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Rotten Palisade Posts and Rickety Baffle Gates

Repairing Native Eastern North American Fortifications

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Proto-Arikara farmers, who had moved into the Missouri River valley from the central Plains around AD 1300, were digging a new fortification ditch in the early fourteenth century around an expanded area of their settlement, now known as the Crow Creek site, located in central South Dakota, when they suffered a massive attack by enemy warriors (Hollinger, chapter 10, this volume). The defensive barrier that encircled the community was being constructed to protect the villagers against an aggressive and violent enemy—perhaps Siouan-speakers who were being slowly pushed out of the Big Bend of the Missouri River, or by Caddoan-speakers like themselves who competed for the arable strips of land along the narrow Missouri trench. Before the project could be completed, an overwhelming enemy force overran the settlement, burned the earthlodges, and tortured, mutilated, and killed at least 486 inhabitants with war clubs (Johnson 2007a:120; Kendell, chapter 13, this volume). Children and women are underrepresented in the body count—suggesting that many were led away as captives. The carnage was so extensive that it is estimated that few if any villagers survived the onslaught. The bodies lay unburied for months before being interred in the unfinished fortification ditch and then covered with a layer of clay, perhaps by relatives from neighboring villages. In 1978 archaeologists excavated and studied the victims prior to reburial, providing a wealth of information on the massacre and the nature of violence in

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the northern Plains (Johnson 2007a; Willey and Emerson 1993; Zimmerman 1985; Zimmerman and Bradley 1993). The warriors' ability to take advantage of unfinished defensive system provided them a decided tactical advantage.

Some three hundred years later in the Northeast, an Iroquois force attacked villages of the Huron Confederacy. After striking two frontier towns in 1648, Iroquois warriors hit the Huron town of Taenhatentaron (St. Ignace) the following summer. Upon breaching the weakest point in the town's palisade, the warriors entered and captured or killed a number of Huron, primarily children and women. The Iroquois then stormed the Huron village of St. Louis, and assaulted the palisade, cutting their way through the wall and burning the town. Their success was predicated on their ability to breach the Huron's defensive walls, to achieve the element of surprise, and to amass an overwhelming offensive force (Abler 2000; Brandão 1997; Lee 2007:707–709; Otterbein 1964, 1979; Starna and Brandão 2004; Trigger 1976).

In the winter of 1712 South Carolina troops, composed of colonists, allied Yamassees, and other Native allies, under the command of John Barnwell, embarked against the Tuscarora. Finding a number of small, unfinished forts throughout the region, Barnwell assaulted, besieged, and burned each one in turn. The Tuscaroras, having been surprised at Barnwell's approach, were forced to abandon their incompletely fortified towns. In the process they left behind a great deal of "plunder" for the South Carolina forces. Barnwell's strategic surprise attack caused the Tuscaroras to decide against protecting their goods and the partially fortified settlements, and to relocate to a completed fort at Hancock's Town (Lee 2004).

As these examples testify, fortifications throughout eastern North America provided varying degrees of protection for indigenous people. Some settlements, such as those of the proto-Arikara, Huron, and Tuscarora, failed to protect their populations due to in-progress construction or insufficient defense by the existing palisades. In others, fortifications proved successful in providing defense and safety (Bridges et al. 2000), but in some cases they may have contributed to a detrimental and diminished way of life for the fearful, sequestered inhabitants under attack, siege, or impending threat of attack. Poor health may have resulted in hardship and malnutrition from warfare due to restricted subsistence activities in the face of aggressive threats (Milner 1999, 2000; Milner et al. 1991a; Steadman 2011). A decline in health along with increased hardship, malnutrition, privation, and undernourishment may have been the tradeoff for protection against one's aggressive and potent enemies. A historic example is provided by a French garrison of 93 who died from scurvy in the winter of 1688 at Fort Frontenac as a result of an Iroquois siege

(Bazely 2007). Precontact fortified settlements may have suffered similar fates by restricting populations within confining walls.

Eastern North American defensive enclosures and structures have been the focus of long-standing archaeological research, in part, for the information they provide concerning aggression, conflict, defense, feuding, raiding, sieges, violence, and warfare among indigenous populations (Bamforth, chapter 1, this volume; Dye 2009; Lafferty 1973; Milner 2000; Payne 1994; Schroeder 2006; Schroeder, chapter 9, this volume; Steinen 1992; Trubitt 2003; Vehik, chapter 7, this volume). Fortifications require defensive strategies, engineering skills, and logistical and tactical organization, as well as available resources for log palisades and labor for construction. In addition, the archaeological presence of fortifications provides convincing evidence that inhabitants built strong defenses because their settlements were being threatened, not simply as testaments to chiefly aggrandizement and exhibitions of authority, power, and wealth—although these may be components or factors in monumental construction projects (Earle 1997:155–158). Finally, fortifications hint at the nature and potential of offensive hostilities and violence and provide key archaeological signatures for the pattern and scale of intersocietal aggression and conflict.

Ethnohistoric descriptions of eastern North American fortifications are found in accounts stretching from the sixteenth to the nineteenth centuries (Black 1967; Hudson 1997; Keener 1999; Swanton 1946). These sources record important details of construction techniques and the political and social dynamics of fortifying a town or village and defending it against attack, but it is the archaeological record that provides time depth for changes in defensive strategies and construction and maintenance efforts and give clues as to regional political relations. When geophysical prospection is integrated with archaeological and ethnohistoric research, a more comprehensive, detailed, and robust perspective of defensive constructions and layouts may be obtained (Kvamme 2007).

By viewing fortification features as artifacts, we may explore their construction and viability using the same assumptions that apply to other elements of architectural culture, such as mounds and plazas. Following Sherwood and Kidder's (2011:69) discussion of mound building, each step of the fortification process must be identified and analyzed. For example, builders had to acquire materials; accumulate, allocate, and coordinate labor; develop and oversee construction plans; and monitor long-term maintenance throughout the use life of defensive systems. These myriad activities provide important information about a town's culture, economy, and politics. The perspective suggested here integrates construction process and resource acquisition as

"artifact." Fortification construction for these complex architectural features required advance planning, considerable engineering knowledge, impressive skill, labor coordination, and political investment and organization. In addition, a regional perspective is required if we are to investigate the development and range of fortifications as well as their durability and effectiveness in safeguarding the populations they were designed to protect.

Information regarding frequency, scale, and type of warfare may be discovered by investigating the physical features of a fortification system. Defensive walls and ditches are sensitive archaeological markers for threats of forceful and sustained external violence. Expenditure of labor, resources, and time in digging ditches, moats, and trenches; excavating postholes; fastening posts; plastering wooden palisade walls; and securing timbers demonstrate that threats were real and serious (Fontana 2007:65–66). Vencl (1999:67) notes that fortifications are "above all the materialized expression of the human fear of being attacked, and losing life, freedom or property," not to mention loss of political autonomy and social viability. People and societies do not build effective and strong fortification systems "unless there is a good reason to do so" (Lafferty 1973:4).

The construction of fortifications also reflects the capability of offensive weapons in use at the time that monumental defenses are being planned and built. People tend to do the minimum to protect themselves and so fortifications are often scaled to the level of the attacker's available resources, tactics, and technology, rather than to contemporary fortification capabilities and engineering knowledge (Arkush and Stanish 2005:7). For example, enemies of the Iroquois League abruptly incorporated flanked designs into their village defenses by the 1660s to counter Iroquois adoption of counter palisades, iron axes, massed musket fire, and wooden shields when attacking fortified positions (Keener 1998:96).

Fortifications are especially diagnostic for evaluating intercommunity conflict, particularly sites lacking skeletal trauma and trophy-taking behavior (Mitchell, chapter 11, this volume). As evidence for past intercommunity relations, and as durable and empirical remains of conflict and territoriality, fortifications are key archaeological signatures of populations who lived in fear and the community leaders who attempted to protect those populations (Dye 2009; Haas 2001; Milner 2000) and who organized and deployed military power in potentially hostile environments. Archaeological studies of indigenous fortifications are important because they provide detailed evidence of the evolution, extent, and nature of antagonistic political relations among competitive social groups and the military mechanisms of aggression, intersociety

conflict, and organized violence. Cooperation also played an important role in fortification construction and the alliances built to withstand assaults from one's enemies.

Despite the ubiquity of fortified settlements throughout much of eastern North America, few comparative regional summaries have been forthcoming (Lafferty 1973; Milner 2000; Payne 1994). As Hammerstedt (2005:218) points out, palisades have not received the same attention as mounds, but they are no less important because they require as much, if not more, effort, expertise, knowledge, labor, and skill in their planning, construction, and maintenance. In this discussion, I employ selected fortified sites from the lower Midwest-Southeast, Northeast, and northern Plains to investigate the construction, maintenance, and use of fortification systems. Information from these Mississippian, Iroquoian, and Caddoan–Siouan (Middle Missouri-Coalescent) cultures enable analysis of indigenous wooden fortifications and their development, durability, and lifespan.

