

## **Late Archaic Shellfish Use at the East Steubenville Site**

Lisa Dugas  
GAI Consultants, Inc.  
570 Beatty Road  
Monroeville, Pennsylvania 15146  
(412) 856-9220  
[l.dugas@gaiconsultants.com](mailto:l.dugas@gaiconsultants.com)

and

Harold Rollins, Ph.D.  
Retired Professor  
Department of Interplanetary and Geological Sciences  
University of Pittsburgh  
[hrollins@twcny.rr.com](mailto:hrollins@twcny.rr.com)

*Paper presented at the Annual Meeting of the West Virginia Archaeological Society, November 1, 2003, Charleston, West Virginia.*

### **Abstract**

Data recovery excavation at the East Steubenville site yielded a total of 15,312 freshwater mussel valves. Shells recovered from features were taxonomically apportioned among 26 species, and are dominated by *Elliptio dilatata* (Spike) and *Elliptio crassidens* (Elephantear). Habitat reconstruction using Warren's *Unio* statistical package indicates that 80-90% of the recovered mussel species are entirely consistent with the extant proximal large river. This implies little geomorphic change of the major riverine environment since the time of Native American occupation of the site. There is no evidence of ritualistic behavior involving shell suggesting that the mussels at this site were used almost entirely for food. However, some culturally modified mussel valves indicate a mussel shell industry during the Panhandle Archaic at the East Steubenville site. Field experiments were conducted to provide additional insights into mussel processing and shell tool use by Panhandle Archaic Americans.

*Please do not site without permission of the authors.*

## **Late Archaic Shellfish Use at the East Steubenville Site**

Lisa Dugas and Harold Rollins, Ph.D.

### **Introduction**

Most archaeologists working in West Virginia would equate the Panhandle Archaic with prehistoric sites containing shell middens of freshwater mussel. Without doubt, shell middens are certainly the most obvious feature of several of the Panhandle Archaic sites that archaeologists have recorded in the Upper Ohio Valley. And the discovery of shell middens at East Steubenville, Globe Hill, and several other sites, provided the basis for Mayer-Oakes to define the Panhandle Archaic in 1955 as a riverine-focused Native American life way (Mayer-Oakes 1955a).

But aside from a brief appendix report in the 1955 Globe Hill Monograph (Mayer-Oakes 1955b), there has never been any substantive analysis of freshwater mussels from a Panhandle Archaic site. With important exceptions (e.g., Claassen 1986; Patch 1976; Morey and Crothers 1998), the same can be said for most of the investigated Green River Archaic sites of Central Kentucky, despite intensive excavations at some sites in the 1970s.

Most archaeologists also assume that freshwater shellfish at Panhandle Archaic midden sites represent food refuse. Cheryl Claassen (1991a, 1991b, 1996, 1998) has recently challenged this notion, suggesting that shell middens at Green River Archaic sites in Kentucky, and Panhandle Archaic shell midden sites in Northern West Virginia, represent ceremonial sites that functioned as dedicated burial locations. Claassen believes that in some Archaic cultures, shell was collected and used to cover the dead during burial ceremonies because of its symbolic association in Native American culture with fertility, purity, and death.

The recovery of 15,000 freshwater mussel valves during the 1999-2000 data recovery excavations at East Steubenville by GAI for WVDOH (Lothrop 2000, 2004) provided an opportunity to understand Late Archaic shellfish use both as a potential food resource and to test notions about other possible uses of shellfish in Panhandle Archaic culture.

We approached this study with four research goals:

1. Taxonomic identification of freshwater mussel valves – to determine frequencies and relative importance of different mussel species harvested.
2. Habitat analysis, reconstructing the stream environments where the mussels were harvested – to project Native American collecting strategies.
3. Identify evidence for non-food uses of mussel shell.
4. Evaluate possible methods for prehistoric processing or cooking of shellfish.

## Research Methods

Prior to analysis, we devised a sampling strategy, conducting taxonomic identification to the species-level on the approximate 10,000 valves from features, and only valve frequencies from non-feature proveniences. To identify species, we assembled a type collection and used regional unionid references (Williams and Schuster 1989; Parmalee and Bogan 1998; Watters 1995). We identified 26 species and sorted the bivalves for the type collection into labeled plastic bins. We then developed a freshwater mussel-coding scheme to record data attributes, including: Genus/species; number of paired valves; number of left or right valves, and minimum number of individuals (MNI).

