Rifle Pits, Shelter Pits, and Entrenchments in the Trans-Mississippi West: Suggestions for Archaeological Study and Analysis

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Abstract

A common perception of military engagements in the Trans-Mississippi West is one of a running fight between antagonists or hit and run tactics of Indians versus the Anglo-American encroacher. A review of the historic literature relating to the Indian War era demonstrates that various types of earthworks were used as defensive measures at forts and encampments as well as in combat situations between various antagonists. An interesting sidelight is that Indians did construct and utilize several types of entrenchments in much the same manner as the Anglo-American combatants. Limited archeological investigation of earthworks in the Trans-Mississippi West demonstrates that the earthworks constructed by Anglo-Americans, specifically soldiers, were not hasty or haphazard as is the common perception. They were constructed according to procedure outlined in various military guides of the period. Native American breastworks and earthworks were also constructed in manner consistent with cultural knowledge of the terrain and need for concealment in conflict situations. A behavioral model for archeological investigation of "hastily constructed" earthworks is presented.

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Introduction

Conflict and means of defense, fortifications, have great depth in human history. Permanent and semi-permanent fortifications have been studied by both historians and archaeologists since the origins of those disciplines. Less formal; ephemeral or hasty field fortifications, are well known within military contexts, but their archaeological expression is less well documented and perhaps overlooked at times as an archaeological feature type. In North America there were fortified villages encountered by the earliest European explorers and conquers. Palisaded villages, whether meant for defense or some other purpose have been studied by archaeologists in North American for decades. They are particularly well-known in the Great Plains of the Trans-Mississippi West.

Their role in both prehistoric and historic Native American cultures is being assessed and reassessed in a variety of works. In the Great Plains that reassessment is reflected in recent studies by Dye (2018) LeBeau (2018), Vekik (2018), and Drass et al. (2018). These studies of Great Plains fortified villages are part of a modern reassessment of the archaeological recognition that conflict on the Great Plains in prehistoric and early contact eras (Clark and Bamforth 2018) is more common than once believed. This study is less concerned large fortified places and more focused on the role and identification of ephemeral or hasty features that were employed in various conflict situations in the Trans-Mississippi West. This study focuses on these lesser known features as overlooked archaeological sites that represent conflict not only between Euro-Americans and Native Americans but as part of internecine tribal conflicts. The American West has seen many conflicts. Battlefields and conflict sites are now part of the broader context of Conflict Archaeology, yet some features of conflict are not being recognized or properly recorded for several reasons. One is the simple lack of knowledge that ephemeral and hasty conflict structures exist and perhaps because of an unintentional bias in some areas that identifies these features as having an origin in Euro-American settlement and animal husbandry.

The intent here is to look at the history of hasty fortifications, first in an organized military context, discuss their mention in historic documents related to conflict in the Trans-Mississippi West, and then range further afield in describing the few archaeological studies that have captured data on these ephemeral features. Finally, an attempt is made to summarize what an archaeologist should be aware of and look for when dealing with a site that may contain rifle pits, breastworks, and other hasty entrenchments.

The Napoleonic Wars and the United States' War with Mexico (1846-1848) heavily influenced Army tactical doctrine during the early years of the Civil War. Officers learned this approach to

warfare during their West Point education and in the field during the Civil War. The basic tactic taught at West Point prior to the Civil War was close-order infantry assaults with bayonets gleaming, cavalry charges with sabers flashing, and direct fire by smoothbore artillery placed to the front of the line. These tactics, through hard learned lessons of the Civil War, gave way to more discrete skirmish order tactics by 1863 (Griffith 1986; 1989). Both Union and Confederate commanders saw appalling casualty rates using these tactics against the commonly used rifled-musket. Smoothbore artillery was no longer able to mass to the front of an infantry line and pound the enemy. The range of the rifled-musket was equal to that of the smoothbore artillery allowing the infantryman to pick off gun crews at will. The time honored cavalry charge to break the infantry line was no longer feasible again due to the long range and accuracy of the rifled-musket and rifled artillery The infantrymen could easily decimate a cavalry charge before it was well underway. Finally the infantryman armed with the rifled-musket could destroy a close-order infantry charge well beyond the traditional 100-yard firing range of the old smoothbore musket.

By the last years of the war tactics had adapted to the effectiveness of modern rifled arms. Infantry tactics were modified to open order skirmish lines with the use of available cover whenever possible. Defensive positions were usually fortified with extensive entrenchments. Prepared riflepits, picket posts, and videttes usually protected even short-term camps. This hard learned lesson continued to be employed in practice during the 1866-1890 Indian Wars and evolved even more during the Spanish-American War and Philippine War by the US Army. World-wide armies learned the lessons of the value of hasty entrenchments from the mid-nineteenth century on. Trench warfare reached a zenith in World War I.

The Indian Wars of the Great Plains and the Southwest, and in general on the western frontier are all too commonly perceived to be the domain of the well-mounted cavalry charging the unsuspecting Indian village or the image of mounted Indians and cavalry chasing each other across the rolling grass covered plains. Those scenarios did occur, but not often. As Dippe (1980:ix) notes

> ..officers and men spent most time in post on routine duty... expeditions or patrols into hostile country encountered few Indians and fought fewer. Despite the impression of contact, pounding action, ornate rescues, thrilling bugle calls, and desperate charges, on the whole campaigning was as frustrating as it was tiring, and there was more dust than glory to be had chasing Indians for Uncle Sam.

When combat occurred those situations involved infantry as well as cavalry, and in some artillery played a significant role. Running skirmishes did occur, usually a few men traveling

unescorted with attackers taking advantage of superior numbers or arms. Very few fights were made on horseback. The clear majority of the 1000 or so battles, fights, and skirmishes of the Indian Wars were fought unmounted, by both sides, and using the best available cover to their advantage.

In general the nature of conflict between soldiers and Indians was unique and afforded some major differences in the way each group of combatants conducted warfare. Within the Native American cultural context fighting opponents was usually done as individuals or in loosely affiliated war groups. Generally fighting employed a surprise, ambush, and decoy (Secoy 1992; Grinnell 1910; 1956; Smith 1937). Tactically, warriors employed the terrain to their benefit, striking quickly in small groups as opportunities presented themselves. The U. S. Army was constantly frustrated by the Indian hit and run tactic (White 1978). There was also little understanding among the men and officers of the frontier army of the Plains warriors' war honor concept or counting coup, which was so ingrained within the cultural construct of the tribesmen to achieve hero status within the group (McGinnis 1990). Aside from touching an opponent one could gain other levels of distinction by capturing a weapon from a live enemy, stealing a horse, or rescuing a fallen warrior from the enemy. Regardless, destruction of an enemy or protection of the family or band were paramount in combat, and inflicting casualties on the enemy by killing or wounding was a natural outcome of such tactics.

Combat did not always involve the construction of earthworks, but various types of entrenchments were utilized throughout the Indian War period, roughly 1866-1890. When mentions of entrenchments occur in the literature they are often referred to as hastily dug entrenchments, quickly dug, a mound of earth thrown up for protection, or a shallow rifle pit. Such statements leave the impression of a haphazard construction to meet an immediate and life-threatening need. These references also convey a feeling of unpreparedness on the part of those constructing the earthwork; a lack of familiarity, training, or knowledge of the purpose or use of an earthwork, beyond that of turning a few bullets in the immediate engagement. None of this could be further from the truth, as a search of the literature of the era demonstrates.

The Army Way to Construct a Field Fortification

The impression left from studying the historic source material is that riflepits and trenches were constructed in the heat of battle and were hasty and expedient affairs. In a sense this is true. They were hastily constructed, they were expedient, and they were temporary. But this does not mean they were haphazardly constructed. The army did train their personnel from prior to the Civil War and throughout the late nineteenth century in the proper methods of earthwork and

rifle pit construction.

The art of fortification construction is quite old. One of the most often cited works on how to build, attack, and defend fixed fortifications was written in the eighteenth century by Vauban (2018) based on warfare conducted in the late seventeenth century. His fortification types and styles remained in vogue well into the twentieth century, and were copied and updated by many authors (e. g. O'Connor 1817). However, none of these works clearly discussed the manner of placement or size of picket posts, shelter pits, or rifle pits.

The Delafield Commission, of which future general officer, George McClellan was a member, was sent to the Crimea in 1856 to gather information on weapon effectiveness of the combatants among other information relevant to the U.S. Army. McClellan observed and commented on the entrenchments he observed in use by the combatant parties, particularly the Russians. He was impressed with the Russian use of riflepits in front of the main entrenchment lines. He described the features as small lunettes covering ten to twenty men or so small as to cover only one individual. It was these small earthworks that were given the name rifle pits. He also observed that some were just piles of loose stones (breastworks) stacked to protect the man lying down (McClellan 1861; Moten 2000:178-191).

