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Why Fortify?

Force-to-Force Ratios and Fortification on the Southern Plains

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Constructions interpreted as fortifications are rare, if not nonexistent, on the Plains until the Late Prehistoric period, after AD 900/1000 (see Schroeder, chapter 9, this volume). Even so, fortification is predominantly a northern Plains phenomenon, being quite rare on the central and southern Plains as far as we presently know. Reasons for why sites are fortified are numerous. Explanations for northern Plains fortification include climatic deterioration that decreased food supplies and increased conflict (Bamforth 2006). Limited arable land, combined with a growing population, is another proposed explanation (Zimmerman and Bradley 1993). Ethnic conflict though is perhaps the more common reason given for northern Plains conflict and hence for the need to fortify as well. This conflict may occur between hunter-gatherers and Middle Missouri–, Coalescent-, and Oneota-tradition farmers. But, more often conflict is posited to be between the farming groups (Caldwell 1964:2–3; Hollinger 2005; Johnson 2007a:218; Keeley 1996:56–57). Regardless, all of these problems also were occurring on the central and southern Plains, but fortification seldom was used.

Outside the Plains, fortification is seen as occurring for all of the reasons cited for the northern Plains as well as for yet other reasons (Allen and Arkush 2006:14; Emerson 2007:130; Keeley 1996:56–57; Milner 2007:197–198; Topic and Topic 2009:52–54; Trubitt 2003). Cross-culturally, frequent internal

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(same cultural group) conflict correlates with village fortification (Otterbein 2004:192). The basic logic for construction of fortifications, which is often implied but only occasionally explicitly stated, is that conflict intensified to some point where fortification became necessary (i.e., Arkush 2009:198–200; Dye 2009:11, 146–148; Dye and King 2007:162; Emerson 2007:135–137; Inomata and Triadan 2009:66–69; Jones 2004:7; Keeley 1996:55–56; Lambert 2007:211; Lovisek 2007:63, 72; Maschner and Reedy-Maschner 1998:25, 32–36; Otterbein 2004:192–193; Solometo 2006:30–31, 33–34, 36–37, 51–52; Topic and Topic 2009:52–53). The degree of social complexity is sometimes suggested to affect fortification decisions, with less-complex societies having less-intense warfare and therefore resorting less often to fortification. At the other end of the social scale, political centers may be fortified, or fortification may be entirely unnecessary because of military size and distribution. Exceptions would be outposts and frontiers (Arkush 2011:63–66). Fortification also is sometimes attributed to attacks that are not predictable (Solometo 2006:53). The question addressed below is why people come to a decision that conflict has reached the point that it is necessary for them to fortify.

DEFINING FORTIFICATION FOR THIS STUDY

There are lots of different types of fortifications. These include walls that run for substantial distances, like Hadrian's Wall and the Great Wall of China. Substantially built walls and towers once surrounded many European cities. Trench systems and discontinuous lines of military weaponry and facilities (such as the Maginot Line) played important roles in World Wars I and II. Military forts are common features of most state-level societies. Apart from large, state-level projects there are smaller fortifications. Many fortifications around the world were designed to protect single small settlements or to provide refuge for people in several such settlements. What a fortification defends can include a group of soldiers, a resident population or the population within a general area, elites, noncombatants, and property, including stored foods, livestock, and symbols of identity and/or authority (Dye 2009:101, 145–146; Ingram 2012; Keeley 1996:56; Klingelhofer 2010; Milner 2007:187–189).

The discussion that follows refers specifically to fortifications involving a system of walls, usually surrounded by a trench, following Keeley et al.'s (2007) discussion. This system of walls and trenches encloses either wholly or partially a settlement or village and/or provides refuge to people residing in an area during conflict. If a wall-and-trench system is only a partial enclosure, the remaining perimeter is usually a natural feature involving a steep drop-off,

like a riverbank or bluff. While these fortifications usually involve one or more stockades or palisades, they can also consist of just a series of trenches. The main feature is that they provide loci around which conflict can center.

Obviously, construction of walls can occur for more reasons than just conflict with outsiders. Social differences within a resident group can involve walls that separate such groups from one another. Elites not uncommonly wall themselves off from some section of the populace. A walled enclosure can also serve as a corral into which to drive bison or pen horses (Halsall 2003:215; Keeley et al. 2007). In addition, I have tried to select examples where it is known, either from written documents or material remains, that external conflict was occurring.

FUNCTIONS AND COSTS OF FORTIFICATION

Fortification is primarily a defensive weapon, reflecting a perception of threat by the leadership of a political entity and/or the population as a whole (Allen and Arkush 2006:7; Dye 2009:11; Keeley 1996:56; Pauketat 2009:255; Topic and Topic 2009:52). That is not to deny that fortification also has an offensive element—essentially an intimidation value. However, its intimidation value must come from the presence of conflict, as otherwise building a fortification seems more likely to be viewed as an odd activity with little inherent meaning (Allen 2006:198; Dye 2009:148; Eames 2011:65; Keeley 1996:57; Pauketat 2009:255).

Assuming that defenders are within a fortification, the fortification protects defenders as well as others and provides defenders an advantage. It causes attackers to focus on one or only a few locations, such as gates or entryways. The offense is then massed and more accessible to the defense. In addition the fortification is an obstacle to the offense and they must attempt to overcome it. In trying to breach a fortification the attacker's combat power is dissipated and their chance for success is lessened. Fortification further aids the defense by obscuring details on defensive numbers and positions. All of these things maximize defensive efforts and make it easier for defenders to inflict casualties on attackers. In effect, fortification reduces the number of defenders needed for successful protection (Eames 2011:65–67; Keeley 1996:56; Mearsheimer 1989:57–58; Pauketat 2009:255).