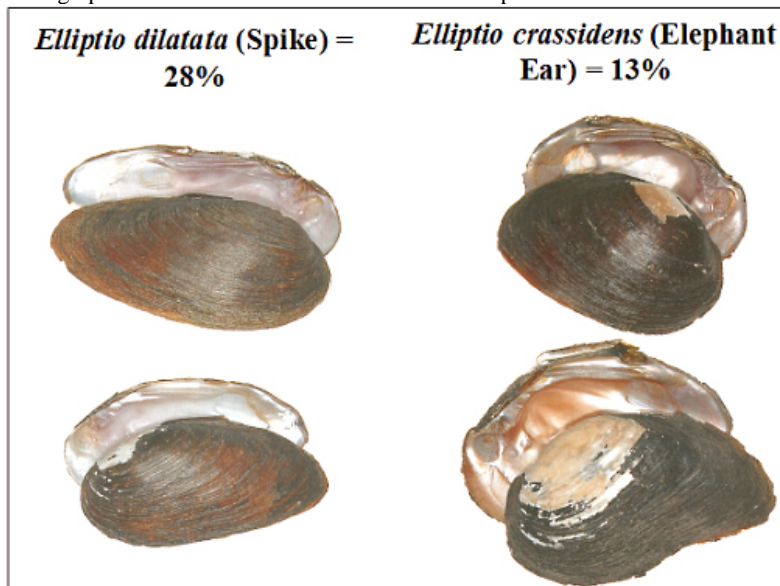
The data was entered into Access, and Excel was used to generate tabulations and statistics. This database was also used for the habitat analysis, with the *Unio* Spreadsheet program developed by Dr. Robert Warren of Indiana State Museum (Warren 1991). The Unio Program provides a systematic quantitative approach to reconstructing the habitat of the mussel assemblage, based on four habitat preferences, including: water body type; water depth; current velocity, and substrate composition.

During analysis, we noticed some shell exhibiting cultural modification, including edgewear, drilling, and notching. These shell artifacts make up a unique component of the Panhandle Archaic material culture at Site 46Br31.

## Results of Analysis

*Taxonomy and Habitat.* The prehistoric Ohio River supported over 40 varieties of freshwater mussels. We identified 26 species from the East Steubenville Site. Two of the most common species in the assemblage are: *Elliptio dilatata* (with the common name “Spike”) at 28% of the sample, and *Elliptio crassidens* (or Elephantear) at 13% (Photograph 1).

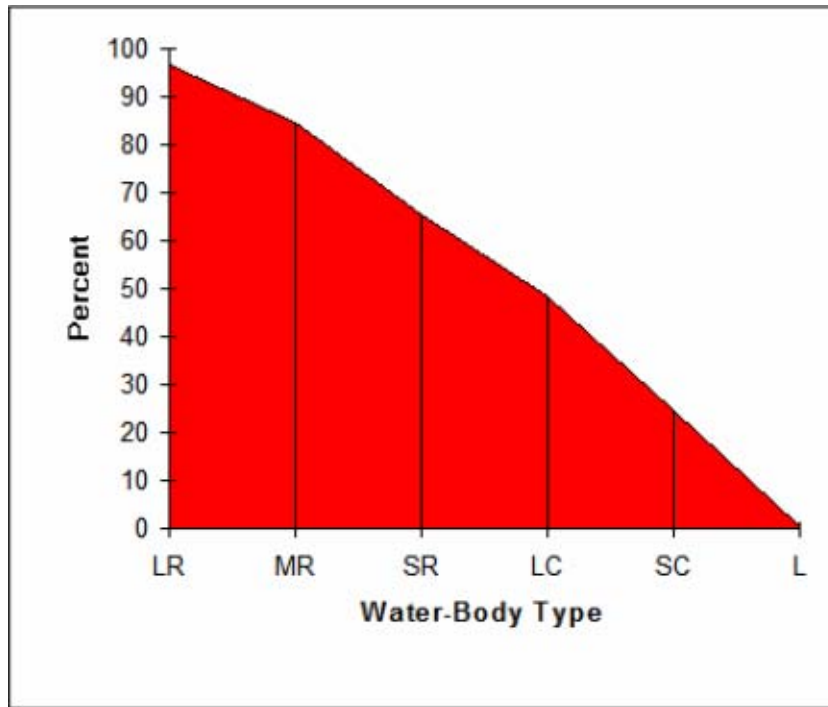
Photograph 1. Most Common Freshwater Mussel Species Identified at East Steubenville