There are, of course, several contemporary guides and treatises on field fortifications. The American classic, and one that guided the construction of earthworks in the Mexican War and the Civil War is D. H. Mahan's 1836 *A Complete Treatise on Field Fortification, with the General Outlines of the Principles Regulating the Arrangement, the Attack, and the Defense of Permanent Works*. Hasty fortifications were defined as those constructed so that troops could take better advantage of the opportunities of natural cover (Mahan 1847). Nevertheless, hasty entrenchments were not to be the rule. American and, for that matter, European military thought was dominated by the concept of massed frontal assault. The use of entrenchments was to play a defensive role.

Dennis Mahan's treatise on field fortifications was uniquely American, in that it recognized most American wars would be fought by militia and only the few regulars would be the most disciplined. If defense was necessary then the militia could build and occupy field fortifications strong enough to resist the enemy's frontal assault until a well-organized counter assault could displace them (Hagerman 1965).

Earthworks surrounding a structure or structures are a type of protective feature that are present at some military and fur trade forts that existed on the frontier. Most army officers serving in the west were United States Military Academy graduates by the time of the Civil War. They were

well-trained as engineers and well-versed in the concept of field fortification by virtue of their West Point training. They knew the principles and techniques of field fortification construction and were ready to apply them when the need arose.

Figure 1. A modern aerial view of Bent's New fort in Colorado. The ruins of Bent's stone structure are evident as is the earthwork constructed by the army during the Civil War to protect against a possible Confederate attack.

The principle components of an ordinary temporary fortification are a heaped up mass of earth to form a shelter and the excavation from which it was taken (Wheeler 1882:12-20).
The excavation was termed a ditch and the heaped up earth a parapet, from the Italian meaning to protect the chest. The parapet was intended as a protection for the men defending the fortification. The ground on the defensive side was termed a terreplein, usually the natural ground surface. Within the defensive side a banquette or banquette tread was sometimes constructed as a firing step if the parapet was higher than a man or protective cover was required from incoming fire. The parapet was composed of the interior slope, superior slope (top of the parapet), and exterior slope. The area between the exterior slope and the ditch was designated the berm, and the ditch walls and bottom were termed the scarp (defenders side), bottom, and counterscarp. If earth was piled up on the attacker's side of the ditch then it was termed the glacis. The height of a parapet was suggested to be at least six feet tall to protect anyone walking about on the terreplein surface. The parapet thickness was suggested, depending on the soil type, to be about three feet thick to protect against rifle and musket fire and from six to nine feet thick to protect from field artillery fire (Wheeler 1882:21-23).

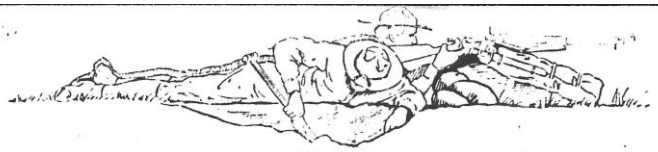

Fig. 2a
Intrenching under fire

1147-1148

Simple Standing Trench, Parapet Suppressed.

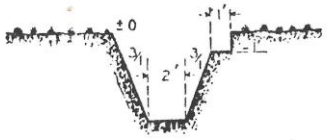

Fig. 6

Simple Standing Trench, Rocky Ground

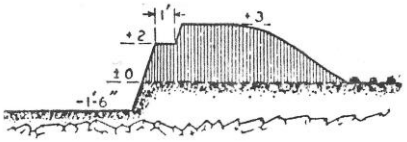

Fig. 7

Narrow Firing Trench with Parados

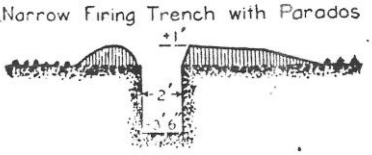

Fig. 8

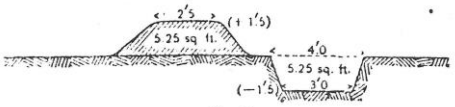

Fig. 3

the proper height for firing over in a kneeling posit
1146. **Standing trench** (Fig. 4) has a bottom wi

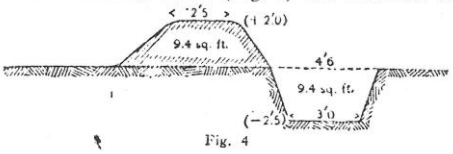

Fig. 4

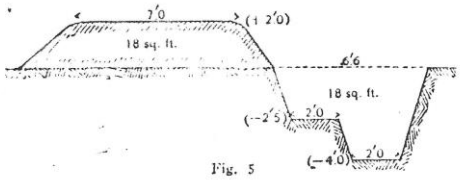

Fig. 5

Figure 2. Digging a rifle pit under fire could range from the simple hastily dug feature to the more complex trench. The hasty pit could be easily expanded and deepened to become the more formal trench, after Moss 1918.

Throughout the Civil War various forms of earthworks and entrenchments were common at long-term camp sites as well as during sieges. Earl Hess' work (2005; 2007; 2009) has demonstrated that both armies entrenched far more often than was thought for many years. Yet Hess and other authors (Gates 1991; Chuber 1996) rarely mention the use of small entrenchments or rifle pits during the war. Since they were considered hasty entrenchments that could be quickly constructed by one or two men they appear to not to deserve too much mention. Yet they were used throughout the war. Barnard (1871) refers to these as "embuscades, mere holes in the earth which individual soldiers dug for themselves…" Wagner (1898) took up the issue of hasty entrenchments in his retrospective article just in time for the War with Spain. Wagner opined that the Civil War officer and soldier was not ignorant of creating breastworks or entrenchments but did not avail themselves of their value until battles in 1862. There after both formal earthworks and casual breastworks and entrenchments became more common as soldiers gained veteran status. He attributed the increase in small hasty entrenchments (rifle pits) to the experience gained in battle and the recognition that a quickly scooped out shelter or rifle pit could save one's life. He also noted that no formal entrenching tool had been adopted, with men using hands, cups, tin plates, and canteen halves, as well as axes and shovels. Some of these small works have received some archaeological attention (Batug et al. 1982).

A perceived need arose during the Civil War to construct earthworks to protect a variety of military establishments in the trans-Mississippi west from the potential of Confederate attacks. Formal earthworks were constructed and manned in anticipation of attacks by Confederate troops or Indians. A number of western forts incorporate earthworks, notably Forts Sisseton, South Dakota; Laramie, Wyoming, Kearny, Nebraska; Craig, New Mexico; Camp Nichols, Oklahoma (Ferris 1971:252); Bent's New Fort, Colorado (Ferris 1971:102); and Union, New Mexico. Fort Union's earthwork is probably the best-known Civil War earthwork on the western frontier, and it is a classic star-fort type construction.

Bent's New Fort was a trading post situated on a bluff located about 40 feet in elevation above the Arkansas River along the Santa Fe Trail. Bent's New Fort was established at Big Timbers about 1853 (Carrillo 2011:4). In its final configuration the structure was about 100 by 200 feet largely constructed of stone, and was reported to have been sixteen feet high with defensive loopholes on the walls of the roof. Two cannon were reportedly mounted there as well. In the fall of 1860 the post was leased to the federal government. It became the commissary and ordnance depot for Fort Fauntleroy, renamed Fort Wise. In 1861 Fort Wise was renamed Fort Lyon, to commemorate General Nathaniel Lyon killed in the Battle of Wilson's Creek, Missouri on August 10, 1861, and who was first Union general officer killed in action during the Civil War.

The Bent structure also became the Upper Arkansas Agency for the Cheyenne. In February 1865

an earthwork fortification was started to protect the agency and its goods as well as the men and material of Fort Lyon (Maj. E. Wynkoop to Adj Gen., District of Colorado, February 4, 1865, Official Records of the War of the Rebellion, Series I, Volume 48 (Part 1):57-58). Wynkoop included a map of the fortification that was not published in the ORs or the Atlas.

The Bent's New Fort/Fort Lyon earthwork is less well-known than the Fort Union star fort, but is nearly as well preserved. It is a classic open-end bastioned earthwork classed as a temporary field fortification (Wheeler 1882:8-10). Wheeler (1882) based his work, a West Point textbook, on the earlier Mahan textbook, but revised to take into account the changes in strategy and tactics that had occurred since Mahan's original 1836 publication.

Figure 3. A circa 1870 image of the Fort Union, New Mexico star shaped fort showing the parapets and some internal features that were converted to quartermaster supply storehouses after the Civil War. Courtesy Fort Union National Historical Site, National Park Service.


Figure 4. A modern aerial view of the Fort Union star fort and associated Santa Fe Trail wagon ruts.

