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FROM COLONIZATION TO DOMESTICATION

Population, Environment, and the Origins of Agriculture in Eastern North America

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ARCHAEOLOGY/ANTHROPOLOGY

Be astern North America is one of only a handful of places in the world where people first discovered how to domesticate plants. In this book, anthropologist Shane Miller uses two common if unconventional sources of archaeological data—stone tools and the distribution of archaeological sites—to trace subsistence decisions from the initial colonization of the American Southeast at the end of the last Ice Age to the appearance of indigenous domesticated plants roughly 5,000 years ago.

Miller argues that the origins of plant domestication lie within the context of a boom/bust cycle that culminated in the mid-Holocene, when huntergatherers were able to intensively exploit shellfish, deer, oak, and hickory. After this resource "boom" ended, some groups shifted to other plants in place of oak and hickory, including the suite of plants that were later domesticated. Accompanying these subsistence trends is evidence of increasing population pressure and declining returns from hunting. Miller contends, however, that the appearance of domesticated plants in eastern North America is the result of individuals adjusting to periods of both abundance and shortfall driven by climate change, rather than simply being an example of necessity as the mother of invention.

"Miller's methods are novel and make creative use of the archaeological data available. The overall theoretical framework has high potential for generality, meaning that the analysis is sure to be emulated and seen as a key contribution to the broader field of prehistory."

-BRUCE WINTERHALDER, professor emeritus, Department of Anthropology & Graduate Group in Ecology, University of California at Davis

"Not only is this a new form of regional data collection, Miller also demonstrates manipulation of traditional big data sets—archaeological site files—in new ways, with incorporation of data from other sources to examine biases. This approach and these methods will start unique trends in the archaeology of eastern North America."

-PHILIP J. CARR, professor of anthropology and director of the Archaeology Museum, University of South Alabama

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From Colonization to Domestication: Population, Environment, and the Origins of the Eastern Agricultural Complex

D. Shane Miller. <u>The University of Utah Press</u>. 2018. xvii+198 pp., 52 figures, 21 tables, references, index. \$55.00 (hardcover), \$44.00 (Ebook).

Reviewed by Natalie Mueller, Postdoctoral Researcher, Cornell University

Dr. D. Shane Miller's new book, From Colonization to Domestication: Populations, Environment, and the Origins of the Eastern Agri-

cultural Complex, attempts to answer the question "How and why did Native Americans go from hunting mastodons to planting sunflowers...(p. 2)?" Miller uses newly analyzed and synthesized databases of stone tools from the Lower Tennessee River valley to address this question. Under the theoretical umbrella of human behavioral ecology, he uses a model of stone tools as resource patches, previously developed by himself and Steven Kuhn (Kuhn and Miller 2015) to reconstruct hunting returns in this region beginning in Paleoindian period and ending in the Late Archaic, a period of some 11,000 years. Towards the end of this period, several of the Eastern Agricultural Complex (EAC) crops were domesticated: squashes, sunflowers, sumpweed and goosefoot were all domesticated during the Late Archaic. Miller argues that these plants were domesticated "as the result of a sequential boom–bust cycle rooted in changing Holocene environmental conditions and increasing populations pressure (p. 151). "

The book begins with an overview of the recent debate within domestication studies between proponents of human behavioral ecology and of niche construction theory. Miller frames his book as a test of Bruce Smith's (2011) contention that factors such an environmental downturn or resource scarcity did not play an important role in the domestication of EAC crops. He argues that it is necessary to test this assertion using stone tools, because of their ubiquity, rather than using paleoethnobotanical assemblages, which are "few and far between (p. 19)." While this is a dubious claim in what is probably the region with the best coverage of paleoethnobotanical data in the world, it is true that the first several millennia of the Holocene are much more thoroughly represented by stone tool assemblages than any other artifact class.

Chapter 2 provides an overview of paleoenvironmental studies of eastern North America, drawing on the classic studies of Delcourt and Delcourt (2004) and more recent work to summarize trends across the entire region, and then focusing on the Tennessee River valley. Miller also provides a useful and detailed discussion of the chronological underpinnings of lithic typologies in this study area. Chapter 3 introduces his formal model of lithic tools as proxies for prey size and hunting returns using two case studies, from Australia and Nevada. He argues that if you hold resource availability constant, as you may in the chert-rich lower Tennessee Valley, then the relative curation of bifaces can be explained by

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the marginal value theorem—basically, if it is easier to catch prey, then each tool used to do so becomes cheaper, and will be discarded more frequently. The key variable of interest then becomes the unexpended utility of a biface, using the interplay of length, width, and thickness as proxies.