While archaeological interest usually focuses on areas within or adjacent to defensive systems, few studies have compared differences among these forms in terms of fortification lifespan; a crucial component of defensive system evaluation. The factors behind the construction and maintenance of defensive systems have not received the attention they deserve. One critical area lacking in fortification studies is an assessment of when fortifications were constructed during the lifespan of a community, their durability as wooden structures, and their need for routine maintenance (Krus 2011). Evidence presented here suggests that fortifications evolved in step with defensive needs, the offensive capabilities of one's enemies, and the regional sociopolitical organization. Fortifications as a component of the built environment also have multiple layers of conceptually embedded group identities, memories of past events, and social meanings. Fortifications, as a durable and encompassing form of material culture, powerfully influence human thought and action over long time scales (Arkush 2011).

Understanding defensive systems provides insights into a community's economic, military, and political institutions, revealing how communities adapt and cope with an oftentimes hostile and violent sociopolitical environment. While fortification walls and regional war might bring about political centralization and regional consolidation through conquest, walled settlements also lead to fragmentation and inconclusive cycles of violence, and can hinder political aggregation (Arkush 2006), as the various pathways of intercommunity conflict and cooperation are both historical and multilinear (Arkush and Allen 2006) and may result in divergent political trajectories. Thus, studies

of fortifications have far-reaching implications for societies throughout the world that constructed energy-consuming, expensive, and massive projects (Martindale and Supernant 2009; Parkinson and Duffy 2007). Because wooden walls have a limited lifespan, they remain viable as defensive structures for only brief periods of time without sustained maintenance—to function properly they require an intensive and extensive maintenance program. Archaeological evidence of fortifications must be evaluated in light of the duration of defensive effectiveness and viability within the overall settlement history.

Ditches and walls served multiple purposes. Monumental defensive systems require regular attention and it might be argued that community and polity leaders could mobilize social labor to keep people busy. Or, in some instances walls might serve as snow fences or windbreaks (Reid 1975:7). Wooden barriers also function to obscure the vision of one's enemies who might wish to examine a town's interiors for signs of weakness (Keeley et al. 2007), and shield elite affairs from the non-privileged within the town. Sacred precincts might be demarcated from profane space by berms, ditches, and walls. Enterprising chiefs, especially in the face of imagined or real threats of attacks, could enhance their authority and power through massive construction projects that required considerable coordination, expertise, and supervision from an elite who possessed the requisite knowledge and skills. Unlike mounds and plazas, wooden palisades would have required almost constant attention, and therefore would be ideal sources for opportunities of labor commitment and mobilization. It is unlikely however that aggrandizing leaders could have effectively mobilized social labor without some degree of a real sense of impending violence—the sheer mass of public defensive systems and the effort, resources, and work required for their construction is a clear signature for seriousness of threats to a community's continued autonomy and viability, as fortifications are both costly and time-consuming.

Finally, wooden palisade walls had to be sufficiently sturdy to withstand not only military assaults, but also forceful, strong winds. Wind speeds vary from region to region, but within any area of North America there can be hurricanes, straight-line winds, tornados, or wind gusts. While average wind speeds might be slight, palisades had to be constructed to withstand blustery and violent winds that periodically threatened buildings, fences, and walls. Eastern North America is struck by severe winds at least once per decade, and many places are affected annually, if not several times per year. Smith et al. (2010) used a quality-controlled database of wind observations from the National Weather Service and other regional networks to document thunderstorm wind gusts at or above 93 km (58 mi) per hour, and found an average of 373 wind gusts

per year across the contiguous United States from 2003 to 2009. There is no consistent distribution of severe wind gusts across eastern North American, as winds may vary from one area to another as a function of elevation, forest cover, large-scale climate change, location, site exposure, and small-scale weather patterns (Don C. Bragg, personal communication, 2013), but any set of wooden walls would need to have the capability of withstanding strong winds to remain effective and viable. To ensure a palisade's durability and efficacy, regular maintenance and repairs would have to be carried out throughout a fortification's lifespan by a knowledgeable and supervised work force.

THE STUDY OF FORTIFICATIONS

Fortifications have been under-appreciated by archaeological and anthropological theorists over the years, but in the past two decades a substantial resurgence of interest has appeared in methodology and theory-building that focuses on ancient defensive systems, the material remains of fortification architecture, and the idea that fortifications are a form of "landscape patrimony"—a durable, physical structure expressed on the ground that profoundly shapes the unfolding histories of specific regions. Increasing interest in the archaeology and cultural anthropology of intersocietal conflict and war, and especially defensive systems and fortifications, has resulted in key archaeological signatures being identified for communities concerned with military defense and security (Arkush and Allen 2006; Earle 1997; Ferguson 2006; Keeley et al. 2007; Rice and LeBlanc 2001; Roscoe 2008; Scott and McFeaters 2011; Vencl 1999). Some of the most vexing questions facing archaeologists today include addressing why some groups are more prone to intergroup conflict than others, and how archaeology can develop accurate measures of violence using material culture, especially defensive structures.

Equally important are the causes of warfare and the role fortifications play in political aggrandizement and hegemony, as well as the ways in which fortifications hinder political centralization and regional consolidation. More nuanced and robust, archaeologically based models of political power and social identifies are crucial for understanding the complexities of fortifications. Finally, how do archaeologists go about clarifying the built defensive landscape and examining long-term defensive histories and associated multiple layers of social identities and memories of past events? An effective understanding of fortifications, polity, and warfare can be gained through archaeological investigation of macroscale patterns of defensive systems when defensive systems are seen as durable, material, and spatially extensive forms of structure. Fortified

landforms and defensive patterns are important components of landscape patrimony, political cycling, and settlement choices. Warfare and its associated material culture, especially durable fortifications, involves cyclical processes that affect society through the medium of physical defenses and the settlement choices people make based on the specific landscape within which they reside (Arkush 2011).

An enhanced understanding of the importance of fortifications and a recent renewal of fortification research and defensive systems has taken place in many parts of the world: Africa (Kusimba 2006), Asia (China) (Underhill 2006), Europe (Harding 2013; Parkinson and Duffy 2007), Mesoamerica (Connell and Silverstein 2006), the Pacific Islands (including New Zealand and Palau) (Allen 2006, 2008; Liston and Tuggle 2006; Liu and Allen 1999), and South America (Peru) (Arkush 2006, 2008, 2011; Arkush and Stanish 2005). Likewise, the last two decades have seen a fluorescence in indigenous, defensive system research in North American, including the Great Plains (Ahler and Kay 2007; Bamforth 1994, 2006; Owsley and Jantz 1994; and this volume), the Midwest and Southeast (Fontana 2007; Krus 2011; Krus et al. 2013; Milner 2000; Schroeder 2006; Trubitt 2003), the Northeast (Engelbrecht 2009; Poplawski et al. 2012), the Northwest Coast (Martindale and Supernant 2009), and the Southwest (Snead 2008; Solometo 2006, 2010). Modern battlefields have also been the focus of recent research, including fortifications and battle sites (Scott and McFeaters 2011). Ferguson (2006, 2008) provides recent global summaries of conflict and warfare, which include defensive architecture and fortifications.

One measure of intergroup conflict is the way in which the physical landscape is modified, structured, and transformed by the choices made by the people who live on it and how the archaeological evidence of violence is integrated and mapped onto the anthropogenic landscape as durable defenses (Arkush 2011). The chronology of a community's fortification construction serves to clarify the causes of warfare and violence and to point to fortification variability across space and through time under states of violence and warfare. Another measure is the changing political climate, including the cycling of polities across the region. Existing models of the causes and consequences of feuding, raiding, and warfare need to be integrated with a site's history, the adjacent landscapes, and the relationships that exist between the people and their physical and political environment. The main theoretical driver behind much of the recent research on fortifications is based on Earle's (1997) model of warfare as one component of how military power functions as the strategic use of force, where the focus is on the political economy of

fortifications. Fortifications are more than structures to defend people, they also serve numerous roles for the people who constructed and maintained them, including their ancestral claims, their material possessions, their sacra, and the regional social landscape.

Studies of fortifications should be integrated with the larger military literature on raiding and warfare, particularly on fortification design (Allen 2006, 2008; Rice and LeBlanc 2001). For example, Lafferty (1973:8) used observations from his experience in Viet Nam in 1971 and 1972 to study Mississippian fortifications from a military design perspective, noting "the general military theory of such should be applicable to all times and places within the limits imposed by the knowledge of military principles and technology possessed by the people constructing the system of fortifications."