At the same time, there are downsides to fortification. Fortification concentrates the defender population, too. Should the fortification be breached or compromised in some way or the defending population somehow be weakened, those inside can suffer higher losses because of limited escape options (Eames 2011:65; Solometo 2006:45; Topic and Topic 2009:52). A population

that must stay near its fortified location can suffer from limited opportunities to forage, hunt, or farm. Internal and external social relations may suffer from consequences of stress and social inequality may increase (Dye 2009:12, and chapter 5 in this volume; Solometo 2006:36–37; Vehik 2002).

Fortification is also an expensive undertaking (Dye 2009:11; Keeley 1996:55–56; Solometo 2006:36–37, 52; see also Schroeder, chapter 9, this volume). Construction and maintenance requires investment of time, labor, and resources (Topic and Topic 2009:52 and Dye, chapter 5, this volume). Plains fortifications involved trenches or ditches that were greater than a meter deep and wide. The interior edge of a trench usually had, or is assumed to have had, a palisade constructed of wooden posts. These posts had to be cut, transported, and set into the ground. On the Plains, wood can be a limited and quickly exhausted resource. Additional construction features such as bastions and mud plaster expand the construction effort, as do the pits excavated at many sites in association with trenches (see Drass et al., chapter 8, this volume). The greater the length of a fortification, the more the construction effort and some Plains fortifications ran for more than a kilometer (Caldwell 1964). Many fortifications also were not a one-time effort as at least some on the northern Plains were allowed to lapse and then were built again. Multiple fortifications at a site are not uncommon; prominent examples include Double Ditch (32BL8) in North Dakota with at least four fortification events and Bryson-Paddock (34KA5) in Oklahoma with a minimum of four (see Drass et al., chapter 8, this volume and chapters in this volume discussing Crow Creek). While some facilities with multiple fortifications may reflect the expansion or contraction of fortification, it is possible all were in use at the same time. Finally, fortification takes labor away from other tasks or, more exactly, increases the amount of labor in which people have to engage.

In sum, fortification is an expensive defensive weapon. Substantial labor and materials are required. The more elaborate the fortification, the greater the engineering required. For instance, the value of bastions is to provide overlapping fire lest the attacker dig under or go through locations where fire does not overlap. Engineering must take that into account. Decisions that a location needed fortification and needed certain kinds of fortification were likely products of careful consideration.

FORTIFICATIONS AND POWER RELATIONS

As noted above, one of the proposed functions of fortification is to reduce the number of defenders needed for a successful defense. Some anthropologists

see fortifications as "tipping the balance of regional power relations" (Pauketat 2009:255 see also Allen and Arkush 2006:7). That is, fortification increases the chance for a successful defense by increasing defensive numbers. Regardless of whether the view is one of being able to get by with fewer defenders or to increase the number of defenders, the point is that fortification increases the chance of a successful defense by altering defensive strength relative to that of the offense or attacker. While ratios of defenders to attackers are not directly addressed in anthropological discussions of fortification, generalizations can sometimes be found (Dye 2009:145). New Zealand *pa* fortifications were occasionally sacked by "direct and overwhelming" assault (Allen 2006:198). LeBlanc (2006:443) suggests that in tribal and chiefdom societies the attacking group will leave part of their force at home for defensive purposes. In consequence, the attacking group typically will be smaller than the defensive group, thereby favoring the defense.

So, if a fortification shows evidence of being breached, the general assumption is that an overwhelming force was involved. The discussion that follows tries to quantify generally what "overwhelming" might involve and then to look at what that could say about sociopolitical relations at the time. The emphasis here is on "could." That is, quantifying the notion of "overwhelming" expands and directs the kinds of questions we can ask about the nature of conflict and the associated sociopolitical dynamics. It is not an answer to anything in and of itself. The basic argument is that fortifications were actually built to keep power relations between the defender and attacker below a certain level. It is proposed that fortifications will be constructed when the ratio of attackers to defenders reaches the point at which defenders perceive the possibility of being overwhelmed, not as a rare event, but as a likely to highly likely event.

Possibly the earliest written source on what it takes to overwhelm or defeat an enemy dates from 403 to 221 BC, the Warring States period, in China. The author(s) of that document note an attacking force should do different things, depending on the ratio of attackers to defenders, beginning with 10:1 and moving down. It concludes with: "If you are in no way your enemy's match, avoid contact. A small force tenaciously resisting will be captured by a large force" (Tzu 2011:19). While the last two sentences do not state a ratio, the first implies less than 1:1 and the last simply a much greater number of attackers. In the early nineteenth century, Napoleon considered an army supported by a fortress or river to be unconquerable if the ratio of offense to defense was 2:1 or less (Phillips 1940:435). Other military strategists from the early nineteenth century also stressed the importance of numerical superiority (Handel 2001:157–163).

There are many modern approaches or theories about what is needed to defeat an enemy. One approach is numerical preponderance: that is, the side with the greatest numbers will commonly win. A second argues that the side with the more advanced technologies will prevail. Other approaches address multiple factors, including the preceding but also many other things, such as tactics and morale. Some try to model the entire dynamics of a conflict (Biddle 2004:2–3, 5, 14–19, 27; Epstein 1989). However, without extensive written records it is almost impossible to address such things as leadership, tactics, and dynamics with any accuracy. For the most part, the discussion below involves conditions of more-or-less technological parity, although inequalities are considered in some of the discussion. So, for these reasons the following discussion centers on the issue of numerical preponderance.