Wheeler (1882:9) defines a temporary earthwork as a fortification intended to strengthen a military position that has acquired importance. By and large they were intended to be constructed in a short period of time from materials at hand and with the labor of existing troops. Within the temporary fortification concept advanced by Wheeler (1882:10) Bent's New Fort earthwork fits the definition of an ordinary fortification, one that was constructed according to plan before the arrival of the enemy on the field. Any such fortification was designed to shelter the defenders from the attacker's missiles**;** arranged so that an attacker could not approach within artillery range without being exposed to the fire of the defenders**;** arranged so that an attacker's movements and approach would be difficult and impeded by the defenders**;** and arranged so that the defenders movements to defend the fortification would not be impeded.

The extant earthworks at Bent's New Fort/Fort Lyon have bastions on the north corners. Bastions were intended to provide platforms and angles of fire that allowed the defenders the greatest field of fire possible to protect the work. The bastions are formed of angled walls to insure no area along the wall, termed a curtain wall between bastions, with the bastion walls now termed curtain angels, was blind or could not be seen by the defenders. Bastions could be defended by artillery pieces, infantry, or both. The Bent's New Fort earthworks do not appear to have the banquette present. The eroded condition of the parapet and ditch preclude, without formal test excavations, determining the original height or width. The same is true for the ditch, but the surviving elements suggest the earthwork was laid out and constructed according to

Figure 5. A surviving wall of the Bent's New Fort earthwork.

standards of the day. It appears to have been a roughly six-foot-high parapet with two bastions on the north and had a ditch. The southern end is open and may have been constructed that way or there may have been a wooden palisade or other enclosure method that is not evident today. There appear to be two entrances, one the north side and one on the east, but only testing can confirm this supposition. Other features such as drains may be present on the east wall, but again only testing can confirm this speculation.

As an aside, Wheeler (1882:78-80) provides information on how much material a work party or gang, composed of at least one pick man, two or three shovel men, and two "finishers" could move in one day. In part this was dependent on the number of work parties available to work six-foot-long sections and the soil types encountered. Using his estimations and the dimensions of the earthwork and assuming an adequate number of work parties available then about six to eight days would have been required to construct the fortification surrounding Bent's New Fort.

Confederate troops also constructed earthworks at a number of locations in the west, such as Fort Hindman or the Post of Arkansas (Walker 1971). Confederate General Thomas C. Hindman mentions rifle pits dug for fifty infantrymen that he had constructed on the bluffs above White River, Arkansas in June 1862. The rifle pits were used to support two 8-inch gun positions that protected Saint Charles, Arkansas from Union attack. A Federal infantry assault and a

bombardment by Union Navy ironclad steamers resulted in the loss of both on June 12 (Schultz 2014:192).

Not until the latter part of the nineteenth century did military theorists begin to formalize the concept of small unit tactics. Small unit movement, essentially the squad level, was first introduced in Emory Upton's 1874 *Cavalry Tactics*, but these were not small unit fighting tactics, only mechanical movements. American experience in the Indian Wars and in the Philippines as well British and European experiences in their colonial endeavors brought out the need for formalized rules of engagement for small tactical units. Most small unit deployment tactics were not well developed until the early twentieth century, however, the Inspector General's staff placed emphasis on teaching small unit minor tactics and marksmanship during the 1890s (Clary and Whitehorne 1987:352-4).

A now classic article on minor tactics appeared about 1902; **The Defense of Duffer's Drift** by Lt. Backsight Foresight (Capt. E. D. Swinton, D.S.O., R.E.) establishing how small units could make effective use of riflepits and trenches to stalemate or defeat superior forces. The concepts presented, learned from hard lessons of field service, are still in use today. The article is still required reading at the U.S. Army Command and General Staff College at Fort Leavenworth, Kansas. **The Defense of Duffer's Drift** epitomizes the on-the-job training received by young officers, both European and American, commanding platoons and companies in small actions during the latter half of the nineteenth century.

Figure 6. English soldiers using hasty rifle pits for protection during the Boer War. From a Kilburn stereograph, 1899.

Unfortunately the U.S. Army published no formal field manuals for small units before the beginning of the twentieth century. However, a number of practical guides for officers were privately published throughout the century to bridge the gap left by the lack of official guidance available outside the West Point classroom (Wheeler 1882). Wheeler's West Point textbook was built on Mahan's work and almost exclusively used American Civil War examples throughout the text. He has one short chapter devoted to hasty entrenchments. One of the most used guides was *Mountain Scouting* by Captain Edward Farrow. Farrow was an instructor at West Point when he wrote his practical guide in 1881. He had seen active field service during the Nez Perce campaign of 1877. Farrow (1881:243) noted "The history of all battles of late years has shown the expediency of making use of natural shelter or constructing field intrenchments", prefacing the writing of Capt. Swinton by 20 years. He also observed "As a last resort, the mules and

horses may be thrown to the ground, with their legs tied together, or may be shot and used as breastworks when there is but little time for preparation."

Farrow (1881:244-5) describes how to dig a rifle pit or as he terms it a shelter-pit.

> All soldiers, and especially recruits, should be frequently exercised in throwing up **shelter-pits** and **shelter-trenches**, on grounds of variable contours, and where there is no natural cover.
>
> A very slight parapet of newly excavated earth is sufficient to protect men from the effects of rifle balls. Experiment shows that the penetration of the ball (service rifle) at a range of 10 yards is 20 inches, and only 10 inches at 200 yards.
>
> After a little practice, each soldier will ascertain the form of pit that best suits and protects him. The depth need not be uniform, but should be at least ten inches where the body rests, and six inches elsewhere. With a view to lessening the effect of the enemy's fire, the soldier should lie down well under and behind the cover..... Many are the instances recorded where it was impossible to forward the **intrenching tools** to the front until after the exigency for their use had passed, and the men were compelled to use tin plates, tin cans, fragments of canteens, knives, sticks, etc., in order to get temporary shelter from the enemy's most galling fire..... I am an advocate of Colonel Rice's trowel bayonet, after several practical tests of its merit.

A drawing accompanying the discussion illustrates an L-shaped pit with a lunate mound of earth thrown up to its front. The drawing and profile indicate the pit should be six inches deep on the long axis and about four feet long. The narrow width a foot, and the wider section two feet three inches. The depth of the smaller section to be five inches to the front and sloping to ten inches at the rear. The dirt mound to be thrown up toward the enemy. A space of six inches to be left between the pit and the mound. The mound to have a height of fourteen inches and a basal width of eighteen inches. This description is similar to the riflepits dug during the 1879 Springfield Armory trials, although there are some differences in dimension.

Farrow also describes a **shelter-trench**.

> Having arrived on the line (not necessarily straight, but determined by the features of the ground, so as to secure all natural cover), the men either stack or ground arms, and begin to throw the earth to the front (using both hands if necessary) so

as to form a parapet from 16 to 20 inches high. All available turf, logs or rocks should be used as a revetment to the interior slope of the parapet.

The main object of these trenches is to afford cover from the fire of the enemy until the proper moment for advancing against him.

When the trench has been made 2 feet wide and 15 inches deep, it will afford excellent cover for one rank kneeling in it, and file-closers lying down in rear. If the trench be made 4 1/2 feet wide, it will afford cover for two ranks kneeling inside of it; if it be 7 feet wide, it will allow the men to lie down in it.

The accompanying drawings illustrate this entrenchment type. One sketch shows infantry kneeling, with arms grounded behind them, using the trowel bayonet to excavate a trench.

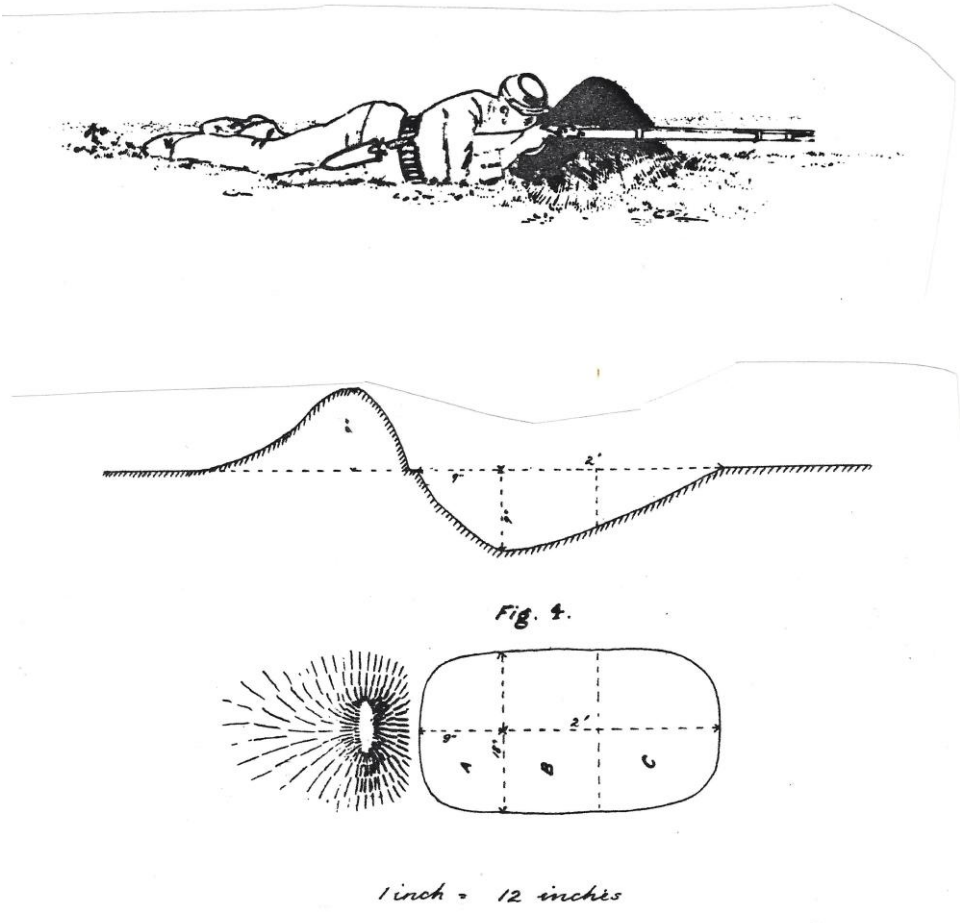

Figure 7. Capt. Farrow's (1881) drawing of what a rifle pit should look like in the field.