Freshwater mussels can inhabit a variety of habitats, including lakes, rivers and streams. Species tolerant of only certain habitats can indicate from what settings they were harvested. Using the *Unio* software developed by Dr. Robert Warren, habitat analysis of the assemblage (MNI values) indicates that Native Americans at the East Steubenville site mostly harvested mussels from large river settings, from depths of 0 to 2 meters, at locations with swift currents, and gravel to sand bottoms (Figure 1). These findings are strongly suggestive of river shoals, such as those that likely existed below the East Steubenville Site at the confluence of Mahan Run and the Ohio River. On this basis, we conclude that Native Americans indeed harvested mussels from the Ohio River immediately below the ridgetop site.

Figure 1. Results of Habitat Analysis Using *Unio* Software developed by Dr. Robert Warren

Figure 1a. Habitat scores of freshwater mussels from the East Steubenville site for water-body type; most species preferred larger river habitats.



\*LR – Large River; MR – Medium River; SR – Small River;  
 LC – Large Creek; SC – Small Creek; L – Lake

Figure 1b. Habitat scores of freshwater mussels from the East Steubenville site for water depth; the majority of mussels favored habitats with water depths of 0-2 meters (Note: water depths in tenths of meters).

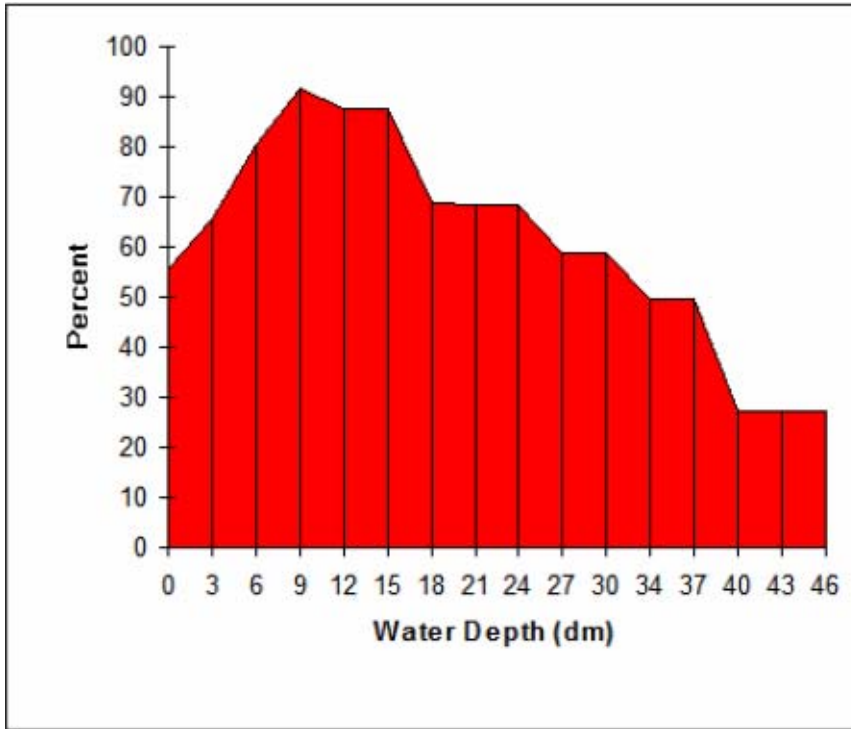
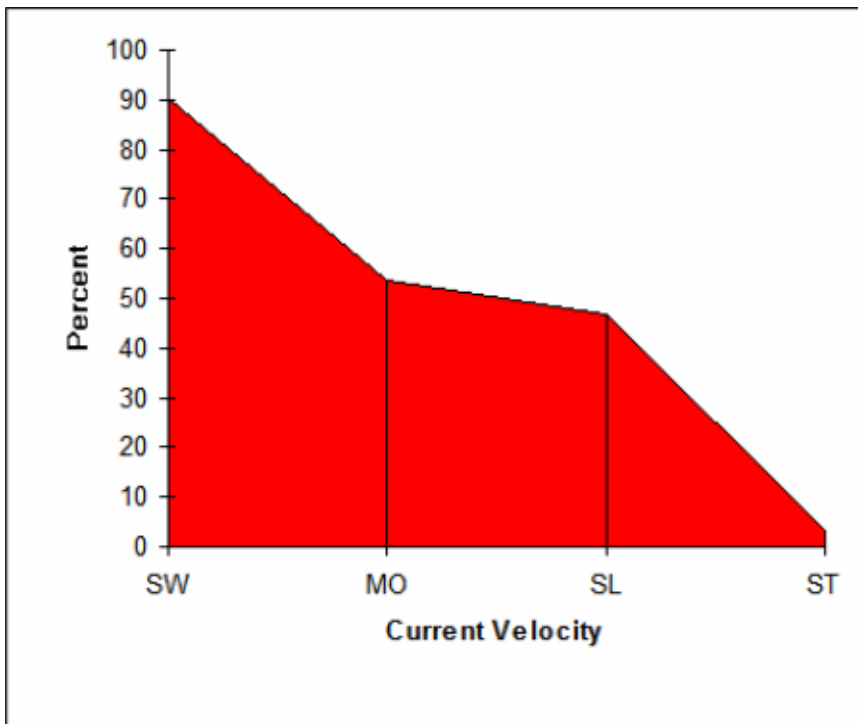
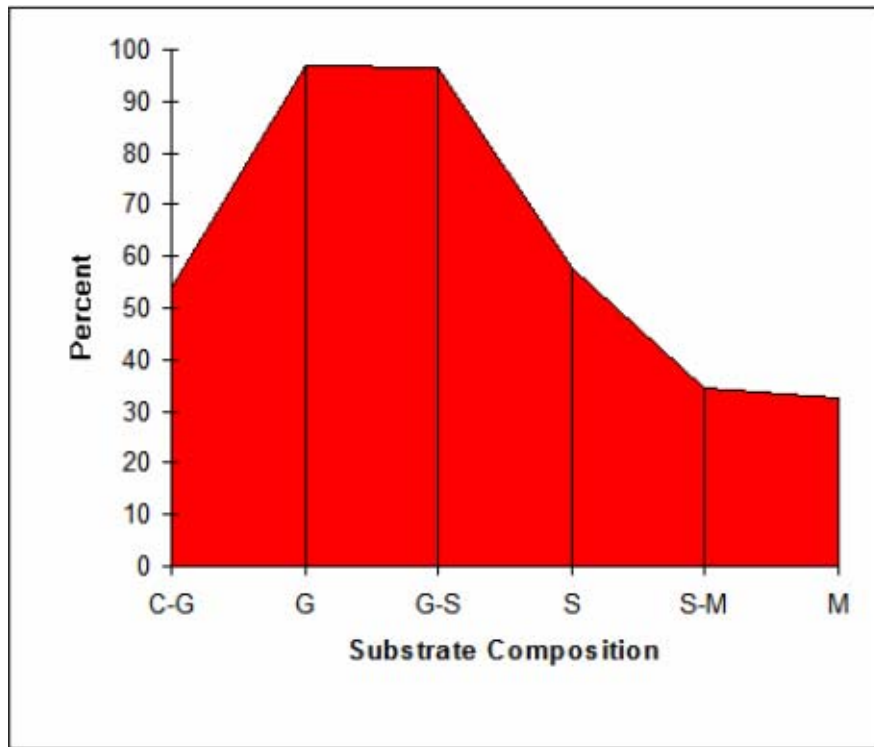


Figure 1c. Habitat scores of freshwater mussels from the East Steubenville site for current velocity; most mussels recovered from East Steubenville favored settings with swift currents.