Numerical preponderance advocates commonly use a 3:1 ratio of attackers to defenders. While the ratio often refers to personnel, it can be of weapons or other things instead. Discussion from this point on refers to numbers of people. The basic idea is that the number of attackers to defenders should approach and usually exceed 3:1 in favor of attackers for a defending group to be overwhelmed, captured, or massacred. This is known as the 3:1 Rule, or Rule of Thumb. The rule is used in modern military planning (Robertson 1987:138–139). However, there is definitely debate on its utility and accuracy as well (Biddle 2004:14–17; Dupuy 1979:13; Epstein 1989:91–93; Glaser and Kaufmann 1998:75 and n91; Kress and Talmor 1999; Luttwak 2001:142; Mearsheimer 1989:65; Robertson 1987:138–139).

The origin of the rule is not clear. It seems to come out of military experiences in the late nineteenth and early twentieth centuries (Epstein 1989:97n20; Mearsheimer 1989:59n14). At this point, one can argue about the difference between relatively modern warfare and that associated with Native peoples of the Great Plains. However, the ratio has been used to discuss early medieval warfare that, while it still involves technological differences, is more similar to Native American conflict (Bachrach 2002:80). The ratio also may have been a known norm in medieval times (Bachrach 2002:82).

Regardless of the origin of this rule or its association with modern warfare, it is evident from the last 2,000+ years of written documents that people have long had concerns about the size of opposing forces and what it takes for an offense to overwhelm and defeat a defense, and that seems to involve an offense-to-defense ratio of 3:1 or greater. Since the rule is not a universal, it could be questioned whether sufficient knowledge existed of opposing-force strengths for the ratio to be of use to Native peoples of the Great Plains. Certainly Native North Americans were aware that numerical superiority was desirable to win

conflicts (Handel 2001:115, 155, 159, 363, 411; Heuser 2010:93, 96). Equally, being outnumbered prompted concern for defense (Heuser 2010:96–97, 150). Native Americans scouted their enemies and traded with them as well. The calumet ceremony is a perfect example of an opportunity to assess another's strength (Fletcher 1996). Native peoples certainly assessed strength relations while conducting ceremonies and trading, to say nothing of conducting scouting expeditions. Ceremonies and socializing among men, particularly within the context of war or military societies, often focused on planning attacks and assessing outcomes (Murie and Parks 1981). Thus, successes and failures were repeatedly reviewed. Middle Missouri–, Coalescent-, and Oneota-tradition sites demonstrate that fortifications were built, allowed to lapse, and then rebuilt. This cannot be a random event. Something prompted such activities. People had to be aware of numerical strengths and any potential differences that might result in their being overwhelmed. Was that relationship exactly 3:1 or greater always? No, human behavior is too complex to be determined by only one thing all the time, if ever (Biddle 2004:69–72, 86–89, 227–228; 2007; Davis 1995:16; Dupuy 1979:11–13, 108–109, 123, figure 3–1; Handel 2001:163–164). But the 3:1 ratio or something very close to it has a long history cross-cutting different technologies and provides a useful guideline by which to explore the sociopolitical framework for fortification on the Plains and by small-scale societies elsewhere.

The 3:1 rule most directly refers to local superiority and to frontal or head-on attacks against entrenched defenders (Biddle 2004:15; Davis 1995:4–5, 16–17; Luttwak 2001:142; Mearsheimer 1989:54, 62). The defender is expected to do the bulk of fighting from prepared positions, including fortifications, and to make little use of counterattack (Davis 1995:25; Mearsheimer 1989:63, 65). This situation for the Plains is most similar to fortified villages and refuges.

An attacker requires a large numerical superiority to break through a defense that is comparable in quality (Mearsheimer 1989:58). As the principal Plains weapons were bows and arrows with similar sizes and shapes of arrowheads, it seems unlikely that differences in technology were present. For the Plains, differences in the possession of the horse and gun (not readily quantifiable) potentially could alter outcomes. These are considered below in some of the examples. For this analysis these other factors that make up "quality" will be considered equal, so the standard caveat "all other things being equal" is relevant.

PLAINS WARFARE AND FORTIFICATION

Peace and conflict are sometimes seen as flip sides of a coin. Following that logic, some researchers argue that the lack of fortifications reflects the

presence of peace (Dye 2009:16; Pauketat 2009:257). However, such is not the case (Otterbein 2004:18, 192–193), as will be demonstrated below. While fortification appears to be lacking until the Late Prehistoric period on the Plains, conflict does not just suddenly begin after AD 900. It was clearly taking place long before that (Lambert 2007:212–214; Miller 2008:206–209; Scheiber 2006:605; Vehik 2002:41–43 and references cited therein). There is instead a continuum between peace and conflict. Somewhere along that continuum, moving increasingly toward conflict and either winning or losing, people make decisions that they need to fortify their location. It is in that context that the 3:1 rule becomes useful for analyzing warfare on the Plains and elsewhere.

It is important to reiterate that fortifications are generally meant to defend against frontal assaults on a location. It is unlikely, because of costs, that a fortification would be constructed without a threat (real or imagined) of substantial population loss. Although Plains warfare is commonly seen as having been more about raids and counting coup based on historic descriptions, it is clearly the case from the Crow Creek site in South Dakota (Zimmerman and Bradley 1993) and the discussion below, that Plains warfare also included overwhelming settlements and massacring and/or capturing their occupants. Crow Creek is not likely an anomaly—given the number of other fortified and aggregated occupations (see Sundstrom, chapter 4, this volume).

Early Southern Plains Warfare

Documents from Coronado's 1541 expedition onto the southern Plains note that various societies were enemies of one another (Flint and Flint 2005). Unfortunately there are no further details, but none of the expedition accounts describes fortified sites.

