not be identified so that the regional versus local outwash correlations of the zone could not be determined. The relatively high percentages of organic matter in the strata suggest erosion of upstream surfaces, with humic matter subsequently "sealed" within the sand-gravel matrices. Intermittent formation of humic floodplain soils may also have taken place subsequent to episodic deposition but with little distinct horizonation (i.e. azonal). Thus, in unit N, while no indications of subsoil weathering or texture B characteristics are in evidence, a weak humic paleosol may be indicated.

Mixed sediment populations support the hypothesis that Zone III represents till-derived, but reworked outwash. The gravelly sands also contain relatively high percentages of illite specifically diagnostic of till origins from the northern Illinois Valley (Frye et al., 1968). It is proposed that the fluvial regime at this time was that of a shallow braided stream carrying a predominantly sandy to gravelly bedload. Meltwater activity was periodic, reflecting annual peak discharges in the wake of large-scale summer ablation during surges of the Woodfordian retreat. Episodic readvances may have been responsible for occasional breaching of proglacial lakes that formed behind the Valparaiso moraine complex. Thus, the abundance of outwash components suggests that Zone III documents the major terminal glacio-fluvial discharge carried through the Illinois Valley.

The critical level in Zone II is H which records an alluviation featuring a comparatively fine-textured bedload and differentiates the lower subunit - a graded "B" solum - from the upper floodplain soils. Levels I and J, displaying clay translocation, concentration of illuvial sesquioxides, and a significant redistribution of carbonates, may represent an eroded lower B-Ca horizon that was subject to episodic reworking by inundation. Hence the H/I and K/J interfaces may be truncated relict surfaces, originally overlain by humic A and poorly developed B horizons that had been weathered in situ and/or eroded by formerly active floodwaters. Levels H through J possibly record a period of environmental stabilization. This is mirrored initially by the high montmorrillonite contents of these deposits which may be attributed to accelerated loess accumulations on the terrace surface (Glass, personal communication). A subsequent paleoclimatic shift, to seasonally moister conditions, would have resulted in B horizon deepening, as the soil assumed a podsolic character, and diminished periodicity of flooding. These Late Beardstown developments may be an expression of increased filtering of discharge through successive proglacial lake basins. Finer sediments attest to overbank accretion and higher proportion of suspended sediment. This could have occurred in the later stages of Lake Chicago during the transition to Two-Creekan times.

Whether H and K actually represent two distinct surfaces is difficult to ascertain, but the fact that K has such a low organic concentration and that the overlying I marks a major drop off in expandables, would argue that stabilization occurred in H and the relatively weathered K and J levels may actually be the lower B horizon. The precise character of the B is difficult to categorize as the uppermost portions of it have been eroded and the depth of leaching cannot be determined. It may be Cambic, as there is clearly a redistribution of carbonates, significant oxidation, and reasonably strong subsoil development.

The upper subunit, featuring coarser sands, is built on a mixed loess outwash surface that formed the parent material for the subsequent E level soil development, perhaps at horizon J with least organic matter and highest silt content. E probably documents a sustained time interval with a relatively stable alluvial regime. It is succeeded by the Modern Soil Profile. Pedogenesis at Richardson is more advanced than it is at Otter Creek, displaying a deep but non-acidic organic A1 horizon and a three stage B level development, underlain by a transitional (B)C.

We suggest that at least 2 (possibly 3) former surfaces are recorded in the Richardson sedimentary suite at levels H and M (and N?). It is significant to note that according to the statistical parameters both H and M as well as the present surface Z2 exhibited the strongest bimodal distributions, as suggested by the platykurtic curves (Folk, 1974:48).

REGIONAL MORPHOGENESIS: A PROVISIONAL RECONSTRUCTION

The Richardson site exposure offers the primary local stratigraphic backdrop against which a morphogenetic hypothesis can be presented for the Central Illinois Valley T-1 sequence. Basically it describes a three-stage model beginning with a terminal meltwater deposition, succeeded by a gradual trend towards environmental equilibrium, and culminating in the development of the Modern Soil at an elevation of 441.5'. It was possible, then to isolate trends in environmental dynamism and obtain perspectives on ecological parameters of site occupation. While these manifestations are evident at Richardson, it is instructive to speculate whether similar sedimentary processes are evident farther downstream, by examining the spatial distributions, morphologies, and geological contexts of other Beardstown alluvial outcrops.