FORTIFICATIONS IN EASTERN NORTH AMERICA

Earthen enclosures appear as early as the Middle Archaic in the Lower Mississippi Valley. The Watson Brake site in northeastern Louisiana includes 11 mounds connected by a large 1-m-high (3.3 ft) oval earthwork about 280 m (920 ft) in diameter (Saunders et al. 2005). Initial earthwork construction began at Watson Brake around 3500 BC. Enclosures are a hallmark of Middle Woodland ritual centers throughout much of eastern North America (Mainfort and Sullivan 1998). The enclosures found at sites such as Newark, Pinson, Toltec, and Watson Brake served fundamentally different functions from those of late prehistoric fortifications in eastern North America. The Archaic and Woodland earthwork centers were ritual locales for alliance formation, exchange activities, and mortuary programs that dampened conflict and promoted cooperation, while Mississippian and Protohistoric defensive systems protected populations from aggressive, offensive assaults.

The wide formal, geographic, and temporal variability of enclosures, especially those used for cosmological and mortuary rituals, has prompted considerable debate and discussion. In contrast to these pre-Mississippian ritual locales, which typically lack defensive functions, late prehistoric enclosures were clearly constructed to defend settlements that faced escalating aggression and violent confrontation among competing chiefly or tribal polities. After circa AD 1250, farming communities, especially great centers and large towns, began constructing defensive enceintes or enclosures in response to intensified warfare and threats of intercommunity violence (Krus 2013).

Throughout much of eastern North America, especially the late prehistoric lower Midwest-Southeast, Northeast, and northern Plains, fortifications

were a critical and vital component of community structure and survival. For example, Holley (1999:28) notes "nearly every Mississippian center was fortified in some manner." Likewise, for the Northeast, Snow (1994:29) remarks "most Owasco villages were palisaded by AD 1350." And for the northern Plains, Bamforth (2006:71) observes "Middle Missouri and Initial Coalescent sites show evidence for warfare in the form of ditch and palisade fortifications." For over 800 years many communities in eastern North America employed some combination of ditches, embankments, and palisades that provided defense in the face of varying degrees of massed, armed forces (Fontana 2007; Milner 2000; Schroeder 2006; Steinen 1992; Trubitt 2003). These forces appear to have been organized as chiefly militias. While a seemingly value-laden term, chiefdoms possessed better command over their forces than tribal societies, with their "kin militia," while lacking, however, the command structure of an archaic state's standing army. Thus, "chiefly militia" best describes these temporary warrior forces, led by chiefs and their retainers, of Mississippian chiefdoms (Reyna 1994). Some cultures—such as the Caddo (Perttula 1992:18), Mississippian and Plum Bayou communities in the Arkansas Western Lowlands (Rolingson 2002), Plaquemine (Kidder 2007:205), and virtually all of Florida (Ashley and White 2012:18)—generally lacked fortifications, but overall, defensive systems were an integral component of late prehistoric town and village life throughout much of eastern North America (Milner 2000, 2004).

Evidence of fortifications typically consists of barriers such as ditches, earthworks, and walls that were integral to settlement plans. Restrictions were placed on the amount of space available for future growth in residential areas enclosed by fortified walls. Perhaps the most fundamental consideration for indigenous populations centered on defending nucleated civic and residential zones and their resident populations. Sacred structures such as ancestor shrines were especially targeted for attack, desecration, and destruction by Mississippian militias (Dye and King 2007; Milner 2000:63). Thus, studying defensive structures at archaeological sites allows assessment of the levels and nature of violent conflict and cooperation, and the expense of construction and maintenance.

As surrounding barriers, defensive enceintes protected resident populations and their built features, including mounds, plazas, and a variety of buildings, both private and public (Bamforth 2006; Lafferty 1973; Mitchell 2007; Payne 1994; Snow 1994, 2007). Fortified communities often included bastions, ditches, embankments, gates, and palisades (Keeley et al. 2007). Fortifications typically leave evidence that is recoverable through excavation, geophysical prospection, and surface surveys. These indelible signatures of defense and protection,

especially when coupled with skeletal trauma, reflect varying degrees of organized violence, including feuding, raiding, and warfare. Fortifications may add weight to interpretations of the form and severity of regional violence by delineating efforts to avoid intercommunity conflict.

Simply put, fortifications protect people from attacks by their enemies by restricting physical access into a town or village while protecting essential routes of entry (Engelbrecht 2009). Fortifications may be defined as building, erecting, reinforcing, securing, or strengthening defensive structures that form physical impediments. Protective enclosures often consist of some combination of ditches, embankments, or walls, designed to defend a place by withstanding attack from an enemy, and impeding access to a refuge or settlement. An effective fortification is one that is equal to or greater than the anticipated capabilities, strength, and weaponry of an attacking force (Stout and Lewis 1998:175). Fortifications are constructed to hinder attackers from flanking maneuvers and surprise attacks (Keeley 1996:56). They often take advantage of natural landforms, such as bluffs, hilltops, islands, river meanders, and ridgelines. Some fortification features, such as V-shaped ditches and palisade bastions, are clear signs of defensive architecture (Keeley et al. 2007). Nondefensive archaeological features are sometimes misinterpreted as performing essentially defensive functions. For example, Mississippian charnel houses and chiefly residences, both typically located atop platform mounds, may include earthen embankments, surrounding ditches, or wooden fences, but these served a non-military barrier or screening function. Likewise, drainage ditches, garden barriers, or privacy walls may also lack a military function, but might be confused with defensive features (LeBeau, chapter 6, this volume).

Fortifications consist of three basic components: defended gates, enceintes, and palisade bastions (Fontana 2007:67–69; Keeley et al. 2007). Enceintes may take the form of curtains, ditches, embankments, fences, palisades, and walls. These enclosures may not have specifically defensive functions, but wooden walls with bastions, an adjoining moat, and an associated embankment are clearly defensive structures, despite possible ancillary iconographic, political, social, and symbolic associations (Engelbrecht 2003:99, 2009:180; Keeley 1996; Keeley et al. 2007). Wooden curtain walls protect a town or village from an attacker's weapons, while allowing defenders to use their most effective countermeasures against an attacking force. The primary purpose of a defending force is to deter or prevent entry of attackers into or through a defended perimeter. However, if an enemy reaches the base of the curtain wall, then "these surficial barriers themselves shield the attackers, causing defenders either to expose themselves to discharge missiles or force them to emerge from behind

the enceinte in a 'sally' counterattack" (Keeley et al. 2007:57). Curtain walls, as protective architecture for settlements, changed over time in eastern North America as the form and severity of conflict varied, but overall, such defensive works signal a level of aggression and combat organization requiring additional defense. Protective embankments usually include dirt excavated from an adjacent defensive ditch, piled up to form a berm or ridge into which posts were then placed, thus increasing palisade height and causing water to flow away from the bases of rot-prone wall supports. Ditches were often excavated parallel to and just outside curtain walls. The most effective ditches are dry and V-shaped, and when backed by a curtain wall, are particularly effective deterrents to attacking forces (Keeley et al. 2007).

The most vulnerable location for defenders along a curtain wall is the entry way. Defending a settlement's entrance may be achieved by defensive gates or towers that assume some form of baffling, flanking, or screening. Bastions may be constructed adjacent to an entrance in addition to reinforcing palisades, but they must jut out from defensive walls to be effective. They may assume many shapes and still be effective. Most bastions are circular, rectangular, or square, allowing flanking fire to be directed on any attackers who approach the palisade wall or other features such as gates or towers. Bastion intervals are thought to have been spaced at about one-half the effective range of offensive weaponry to enable overlapping fire power (Fontana 2007:174; Keeley et al. 2007:74–77).

Important considerations in palisade construction include placement (spacing and positioning) of vertical supports, post dimensions (depth, height, and width), and wood type. Additional factors include the number of rows, use of horizontal members, and location of adjacent elements such as bastions, gateways, towers, and walkways (Prezzano 1992:236). Archaeological and ethnohistorical data indicate that specific wood types were selected for palisade construction. Examples are presented in the following case studies. Wood choice was based on considerations of raw material, including decay resistance, local availability, and physical attributes. Depending on the degree of resource overexploitation and utilization, choices of wood may have been limited to considerations of convenience rather than advantageous properties.

CASE STUDIES OF INDIGENOUS EASTERN NORTH AMERICAN FORTIFICATIONS

By the middle of the thirteenth century there was a sharp increase in fortifications throughout much of eastern North America, suggesting greater violence or heightened threat of violence. Widespread interpolity conflict, prompting

the construction of defenses, is also seen in buffer zones, conflict iconography, settlement nucleation, skeletal trauma, and symbolic weaponry (Dye 2009; Milner 2000, 2007). The bow and arrow, introduced in the seventh century (Nassaney and Pyle 1999), provided the ideal assault weapon for warriors who attacked enemy settlements en masse, but the war club was the preferred killing weapon (Van Horne 1993). Increased defensive preparedness was the only practical, long-term option to maintain village autonomy and sovereignty.