\*SW – Swift; MO – Moderate; SL – Slow; ST - Standing

Figure 1d. Habitat scores of freshwater mussels from the East Steubenville site for substrate composition; mussels recovered from East Steubenville typically preferred settings with gravelly to gravelly/sandy bottoms.



\*C-G – Clay/Gravel; G – Gravel; G-S – Gravel/Sand; S – Sand;  
S-M – Sand/Mud; M – Mud

*Subsistence Vs. Ritual Uses of Shell.* As I noted, Cheryl Claassen has argued that many Archaic shell midden sites are dedicated burial grounds where the shell was collected for use as a burial matrix rather than for food. As evidence, she points to the large number of human burials at Kentucky Archaic shell mounds (as many as 1.2 burials *per square meter* at some sites) and the reported high frequency of paired mussel valves in shell excavated at these sites (Claassen 1991b, 1996, 1998).

To address this hypothesis for East Steubenville, we first note that we found only 6 human burials at this fully-excavated 7500-square-meter site, a burial frequency that is far less than the hundreds of burials found at the many Kentucky Shell Mound Archaic sites.

In addition, during excavations at East Steubenville, we recorded and bagged separately any paired mussel valves found in features at the site. We hypothesized that if Panhandle Archaic Americans at the site had routinely collected mussels and extracted meat for subsistence purposes, there should be a low frequency of articulated pairs. At East Steubenville, only 0.07% of the valves from features were found articulated. We believe that the low occurrence of articulated pairs does not support the idea of collecting shell for ritual purposes, but instead that Native Americans at East Steubenville collected mussels primarily for food.

*Modified Shell and Shells As Tools.* Other shell analysts have noted modified mussel valves at Archaic shellmidden sites. For example, Paul Parmallee recorded drill holes on a small number of mussels at Riverton culture sites in Indiana (Parmallee 1969). Howard Winters thought these artifacts might have been used as digging tools (Winters 1969).

We identified 86 shells from the East Steubenville Site that exhibit cultural modifications, including *edgewear* and *notching*, as well as *drilling*. The edgewear is thought to most likely be the result of using the shell as a scraper (Photograph 2). I observed edgewear along the ventral margin of individual shell valves at both the proximal and distal ends, similar to macroscopic unifacial edge damage on stone tools used for scraping tasks.

Photograph 2. East Steubenville mussel shell valve exhibiting edgewear.



Notching was observed in various locations of the shell (Photograph 3). The number of notches on a single specimen ranges from one to five, with the depths of notches (distance invading the shell and edge) ranging from 3 mm to 1 cm. On shell valves with bipolar notching, the ventral margin displayed unifacial edgewear, perhaps from scraping tasks. The bipolar notching, located near the hinge of the shell valve, may have served for hafting.

Photograph 3. East Steubenville mussel valves exhibiting notching.



We identified a variety of drilled shells at the East Steubenville Site (Photograph 4). The locations of the drill holes varied between specimens, but are generally centrally located on the valve. There were two shapes of drill holes: round and oblong. These perforations measure approximately 3mm to 1.5cm in maximum horizontal dimensions, where the oblong holes exhibit the greatest length. These shells could have been used as suspended ornaments, although there are certainly other possible purposes as well.

Photograph 4. Drilled mussel shells recovered from East Steubenville



Based on evidence for possible scraper edgewear, we hypothesized that some of the shell tools might have been used for deer hide defleshing and/or dehairing. To informally test these notions, we conducted a hide-scraping and de-hairing experiment with a hide of a recently killed deer, using Elephantear (*Elliptio crassidens*) valves collected under the West Virginia Division of Natural Resources Scientific Collecting Permit.

Before we began attempting hide defleshing, we sharpened the edges of the mussel valves with a cobble. Flesh removal wasn't too difficult: with one hand free to pull at loose flesh, I was able to scrape the flesh from the hide using the sharpened edge of the shell valve (Photograph 5). By comparison, defleshing with an antler scraper was not as effective; with this non-shell tool, I had to use both hands to get leverage to scrape the flesh. It was easier instead, using the shell tool, to have one hand free to stretch the flesh and simultaneously scrape the meat from the hide.

Photograph 5. Experimental Defleshing of a deer hide using an Elephantear mussel valve.