In differentiating the Beardstown Terrace complex from the adjacent T-2, T-3 and T-4 terraces one could argue, on spatial and morphological grounds, that the discontinuous but widespread distribution of the Beardstowns is in marked contrast with the elongate patterned array of the higher surfaces. This could be explained by lateral facies variation between channel sands and finer flood silts, or it could be attributed to the sinuosity and shifts of younger channels that ultimately dissected the Beardstown floodplain and subsequently created a new floodplain topography in Holocene times. Altogether meandering tendencies and sinuosity tend to increase downstream and may be attributed to a diminished sediment load with decreasing quantities of bedload material (Schumm, 1972). In the Beardstown sequence the succession of downstream terrace depositions associated with increasingly fine sediments resulted in a more subdued floodplain topography increasingly prone to overbank accretion of flood silts. This is suggested at Otter Creek by:

1) finer grade sizes in the cores;
2) the relatively lower elevations at which the T-1 formation occurs; in fact, in the case of Otter Creek 3, relief above the alluvium is so marginal that overbanking and natural levee formation appear to be incipient sedimentary processes.

However, the downstream outcrops are patterned along a southwesterly axis aligned with the meander belt, attesting to their common depositional origin as part of the Beardstown T-1 system. Finer textured clay-silt sediments conform technically to the Cahokia Alluvium, while the coarser Otter Creek 2 and Richardson sands and gravels could theoretically be equated with Henry Formation, according to rock-stratigraphic criteria outlined for late-Wisconsin sediments (Willman and Frye, 1970; Willman, 1973). It is possible, however, that the Otter Creek 3 backswamp deposits merely record seasonal inundations of

Cahokia Alluvium over Henry Sands. There is no question that the surface and margins of the Beardstown outcrops have been eroded and subject to varying degrees of redeposition. In this context it is just possible that the uppermost horizons of Beardstown Terrace surfaces of low relief may actually correspond to T-0 alluvial accumulations on their slopes grading onto the floodplain in some sectors of the valley. It is more probable, as a general explanation, however, that Zone I represents terminal flood silts that form an integral part of the Beardstown alluvial complex, and that the Modern Soil profile began development as soon as the surface became relatively stable. A similar aggradational sequence of coarse to fine facies is apparent in the terminal Pleistocene Deer Plain Terrace at the mouth of the Illinois Valley (see Rubey, 1952, Butzer, in press).

Such an argument finds support in the subsequent alluvial history of the Valley. As indicated above, floodplain incision by 60 feet or more took place during Two-Creekan times, ca. 12,5000-11,000 B.P. in response to a less competent stream with higher suspended load and may be attributed to a major paleoclimatic shift to warmer and drier conditions. Subsequent readjustments included a rapidly aggrading floodplain, strong seasonality, increased competence, and depositions of higher proportions of coarser sediment intermediate in texture between that of the Wisconsin outwash terraces and the modern floodplain. Butzer (in press) dates this interval to a few centuries prior to 9000 B.P. in the Lower Illinois Valley. Assuming similar trends in fluvial activity for the Central Valley, the major terminal episode for the evolution of the Beardstown Terrace level would correlate with the Calumet beach stage and renewed accretion would coincide with Farrand's (1969, personal communication) postulated interval for the lowering of the Michigan basin to the early Lake Chippewa level.

Along broader lines the late Wisconsin activity in the Illinois Valley may be linked with events in the Middle Mississippi. This is shown by the diagram depicting shoreline drops in the Lake Agassiz and Lake Michigan basins, associated with the Upper-Middle Mississippi and Illinois Valley drainageways respectively (Fig. 6). Data presented is gathered from Elson (1967:76), Matsch and Wright (1967), and Willman (1971), and we caution that absolute chronological associations are tenuous due to absolute dating problems and discrepancies in the correlations of even local sequences. It does appear that incremental drops in level within the two river systems do co-vary, at least on a broad scale. Leighton, in dating the glacio-fluvial Mississippi Valley Modoc deposits attributes the origin of the late Pleistocene sediments to the Lake Algonquin stage at 9,500-8,500 B.P. (Fowler, 1959). This would tie in generally with the Lake Algonquin shoreline drop indicated by Willman (1971), and it also fits in with an episode of major environmental discontinuity postulated by Wendland and Bryson (1974) at 9,500 B.P. on the basis of a statistical sampling of geologic and paleobotanic radiocarbon dates.