Offensive posturing and intercommunity threats are clearly evident where populations begin digging ditches, erecting palisade walls, and placing towns or villages in defensive locations. These efforts arose in response to heightened levels of violence that began in the Late Woodland period (Knight and Steponaitis 1998:11; Little 1999). McElrath et al. (2000:24) note the presence of defensively located, fortified, and moated Late Woodland sites in the eastern Woodlands, and Green and Nolan (2000:349) state "abundant evidence of violent death indicates that raiding or warfare was common among Late Woodland peoples." In the Middle Ohio River Valley, between AD 400 and 700, relatively large nucleated sites, located on bluff tops, had encircling ditches, presumably for defense (Royce 2007). By the end of the Late Woodland period across the midcontinent, community life and military defense underwent additional alterations and transformations, resulting in greater defensive needs and stronger fortifications during succeeding centuries (Gramley 1988).

The Mississippian Midwest/Southeast

Although attention has been directed toward the development and nature of Mississippian defensive systems (Fontana 2007; Iseminger 1990; Lafferty 1973; Larson 1972; Stout and Lewis 1998; Milner 2000; Payne 1994; Milner and Schroeder 1999; Steinen 1992; Trubitt 2003; Vogel and Allan 1985), few archaeologists have examined the timing of fortification building relative to the overall occupancy of a community and the durability of palisade walls (Krus 2011, 2013). The problem of palisade longevity is not addressed in current discussions of Mississippian warfare, yet it holds important implications for assessment of the duration and intensity of intercommunity violence. The length of time that any particular palisade was in use is unknown for most sites. In many instances, charcoal or preserved wood is not available for dating purposes, making chronological assessments difficult if not impossible. Mississippian palisades were either refurbished on a regular basis or had brief lifespans of one to two decades, based on direct observations of reconstructed palisade decay rates in the Northeast (Prezzano 1992; Warrick 1988). Increased

frequency of woodworking tools, including adzes, axes, chisels, and mauls, may be indicative, in part, of palisade construction, maintenance, and repair (see Poplawski et al. 2012).

A new era of violence is seen in the initial, widespread rise of Mississippian fortifications and warfare around AD 1250. The intensity of attacks is reflected in the greater numbers and increased strength of fortifications with bastions, ditches, embankments, gates, palisades, and towers (Milner 2000). Prior to the mid–thirteenth century, few defenses match the scale of those that characterized later defensive efforts, with the exception of Early Mississippian towns such as the Mound Bottom (O'Brien and Kuttruff 2012) and Obion (Garland 1992) sites.

Mississippian military tactics and operations against fortified towns would have included storming defensive walls—especially those that were weakened or under construction—by warriors armed with axes, bows and arrows, clubs, fire, and knives. Palisades encircling settlements provide impressive evidence of heightened expectations for attack, severity of armed conflict, social labor to construct fortifications, and threats of increased intensity. Throughout much of the lower Midwest and Southeast, fortifications accompanied the rise of Mississippian chiefly polities (Milner 2000; Milner and Schroeder 1999:104). In some areas populations nucleated, while in others households and hamlets remained dispersed but sought refuge in fortified centers during times of increased conflict and intensified hostilities (Dye 1994; Morse and Morse 1983:266).

Palisades were built to withstand attacks from bow-and-arrow warfare and in this regard they were usually effective, but when towns were vulnerable through palisade weakness or internal strife, one's enemies would have taken advantage of the opportunity to initiate an attack. The bow and arrow, coupled with fire and war clubs, fundamentally transformed the nature of intergroup conflict (Blitz 1988:124). Restructuring both the scale and organization of warfare (Nassaney and Pyle 1999:260), militias armed with bows and arrows and war clubs brought about a significant increase in mortality, especially in lightly fortified or unfortified communities (Bridges et al. 2000:56). Massed attacks would have prompted population dispersion and settlement relocation (Seeman 1992).

The self-bow, generally crafted from a single piece of wood, was used throughout the Eastern Woodlands. Self-bows had a cast of about 160 m (525 ft) (Hamilton 1982), but the effective range may have been closer to 60 m (197 ft). The bow did not immediately necessitate construction of fortified communities, but the fortifications that arose around AD 1250 were clearly designed as a direct response to militias armed with bows and arrows: tall, plastered,

palisade walls; bastions; constricted entrances; embankments; and deep, wide ditches (Milner 2000). Plastered Mississippian palisades may have emerged to counteract fire-tipped arrows shot in unison by massed warriors (DePratter 1983:47). Closely spaced bastions, averaging around 30 m (98 ft) apart, allowed defending archers to overlap their fire power and prevent attackers from breaching the curtain wall (Fontana 2007:173; Milner 1999:120, 2000:58). This distance is comparable to what is found in other areas of the world where simple bows are used (see Keeley 1996:96; Keeley et al. 2007). John Smith wrote that the Indians of Virginia could shoot well at 40 yards (ca. 37 m) and were fairly accurate at 120 yards (ca. 110 m) (Smith 1624:132). Lafferty (1973:138) notes that "the curtain walls of all archaeologically known fortifications could have been easily defended from the bastions" and that "the bastions of the aboriginal Americans were constructed close enough together to have had the curtain wall covered by bows and arrows fired from the bastions."

A member of the Hernando de Soto entrada—a "Gentleman from Elvas"—described the fortified town of Tascaluça as seen in 1540: "the enclosure, like that in other towns seen there afterward, was of thick logs, set solidly close together in the ground, and many long poles as thick as an arm placed crosswise. The height of the enclosure was that of a good lance, and it was plastered within and without and had loopholes" (Robertson 1993:94). Vogel and Allan (1985) estimate that palisade height at Moundville was 3–4 m (9.8–13.1 ft), based on the depth of postholes. Typical of many Mississippian sites, the Annis Village fortifications were built as "screens to prevent raiders from gaining easy access to the village" (Hammerstedt 2005:261).

An increase in skeletal trauma and trophy-taking behavior is associated with the rise of Mississippian intersocietal conflict and the construction of fortifications. The types and severity of violent trauma also reflect the nature of settlement defense. Mortality rates and traumatic injuries were at their greatest levels in small to medium-sized sites (Bridges et al. 2000). Undefended hamlets exposed individuals to direct attack by warriors armed with bows and arrows, resulting in high percentages of human remains with embedded arrow points. On the other hand, mid-sized sites with defensive features, such as palisades, have high mortality from upper-body trauma and cranial injuries due to axes and war clubs, but rarely from arrow points. In contrast, the largest and best-defended Mississippian sites were formidable to invaders. Large defending forces and strong defenses made communities relatively immune from overpowering, successful attacks (Bridges et al. 2000). But to be effective, defending militias had to be coordinated and organized and defensive walls had to be constructed with skilled planning and sound engineering. Above all,

protective palisades had to be evaluated, maintained, and repaired on a regular basis to insure their durability and integrity.

There is an interpretive dilemma in assessing the occupational life history of Mississippian towns and the palisade walls that surrounded them. If wooden palisade walls have a lifespan of some 10–20 years (Cole and Albright 1983:159–162; Iseminger 1990:35; Lafferty 1973; Scarry 1995:235), then the walls that encircle a long-lived community would have to be maintained and rebuilt many times, assuming the inhabitants needed continual protection by the town's fortifications. Even this 10–20-year use-life for fortification may be inaccurate. Bragg notes, "depending on the species used, 10–20 years may be too long to maintain the structural integrity (strength) of wood buried in typical soils in eastern North America, especially in areas with termites, carpenter ants, and other wood-consuming detritivores (not to mention fungi)" (Don C. Bragg, personal communication, 2013). Blew and Kulp (1964) note that untreated fence posts typically have 3–6-year lifespans. Lafferty (1973:108) suggests that untreated poles used in palisades would have a shorter lifespan than the 15–20-year life expectancy of modern creosote-treated telephone poles.

If defensive walls were no longer needed, then presumably the town would expand beyond the walls, and debris would extend out from the palisade and associated ditches. In some cases, multiple palisade lines are exposed by archaeological excavation. In other instances, towns remained within circumscribed areas, resulting in deep middens. The majority of Mississippian towns had only one functional palisade at a time, although numerous non-defensive screen fences might be present, demarcating charnel houses, council lodges, courtyards, elite compounds, kitchen gardens, restricted plazas, or other mundane and sacred spaces. How then do we account for single palisade lines at so many Mississippian sites that were occupied for several centuries? Did they need defensive walls for a short period of time, or were walls rebuilt or refurbished over time in such a way as to leave virtually no archaeological evidence?

An example of this problem is seen in a distinctive set of late prehistoric sites in the Lower Mississippi Valley labeled the "St. Francis type" by Phillips et al. (1951). The site type has a specific configuration that embodies a large, planned community laid out in rectangular form with straight, surrounding, and wide ditches. These sites stand several meters above the surrounding floodplain, having been built up over several centuries from accumulated debris and refuse. Surrounding defensive ditches, embankments, and wooden palisades would confine the crowded town and its future growth within fixed limits for a considerable time period. Residential structures were located within the encircling ditch and palisade wall, resulting in a thick midden. A relatively large number

of people are thought to have lived at these sites based on extensive cultural deposits, midden depth, numerous structures, and overall site size.