Dehairing hide with shell, on the other hand, proved difficult (Photograph 6). Perhaps because our shell wasn't hafted, it was difficult to get enough leverage to make this method effective. Using an antler scraper proved to be more efficient for dehairing the hide.

Photograph 6. Experimental Hide dehairing using an Elephantear mussel valve.



*Prehistoric Shellfish Cooking/Processing.* Ethnographic accounts indicate that in foraging cultures, shellfish were most commonly processed by cooking in roasting hearths or steaming pits (Waselkov 1987). At East Steubenville, excavation showed that pit features were common, and were typically found along the ridgeflanks at positions overlapping the extent of shell midden. To help evaluate which cooking method was used at East Steubenville Site, we conducted roasting and steaming experiments at the western flank of the east Steubenville site, after excavation was complete. We again used live Elephantear mussels collected by staff of the Ohio River Islands National Wildlife Refuge.

For the roasting experiment, we constructed a platform hearth, first laying a bed of tabular rock as the base and then stacking three layers of split hard wood on the rock (Photograph 7). Next we added the shellfish in a layer on top of the wood, and then placed additional split hard wood on top of the shellfish. Less than ten minutes after kindling the fire, the individual mussel shells had opened and the meat was cooked. However, with this cooking procedure, the open flame scorched the shell valves, causing most specimens to crumble and disintegrate as the meat was removed (Photograph 8).

Photograph 7. Mussel shell roasting experiment, construction of a platform hearth



Photograph 8. Mussel shell after roasting experiment, showing disintegrated condition of valves.



For the steaming experiment, we first built a second fire to heat locally collected tabular rocks and river cobbles identical to rocks recovered at the site. While this fire was burning, we excavated a pit to use as a cooking vessel. After heating the rock for one hour, we lined the bottom of the pit with these heated rocks (Photograph 9), and then placed plant material collected from nearby forest understory to use as a hydrating agent. We then added the live mussels, covered these with more plant material, and finally covered the pit with a sheet of plastic. We allowed the shellfish to steam for 30 minutes. When we open the pit, all of the valves had opened, and the shell meats were cooked. As expected, the mussel valves from this steaming procedure were undamaged (Photograph 11), and closely resembled the generally well-preserved archeological shell we had excavated at East Steubenville Site. From this experiment, we concluded that steaming might have been the primary shell cooking method for the Panhandle Archaic occupants.

Photograph 9. Placing heated rock in excavated pit for shell steaming experiment



Photograph 10. Placing live mussels and plant material on heated rock for shell steaming experiment



Photograph 11. Mussel shell used in steaming experiment, showing undamaged condition of valves after cooking.



## **Conclusion and Summary**

These studies have provided the first quantitative data on shellfish use at a Panhandle Archaic site in the Upper Ohio Valley, and (1) offered insights into the river habitats Native Americans at the site exploited to procure this resource, (2) evaluated hypotheses for subsistence vs. ritual use of shell, (3) documented cultural modifications of mussel shell at the site for probable tools and other purposes, and (4) informally evaluated alternative methods for shellfish processing that might have been used by the prehistoric inhabitants. While there is little comparative data on freshwater mussel use at other Late Archaic sites in the Upper Ohio Valley, we look forward to future excavations elsewhere that can build upon this research, shedding further light on Panhandle Archaic shellfish use.

## References Cited

Claassen, Cheryl P.

- 1986 Shellfishing Seasons in the Prehistoric Southeastern United States. *American Antiquity* 51(1): 21-37.
- 1991a New Hypotheses for the Demise of the Shell Mound Archaic. In *The Archaic Period in the Mid-South*, pp. 66-72. Proceedings of the 1989 Mid-South Archaeological Conference, Memphis, TN. Ed. Charles H. McNutt. Archaeological Report No. 24, Mississippi Department of Archives and History, Jackson, Mississippi.
- 1991b Gender, Shellfishing, and the Shell Mound Archaic. In *Engendering Archaeology: Women and Prehistory*, J.M. Gero and M.W. Conkey (eds.), pp.276-300, Basil Blackwell, Inc., Cambridge, Massachusetts.
- 1996 A Consideration of the Social Organization of the Shell Mound Archaic, in *Archaeology of the Mid-Holocene Southeast*, Sassaman, K. and Anderson, D. (eds.), pp.235-258. Gainesville, University of Florida Press.
- 1998 *Shells*. Cambridge Manuals in Archaeology. The Press Syndicate of the University of Cambridge, UK.