No fortified sites are described by the Oñate expedition of 1601 either. The expedition encountered a group of Escanjaque who were hunting bison west of the Arkansas River in north-central Oklahoma. The Escanjaque encouraged the expedition to attack their enemies, the people of the Great Settlement or Etzanoa (figure 7.1). The people of Etzanoa lived in a large, aggregated farming settlement on both sides of the Walnut River near where it joins the Arkansas River in south-central Kansas (Hammond and Rey 1953:751–756, 841, 854; Vehik 1986).

Expedition accounts describe the sizes of both groups. We can debate endlessly how accurate early historic population counts are. The point to the subsequent discussion is not the absolute counts, but the relative sizes (ratios) of the two groups. The Etzanoan settlement consisted of 1,200+ houses at the low

Figure 7.1. *Sites and locations discussed in text.*

end and "close to" 2,000 at the upper end. Several different people counted the houses (Hammond and Rey 1953:754, 846, 867–868). The population of a house was estimated at between eight and 10 people (Hammond and Rey 1953:754). Etzanoans were a Wichita group, specifically ancestral to the Wichita subdivision of the modern Wichita tribe, and eight to 10 people per house is fairly consistent historically (Perkins et al. 2008:table 2; Vehik 1986, see Vehik 2006 for a discussion of Wichita subdivisions). With 1,200 houses and eight people per house a population of 9,600 is indicated. At the upper end of houses and numbers of people per house, around 20,000 people may have resided in the settlement. Population of the Escanjaque camp was estimated at 5,000–6,000 people or, in two cases, warriors. Descriptions indicate the Escanjaque were out bison hunting with men, women, and children all present (Hammond and Rey 1953:751–752, 759, 841, 854, 865).

For purposes of discussion, because the Etzanoans lived in an aggregated and not a dispersed settlement, they provide a locus that the Escanjaque could attack. Assuming counts were of people, not warriors, the Etzanoan population was double or more that of the Escanjaque group. A 1:1.6 or greater ratio in favor of Etzanoa suggests a direct Escanjaque attack on the Etzanoan village would be unlikely. That does not mean that advantage would not be taken of opportunities where awareness was lax or a substantial number of people were away from the village, just that under normal conditions an attack would be unlikely.

Historically when only a count of warriors was available, a multiplier was used to estimate the total population. This multiplier was most commonly five (see discussion in Perkins et al. 2008:441–442 for attendant problems). In this case, the Escanjaque population would be 25,000 to 30,000. The ratios then range between 2.6 and 1.5 to 1. This time the ratio is in favor of the Escanjaque. A frontal attack on Etzanoa still seems unlikely to marginal.

During the time Oñate's expedition was in the area, the Escanjaque did not attack Etzanoa, at least while its residents were there. However, once Etzanoa was abandoned the Escanjaque did burn many houses and steal corn (Hammond and Rey 1953:848). Escanjaque failure to attack Etzanoa in this instance, however, does not mean they never attacked farmers on the eastern edge of the southern Plains. One member of the Escanjaque party, whom the Spanish named Miguel, originally resided in a similar village, Tancoa, farther to the north in central Kansas. He was captured in an Escanjaque attack on that village (Hammond and Rey 1953:874–875). Unfortunately, there are no other details about the nature of that attack.

As the Escanjaque and people of Etzanoa were frequently at war (Hammond and Rey 1953:875), it seems likely that opportunities did arise for one or the other to attack, as the Escanjaque did to Tancoa. Frontal assaults on the Etzanoan village are unlikely, but attacks on Etzanoan special-task groups operating away from the settlement are another matter.

Even though Etzanoa likely had a much larger population than the Escanjaque group, evidence suggests the people of Etzanoa were concerned about being attacked. Etzanoans not only lived in a large group, known archaeologically as the Lower Walnut focus, but most of their settlement was on the floodplain and low terraces of the Walnut River near where it joins the Arkansas River (Hoard and Schoen 2012; Wedel 1959:344–379). This setting involves large patches of highly fertile soil likely frequently renewed through flooding (Horsch 1980). Oñate expedition accounts describe the settlement pattern as consisting of clusters of houses with the houses surrounded by farm fields. The fields were never out of sight of the village (Hammond and Rey

1953:755, 844, 846, 858, 867). Small parties therefore would not range far to work the fields, limiting their susceptibility to attack. Etzanoa's settlement strategy represents a major change from that used no more than 200 years earlier when settlements involved a few houses scattered along stream valleys. Although warfare had altered settlement strategies significantly, attacks had not reached the point where Etzanoans believed they might be overwhelmed and therefore needed to fortify their settlement.

At least at the beginning of the seventeenth century, written records suggest farming people on the eastern edge of the southern Plains could live in large-enough aggregations that the chance of a settlement being overwhelmed was small (compare to Bamforth, chapter 1, this volume). However, this strategy had brought with it a substantial reorganization of sociopolitical systems (Vehik 2002). Subsistence production was likely restructured as well, since storage facilities almost double in size and tend to occur in clusters at this time. Sociopolitical ceremonies and organizations designed to organize the disparate cultural entities that were coalescing into these large communities were no doubt developed. Had Oñate's expedition decided to help the Escanjaque, their firearms and horses would have increased the possibility that the Etzanoans would be overwhelmed through technological advantage. Indeed, Etzanoans abandoned their settlement when they perceived the Spanish to have hostile intentions. As things stood at the beginning of the seventeenth century, large farming settlements on the eastern edge of the southern Plains did not need fortification to cope with conflict, they did it instead through aggregation and substantial sociopolitical and subsistence reorganization. An interesting question that cannot be addressed here is at what point aggregation was viewed as less costly or more desirable than fortifying smaller villages.