In general, St. Francis–type sites date from approximately AD 1350 to 1650, representing some 300 years of continuous occupation (P. Morse 1990), but some sites, such as Parkin and Rose Mound, have earlier Baytown and Mississippian antecedents dating between AD 1000 to 1250 or earlier. Phillips et al. (1951:329, table 14) assigned 21 sites to the St. Francis–type settlement within an area comprising the Upper Yazoo Basin of northwestern Mississippi and the adjoining Lower St. Francis Basin of northeastern Arkansas/southeastern Missouri. Textbook examples of the St. Francis–type settlement may be found in the St. Francis and Tyronza River confluence area, including Castile Landing, Fortune, Neeley's Ferry, Parkin, Rose Mound, and Vernon Paul.

Philips's observations of the St. Francis–type sites, as he witnessed them in 1947, are noteworthy:

> As one approaches these sites across the level flood plain, the first impression is made by the unusual depth of the refuse that has accumulated. The entire area of Rose Mound . . . stands up about 10 feet [3.1 m] above the surrounding plain. Cuts into this 'mound' showed 2.5 meters [8.2 feet] of rich refuse deposit. This impression of the elevation of the entire village area is heightened by the wide ditch which surrounds most of the sites of this type. The concentration of the refuse in a rectangular area surrounded by a ditch indicates almost conclusively that these towns were fortified. A stockade as well as a ditch probably protected as well as defined the village area. (Phillips et al. 1951:329)

Sixteenth-century descriptions from the Hernando de Soto expedition of the principal town of Pacaha, located on the Mississippi River just north of present-day Memphis, Tennessee, provides striking correspondence of ethnohistoric accounts with archaeological excavations. Pacaha, encompassed around 500 large houses, and was surrounded on three sides by a moat some 12–15 m (ca. 40–50 ft) wide. The Mississippi River supplied water to the moat via an artificial canal three leagues (ca. 16.7 km) long and three fathoms (ca. 5 m) deep. The canal was so wide that two large canoes could pass one another without the oars of one canoe touching those of the other (Hudson 1997:293). The fourth side was "enclosed by a very strong palisade in the form of a wall made of thick logs set in the ground, touching one another, and other, transverse logs fastened and covered with packed mud and straw" (Shelby 1993:395). The "Gentleman from Elvas" described the town as "very large, and furnished with towers; and in the towers and stockade many loopholes" (Robertson 1993:117).

Phillips excavated test pits at Rose Mound, but unfortunately missed the palisade wall and so was unable to confirm his hypothesis that the St. Francis–type site configuration and layout resulted from a defensive ditch-and-palisade system. Recent excavations by Jeffrey Mitchem (Bragg 2012; Mitchem 2013; Mitchem and Lockhart 2012) at two St. Francis–type sites, Parkin and Neeley's Ferry, however, have confirmed Phillips's hypothesis of defensive ditches and palisades and Garcilaso's sixteenth-century descriptions. The Parkin site is a 6.9 ha (17.1 acre) occupation at the confluence of the St. Francis and Tyronza Rivers. The site is surrounded by a ditch 26 m (85 ft) wide and 1.9 m (6.2 ft) deep with an adjacent palisade and associated bastions. Palisade posts extend into sterile clay, and appeared to be holes from which posts had been removed, as opposed to post molds where the original post has burned or decayed in place (Mitchem 2013). Typical of Mississippian palisades, charcoal or wood was lacking for radiocarbon dates. Based on later superimposed houses, the site continued to be inhabited for a substantial length of time after the palisade had either been destroyed or dismantled. Members of the community may have removed the posts for fuel or building materials, or they may have been forced to eradicate the palisade if they found themselves dominated by another polity. Two human burials were found above the palisade postholes, indicating that they were buried after the palisade had been dismantled. Interestingly, one of them had a chert adz in the area of his abdomen (Jeffrey M. Mitchem, personal communication, 2013).

Neeley's Ferry is another important Parkin-phase site with a 14-m-wide and 1.1-m-deep ditch and adjacent palisade. Unlike Parkin, the Neeley's Ferry palisade posts were left in place and had rotted, perhaps because the site was abandoned with the palisade wall still standing. Overlapping features indicate some palisade rebuilding or repair (Mitchem 2013). Excavations at Parkin and Neeley's Ferry point to the need for more detailed excavations documenting the nature of fortification systems because repairs have important implications for the degree of political consolidation and violence. Parkin and Neeley's Ferry reveal differences in palisade maintenance and repair, indicating the problems archaeologists face when interpreting community protection, defensive systems, and site longevity.

Mississippian fortifications present challenges for archaeological interpretations of conflict and violence. Palisade construction and maintenance have not received sufficient attention to tackle questions of duration and levels of intercommunity raiding and warfare. The timing of fortification construction and evaluation are crucial for such assessments and archaeologists investigating Mississippian fortifications must examine palisade durability,

rebuilding, and refurbishing to answer the questions of warfare intensity and military organization. The length of time that a palisade wall is viable may be addressed through detailed excavation and chronological assessment where posts remained in the ground. Archaeological approaches to palisade maintenance in the Northeast offer innovative methods for eastern North America.

The Northeast: Iroquois

Violence in the form of small-scale raiding may date as early as AD 950 with the advent of the Medieval Maximum (AD 950–1250), and the collision of southward-moving eastern Algonquian hunter-gatherers with northward-migrating northern Iroquoian swidden farmers (Snow 2010:219–225). By the late tenth century fortified villages were being built on defendable terrain away from major transportation routes, suggesting that concerns with defense dictated settlement placement (Snow 1995). In the Upper Susquehanna Valley multifamily dwellings and fortified villages are evident between AD 1000 and 1100 (Prezzano 1992:431). Swidden farming prompted periodic, short-distance village relocation due to depleted soil, which resulted in competition over vaguely defined territorial tracts, especially hunting reserves. Proto-northern Iroquoians pursued revenge-based raids consisting of small war parties (Snow 1994), necessitating defenses to prevent counterattacks and retaliation. Evidence of violence is reflected in arrow-riddled bodies, cannibalism, protective palisades, and trophy-taking behavior (Snow 2001). Iroquois palisades evolved to become increasingly effective barriers and defensive structures (Keener 1999:782).

By approximately AD 1250, a time when many Mississippian centers were being fortified, most northern Iroquoian villages were also being palisaded, some having exterior ditches. During the fourteenth century, the frequency of well-planned, heavily palisaded sites increased throughout Iroquoia as raiding and warfare intensified (Snow 1994). Communities that had been formerly separate but allied, now begin to relocate and amalgamate for defense into fewer and larger fortified settlements (Birch 2010a, b; 2012; Williamson 2007). The sporadic violence that had been evident prior to the fifteenth century now erupted into endemic warfare, perhaps impelled by increased stresses resulting from climate change, especially droughts (Cook et al. 2007). Communities relocated to more defensible locations and coalesced with neighboring groups for mutual protection. An ideology of revenge prompted increased competition, confederacy formation, village fortification, and population fractioning. Intervillage aggression was replaced by conflict among confederacies that sought to annihilate one another through genocidal warfare (Snow 1994).

Ethnohistoric records provide documentation for postcontact Iroquoian attacks against fortified settlements (Keener 1998). Militias were organized on the village, nation, or confederacy levels in which several hundred warriors might be involved for joint enemy raids (Brandão 1997; Trigger 1990). Taking calculated tactical approaches to increase their chances of survival, and to ensure success in raids against fortified positions, war parties of five to 20 individuals relied on ambushes and surprise attacks. They avoided frontal assaults on fortified villages and, if outnumbered, refrained from engaging in combat. When threatened with attack, especially by an enemy that appeared too strong to resist effectively, they burned their own settlements, retreated behind palisades, scattered into the surrounding countryside, or sought refuge at neighboring villages with which they had previous alliances. If their defenses were sufficiently strong, on the other hand, they might remain in the village or town, protecting their possessions, resources, and themselves (Milner 1998:75).

As with Mississippian militias, Iroquois warriors used bows and arrows first when attacking an enemy, followed by hand-to-hand combat with war clubs, and finally, using knives for trophy-taking. Fighting continued until one group fled, surrendered, or was wiped out. In the first decade of the seventeenth century, Champlain noted relatively bloodless battles between massed confrontations of warriors. These assaults were quickly abandoned in favor of ambushes and small-scale raids once muskets were introduced into the existing suite of weaponry (Richter 1983:538).