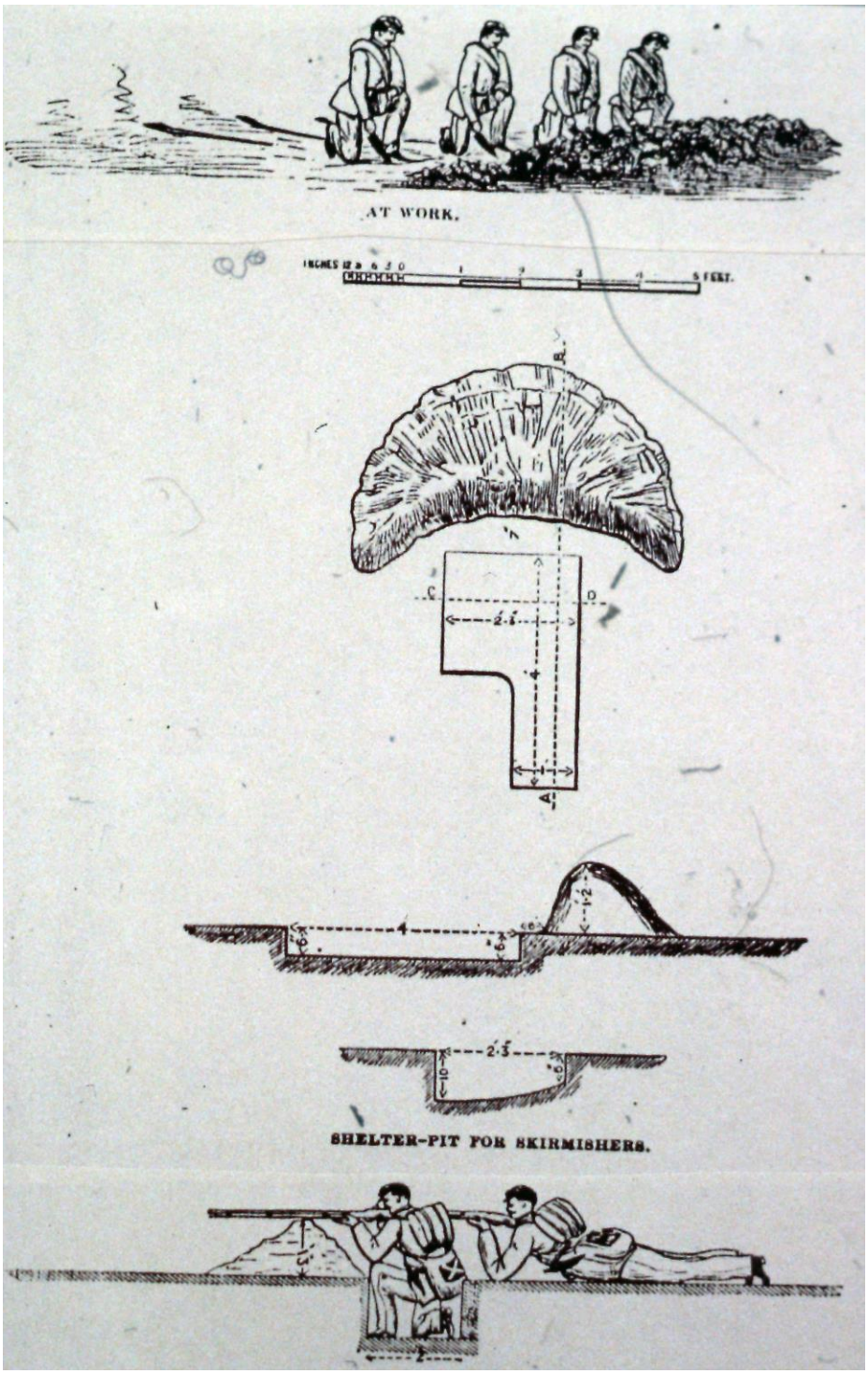

Figure 8. This sketch shows Capt. Farrow's (1881) shelter pit concept. The upper portion of the sketch illustrates four soldiers using trowel bayonets to dig a multi-man shelter pit.

Maj. J. P. Sanger was another officer interested in not only the use of a hastily constructed shelter pit under fighting conditions, but developing a solider carried tool to do the job. He noted the individual rifle pit construction technique was ignored in most texts of the day. He suggested the method of individual entrenchment be a pit constructed under fire for the protection of the head and trunk of the soldier, thus leaving the legs exposed.

Sanger indicated the pit should slope upward from front to rear. He believed the upward slope to be an important feature, so that if the pit were abandoned it could not easily be turned to use by the enemy without alteration. Sanger indicated a pit thirty-three inches long, eighteen inches wide, nine inches deep, with a nine inch high mound to the front could be constructed, under fire, in about three minutes. A photograph of regulars in training in Florida during the 1898 Spanish American War illustrates the actual practice of the Sanger entrenching technique (Urwin 1988:138-9).

Figure 9. Spanish American War era regulars training in Florida to dig hasty rifle pits. From an Underwood and Underwood stereograph, 1898.

Figure 10. The men have finished their rifle pits and are now in firing position. From and Underwood and Underwood stereograph, 1898.

Military manuals of the early twentieth century are more structured than Farrow's or Sanger's instructions, but they describe essentially the same procedure for digging riflepits and trenches in the face of the enemy. Moss (1918:385-7) is a good example of such a work, and provides some clear definitions of the purpose of such works. Moss states the object of field fortifications are twofold; first to increase the fighting power of the troops by enabling the soldier to use his weapons with the greatest possible effect, and second to protect the soldier against the enemy's fire. While the military objective might be stated in that order, the soldier of any era might have reversed the priority order.

Moss' description of entrenchment methods and types is nearly identical to the American classic on field fortifications, and one that guided the construction of earthworks in the Mexican War and the Civil War. D. H. Mahan defines hasty fortifications as those constructed so that troops could take better advantage of the opportunities of natural cover (Mahan 1847).

Moss follows the objective with a nomenclature of the trench. He identifies three types of trenches; hasty entrenchments, deliberate entrenchments, and siege works. He further identifies three types of hasty entrenchments the lying trench, kneeling trench, and standing trench. Hasty entrenchments are defined as trenches dug by troops upon the battlefield to increase their fighting power. They were meant to be constructed in the presence of the enemy and in haste.

The lying trench was constructed to cover a man lying down. Moss (1918:385-6) states:

> When intrenching under fire the rifle trench can be constructed by a man lying down. He can mask himself from view in about 10 to 12 minutes and can complete the trench in 40 to 45 minutes. A good method is to dig a trench 18 inches wide back to his knees, roll into it and dig 12 inches wide alongside of it and down to the feet, then roll into the second cut and extend the first one back. Conditions may require men to work in pairs, one firing while the other uses his intrenching tool. .... The height of the parapet should not exceed 1 foot.

The descriptions of the kneeling and standing trenches are based on the deepening and widening of the lying trench.

> Time permitting the lying trench may be enlarged and deepened until the kneeling trench has been constructed. The width of the bottom should be 2 1/2 feet - preferably 3 feet - and the relief (distance from bottom of trench to top of parapet) is 3 feet - the proper height for firing over in a kneeling position.
>
> Standing trench has a bottom width of 3 to 3 1/2 feet and a relief of 4 1/2 feet which is the proper height for men of average stature.

Figure 11. The use of natural features for cover during the Philippine War. From an Underwood and Underwood stereograph, 1899.

Figure 12. A staged photograph showing Filipinos using palm logs as a shelter from incoming fire. From a Kilburn stereograph, 1900.

