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REPLY TO COMMENTS OF NOLAN AND COOK

Larry V. Benson, Timothy R. Pauketat, and Edward R. Cook

The following reply to the comments by Nolan and Cook makes the following points. The Palmer Drought Severity Index (PDSI) is not a measure of summer rainfall. Cahokia's "Big Bang" dates to the end of the Edelhardt phase and continued through the Lohmann phase. The "American Bottom" refers only to the Mississippi River floodplain in the vicinity of East St. Louis, and the exact nature of human response to climate change cannot be predicted from PDSI data alone.

La siguiente respuesta a los comentarios de Nolan y Cook hace los siguientes puntos. El Índice de Palmer para la severidad de la sequía (PDSI por sus siglas en inglés) no es una medida de las lluvias de verano. El "Big Bang" de Cahokia se fecha al final de la fase de Edelhardt y se continúa a través de la fase de Lohmann. El "American Bottom" se refiere solo a la Rivera inundable del Río Missisipi en la vecindad del Este de St Louis. La naturaleza exacta de la respuesta humana al cambio climático no puede predecirse con base únicamente en los datos del PDSI.

We appreciate and would like to respond to the comments made by Nolan and Cook. We make three points in our reply, which are directed at clarifying our position and responding to a few of Nolan and Cook's assumptions.

First, as a matter of clarification, the Palmer Drought Severity Index (PDSI) is not a measure of summer rainfall as Nolan and Cook (2010) imply. Instead it is a theoretical measure of soil-moisture, the value of which evolves over several months in response to fluxes of precipitation, evaporation, and runoff. In practice, PDSI is usually heavily weighted toward the precipitation side of the soil-water balance.

Second, with regard to archaeological facts, the known developmental trajectory of the greater Cahokia region is not quite as Nolan and Cook describe it. In their discussion of the "timing of the precocious development of social complexity" in the American Bottom, Nolan and Cook refer to the American Bottom during both the Edelhardt (A.D. 1000–1050) and Lohmann phases (A.D.

1050–1100) as being relatively wet but not the wettest areas in the Upper Mississippi and Ohio Valleys. However, Cahokia's "big bang" dates to the end of the Edelhardt phase and continued through the Lohmann phase, so the overall climatic state of the Edelhardt phase is not at issue. Nolan and Cook's Figure 2 supports the concept that the Cahokia area was extremely wet during the Lohmann phase as opposed to the Edelhardt phase.

In addition, the American Bottom refers only to the Mississippi River floodplain in the vicinity of present-day East St. Louis, not to the tall-grass prairie upland ecotones farmed by Richland complex inhabitants, many of whom immigrated to the upland locality subsequent to A.D. 1050. Nolan and Cook appear to include both of these ecosystems as the "American Bottom," referring only once to the American Bottom region. Our hypothesis is that these bottomland and upland ecosystems responded differently to the enhanced precipitation that characterized the Lohmann phase; i.e., rising water tables and increased flooding of the American Bottom floodplain decreased its agri-

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cultural viability, causing some farmers to move to higher areas of the floodplain, and perhaps causing many to abandon farming of the floodplain altogether. On the other hand, enhanced rainfall intercepted by the tallgrass prairie during the Lohmann phase encouraged the agricultural development of the uplands.

This brings us to our third point, concerning theoretical inferences about Cahokian development. Regarding the linkage between climate and social change, Nolan and Cook rightly state that “abundance of precipitation, and by extension agricultural produce, does not alone explain why individual households and communities would cede autonomy to a newly developed elite class.” We agree in spirit with the first part of this statement. Though not stated in our paper, it is our opinion that there is a recursive relationship between climate change and environmental deterioration, on the one hand, and migration, cultural transformation, or societal reorganization, on the other hand. However, the exact nature of the human relationship to climate change generally and the development of social complexity specifically cannot be predicted from PDSI data alone. Indeed, to warrant the applicability of the Winterhalder-Kelly model, Nolan and Cook make certain essentialist assumptions about human behavior and social organizations. For instance, they assume that elites, households, and autonomous communities were decision-making bodies that predate the Lohmann phase. However, many archaeologists recognize these as social constructs that remained malleable and subject to political appropriation and social redefinition through time (e.g., Emerson and Pauketat 1999; Mehrer and Collins 1995; Pauketat 2008; Saitta 2004).

Let us be clear: the timing, rate, and scale of the Cahokian case strongly argue for a historical model

and against an evolutionary reading of greater Cahokia (Alt 2002; Pauketat 2003). To their credit, Nolan and Cook desire a *rapprochement* between evolutionary and historical schools, a sentiment with which we agree. But in practice, invoking the Winterhalder-Kelly model to explain precolumbian sociohistorical complexity in the eastern Woodlands is incompatible with historical approaches.

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