BRYSON-PADDOCK SITE

Around a century after Oñate visited Etzanoa, the descendants of Etzanoa, along with another Wichita subdivision, established two fortified locations about seven miles to the south of the Walnut River juncture with the Arkansas River. These villages, represented by the Bryson-Paddock (34KA5) and Deer Creek (34KA3) sites are on the west bank of the Arkansas River about 3.2 km apart. Bryson-Paddock quite likely was established earlier than Deer Creek, possibly in the late seventeenth century, while Deer Creek's occupation may begin around 1735 (Vehik 1992:325). Both sites were abandoned by 1757 (Weddle 2007:31, 55). Bryson-Paddock is about 40 acres in size and has as its east boundary a 70-foot vertical limestone bluff. This is almost the

only such setting on the Arkansas River between Wichita, Kansas, and Tulsa, Oklahoma, and the only one that gives way to a broad, gently sloping upland where something more than a small settlement could be placed. This location no doubt was selected for the steep bluff and adjacent sloping upland. Deer Creek occupies a slight knoll on a low terrace overlooking the river and surrounding terrain (USGS Kaw City NW, Okla.-Kans. 7.5 minute quadrangle map). By 1740 these two villages most likely were the only Wichita villages left on the Arkansas River, although it is possible a village remained at the juncture of the Walnut and Arkansas Rivers (Vehik 2012).

According to Felipe de Sandoval, in 1750 these two villages consisted of houses made of poles and grass (standard Wichita circular, conically shaped, grass-covered houses). "All were fortified with poles and earth" that had openings (Wedel 1981:72). Similar openings for musket fire existed at the slightly later and related Longest site (34JF1) on the Red River (Weddle 2007:27, 31, 55). Deer Creek was likely a village of the Taovaya subdivision of the Wichita, while Bryson-Paddock was occupied by the Wichita subdivision. Both groups traded hides, meat, and fat/oil of bison and other animals to the French (Vehik et al. 2010).

Of the two sites, Bryson-Paddock has a long history of research while Deer Creek has seen almost no research. Excavations began in 1926 at Bryson-Paddock and took place again in the 1970s. Research during the past decade at Bryson-Paddock includes remote sensing and excavation (see Drass et al., chapter 8, this volume). Remote sensing detected none of the houses described by Sandoval. Wichita houses were built on the original ground surface. Because they did not penetrate the ground surface, these houses may have been plowed and eroded away. This is a common problem on Wichita sites. Four trenches, some with large-diameter inset posts, have been defined, though. One trench includes semi-subterranean structures possibly representing hiding places into which noncombatants retreated, such as is described for the Longest site (Weddle 2007:10, 55). Regardless, Sandoval does not describe any such structures nor does he note any fortifications beyond a palisade. His description implies the whole village was fortified, although our work does not necessarily support that. There are at least two surface structures along with many storage pits and trash mounds that are outside the fortified area as we have reconstructed it. Whether the areas outside the fortification, especially the cache pits and surface structures, are contemporaneous with the area inside the fortifications is unknown. Possibly, when initially established, Bryson-Paddock was unfortified but that as time passed fortification became increasingly necessary. As well, some features were constructed after at least some trenches were abandoned.

Deer Creek and Bryson-Paddock in the late 1740s and 1750s were transit points for people wanting to make connections with New Mexico. Interrogation of three Frenchmen in 1749 and Felipe de Sandoval in 1750 who all made it to New Mexico provided the Spanish with warrior estimates for the two villages: 300, more than 300, and 500 warriors in total (Wedel 1981:69, 70–71, 73). At five people per warrior, there are about 1,500 to 2,500 people in the two villages. Thus, there are likely between 750 to 1,250 people in each village. In addition, when the residents of Bryson-Paddock and Deer Creek moved south to the Longest site in the late 1750s the number of warriors was given as more than 500. This number comes from Antonio Treviño, who spent two years as a captive in the village represented by Longest, and so his count is likely to be reasonably accurate (Weddle 2007:51, 55). This estimate is for the Taovaya and Wichita as well as Iscani subdivisions. How many warriors the Iscani contributed is unknown. Subsequent discussion will use both 300 and 500 warriors.

Excavations indicate intensive burning in two areas of the innermost trench/subterranean structures at Bryson-Paddock while other areas are unburned, suggesting that the fortifications could have been breached at some point. According to the Wichita, it was the Osage who drove them from the Arkansas River valley (Flores 1985:48). A prelude to Wichita abandonment of the valley involves Great Osage destruction, around 1750, of a Wichita village already decimated by measles and smallpox (Pease and Jenison 1940:357). While this village might be the one represented by Bryson-Paddock, there is no way to determine that at present.

With the Osage attack on the Wichita it is possible only Osage warriors were involved, as Great Osage villages were in west-central Missouri at the time. In 1749 the number of Great Osage warriors is said to be 700 (Din and Nasatir 1983:49). The warrior-to-warrior ratio would have been between 1.4 and 2.3 to 1 in favor of the Great Osage, if they were attacking both villages. If attacking only one village, the ratio would have been between 2.8 and 4.7 to 1 in favor of the Great Osage. Assuming non-warriors (women, children, old men) also need to be overwhelmed, the ratio ranges between a little over 1:1 to 1:1.8 in favor of the Wichita. All but one of these ratios are marginal for overcoming a fortified village without the aid of a smallpox/measles epidemic that either decreased the fighting population or left it physically very weak. Without the epidemic, the Osage would have faced a more rigorous defense, and with a force ratio mostly below 3:1, the Osage would likely not have been successful. There is no evidence that the Wichita village was totally annihilated, however, as both Bryson-Paddock and Deer Creek were occupied into the mid- to late 1750s. If there was another village to the north of these two,

there is no evidence as to whether it continued to be occupied into the later 1750s or not. Regardless, it seems very likely the breaching of village fortifications was aided by an epidemic that affected the force-to-force ratio.