Although written nearly forty years after Farrow's 1881 publication the Moss description of entrenchment methods and types is very similar. It can be argued that riflepits or hasty entrenchments, those meant to be constructed in the face of the enemy, did not change in type, or need. Even the World War II "foxhole" as described in the manuals (Anon. 1883; Beach et al. 1897; FM 4-105 1940; FM 5-35 1941; FM 5-34 1947) do not differ significantly in purpose or construction from that advocated by Farrow (1881) and Wheeler (1882). The same is true in

today's conflict situations. Certainly weapon systems and personal protective equipment have evolved, as has how to construct a fortified fire base, a protective bunker, or a rifle pit. Even so, these features are recognizable on a landscape and can be recorded and researched archaeologically. This is exemplified in the study of the entrenchments and earthworks associated with World War II (Passemore and Harrison 2008; Passemore et al. 2013) and the 1968 Warsaw Pact invasion of Poland (Musil and Netolický 2017).

Figure 13. Soldiers in the Philippine War using a kneeling trench as a firing platform and for protection. From a Kilburn stereograph, 1899.

Figure 14. South Dakota volunteers use a prepared earth berm or parapet with a trench to the front for defense in the Philippine War. From a Works Studio stereograph, 1899.

The concept of the entrenching tool, issued to individual soldiers to prepare hasty entrenchments, gained favor in the U.S. Army only about 1871. The entrenching tool developed by Col. P. V. Hagner was designated the Model 1873 and about 10,000 were produced. They were poorly received by troops who tested them. Edmund Rice (1874) developed a privately published manual on how to dig hasty field entrenchments ranging from rifle pits or lying pits to full entrenchments quickly and in an organized manner. He advocated for the issue to the individual solider of an entrenching tool to be carried as part of his regular issue field equipment. Rice, it so happened, developed the trowel bayonet in 1871 (Hartman 2016:5-20), a combination bayonet

and small entrenching tool (War Department Circular 1875). Rice's trowel bayonet was produced and issued to troops after field experimentation.

Figure 15. The experimental personal Model 1873 entrenching tool. It was poorly received by the ranks. Author's collection.

Figure 16. The trowel bayonet developed by Edmund Rice. During field trials it saw actual combat use at the Big Hole Battle in 1877. As a bayonet it was a failure, but as an entrenching tool it worked well. Author's collection.

Figure 17. The Model 1880 hunting knife that became a standard issue multiuse tool with troops. Author's collection.

Major J. P. Sanger developed an entrenching method utilizing a wide bladed hunting knife as the digging implement (Sanger 1896; Hardin and Hedden 1973:71-75; Hartman 2016) that became the Model 1880 Hunting Knife. His knife/entrenching tool was tested along with other experimental entrenching tools. One experiment at Springfield Armory included testing belt knives, a hunting knife (later adopted as the Model 1880 Hunting Knife), and the Model 1873 entrenching tool for their reliability in digging hasty entrenchments. The October 15, 1879 test involved four soldiers digging rifle pits with the various tools to test their efficiency (Hardin and Hedden 1973:4-8; Hartman 2016). The pits dug took from eight to eleven minutes to construct. They were all about four feet long, thirty-two inches wide, 12 inches deep, with the spoil dirt mound up at one end of the long axis, and essentially the same as riflepits employed during the late Civil War.

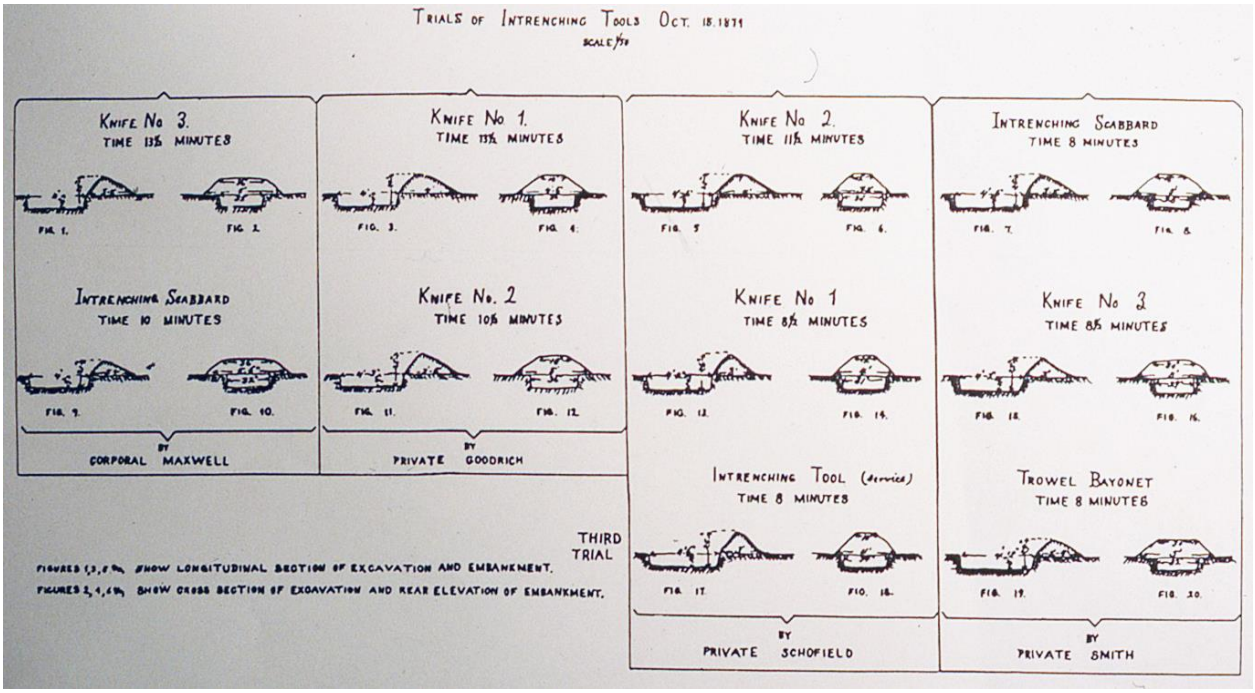

Figure 18. Results of the 1879 Springfield Armory entrenching tool trials are displayed in this sketch. Both what became the Model 1873 entrenching tool and the Trowel Bayonet did well in the trials. Note the rifle pits profiles are of the type described in guides of the day. After Hardin and Hedden 1973.

Rickey (1963:242) presents a photograph of regular army infantry digging trenches during maneuvers in Nebraska in 1889 that appear to follow this scheme. And Brigadier General Joseph C. Breckenridge stated in his annual report "The spade is raised almost to the rank of a weapon" (*Annual Report of the Inspector General* 1897:119). However, the army did not issue an individually carried field entrenching shovel to troops until 1910 (Hartman 2016).

Field Fortifications, Breastworks, and Rifle Pits in the Historic Record

Earthworks are seldom mentioned in western literature prior to the Civil War. However, the lack of their mention should not be construed as a lack of knowledge of their use or construction. Discussed here, in more or less chronological fashion are mentions in the recollections of civilians, officers and soldiers of the use of field entrenchments as means of self-protection and defense. These recollections and reports do not, by any means, exhaust the literature on the use of defensive features in the west. They are included as good examples of the types of earthworks,

redoubts, and rifle or shelter pits used in the west by Native Americans and Euro-Americans alike in the nineteenth century.

Hasty as well as formal entrenchments and earthworks were used in 1836 at the Alamo (Fox et al. 1976) and during the war with Mexico (Singletary 1960) at Fort Brown where a pentagonal earthwork with bastions was constructed. The earliest known mention of earthworks in the Anglo-American period is related by Gregg (1967) concerning an attack on some American traders on the Santa Fe Trail in 1832 or 1833. In defending themselves the traders dug a shallow trench and placed the mule packs around them for a breastwork. The Kiowa attack was successful and only a few of the Americans escaped.

Earthworks were not just the domain of the United States Army or civilian freighters. A pre-1820 possible defensive site, a dug trench some 200 feet wide, 130 feet long and 30 feet deep located on Shell Creek, Nebraska, was visited by members of the Long expedition on April 23, 1820. It was reportedly revere by the Pawnee at the time (Bozell et al. 2018:32). The Gros Ventre are reported to have used trenches with log breastworks during the Battle of Pierre's Hole in 1832 (Patterson 1966). About 1833, according to Kiowa oral history (Nye 1962:4-5), the Kiowa threw up earthworks to protect themselves from an attack by Ute Indians. This fight has become known as the Massacre of Cutthroat Gap, Oklahoma. According to Nye (1962:5 note) remains of those earthworks were still visible on the south bank of the Washita river in the 1930s.

The Kiowa are also known to have used earthworks on at least one other occasion. During the summer of 1838 Cheyenne and Arapaho warriors attacked a combined camp of Kiowa, Comanche, and Apache on Wolf Creek of the North Canadian in Oklahoma. The camp defenders dug holes to form a circular breastworks (Mooney 1898:273).