Iroquois palisades evolved over time with a general increase in overall size (Keener 1999:782; Prezzano 1992:242). Palisades that surrounded Iroquoian villages often consisted of a single row of tall saplings, interlaced with bark, logs, and poles. Interwoven branches were used for fortifying temporary camps, but palisades constructed around permanent villages made use of bark sheets (Poplawski et al. 2012). Defensive construction included baffled entrances, ditches, protected gateways, scaffolds, and towers. Houses were positioned a considerable distance from the palisade wall to protect the inhabitants from ambushes (Prezzano 1992:435). Palisades often contained three rows of posts with a vertical central row; the outer rows being bent inwards and lashed at the top. Bark and withes were interwoven between the posts and small vertical poles were sometimes fitted between gaps in the uprights (Funk 1967:81; Jones and Jones 1980:66; Ritchie 1980). Logs might be piled up and then lashed behind and between the posts, to at least the "height of a man" (Coyne 1903:23). These palisades, when completed, stood between 4 and 10 m (13 and 33 ft) in height (Prezzano 1992:248; Ritchie 1980:307). A walkway or platform was created by fastening poles or logs at the top of the palisade where the

vertical members crossed (Biggar 1924:155–156; 1929, 3:122; Sagard-Théodat 1939:91), providing a sturdy, self-supporting structure several meters wide that was difficult to breach (Knight 1987:181).

At the Eaton site in western New York, an ancestral Erie village dating to approximately AD 1550, Poplawski et al. (2012) argue that the relative abundance of large used flakes and core fragments found by the palisade were used for cutting bark lashing and cordage used in its production. Ethnohistoric references indicate that bark could be removed from trees or palisade poles after a slow fire had been set under them and warm water poured over them to facilitate bark removal with the aid of antler, bone, or wooden chisels. Poles with the bark removed would last longer than those with bark, as they would not be subject to insect infestation between the wood and the bark, and they would be more resistant to decay and rot (Hamell and Rogers 2001; Poplawski et al. 2012).

Beauchamp (1905:111–112) notes, "for a triple stockade . . . but one line of post holes was required. The cross poles needed none, and for some stockades no holes at all were used . . . A shallow trench, or anything to hold the base of the pickets temporarily in position was all that was needed." Laying the auxiliary poles horizontally between the vertical supports explains why many Iroquois palisades are defined by shallow post molds and are often considered "flimsy" based on archaeological evidence. As an example of the complexity of palisade design, the Boland site (AD 1000–1100) palisade consisted of a baffled entrance, elevated scaffolds, and protected gateway (Prezzano 1992:435).

In his 1655 account, the Dutch ethnographer Adriaen van der Donck provides an early description of a Mohawk/Mohican palisade:

> First they lay a heavy log on the ground, sometimes with a lighter one on top, as wide and as broad as they intend to make the foundation. Then they set heavy oak posts diagonally in the ground on both sides to form a cross at the upper end, where they are notched to fit tighter together. Next another log is laid in there to make a very solid work. The palisades stand two deep and are strong enough to protect them from a surprise attack or sudden raid by their enemies, but they do not as yet have any knowledge of properly equipping such a work with curtains, bastions, and flanking walls, etc. (Donck 2008:83)

In 1666 a French military force observed a Mohawk village that included a 20 foot (6.1 m) tall, triple palisade, a prodigious hoard of provisions, and an "abundant supply of water they had provided, in bark receptacles, for extinguishing the fire when it should be necessary" (Le Mercier 1959:145). Water was stored in bark buckets placed along galleries or in watchtowers (Sagard-Théodat 1939:91). During Champlain's voyage made in 1615 to Canada, he describes Iroquois

palisades as "well-supplied with gutters, placed between each pair of palisades, to throw out water, which they had also under cover, in order to extinguish fire" (Champlain 1882:131). Given the flammable nature of Iroquoian villages, storing an abundance of water on platforms over wooden palisades would have been crucial for putting out fires during attacks (Poplawski et al. 2012).

The average precontact village was relocated about every 25 years as a result of depletion of agricultural soil, construction supplies, and firewood (Warrick 1988:49). Given estimates of limited village occupation for Iroquoian sites and a use-life for construction posts between five and eight years, palisades would have to be rebuilt from three to eight times during a village's lifespan (Prezzano 1992:253–256). Palisade maintenance would therefore result in removing considerable numbers of decayed posts because the average-sized Iroquoian village required approximately 20,000 poles for construction and maintenance of long houses and palisades (Finlayson 1985, 1998; Heidenreich 1971:152). Structural decay and depletion of available timber for suitable posts might also have precipitated Iroquoian village abandonment and relocation (Warrick 1988:50; 1990). Early French accounts document the transportation of house and palisade poles to new settlements upon the abandonment of old villages (Prezzano 1992:254).

Experimental archaeology reveals the limitations of Iroquois palisade longevity. Protective walls constructed of mixed hardwoods, such as beech, maple, and oak, had short use-lives. For example, the mixed-hardwood palisades at "Crawford Lake and Lawson reconstructed villages rapidly decayed and blew down in windstorms only 3 years after construction" (Warrick 1988:49). Reconstructions using cedar have much longer use-lives. Longwoods village survived for 16 years and was in an excellent state of repair because it received annual maintenance, including replacement of unsound posts. Without maintenance, cedar posts lasted 29 years at the Huronia village. A reconstructed village built of pine and cedar at Cayuga Lake, however was falling apart after 22 years (Warrick 1988). As was the case with the Lower Mississippi Valley St. Francis–type sites, there is a general lack of charred or preserved timbers in Iroquoian sites (Warrick 1988:24), suggesting that post removal was routine and that charring or other post treatments were not a component of long-term maintenance and repair.

Warrick (1988) designed a method for estimating the age of Iroquoian palisades by determining the decay rate of the wood species used in palisade construction. He employed use-life curves and tables for various wood species based on their average decay rate and postulated three key assumptions about longhouse construction that are applicable to palisades. First, the initial design

of construction was recognizable, therefore original and replacement posts could be determined. Second, when structures were repaired, the decayed posts were replaced almost immediately because all defensive components were critical for stability. Third, replacement posts were not inserted into the same holes as the original posts, suggesting that decayed post butts were left in place. The average use-life of palisade posts at the Boland site would have been between four and eight years, but the effective lifespan would have been limited, suggesting that actual palisade use-life at a particular village may be shorter than estimates based on pole decay rates. Average post use-life is measured at the point when 60 percent of posts fail due to mechanical stress, but it is doubtful that palisade walls would have been allowed to reach the point of failure (Prezzano 1992).

Fortified villages in the Northeast present different problems from those associated with Mississippian towns. Iroquois fortifications appear flimsy and weak from an archaeological perspective, compared to the deep-set and thick posts of Mississippian towns, but closer examination reveals a sturdy defense system composed of complex entrances, gateways, and scaffolds. As is the case with Mississippian fortifications, Iroquois settlements were short-lived, and they would have required continual maintenance and repair of posts and wall segments to provide protection for village inhabitants. Assessments of Northeastern fortifications reveal much about the evolving nature of Iroquoian aggression and violence. Research in the Northern Plains offers new perspectives on the ways in which eastern North American communities coped with a violent political environment.

The Northern Plains: Proto-Arikara and Proto-Mandan

Plains Village cultures appear on the Middle Missouri River as early as AD 1000 (Johnson 2007a:168), and from the outset fortified villages and skeletal trauma are evident. Village farming success at the northern margins of plant cultivation was made possible with the warmer climate regime of the Medieval Maximum. The competitive edge of Plains villagers was enhanced through their exchange with Mississippian cultures to the east; the westward expansion of crops, including beans, corn, squash, and sunflower; the adoption of the bow and arrow; and the eastward movement of bison (Gibbon 1993; Henning 2005). In the Middle Missouri region, violence and warfare can be linked to droughts on a decade-to-decade scale. Sites were fortified during large-scale or extended periods of droughts and they were not fortified during wet intervals (Bamforth 1994, 2006, chapter 1 in this volume; Blakeslee 1994;

Brooks 1994; Hollimon and Owsley 1994; Owsley 1994). A culture of aggression and violence associated with settled farming, along with templates for constructing and maintaining defensive systems, may also have accompanied a developing farming adaptation. Fortifications consisting of ditches and palisade walls were part of the community plans for these earliest Plains villagers (Bamforth 2006), and provide telling evidence for increased levels of community protection, intersocietal violence, and military organization.

Woodland-period settlements typically lack fortifications, but once Middle Missouri people began to engage in farming, village sites reveal a shift toward defensive measures. Violence apparently took the form of small-scale raids precipitated by intermittent bouts of feuding. By the eleventh century, feuding and raiding intensify, resulting in lightly fortified villages surrounded by ditches. Although these communities consisted of relatively small populations, confrontations could become severe and violent. Population clustering of these earliest village farmers is evident, perhaps representing political alliances among ethnically similar populations (Clark, chapter 12, this volume).

Almost half the sites scattered along the Middle Missouri River and dating to the period from circa AD 1000 to 1100 are fortified, suggesting that conflict and violence were central concerns. The Sommers site, for example, was initially unfortified, but in the late eleventh century the inhabitants constructed a fortification ditch and palisade around a series of houses at the north end of the site. Sommers is an "unusually large site composed of almost 100 houses within and outside of a fortification ditch, indicating a consolidation of peoples for mutual defense" (Johnson 2007a:170). Potential attackers menacing Sommers include local hunter-gatherers, Middle Missouri villagers, and resident Late Woodland groups (Clark, chapter 12, this volume). Neighboring Plains villagers probably also threatened these fortified communities because they possessed sufficient warriors as well as the organizational capability to storm defensive positions with mass assaults. Some hunter-gatherer sites to the north, however, were also fortified and their occupants may have been the assailants (Bamforth, chapter 1, this volume). In the twelfth century, the fortified Fay Tolton site was the scene of violent confrontation between occupants and attackers (Hollimon and Owsley 1994). Also at this time, local population clusters fissioned, expanded northward, and became heavily fortified, with buffer zones separating them (Clark, chapter 12, this volume).