The Wichita exacted revenge for this attack. They waited until the Great Osage moved out of their wooded western Missouri home to hunt (Nasatir 1990:44). The Osage were likely hunting bison to the north and northwest of Bryson-Paddock and, being in the open, they were more exposed to attack. Still, quite likely because of low force-to-force ratios, the Wichita had to enlist help from the Comanche in order to attack the Osage. Both sides suffered losses, with the Osage losses probably being more severe (Din and Nasatir 1983:47). The Osage, of course, then desired revenge. This time, not having the advantage of a preceding episode of epidemic disease, the Osage, too, needed help, as their force-to-force ratios were likely still below 3:1. Their prospective allies, the Illinois, were dissuaded from participating by the French (Nasatir 1990:45).

The Wichita had many enemies in the early eighteenth century and it is not clear exactly against whom the people of Deer Creek and Bryson-Paddock were fortifying. Conflict between the two villages is unlikely. They were actively trading together with the French, and the occupants of both villages resided near one another upon removal to the Red River. Other Wichita were between the Red River and central Texas and seem unlikely enemies. Certainly the Osage are one possibility, especially when the Wichita response force is split between two villages. Other possibilities include the Comanche and Apache. The Wichita and Comanche made peace sometime in the first half of the 1740s (Wedel 1981:69–71) and so at some point earlier in time the Comanche were in conflict with the Wichita. The Comanche in the early eighteenth century had only recently moved from the Rocky Mountains onto the Plains, displacing the Apache southward. Prior to 1730 the major threat was likely from the Apache (Wedel 1988:102–105). Perhaps much like the Escanjaque 100+ years earlier, fall communal bison hunts provided any or all of these three groups opportunities to attack the Wichita. The Wichita at this time were losing population to epidemic disease while more mobile groups such as the Apache, Comanche, and Osage were increasing in population.

Differences in technology could increase the likelihood of offensive success for the Osage in spite of some low force-to-force ratios. A little later in time, the Osage were feared because of their firearms skills (Weddle 2007:55). However, the Osage still needed help from epidemic disease and allies to attack the Wichita in the 1750s and so their possession of guns may have provided limited advantages against a fortified setting. The Wichita also had guns, but at least in the late 1740s they had insufficient supplies of ammunition,

although Sandoval simply noted the Wichita were not very proficient in the use of guns (Wedel 1981:69, 70, 71, 73). Apache and Comanche access to horses could lower the force ratio needed to attack the Wichita, but it is not clear that horses would provide an advantage against fortifications. In fact, if all trenches at Bryson-Paddock existed simultaneously, horses and humans would wind up in the trenches if attempts were made to jump them. The Wichita also had horses, although it is not clear how many, and they seem to have come through trade with the Comanche (Wedel 1981:73). Wichita use of horses would have required leaving the fortification and a change in fighting tactics. It would also have brought a reduction of force inside the fortifications. It does not seem likely that guns and horses would have provided attackers an advantage in this instance.

Splitting the Wichita defensive force into two groups seems a questionable strategy. It renders both villages more susceptible to attack since it increases enemy force-to-force ratios. While one Wichita village could respond to an attack on the other, to do so would bring responders out from the fortification that provides their defensive advantage. Loss of cover by the Wichita could aid the attackers, especially if those attackers have more firearms, are better at using them, and/or are mounted. It would also leave the responding village rather defenseless. Strategically, it would be better to settle in one fortified village, thereby concentrating all 500 defenders, which substantially lowers the likelihood of a frontal Osage attack.

The question is then, why were two villages rather than one established? Potentially the fortified area at Bryson-Paddock could not accommodate the Taovaya without doubling its size. Though doubling the size seems feasible, it is possible that after 50+ years of living at Bryson-Paddock the resources to enlarge the fortification were not available. Unfortunately we do not have enough data on construction-post sizes over time to see if they decrease. Still, Deer Creek is fortified and so the only problem seems to be the distance over which posts would have to be moved in order to enlarge the Bryson-Paddock fortifications.

Although it might seem feasible to simply cut down on the spacing between houses and add Deer Creek residents to the Bryson-Paddock village without doubling its size, there is a potential downside. Grass houses easily catch fire. Historically the Wichita spaced them about 100 feet apart to prevent the spread of fire. So adding more houses without increasing village size seems unlikely.

Potentially, ethnic differences were significant enough that separate residences were desirable. In 1765 at the Longest site, separate settlements were maintained by the three Wichita subdivisions (Weddle 2007:55). In 1808

the Wichita and Taovaya resided in one village but did so in separate areas (Flores 1985:50). Potentially the two subdivisions may have preferred to live apart, even though that affected force-to-force ratios. Still, that introduces the question of why, with 300 years of experience welding different groups together through coalescence, the Wichita and Taovaya at this point would not simply continue the process.