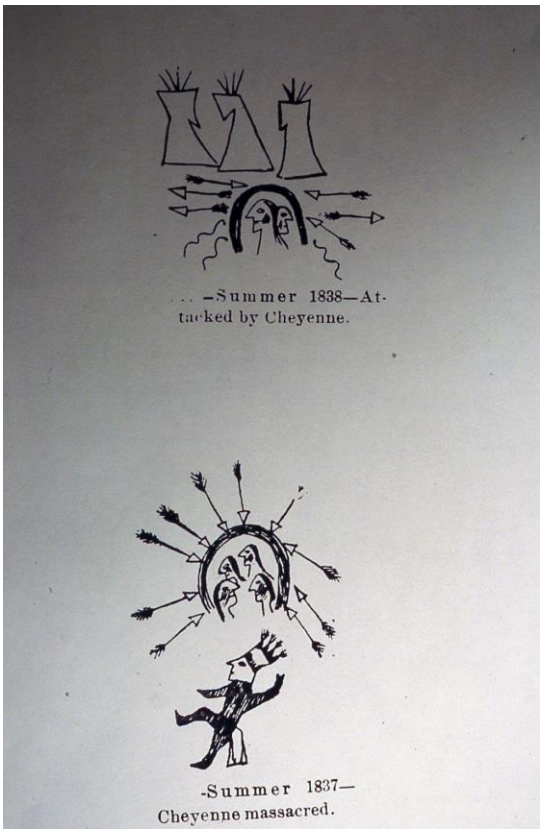

Figure 19. Mooney (1898) illustrated Cheyenne calendar pictographs for 1837 and 1838 depicting Native American use of rifle pits for defense against other attacking Native American groups.

A year earlier Kiowa warriors were attacked by Cheyenne but routed them. In the ensuing chase the Kiowa found the Cheyenne camp and attacked it. The Cheyenne made breastworks by digging in the sand. The Kiowa were successful in their attack, wiping out the entire camp (Mooney 1898:271-2).

Francis Chardon (1932:90) in his diary entry for December 4, 1836 at Fort Clark, North Dakota mentioned that the Mandan, were concerned with a possible attach by the Yankton Sioux, while they were camped outside the fort "dug a deep hole in the ground opposite the fort door, they set up all night watching."

The only known contemporary image of an Indian rifle pit is one taken by a Canadian North American Boundary Commission photographer in 1874. The image show Dr. Thomas Millman sitting in a Crow rifle pit dug on the Canadian Plains in 1873. The pit is surrounded by the skeletons of Crow who were unable to escape a Sioux war party from whose camp they had attempted to steal horses. In this case the hasty rifle pit was of little use to the defenders

(Featherstonhaug 1876; Millman 1926-1927).

Figure 20. Dr. Thomas Millman of the Canadian Boundary Commission poses on the edge of a rifle pit dug by Crow warriors in 1874. The Crow unsuccessfully defended their position against Sioux warriors.

Another instance of Indian use, of at least rudely constructed, defenses are stone breastworks thrown up by the Apache Indians during the second Battle of Apache Pass, Arizona. Fort Bowie, later located in the Pass, had some stone walls erected for defenses at several locations (Lockwood 1987).

During second day of the Jenny Expedition of 1875 after leaving Fort Laramie Lt. James Foster noted in his diary entry for May 27, 1875: "210 [pm]. Opposite Camp is a rocky Know [*sic*] 196 ft. above level of Camp the summit of which is covered with fortifications evidently thrown up (of loose stone) years ago"(Beucker 2013:78-79).

John Gregory Bourke (1987) recorded observations on the same fortifications as: "Persons who climbed to the summit told me of some Indian fortifications there found; from their descriptions, these structures of rude piles of stone not over three feet high, probably once served as rifle pits or trenches to defend the Crow Indians, originally possessors of this region, against the Dacotahs or Sioux, the present occupants."

The so-called Mormon War of 1857 also saw breastworks constructed, but never used. Brigham Young sent men to Echo Canyon where at a narrow point where his men dug a five hundred foot long trench or extended rifle pit across the canyon floor. The Mormons also enhanced the cover provided by the natural terrain of the canyon wall by the using cut logs and stone walls to form protective barriers. One section of a stacked rock breastwork still exists and can be seen from the modern highway running through the canyon (Bigler and Bagley 2011).

Seldom considered as an earthwork are some of the military and fur trade forts that existed on the frontier. Perhaps the most notable example of these unique earthworks is Bent's Old Fort, a massive adobe structure in southeast Colorado (Moore 1973). Although utilized by the military they are not the primary subject of this effort. The adobe fur trading post of Fort John that became Fort Laramie was used during the early days of the Civil War as an expedient earthwork to protect the soldiers serving there (Murray 1974).

The Apache campaigns of Arizona, New Mexico, and Texas date to well before the American occupation of the area in 1846. The Spanish and later Mexican governments were in conflict with the Apache from the time of their arrival in the area in the 1540s. The records of the Spanish Colonial and Mexican government eras are replete with encounters with the Apache. It well-known the Apache used the natural terrain to limit exposure of their warriors in conflict situations. They often enhanced the natural features by adding stacked rock or other available materials to create breastworks from which to conceal themselves. Conflict during the 1860s and into the 1880s with the US Army saw the continued use of these features. United States troops were not the only soldiers to utilize riflepits in their campaigns against the Indians. Bourke (1987) alludes to the use of riflepits by Mexican troops during the Apache campaign of 1883. These are discussed in the following Archaeological Investigation section.

Lieutenant Daniel Robinson, a sergeant in February 1861 at the Battle of Apache Pass, recalled digging in around the stage station in the Pass during the several day fight (n.d.). Lt. George Bascom may have had his men construct a stacked stone breastwork for protection as well (Ludwig 2016:106). That breastwork, if constructed by Bascom, was reused by the Apache during the second battle of Apache Pass in July 1862 which involved a column of California Volunteers. Ludwig (2016:106) describes the stacked stone breastwork as likely never over 18 to 24 inches high and approximately 32 feet in diameter. Ludwig suggests the idea that this breastwork was constructed by Bascom's soldiers as it does not meet the general criteria for known Apache breastwork construction, which usually involved adapting natural rock formations or cover by adding stacked rocks to create a place of cover and concealment.

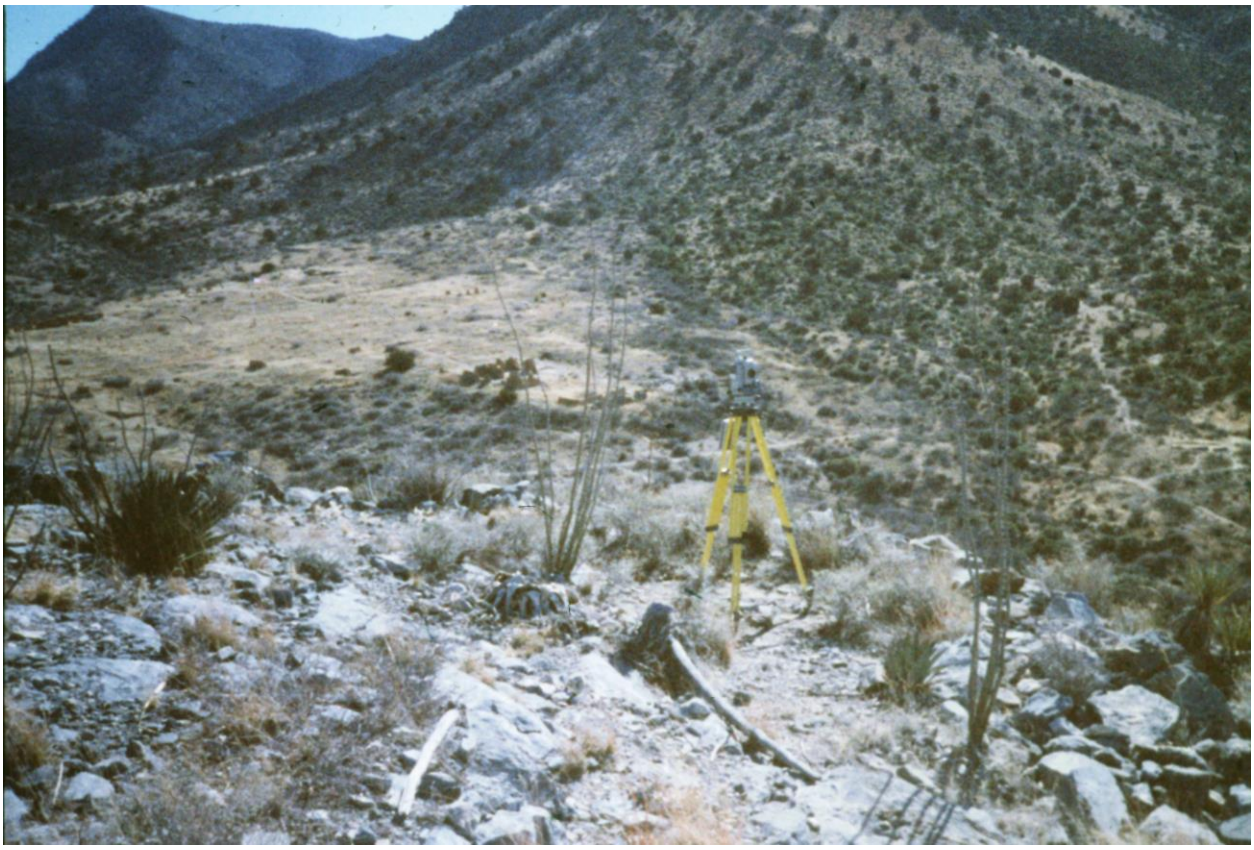

Figure 21. A stacked rock breastwork probably constructed by the Apache during the 1861 Battle of Apache Pass at what is now Fort Bowie National Historic Site, Arizona.