Evidence from the thirteenth century is clear for three divisions of fortified villages consisting of ethnically different populations who occupied the same stretch of the Missouri River but who were separated by buffer zones (Clark, chapter 12, this volume). By the end of the century, all traces of the Initial

Middle Missouri villagers disappear from the archaeological record, perhaps as a result of deteriorating climatic conditions, incursions of competing proto-Arikara (Initial Coalescent) groups from the central Plains and proto-Mandan (Extended Middle Missouri) villagers from the north, and disruptions in the Cahokia exchange network (Johnson 2007a:100, 178).

The fourteenth century witnessed strong, fortified towns with large populations and massed attackers. The massacre of almost 500 Initial Coalescent (proto-Arikara) occupants of the Crow Creek site indicates a rise in violence (Hollinger, chapter 10, this volume; Willey and Emerson 1993; Zimmerman and Bradley 1993). Conflict may have been generated by outsiders, such as the Oneota who were expanding into the northern Plains from the east, or by Caddoan-speaking (Coalescent) central Plains villagers who had recently moved into the valley, or by the resident Siouan-speaking (Middle Missouri) people who were being forced to move northward, out of the Big Bend region. The escalated violence appears to have resulted in some villages becoming larger and more compact. These intrusive (Initial Coalescent) settlements were fortified by complex and elaborate defenses consisting of ditches, palisade walls, and bastions surrounding the village perimeter (Bamforth, chapter 1, this volume; Johnson 2007a:178). Bastions are designed to prevent massed attackers from breaking down or setting fire to palisades, suggesting that a fundamentally different scale of conflict and organizational basis for combat was present in the fourteenth century. Village leaders were now able to mobilize large forces and bring together multicommunity alliances.

Zimmerman and Bradley (1993) suggest that these Initial Coalescent communities may have competed with resident Middle Missouri populations for horticultural floodplain land. Linkages of an ideology of status, violence, and warfare may have brought about changes in dehumanization of the enemy, male status, and trophy-taking behavior. Patterns of socialization created an ethos of sanctioned violence (Bamforth, chapter 1, this volume). Populations throughout the region reestablished their presence as evenly distributed, paired fortified villages. Interestingly, one of these pairs consists of two different cultural traditions (Coalescent and Middle Missouri), suggesting that alliances are not always structured along cultural or ethnic lines (Clark, chapter 12, this volume).

By the early 1400s, newly established horticultural sites were open and unfortified, with substantial intersocietal interaction. But during the mid- to late 1400s, the Middle Missouri communities reaggregated into large fortified towns and witnessed reduced intervillage interaction (Bamforth, chapter 1, this volume). Two population clusters separated by a buffer zone, situated

along the Middle Missouri, apparently represent Siouan-speaking, proto-Mandan/Hidatsa to the north and Caddoan-speaking proto-Arikara to the south. Some type of interethnic rivalry apparently played out between these two groups in the form of violent conflict. However, Mitchell (2007) suggests that ancestral Mandan towns may have defended themselves from one another in the face of increasing competition for control of exchange networks. At the same time, fortified hunter-gatherer sites on the northeastern Plains, such as the Shea site, may have been involved in violent confrontations with Middle Missouri villagers. These groups may have been proto-Lakota or hunter-gatherers located to the west in the Black Hills (Bamforth, chapter 1, this volume).

By the later 1400s, community size had increased again, and fortifications had become elaborate and widespread in the south, although they appear to remain absent in the north. This pattern of fortifying permanent horticultural communities, at least in some regions, continues into the contact period. Fortifications ranged from a ditch and palisade set across the neck of a promontory, to elaborate bastioned walls incorporating *chevaux-de-frise* obstacles (Bamforth, chapter 1, this volume). Buffer zones still remained between divisions, including one that separated two fortified Initial Coalescent communities. Regionally, there was a trend for dispersal, but locally small clusters are also evident (Clark, chapter 12, this volume). Communities appear to have remained relatively large and fortified well into the sixteenth-century (Bamforth and Nepstad-Thornberry 2007b:152).

Northern Plains fortifications and warfare have been topics for discussion by a number of researchers (Bamforth 1994, 2006; Caldwell 1964; Ewers 1975; Henning 2005; Hollimon and Owsley 1994; Kay 1995, 1996, 2007; LeBeau 2010; Lehmer 1971; Owsley 1994; Robarchek 1994; Willey and Emerson 1993; Zimmerman and Bradley 1993). However, the maintenance and durability of palisades in the face of limited timber resources has rarely been discussed (Griffin 1977; Mitchell, chapter 11, this volume). Construction of a Middle Missouri earthlodge village, especially its ditch-and-palisade system, would have been an organized and planned community process, requiring the efforts of a large workforce to cut and move substantial amounts of timber (Wilson 1934). Judging from the planned nature of most villages, a settlement would have been constructed during a relatively short period, perhaps a few weeks or less, and occupied quickly by a substantial, aggregated population. The village was probably abandoned as a single event, with many of the inhabitants moving simultaneously to construct another village at a new location. It is also possible that a new fortified village was built prior to abandonment of

the previous settlement. Therefore, large numbers of lodges within a typical village may have been abandoned in one village and constructed in another in a coordinated and synchronous manner (Johnson 2007a:57).

Ethnographic reports (Will 1930; Wilson 1934; Weitzner 1979) and data obtained from modern earthlodge reconstructions (Ahler 1988) indicate that the useful life of an earthlodge is about 20 years or less, due primarily to rotting posts and beams that form the main structural support elements of such lodges (Johnson 2007a:65). If a village were in use for more than about 20 to 30 years, there should be clear evidence of repairs or replacements (Johnson 2007a:65). The norm is for a village to be occupied for a half-century or less, perhaps only for a decade or two (Johnson 2007a:66). In the Big Bend region, for example, each village was inhabited for about 30 years. The brief occupation of most Middle Missouri villages is seen as a "response to warfare, competition for bottomland suitable for horticulture, timber depletion, and the meandering effects of the Missouri River on available floodplain lands" (Johnson 2007a:100).

Timber depletion was a primary factor in Middle Missouri village locations and movements because non-domestic units, such as palisades, would have required considerable amounts of wood for initial construction and subsequent maintenance. Building and fortification repair would have continued throughout the occupancy of a village, further affecting timber resources. To utilize timber in the immediate surroundings most efficiently, villages would have been located near young stands of cottonwood and willow, whose constituent elements were dense, had relatively small boles, and were fairly straight (Griffin 1977).

Demands for timber in palisade construction may have influenced bastion construction at sites along the Middle Missouri, where they were spaced about every 54 m (177 ft), almost twice the spacing of Mississippian bastions. Keeley et al. (2007) suggest that the distances between Middle Missouri bastions resulted from the use of sinew-backed compound and/or composite bows, which had a longer cast than the eastern self-bow. "Thus, prehistoric eastern North American bastions were spaced at one half the effective range of a self-bow at the same time that the intervals between bastions on the Upper Missouri were half the effective range of the composite bow" (Keeley et al. 2007:77). Bastion spacing may have also resulted from scarcity of timber along the Missouri River, in addition to the casting abilities of Upper Missouri bows.

Cottonwood (*Populus deltoides*) and willow (*Salix* spp.) appear to have been the preferred trees used for posts in their respective habitats in the Great Plains, but there may not have been many other options in wood choice.

Buffalobird-woman (Hidatsa) noted that tobacco garden fences were made from diamond willow (*Salix* spp.) posts (Wilson 1917:126). Cottonwood and willow have short use-lifespans and would have required constant palisade inspection and repair. Given that Middle Missouri villages were occupied for some 30 years or longer, palisade post maintenance and repair would have been primary concerns. The earliest description of Middle Missouri defenses comes from Jean Baptiste Truteau. He noted in his 1795 journal (Nasatir 2002:295–296):

> The Ricaras have fortified their village by placing palisades five feet [1.5 m] high which they have reinforced with earth. The fort is constructed in the following manner: All around their village they drive into the ground heavy forked stakes, standing from four to five feet high [1.2–1.5 m] and from 15 to 20 feet [4.6–6.1 m] apart. Upon these are placed cross-pieces as thick as one's thigh; next they place poles of willow or cottonwood, as thick as one's leg, resting on the cross-pieces and very close together. Against these poles which are five feet [1.5 m] high they pile fascines of brush which they cover with an embankment of earth two feet [0.6 m] thick; in this way, the height of the poles would prevent the scaling of the fort by the enemy, while the well packed earth protects those within from their balls and arrows.