Chapters 4 and 5 are the meat of the book. They present a large, newly compiled dataset of biface measurements (4) and site distribution (5) in the study area (Humphreys and Benton counties, TN) covering most of the Holocene. Miller identifies three "breaks" in the size and shape of his biface assemblage (pp. 102-103): at the transition from the Paleoindian to the Early Archaic period, at the beginning of the Middle Archaic period, and during the Late Archaic period. While he finds the first two of these conform to the expectations of his model given paleoenvironmental proxies and faunal assemblages, he argues that the third break, during the Late Archaic, does not. He presents the hypothesis that with the appearance of domesticated plants the predictable covariation of stone tool, zooarchaeological, and paleoenvironmental variables was broken (p. 111). Closing his discussion of the lithic analysis with this observation, he turns to proxies for population pressure, using an ideal free distribution model for habitat selection. He finds that by the end of the Early Holocene, and ever since, all of the different habitat zones in the study area were occupied, providing "evidence for increasing population pressure in the time periods leading up to the domestication of plants in eastern North America (p. 137)."

Miller concludes the book by presenting his boom-bust model for the origins of agriculture in eastern North America. During the Early-Middle Archaic, the floral, faunal, lithic, and site distribution data all support a scenario in which the expansion of oak-hickory forests created a "wave of abundance," and supported an economy based on deer and hickory (pp. 145). Then, towards the end of the Middle Archaic, environmental conditions in Tennessee deteriorated, and Miller's analyses indicate that so did hunting returns. At this point, Miller argues that:

"... As hickory and deer diminished, it appears that some groups began to focus more on weedy annuals, including some that would eventually become domesticated. Doing so would have allowed some groups to expand the productivity of their catchments by finding alternative items to fill their storage pits as the availability of hickory and acorns waned, an example of hunter-gatherer groups innovating to expand productivity in a limited area (p. 147)."

I appreciate several aspects of Miller's analysis, not least this succinct marriage of human behavioral ecology and niche construction theory—two perspectives that need not be at odds. His synthesis of many lines of evidence from a particularly wellsurveyed region provides a point of comparison for similarly well-documented areas that are frequently invoked in discussions of the origins of eastern North American agriculture, such as the Ozarks, American Bottom, Illinois, Wabash, and Red river valleys—as well as for future regional studies. He also makes a valuable contribution by placing domestication during the Late Archaic within the trends of the Early and Middle Archaic. Given that domestication is an evolutionary process, EAC specialists need to pay more attention to the practices that characterized early use of these plants, before we can see evidence for their domestication. It is there that we will find evidence for how and why they were domesticated.

While this book presents a wealth of demographic and paleoenvironmental data, and solid proxies for hunting strategies, it does not directly consider lines of evidence that could explain the process of plant domestication, making the title somewhat misleading. In his introduction, Miller makes one brief reference to David Rindos (1984), summarizing his argument as follows: "the transition to agriculture...was likely the result of a coevolutionary relationship between people and plants...(p. 5, emphasis added)," before turning back to economic theories about this transition. While anthropologists may disagree about how various agricultural systems arose, domestication per se is definitely a coevolutionary relationship between plants and people: it results from human-mediated changes in the selective pressures acting on plant communities. Neither climate change nor population pressure can directly cause plants to become domesticated, although both are important contexts in which new practices and knowledge systems leading to domestication may arise. For a book with domestication in the title, this one only rarely mentions the species that were domesticated during the Late Archaic, much less their unique ecologies and nutritional properties, or the challenges and potentialities that each present to those who sow, tend, harvest, and process them. It presents no discussion of how they may have been cultivated in ways that would have led to domestication.

Miller concludes his book with the thought-provoking conclusion that the Middle Archaic "boom" resulted in 1) decreasing residential mobility; 2) increasing food storage, and 3) population growth, which was unsustainable when environmental conditions deteriorated without some new strategy. All of these factors created the context for plant domestication in the Late Archaic. He makes a convincing argument for all of these processes, but to his list I would add that the sedentary populations of the Middle Archaic were able to build a base of traditional ecological knowledge and practice. This allowed them to begin manipulating annual plant communities to increase yield and predictability when environmental conditions deteriorated. Miller is right to call for more integrated subsistence datasets (pp. 152), especially for the Middle and early Late Archaic—periods that were pivotal to the domestication of EAC crops. This book makes an important contribution to our understanding of human-environmental interaction during these periods.

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