The Dakota Sioux war of 1862 came in the midst of the larger Civil War. The Dakota were divided into war and peace factions, and those groups nearly came to blows on several occasions. After the Wood Lake battle in which the war faction was soundly defeated a peace faction tried to surrender to the field commander Brig. Gen. Henry Hastings Sibley. At one point Red Iron's peace faction village was so concerned about an attack by the pro-war Dakota faction they dug rifle pits to protect themselves (Beck 2013:37).

After suffering several costly defeats in Minnesota the Dakota fled westward onto the Great Plains. An expedition was formed under the command of Brig. Gen Sibley to chase and subdue the troublesome Dakota. Sibley, fearful of retaliatory Indian attacks had earthen embankments thrown up at many of his encampments (Beck 2013:92-94). He also made good use of rifle pits during the Big Mound battle of July 24, 1863 and at Buffalo Lakes on July 26. In 1897 Jacob V. Brower, who had been a solider on the expedition, returned to the battle sites to record them Brower 1976). In his No. 2 Field Book he records a map of a large entrenched field

encampment, Camp Atchison, located near Sanborn, North Dakota. The entrenchments were still visible at the time of his visit and were a series of long trenches and earthen embankments covering some 820 feet long and about 400 wide. At the Big Mound battle site he noted the location of a Sibley camp that overlooked the Dakota encampment. The camp was protected by the river on one side, and the others were protected by a series of entrenchments. Brower's field book No. 22, 1902 records his recollections and observation of what he identified as the Apple Creek rifle pits constructed by Sibley's command in 1863. He mapped the series of rifle pits which were located on the crest of terrace overlooking the floodplain of the Missouri River. He continued on to Burleigh and mapped another series of riflepits which he noted he helped construct in July 1863.

Field entrenchments, riflepits, and breastworks use were not uncommon in the Trans-Mississippi West during the Civil War, but are largely mentioned only in passing in historical documents. One example relates to the defense of Union encampments at Pea Ridge, Arkansas. General Samuel. Curtis commanded Union troops in Northwest Arkansas in 1862 during a push into the state to dislodge pro-southern troops that had wintered in the area. In order to protect his position near Elkhorn Tavern, Curtis had his troops construct a series of shallow entrenchments along the bluff edge overlooking Sugar Creek. The Battle of Pea Ridge that occurred in March 1862 resulted from a flanking maneuver by Confederate General Earl Van Dorn who was avoiding a direct assault on the entrenched Union position at Sugar Creek (Shea and Hess 1992). The entrenchments were mapped, and metal detected as part of a multi-year archaeological project (Carlson-Drexler et al. 2008).

Figure 22. Today an interpretive trail loops along Gen. Curtis' entrenchments located on a bluff above Sugar Creek, a part of Pea Ridge National Military Park, Arkansas. Google Earth image.

Figure 23. The figure stands in the Sugar Creek entrenchment. The berm or parapet is to the left. The entrenchment most closely conforms to a kneeling trench defined in the guides of the day.

The close of the Civil War did not eliminate the need or use of field entrenchments. They were constructed and used throughout the Indian Wars. During a routine trip from Fort Reno to Fort Phil Kearny, Wyoming in July 1867 a resupply wagon train commanded by Lt. George Templeton (Newberry Library, Templeton diaries) was attacked at or near the crossing of Crazy Woman's Fork. Templeton recorded in his diary that he used the wagons as a barricade and had the men dig rifle pits underneath for protection. He reported one death, a corporal, who was buried in one of the rifle pits.

The so-called Snake War of 1867 found then Colonel George Crook commanding a unit chasing Paiutes, Modocs, and Achumawi into a natural basin in what would become the Battle of Infernal Caverns (Magid 2015:32-36). There Crook's men assaulted a well-fortified Indian position much to their chagrin. The position was an old site used for various tribal gatherings and the stronghold tucked into a shelf on the canyon wall that had be fortified many years earlier by warriors using stone breastworks connecting to natural boulder features creating excellent cover. The volcanically formed basin was replete with caves and old lava tubes that interconnected to form a series of tunnels that could be used by the defenders to appear to pop up out of nowhere

to fire at their adversaries. Crook's command prevailed over the warriors at the cost of one officer's and four enlisted men's lives. The Indians are reported to have had about 16 killed. Once the soldiers took their stronghold the warriors and their families fled overnight using the lava tunnels to aid their escape.

One of the best known Indian Wars battles is the Beecher Island fight of September 17-25, 1868. Major George "Sandy" Forsythe and 50 scouts, armed with Spencer carbines and Colt revolvers, fought about 600 Cheyenne warriors directed by the famed Roman Nose (Hutchins 1960). Roman Nose was killed in the battle. The Forsythe command entrenched on an island in the Arickaree River, Colorado and fought from this position. Using whatever was available the scouts and soldiers created hasty entrenchments in the bank of the river to protect themselves from Indian attacks and long-range shooting. They also used their dead horses and mules to enhance their small defensive perimeter until they were rescued (Dixon 1994; Monnett 1994). Forsythe (1930:43) states:

> During this comparative lull in the fight the men were not idle, and with their butcher knives to cut the sod, and their tin plates to throw up the sand, most of them had already scooped out a hole the length of their bodies, from eighteen inches to two feet in depth, and piling up the sand on the side facing the enemy, had ample cover against rifle bullets.... Each man was fairly will sheltered in a rifle-pit of his own construction, generally two men in a pit, and the various pits were in an irregular circle, about six feet apart, and fortified by an embankment of sand fully eighteen inches in thickness both front and rear, for enemy bullets came from all points of the compass.

Also at the 1868 Hayfield Fight at Fort C. F. Smith, Montana, between the Sioux and the 27th Infantry trenches were dug outside the corral in preparation for an attack. However, they were not used during the famous engagement (Appleman 1960:138).

Major A. W. Evans from Fort Bascom, New Mexico built a redoubt at Monument Creek on the Canadian River in 1868. He used the redoubt to store supplies that could not be conveniently carried during the southern Plains campaign of 1868 (Nye 1962:78).

Chambers (2008:42-42) describes the establishment of Fort McKeen, North Dakota on hill above the Missouri River. The plain below would become the site of the famed cavalry post Fort Abraham Lincoln later in 1872. Fort McKeen's infantry barracks had deep cellars that were described as bomb proof shelters to be used in case of attack. Likely these were just deep rock lined cellars. A wood fence with blockhouses at each corner, referred to as a palisade, covered

two sides of the parade ground with the high bluff being the defensive feature on the other two sides. An earthen breastwork was dug outside the southwest corner of the fort. It is 140 feet long and 16 feet wide. Remains of the breastwork are still visible at the site of Fort McKeen (Chamber 2008:53-54).

One of America's longest and most expensive Indian War campaigns occurred in 1872-1873 in the Klamath Basin. The Modoc War, as it was once called, ended after a prolonged siege of the Modoc by the US Army in what is now Lava Beds National Monument. In the rough volcanic terrain the Modoc used deep caves and tunnels to protect themselves in late April through mid-May 1873. Both sides constructed and used stacked rock breastworks for defense. The army could not dislodge the Modoc warriors and their families with direct assaults over nearly a month long siege. The Modoc decimated by the army's gunfire were running out of food and were physically and mentally exhausted by the siege. They simply slipped away using the terrain they knew so well. The army rounded up individuals and small groups over the next several weeks.

The Spotted Tail Agency located in northwest Nebraska was subject to army protection and observation during the turbulent era of Plains Indian warfare. Spotted Tail, a prominent peace leader among the Lakota bands, was nevertheless considered suspect enough that Camp Sheridan was established in March 1874 on a flat topped bluff about 600 yards south of the agency itself. The infantry camp was exposed, and the commander had the soldiers construct a series of earthen redoubts connected by extended rifle pits or trenches. Hundreds of feet of trenches and the redoubts are still visible today. Some of the redoubts were used as Gatling gun emplacements (Beucker 2016:42).