It is also possible that there was not enough fertile land within safe walking distance of Bryson-Paddock to support 2,500 people. In 1808 the Wichita establishment on the Red River had about 2,000 people supported by farming a total of 450 acres (Flores 1985:48, 50, 56). This is 0.225 acres per person. For 2,500 people to live in one village at Bryson-Paddock just under 563 acres of land would be needed. Although the upland soils surrounding the Bryson-Paddock and Deer Creek sites are fertile and potentially tillable, most fields were likely on the more easily worked terraces and floodplains of the Arkansas River (the type of setting farmed in 1601). Sandoval describes the Wichita as living in their villages year round and growing corn, beans, and squash. He does not say where the fields were. As he arrived at the villages by boat, the fields were possibly in the floodplain/terrace setting (Wedel 1981:59). Around 1,000 acres are available from the Arkansas River valley terraces and floodplain within a mile upstream and downstream of Bryson-Paddock. However, within half a mile upstream and downstream of Bryson-Paddock, the Arkansas River valley is narrower than either above or below. Only about 480 acres of terrace and floodplain soil is available between those constrictions. Thus some of the acreage for farming would require a greater travel distance, thereby increasing opportunities for raiders. It may be, then, that separate residences were established, not primarily to maintain distinct ethnic identities, but to ensure adequate amounts of farmland within close and safe proximity to each village.

In sum, between 1601 and 1680–1700, epidemic disease and warfare decreased the numerical advantage the Wichita subdivision once enjoyed over its enemies. Their numbers continued to decrease through the eighteenth century. Their village was moved from the wide and fertile floodplain and terraces of the Walnut River valley and placed in a setting that was naturally defensive and the Wichita then proceeded to increase their defensive capability by fortifying all or parts of it. In the process of settling the Bryson-Paddock location, Wichita fields were no longer in immediate proximity to their houses but instead were likely placed on terraces and a floodplain below a 70-foot vertical drop-off. With a loss in population, certain tradeoffs became necessary to maintain security, and the proximity of fields was that tradeoff. The Wichita and Taovaya subdivisions clearly anticipated the possibility of being

overwhelmed and so they fortified. Nonetheless, even with fortification, force-to-force ratios become such that the Wichita could not maintain their hold over the Arkansas River valley, so they moved south in closer proximity to other Wichita (and the Comanche) and away from the Osage.

In their new location on the Red River, the Taovaya fortified their village while the Wichita lived adjacent to them but did not construct a fortification. The Iscani subdivision of the Wichita also lived nearby. Both went into the Taovaya fortification when threatened. Documents imply that not only is the Taovaya village fortified but so are fields and corrals (Weddle 2007:30, 32–33, 55, 126–127). Ortiz Parilla in 1759 attacks this grouping of Wichita and especially the Taovaya fortification. This attack fares badly. Afterwards, Ortiz Parilla admits he was outmanned and deficient in weaponry and resolve when faced by the Wichita along with their Comanche and other allies (Weddle 2007:127). In this case the offense was not remotely capable of overwhelming or even competing with the defense and Ortiz Parilla quickly made a retreat.

DISCUSSION

The southern Plains analyses incorporate written documentation but such records are not necessary to use the 3:1 rule to explore issues surrounding fortification and conflict. Crow Creek is an example (details are in several other chapters in this volume). Crow Creek village belongs to the Initial variant of the Coalescent tradition. It overlooks the Missouri River in southern South Dakota. The site dates to the fourteenth century (Johnson 2007a:122). People of uncertain identity massacre approximately 500 people at Crow Creek. Commonly the attackers are considered to be people of the Middle Missouri tradition but some suggest other Initial Coalescent groups, an Oneota-tradition complex, or yet others (Caldwell 1964:2–3; Hollinger 2005; Johnson 2007a:218; Zimmerman and Bradley 1993). There are two fortifications at the site and Zimmerman and Bradley (1993:220) believe the outer and most recent was unfinished at the time of attack. The outer ditch is 4.6 m wide in general and between 1.8 and 3.7 m deep. Two very limited test excavations did not detect a palisade (Kivett and Jensen 1976:8, 70). The ditch in and of itself would have been a formidable obstacle, with or without a palisade. Nonetheless, if the Crow Creek fortification is unfinished, then much like the Osage attack on the Wichita, a nearby village might be able to take advantage of an opportunity and annihilate Crow Creek to gain its land or for some other reason.

The question is how feasible such action is, and that is where the 3:1 rule is useful. At least 50 houses are in the Initial Coalescent occupation at Crow

Creek (Kivett and Jensen 1976:68). The nearest known, contemporaneous Initial Coalescent site is Talking Crow (39BF3) (Johnson 2007a:figure 29). It is possibly the attacking village, as it is relatively close by (Zimmerman and Bradley 1993:220), although others suggest Talking Crow is an ancestor or descendant of Crow Creek (Johnson 2007a:178). The number of Initial Coalescent houses at Talking Crow is unclear but seems to be around 32 (Smith 1977:1, 14). Assuming the same number of people and warriors per house at both villages, the difference in house numbers suggests that if Talking Crow was the attacker, the force-to-force ratio was not in their favor and they likely would not have been able to overwhelm and annihilate Crow Creek—probably not even with surprise.

The next nearest contemporaneous Initial Coalescent site, Whistling Elk (39HU242), is around 64 km upstream (Johnson 2007a:figure 29). It consists of somewhere between 33 and 67 possible houses (Toom and Kvamme 2002:8). Whistling Elk alone could not generate a force-to-force ratio large enough to overwhelm Crow Creek and only at the highest end of possible house numbers could it, in concert with Talking Crow, potentially overwhelm Crow Creek. But, gaining control over land is not likely a motivation for Whistling Elk's participation. It is a long distance to travel just for the use of farmland, unless they planned to move there. However, no Coalescent-tradition site occurs in the area of Crow Creek or Talking Crow until after 1650 (Johnson 2007a:figures 29–39). An attack on Crow Creek by another Initial Coalescent village alone seems unlikely. If two or more villages united to make an attack, farmland seems an unlikely motivator.