ARCHEOLOGICAL IMPLICATIONS OF THE PALEO-ECOLOGICAL OBSERVATIONS

The Beardstown Terrace Group exhibits an overall distribution of Middle Archaic through Mississippian assemblages. Interestingly, the southern terraces are generally correlated with later assemblages than their northern counterparts. The lower downstream terraces are and have been more subject to flood-silt accumulation. Furthermore, T-1 surfaces downstream are often indistinguishable, topographically, from the active alluvium, allowing greater possibilities for Holocene erosion and local accretion or redeposition at the margin of the functional floodplain. Thus, the paucity of diagnostic Early-Mid Archaic components on either the Beardstown (T-1) or floodplain (T-0) stages supports the hypothesis that the functional floodplain between 10,000 and 5,000 B.P. was at a much lower level, even though accumulating at a rapid rate. Butzer (in press) has estimated the rate of sedimentation of the Peyton Colluvium in the Koster tributary valley of the Lower Illinois to be c.20"/century during Horizons 12 and 11 (ca. 8750 - 8200 B.P.), and 6"/ century for the time span between Horizons 11 through 6 (8200-500 B.P.). In the adjacent Mississippi Valley, Willman and Frye (1970:37) report an upright tree dated to 6600 B.P. at a depth of 50 feet below the present surface. The implication here is that the record of pre-late Archaic occupation of the floodplain (if indeed there is one!) is buried beneath tens of feet of sandy to silty sediments.

In the Central Valley area, later Archaic sites begin to proliferate contemporaneously on the alluvial surfaces as well as on the Beardstowns and 26.7% (8) of all Archaic sites were found on the Qal formation. This suggests two possibilities. First, the areas mapped "Qal" (see Wanless, 1957: Plate 3) may actually include eroded Beardstown formations and were not classified accordingly because they were at similar elevations as the "Qbn". Second, parts of the "Qal" surface consist of "higher bottoms", i.e. sandy stretches of higher ground related to the mid-Holocene floodplain known as the Sand Ridge Terrace in the Lower Illinois Valley (see Fig. 7). In either case detailed geomorphological mapping, sedimentological tests, and correlations with soil maps should be able to establish the identity of once preferred site locales. Two sites in the Central Valley are especially significant in this regard, as they occur in the Thompson Lake "sand ridge". Summarily, the early to mid Holocene alluviation may well have buried or destroyed Paleo-Indian and Early Archaic sites on the lowest Beardstown outcrops, i.e. selectively in the southern area of Beardstown exposures, where lateral accretion of finer sediments may have been more active.

Subsequent flooding at the Sand Ridge Terrace level (+2M) began to stabilize after 5,000 B.P., it appears, and came to a halt by 2800 B.P. (Butzer, in press). Munson (1974) has noted a contemporaneous aggradational sequence for the Middle Mississippi Valley. Struever (1968) has documented the widespread distribution of Late Archaic/Early Woodland Black Sand settlements along such "floodplain sand ridges" for the Lower Illinois. Similar locational factors may have applied in the Central Valley for these transitional populations, suggesting parallel patterns of exploitation of river-margin habitats (Munson and Harn, 1971, Griffin, 1968). The channels in question were braided with high bedload content, on the basis of sandy and lenticular texture along the Illinois (Butzer, in press),

while the numerous meander scars on the Beardstown surfaces referred to by Manless (1957:23) attest to a similar fluvial regime farther upstream.

By approximately 2500 B.P. the Illinois River appears to have incised its bed once again and returned to a meandering pattern with convex floodplain and dominantly suspended sedimentation. This may relate to a re-establishment of moister conditions and a less periodic discharge curve co-inciding with both the close of the Altithermal and a lowering of Lake Michigan (Larsen, 1973: Fig. 7). Such evidence may corroborate Griffin's (1961:714) hypothesis for Late Archaic cultural expansion in conjunction with ameliorating climatic trends.

CONCLUSIONS

The geo-chronological arguments presented above offer several possibilities bearing on the prehistoric occupation of the alluvial micro-environment. Perhaps the most important of these derive from the dating of the final terrace deposition and the onset of aggradation of the present floodplain. Assuming that the general morphology of the Beardstown Terrace had been established by Woodfordian times, the overall absence of diagnostic Paleo-Indian (Clovis) and Early Archaic assemblages is not a function of wide-scale Wisconsinan activity in the Valley. Such an explanation is at variance with that offered by Munson (1974) who has postulated a mid-Valderan deposition of the Festus (T-1) Terrace in the Mississippi Valley on artifact typological grounds. Thus, it is suggested that the absence of Clovis points and the presence of the tightly dated Dalton-Meserve points indicated a range of 10,000-9,000 B.P. for terminal Festus deposition. Munson himself (personal communication) has noted that finds of several late Paleo-Indian points have come to his attention from the Beardstown Terraces, suggesting at least the possibility that the fluted point hunters traversed the area. The fact that these represent isolated finds is inconclusive, as most Paleo-Indian sites in the Midwest have been recorded on scanty evidence.

It is proposed here that the lack of diagnostic indicators attesting to the presence of early cultures in the Central Illinois River Valley reflects on 1) local Holocene sediment reworking, and 2) cultural/subsistence strategies that were oriented toward upland biomes.