Lothrop, Jonathan C.

- 2000 Management Summary: Phase III Data Recovery at Prehistoric Sites 46Br31 and 46Br60, U.S. Route 2 Follansbee-Weirton Road Upgrade Project, Follansbee, Brooke County, West Virginia. Report prepared for Whitney, Bailey, Cox, & Magnani LLP, and West Virginia Department Of Transportation, Division of Highways. On file, West Virginia Division of Culture and History, Charleston, West Virginia.

Lothrop, Jonathan C., editor

- 2004 Panhandle Archaic Americans in the Upper Ohio Valley: Archaeological Investigations at the East Steubenville (46Br31) and Highland Hills (46Br60) sites. WV Route 2 Follansbee-Weirton Road Upgrade Project, Brooke County, West Virginia. Report prepared for Whitney, Bailey, Cox & Magnani, LLP, and the West Virginia Division of Highways. (Completion anticipated May, 2004).

Mayer-Oakes, William J.

- 1955a *Prehistory of the Upper Ohio Valley: An Introductory Archaeological Study*. Anthropological Series No. 2, Vol. 34. Annals of Carnegie Museum, Pittsburgh, PA.

- 1955b The Globe Hill Shell Heap (Site 46Hk34-1) Hancock County, West Virginia. *West Virginia Archaeological Society*, Publication Series No. 3.
- Morey, Darcy F. and George M. Crothers  
 1998 Clearing up Clouded Waters: Paleoenvironmental Analysis of Freshwater Mussel Assemblages from the Green River Shell Middens, Western Kentucky. *Journal of Archeological Science* 25: 907-926.
- Parmalee, Paul W.  
 1969 Appendix I. Animal Remains from the Archaic Riverton, Swan Island and Robison Hills Sites, Illinois. In: *The Riverton Culture: A Second Millenium Occupation in the Central Wabash Valley*. Published jointly by the Illinois State Museum as Reports of Investigations No. 13, and the Illinois Archaeological Survey.
- Parmalee, Paul W. and Arthur E. Bogan  
 1998 *The Freshwater Mussels of Tennessee*. The University of Tennessee Press, Knoxville.
- Patch, Diana Craig  
 1976 An Analysis of the Archeological Shell Of Freshwater Mollusks from The Carlston Annis Shellmound. Bachelor of Arts Honors Thesis, Washington University at St. Louis.
- Warren, Robert E.  
 1991 Freshwater Mussels as Paleoenvironmental Indicators: A Quantitative Approach to Assemblage Analysis, pp. 23-66. In *Beamers, Bobwhites, and Blue-Points*. Illinois State Museum Scientific Papers, Vol. XXIII, and the University of Tennessee, Department of Anthropology Report of Investigations No. 52. Ed. James R. Purdue, Walter E. Klippel, and Bonnie W. Styles.
- Waselkov, Gregory A.  
 1987 Shellfish Gathering and Shell Midden Archaeology. In *Advances in Archaeological Method and Theory* 10. Michael B. Schiffer (ed.), pp.93-210. Academic Press, NY.
- Watters, G. T.  
 1995 *A Guide to the Freshwater Mussels of Ohio*, 3<sup>rd</sup> Ed., Columbus, OH. Ohio Department of Natural Resources, Division of Wildlife.
- Williams, John C. and Guenter A. Schuster  
 1989 *Freshwater Mussel Investigations of the Ohio River, Mile 317.0 to Mile 981.0*. Report prepared by U.S. Army Corps of Engineers, Louisville District; Kentucky Department of Fish and Wildlife Resources, Division of Fisheries; and U.S. Fish and Wildlife Service, Regions III and IV.

Winters, Howard D.

1969      *The Riverton Culture: A Second Millenium Occupation in the Central Wabash Valley.* Published jointly by the Illinois State Museum as Reports of Investigations No. 13, and the Illinois Archaeological Survey.