The nearest Extended variant of the Middle Missouri–tradition site, Durkin, is near Whistling Elk. It probably was not occupied contemporaneously with Whistling Elk, although Clark (chapter 12, this volume) suggests they are contemporaneous. Other Extended Middle Missouri villages are farther on up the Missouri River (Johnson 2007a:figure 29). There is no information on the size of these villages or the number of houses. In general villages of the Initial and Extended variants of the Middle Missouri tradition have 15–30 houses, with villages in more southern areas being larger, generally having between 20 and 30 houses. Average house size is 875 square feet (Lehmer 1971:66, 69; Winham and Calabrese 1998:287). Initial Coalescent villages have an average house size of 642 square feet (Johnson 1998:313). Crow Creek had a total of 32,100 square feet of housing while a Middle Missouri–tradition village with 30 houses had only 26,250 square feet. Assuming similar per person space requirements, Crow Creek is unlikely to have suffered an attack by a single Extended Middle Missouri–tradition village. An attack by multiple

villages would require movement over a substantial distance and through an area where there were other Coalescent-tradition villages. If more than one Extended Middle Missouri village attacked Crow Creek, the motivation is unclear, as gaining control of that location increases the distance to other Extended Middle Missouri villages. Not only were there no subsequent Extended Middle Missouri occupations of the Crow Creek location but also later Middle Missouri–tradition villages and most Coalescent villages are farther up the Missouri River (Johnson 2007a:figures 29, 30, 34). Coalescent-tradition villages return to the Crow Creek area around 1550, but Middle Missouri–tradition villages continue a northward move. An attack by Middle Missouri–tradition villages on Crow Creek seems unlikely.

It is difficult to assess Hollinger's argument that the attackers were from the Oneota tradition. There is no information on numbers or sizes of houses in Oneota villages. The only comparative information is site size, with Initial Coalescent at an average of 25.6 acres (Johnson 1998:313) and Oneota with between 15 and 21 acres for three sites most likely contemporaneous with Crow Creek (Hollinger 2005:190, 192, 213). All three traditions likely used village space much differently and so site size is not a very good comparison. Nonetheless, site size is comparable, suggesting Oneota likely needed more than one village to overcome Crow Creek.

Clearly the occupants of Crow Creek expected an attack by a force that could overwhelm them or they would not have been in the process of fortifying themselves, but that force likely numbered closer to 1,500 than the 200 suggested to have lived at Talking Crow (Smith 1977:152). Use of the 3:1 rule does not provide a definitive answer to who essentially annihilated Crow Creek but it does suggest that whoever did it likely involved an alliance of two or more other villages, either of the same or different traditions: the best guess is an alliance of Oneota villages. Crow Creek was the nearest Coalescent-tradition village to Oneota occupations in extreme southeastern South Dakota. In the century following Crow Creek most Coalescent-tradition occupations are farther up the Missouri River (Johnson 2007a:figure 30). But, with the collapse of Oneota that begins in the late sixteenth or early seventeenth century (see Hollinger, chapter 10, this volume), there is a southward shift of Coalescent villages back into the region once occupied by Crow Creek (Johnson 2007a:figures 34 and 36).

Lest it be thought that only sedentary people fortify, there are fortified fall bison-hunting locales, represented by the Edwards I (34BK2) and Duncan (34WA2) sites of western Oklahoma. The Shea site and other similar ones in North Dakota also likely were fortified seasonal camps (Michlovic and Schneider

1993). These fortified areas are possibly refuges. Nonetheless, their analysis could be accomplished based on considerations of the amount of space that was fortified. People generally do not construct fortifications with more perimeter than can be defended. To do so results in weak areas that can be breached.

The issue remains as to why the northern Plains fortification history differs so much from that of the southern and central Plains. Briefly, the answer may lay in the wider and more continuously distributed floodplains of the central and southern Plains. Southern Plains soils at least were also potentially more productive. From the early soil survey reports (1920s–1950s), when corn was commonly grown on both the northern and southern Plains, the per acre corn productivity was greater on the southern Plains. The southern Plains also has a longer growing season. As a result, Late Prehistoric–period farmers could generally deal with conflict by forming larger residential groups on the southern Plains, such as is reflected by the Lower Walnut focus. Because the northern Plains has narrow, discontinuously distributed floodplains that are less fertile, farming people could not make as great a use of aggregation as a defensive tactic. Consequently, they adopted fortification earlier.

CONCLUSIONS

It is not really the intensity of conflict nor its unpredictability that is the cause of fortification. Rather it is the belief that an overwhelming attack is possible. People either know this from direct experience or perhaps can be led to believe such is possible. An overwhelming attack can occur when the force-to-force ratio reaches 3:1 or greater in favor of the attacker. Fortification is an attempt on the part of the defense to keep the force-to-force ratio below that value. Because fortification is an expensive defensive undertaking, no doubt other solutions will be attempted first, if possible. Occupying points on the landscape offering defensive advantage and aggregating into larger groups are potential options—if they are feasible. The ratio of potential attackers to defenders also may be such that fortification will not help. Abandonment in such a case may take place as opposed to suffering a Crow Creek level of annihilation. The Wichita who lived at Bryson-Paddock and Deer Creek ultimately opted for abandonment.

Use of the 3:1 rule helps frame issues and questions surrounding conflict and use of fortification in a more precise manner. Use of the rule gives direction to questions about why people decide to fortify, why fortifications are allowed to lapse, and why they fail. With further consideration we should be able to refine our understanding of why people decide to fortify and define the factors that are important to that decision.

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