If we accept the initiation of Holocene conditions to coincide with a renewed aggradation of the floodplain ca. 9000 B.P., it is clear that pre-Mid Archaic assemblages would be obliterated by sandy-silty fill on Qal surfaces and differentially eroded and reworked at the Qbn (Beardstown) level. Stabilization by about 5000 B.P. at the approximate elevation ofthe present floodplain fits in with the widespread distribution of diagnostic Mid/Late Archaic Matanza and Raddatz side-notched points reported for the area (Munson and Harn, 1966), i.e. on Qal-Qbn surfaces.

Given the relatively early (12,000 B.P.) date advanced for the evolution of the Beardstown surfaces, it would appear that even major

episodes of alluvial activity at the present floodplain level, i.e. after 5000 B.P., would not have destroyed all traces of earlier cultural activity unless the riverine micro-environment proved an unattractive habitat prior to Mid-Archaic times. Backswamp and low-lying marshy-sloughs provided seasonal sustenance to the specialized economies that had developed only by the Late Archaic. On the other hand, the exploitation of large Pleistocene herd mammals preferring higher elevation prairie habitats is documented up to 8000 B.P. (Wright, 1974:13) and this period marks the end of accelerated alluvial aggradation in the Central Valley bottoms. It may be inferred then, that shortly after this period Archaic peoples were occupying sites that are presently exposed. Whether this points to a general demographic change associated with increased exploitation of aquatic resources remains problematic.

The transition from the Big Game hunting economy to the more varied subsistence base offered by the mesic terrace environments may be given geomorphological support, if we assume the utilization of a more specialized set of adaptations suggested by recognizable Mid-Archaic assemblages on the Beardstown outcrops ca. 5000 B.P. Cook(personal communication) has indicated that the period of maximum popularity of Matanzas points was 5500-4800 B.P. in the Lower Valley.

The parameters of geo-archeological stratigraphic correlation in the Central Illinois Valley are still questionable given the lack of stratified Archaic sites and absence of datable materials. The present study has attempted to outline the geomorphic history of the alluvial environment by documenting the period from terminal meltwater deposition to the onset of ecological stabilization and present floodplain utilization as suggested for later Archaic times. It can be inferred that the latter interval represented a protracted period subsequent to the Zone I deposition, perhaps in line with Butzer's Koster stratigraphy. It may have been initiated during the Woodfordian-Two Creekan transition on the T-1, and followed by renewed activity on the present floodplain. Munson and Harn's (1966) Raddatz and Matanzas side-notched points imply a reasonably extensive Mid-Archaic occupation in the alluvial micro-environment. On archeological grounds it is impossible to advance more convincing arguments until the spatio-temporal distributions of these typologies are more definitely established. This is especially true for the riverine micro-environment where short-term and seasonal environmental periodicity mitigated against the extrapolation of intra-assemblage components to examine inter-assemblage variability from differential scatters of surface materials.

ACKNOWLEDGEMENTS

The author wishes to thank Dr. R.L. Hall, U. of Illinois (Chicago) for the opportunity and financial support needed to undertake the research described in this paper. Research was partially funded by a grant from the U.S. Army Corps of Engineers to Dr. Hall and the Department of Anthropology, U. of Illinois (Chicago). Dr. B.G. Gladfelter, U. of Illinois (Chicago), provided assistance and laboratory space for sedimentological analyses. Dr. L. Follmer, Dr. H.D. Glass and Mr. D. McKay, Illinois Geological Survey, Urbana, ran X-ray diffraction tests on sediments collected in 1974. Finally, my deep thanks to Dr. K.W. Butzer, who offered numerous criticisms, suggestions, and re-read and amended several revisions of the preliminary drafts.

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FIGURE 1 MAP OF CENTRAL ILLINOIS VALLEY

FIGURE 2. DISTRIBUTION OF TERRACES IN THE MIDDLE-LOWER ILLINOIS VALLEY

(After Walker et al., 1965 figure 17 and Wanless, 1957 figure 59)

FIGURE 3

CONTOUR MAP OF 111.3R CORING AREA

GENERALIZED PROFILE OF CORING AREA

UICC GEOG DEPT

FIGURE 4

PROFILE OF RICHARDSON SITE SECTION

FIGURE 5

ANALYTICAL RESULTS OF THE RICHARDSON SEQUENCE

FIGURE 6

ELEVATION SHIFTS IN LAKE AGASSIZ AND MICHIGAN SHORELINES

FIGURE 7 GENERALIZED PROFILE OF CENTRAL ILLINOIS FLOODPLAIN ENVIRONMENT