Truteau's account accords well with the archaeological evidence of fortifications in the Middle Missouri Valley, but this area too presents problems similar to those of the Iroquois, who frequently moved their villages. To what extent do heavily fortified villages reflect the degree and intensity of conflict and violence in the northern Plains? The well-documented development of short-lived, fortified village farming communities offers important opportunities for assessing palisade construction techniques and maintenance requirements. Middle Missouri Valley populations shared common ground with Iroquoian and Mississippian communities in defense of their communities, but differences in environment, history, and political organization present challenges and intriguing research questions for archaeologists.

DISCUSSION

Throughout eastern North America, the chronology of fortification construction and an appreciation of defensive structure maintenance and repair are poorly defined and understood (Bamforth, chapter 1, this volume; Clark, chapter 12, this volume; Prezzano 1992). A raft of questions may be posited. At what point in the lifespan of a site's history were fortifications built and maintained? How long do fortifications last and how much effort is expended

toward construction, maintenance, and repair? Do multiple fortifications represent contraction or expansion of village dimensions (Clark, chapter 12, this volume)? Were posts shortened and then reused in the palisade as supports? Were old posts pulled and used as building materials, employed as firewood, or simply discarded? Did conflicts erupt among groups over scarce wood resources, especially if certain preferred species were desired? Which aspects of palisade construction represent engineering compromises concerning effectiveness, expedience, and resource (post) availability? How were structurally inadequate logs inspected/tested? Would fortification builders have allowed posts to stand until they failed, would they have dug into the decaying post to look for unacceptable levels of rot, or would they have replaced posts following a predetermined interval based on their prior experiences (Don C. Bragg, personal communication, 2013)?

Palisades are often treated as long-standing, durable features, an interpretation that unfortunately results in the perspective of violence and warfare as continuing over protracted periods of time rather than as episodic and limited. Based on known durability rates of posts in eastern North America, palisades would have required frequent and routine maintenance for long-term viability, resulting in considerable effort with construction and maintenance using stone adzes, axes, and chisels. Some palisades may have been "expedient constructions meant to deter ambushes and sneak attacks in the middle of the night or early in the morning" (Hammerstedt 2005:230). Lewis and Kneberg (1946:33) suggest that the palisade at the Hiwassee Island site was used only at certain times during the site's occupancy, rather during the entire history.

Many posts, due to rotting, would have been intentionally removed on a regular basis, but this would be difficult to assess in the archaeological record (Lafferty 1973:109). Rebuilding presents a different archaeological signature. For example, the 20,000-log Cahokia palisade was built and then rebuilt four different times between AD 1170 and 1300 (Trubitt 2010). As one palisade weakened with age, a new one replaced it. During excavation it was possible for the excavators to see where portions of a new wall were erected in front of an old wall, which was subsequently removed. Thus, a continuous barrier was maintained at all times (Iseminger 1990:31). Palisades may also have been realigned due to community contractions and expansions. Hammerstedt (2005:129–138) records three nested palisades at Annis Village, representing successive enlargements of the town over time.

Researchers have attempted to quantify the labor involved in palisade construction (Bigman et al. 2011; Hammerstedt 2005; Iseminger 1990; Krus 2011; Lafferty 1973; Milner 1998). Hammerstedt (2005:226–231) calculated the labor

required to construct the palisade at Annis Village and found that labor costs were similar to those for mound construction. The third and last palisade, measuring 277 m (909 ft), required 1,385 posts and took less than 20 days to construct. Proportionally more labor was invested in moving and raising posts than to fell trees. The time involved in palisade post inspection, planning, and replacement was not calculated. Lafferty (1973:98) suggests that "it took an estimated 500 to 100,000 man-hours to build 100 linear feet of earth wall while it took 50 to 400 man-hours to build a similar section of wood wall." A wooden palisade would require between three and six hours of labor for each linear meter (Lafferty1973:93).

Not only were labor demands high, but the need for construction timbers also brought about deforestation, which had a dramatic impact on the environment (Chacon and Mendoza 2012:477). During the lifespan of the Toqua site on the Little Tennessee River, for example, over 20,000 trees were removed from the surrounding forest to build three different palisades during various phases of the village occupancy (Davis 2000:30). The Etowah palisade stretched along the Etowah River for more than three-quarters of a kilometer. The approximately 5-km palisade constructed around Moundville, located on the Black Warrior River, may had as many as 125 square-tower bastions, spaced every 35–40 m, each of which was 4 m wide and 7 m deep (Bridges et al. 2000:39–40; Dye 2006:114).

In the temperate forests of eastern North America, wood decay is caused primarily by fungi, which consume wood fiber when supplied with sufficient oxygen and a suitable moisture and temperature regime (Warrick 1988:36). Thus, wood posts placed in the earth decay first at the ground line (Krzyzewski and Spicer 1974; Krzyzewski et al. 1980:2). In many parts of North America, particularly the Southeast, termites can be a major consumer of wood with ground contact, while other insects that cause major problems with wood degradation include carpenter ants and powderpost beetles (Don C. Bragg, personal communication, 2013).

Decay rates of untreated wood are known for many North American trees (Blew and Kulp 1964) that were likely used in log palisade construction: in the Northeast, northern white cedar (*Thuja occidentalis*); in the lower Midwest-Southeast, eastern red cedar (*Juniperus virginiana*) and pine; and in the Middle Missouri, cottonwood (*Populus deltoides*) and willow (*Salix* spp.). The rate of decay in eastern North America depends on a number of circumstances. Young, fast-growing trees of many species, including bald cypress and eastern red cedar, produce sapwood that is prone to predation by insects and decay. Heartwood, the most resistant wood type, usually forms later in the

growth cycle as the tree moves protective chemical compounds into the dead tissues at the center of the stem. Moisture content, salt content, and soil acidity also give rise to increased decay. Too little oxygen, usually, from too much water, will slow wood decay, as will soils high in salt content or acidity levels. Extremely dry conditions will also slow decay (Don C. Bragg, personal communication, 2013). Soil conditions do not affect post use-life, nor does charring (Prezzano 1992:241; Warrick 1988:39), but decayed posts would have been replaced almost immediately, necessitating routine inspection and testing to relocate such posts. Most posts would begin to decay from the outer surface inward—assuming posts with existing heart rot were not being used. External decay is not necessarily indicative of what the internal condition of the wood is like. A post may be doughty, punky, or rotted on the outside, yet it may be sound in the middle, especially if it has a lot of heartwood (Don C. Bragg, personal communication, 2013). In 1973, Lafferty (1973:186) called for long-terms experiments of palisade walls to "see how they decay when exposed to different conditions" and his call is as pertinent today as it was then.

CONCLUSION

In this chapter I have suggested that archaeologists consider construction episodes, labor planning, long-term maintenance, and resource procurement in their discussions of fortifications. Palisades should be examined as artifacts, that is, they must be investigated from the perspective of the overall construction system, including the process of production and maintenance. Archaeological evidence for palisade maintenance is evident at many late prehistoric sites. Determining whether posts have been burned, pulled, or rotted in places provides compelling evidence for maintenance and rebuilding episodes. Thus, the use-life of palisades may be correlated with the lifespan of a community and the degree of labor and material costs involved in fortification construction.

Evidence presented here suggests that fortifications evolved in step with village defensive needs, the offensive capabilities of one's enemies, and sociopolitical organization. Fortifications are cultural artifacts that require actions and decisions on the part of their builders. Accumulated skills learned from trial and error would have been taught to the next generation. These learned skills involved advance planning, labor mobilization, and resources management, and were essential to construction and maintenance. The engineers who planned and built the multitude of fortifications found throughout the eastern Woodlands had to be mindful of the community's level of defensive needs and their enemies' offensive level of combat power. As military

deployment, organization, and weaponry changed, so did levels of fortification sophistication.

The more common and diverse forms of archaeological evidence for violence are circumstantial or indirect and may include exchange, fortifications, iconography, settlement patterns, and weapons. Fortifications, intentionally constructed to repel offensive attacks, remain one of the most obvious and unambiguous archaeological indicators of severe intercommunity conflict (Fontana 2007; Keeley et al. 2007; Lafferty 1973; Milner 2000; Schroeder 2006; Trubitt 2003). Unequivocal characteristics of defensive fortifications include baffle gates, bastioned palisades, and V-sectioned ditches (Keeley et al. 2007). These fortification features have been identified among many, if not most, of the late prehistoric cultures in eastern North America (Milner 2000). They indicate that, as social organization became more complex, so did the capacity for intercommunity aggression and violence. Fortifications are archaeological signatures of intersocietal conflict, or at least the potential for conflict, because structural defenses indicate elevated levels of warfare. The construction of fortifications in eastern North America required considerable knowledge, labor, and planning on the part of indigenous engineers. Only a regional perspective enables us to investigate the evolution, maintenance, and variability of well-developed defensive architecture in eastern North America.

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