During the 1874 southern Plains campaign another redoubt was built as a supply depot for the Fort Sill column (Nye 1962:205) Nye (1962:251) says the redoubt site was still visible in the 1930s. The Anadarko Affair of August 22 and 23, 1874 involved Tenth Cavalry troopers and a group of Kiowa Indians. During the night of August 22 the soldiers dug trenches and the next morning there was some skirmishing around the trenches (Nye 1962:209-10).

The Kiowa unrest of 1874 spawned the construction of numerous entrenchments and riflepits in Texas and Oklahoma. A wagon train carrying supplies for Colonel Nelson A. Miles was attacked by Kiowas on September 9. The wagons were corralled, during the night riflepits were dug at each end of the wagon corral, and were used in the sporadic fighting that continued until the Indians withdrew on September 13. The soldiers reported the Kiowas dug riflepits for protection during the fight, as well (Nye 1962:215-17).

Scout Billy Dixon, another scout, and four soldiers carrying dispatches from Miles to the train were attacked on September 12. Caught in the open near the Washita River the men found a blow-out and proceeded to scoop out a basin about six feet in diameter and eighteen inches deep for their protection. The men were pinned down until September 14 when the Indians were driven off by the approaching Miles column (Nye 1962:219).

Civilian expeditions such as the 1874 Yellowstone Road and Prospecting Expedition (MacLean 2016) learned from their Civil War experiences and created breastworks and entrenchments for protection. Expedition member Joe Cook stated that when the wagon train halted for the night, the men would dig a trench about two feet wide and two feet deep as breastworks for protection of the pickets on both sides of the corral. They would dig individual protection holes 200 to 300 yards from the camp. Each man cut a head log from eight to ten inches in diameter and about three feet long. They would lay these on the embankments and dig small post holes under the logs, so that the Indians could not shoot them in the head, while the frontiersmen where shooting from the covered positions (MacLean 2016:106-107). The expedition members camps were rarely attacked, but the wagon train was attacked on several occasions and rifle pits were used as defensive measures at the fights on Rosebud Creek on April 4, Great Medicine Dance Creek on April 12, and at Lodge Grass Creek on April 16 (MacLean 2016:140-154, 164-170, 187-221).

Warriors who attacked the expedition wagon train also recalled the frontiersmen use of rifle pits and entrenched camps. Stands With Horses In Sight recalled the wagons formed in a large circle with the stock in the center (Brown and Willard 1924:5610562). The warrior in an interview with Judge Frank B. Zahn stated: “The white men dug long cellars or trenches holding about 6 to 8 men and they were deep. .... From these dugouts they shot at the warriors as they rode close to these mounds. The white men were excellent shots” (Statement from Stands-With-Horns-In-Sight made to Judge Frank B. Zahn, Fort Yates, North Dakota, in October 1956, http://digital.libraries.ou.edu/utilities/getfile/collection/CampbellWS/I’d/5792/filenames/5774.pdfpage/page/82).

Gen. George Crook left his wagon train at Goose Creek near present day Sheridan, Wyoming when he began his movement north to join Brig. Gen. Alfred Terry during the Sioux campaign of 1876. Crook’s command returned to Goose Creek on June 19 with the wounded from the Battle of the Rosebud. They found that Maj. Furey had converted the wagons into a fortress, placed on a tongue of land surrounded on three sides by a deep creek, and on the land’s neck he dug a line of breastworks. Those earthworks commanded all approaches. The livestock was placed in the center of wagons and were protected from being run off by ropes and chains running through the wagon wheels (Bourke 1891:318-319).

While the Battle of the Little Bighorn is not well remembered for its use of field entrenchments, they were definitely employed to good advantage by the Reno-Benteen command. The June 25-27, 1876 Reno-Benteen defense is perhaps one of the best documented in the Trans-Mississippi west. There are several accounts of the construction and use of the riflepits during the battle. Private William Slaper, who was on the Company M line recalled:

> We were not very well entrenched, as I recall that I used my butcher knife to cut the earth loose and throw a mound of it in front of me upon which to rest my carbine..... a bullet struck the corner of this mound, throwing so much dirt into my eyes that I could scarcely see for an hour or more...(Upton 1990:)

Lieutenant Edward Godfrey, Company K, recalled that the men:

> ...settled down to the work of digging rifle pits. The men worked in pairs, in threes and fours. The ground was hard and dry. There were only three or four spades and shovels in the whole command; axes, hatches, knives, table forks, tin cups, and halves of canteens were brought into use....(Godfrey 1892).

The clearest statement regarding the rifle pit construction comes from Sergeant John Ryan:

> We went to work with what hand tools we had, consisting of two spades, our knives, and tin cups, and, in fact, we used pieces of hard tack boxes for stakes, and commenced throwing up temporary works. We also formed breastworks from boxes of hard bread, sacks of bacon, sacks of corn and oats, blankets, in fact everything that we could get hold of... After the Indians moved out of sight we jumped out of our works, built better rifle pits, and unsaddled our horses.... (Upton 1990:53,57).

A formal redoubt was even built on the evening of June 26, 1876 when the Reno-Benteen command moved from its initial position to a bench above the river. The move was made to secure a reliable access to water. The redoubt was constructed to overlook the river, the valley to the south, and a ravine that constituted access to the river.

The 1876 campaign resulted in the construction of numerous riflepits besides those of the Reno-Benteen defense. Riflepits were dug as a defensive measure at the Powder River Depot, Montana. Others were dug at a camp at the mouth of the Little Bighorn River in August 1876, and still others dug after the Battle of Wolf Mountain in order to protect and secure the area (Jerome Greene, personal communication March 16, 1990).

Settlers and miners in the Black Hills during the 1876 campaign may have created a fortified earthwork with corner bastions or embrasures near Deadwood, South Dakota as a measure of self-defense. The earthwork is about 18 meters on a side with corner bastions and an opening in the center of the south side (Fosha 2008).

The flight of the Chief Joseph and the Nez Perce during the summer and early fall of 1877 is characterized by the image of the fleeing Indians doggedly, but ineptly, pursued by General O. O. Howard's troops. And it is probably most famous for the words uttered by Chief Joseph during his surrender "I will fight no more forever" (Beal 1971). The Nez Perce flight was anything but beleaguered. The Indians fought several pitched battles and numerous delaying actions. Many of the fights included the construction of riflepits. Jacob V. Brower, the recorder of the 1862 Dakota war earthworks traveled to Idaho in search of prehistoric archaeological materials. In early May 1897 he mentions finding some of Gen. O. O. Howard's riflepits at an encampment from the 1877 Nez Perce Campaign on Targhee Pass near Henry Lake (Brower 1976).

During the Nez Perce campaign of July 1877 Captain Steven Whipple went out to meet Captain David Perry near Cottonwood Creek, Idaho. Fearful of an attack the combined commands dug riflepits near the Horton house. Some rear guard Indians did fire on the men in the pits (Beal 1971:74-5). A group of volunteer militia came under attack July 10 by Nez Perce sharpshooters. Fearing a more general assault the men dug trenches for protection. They were attacked and the fight became known as the Battle of Misery Hill (Beal 1971:77).

The Battle of Clearwater Creek in mid-July combined the use of artillery with entrenchments in an action more reminiscent of a Civil War skirmish than a clash with the Indians. The dismounted troops began a foot assault across a meadow. The Indians dug entrenchments to meet the assault (Beal 1971:80). The army brought a battery of artillery into the action. It was placed on a hillside and an excavation was required to lower the angle of the gun's muzzle for effective fire (Beal 1971:81).

Ft. Fizzle, apparently aptly named, was constructed by Montana troops on the Lolo Trail to intercept the Nez Perce. It failed to do so. It was constructed as a temporary breastworks of earth and logs (Beal 1971:110).

The Big Hole Battle in western Montana on August 9-10, 1877 was a major defeat for the Colonel John Gibbon and the Seventh Infantry. The Nez Perce slipped away again. After the soldier's assault on the village was countered by the Nez Perce, the command retreated across the creek and took up defensive positions on a terrace. The soldiers dug a series of riflepits along

the terrace. These pits were constructed with the use of trowel bayonets issued to the infantry at Fort Missoula, Montana (Beal 1971:128-42). The Seventh Infantry became very attached to the trowel bayonet and did not turn them in after their experimental use. The men believed they had saved their lives at Big Hole by giving them a serious tool to quickly did rifle or shelter pits. The trowel bayonet was withdrawn from service by General Order No. 76, 1879 Series, Office of the Adjutant General, but the men were still falling out on parade with them in 1883 and 1884 while stationed at Fort Laramie, Wyoming (Reports of Inspection made by Acting Assistant Inspector General Lt. Col. Edwin C. Mason, 4th Infantry on July 25, 26, 1883 and August 28, 29, 1884 at Fort Laramie, copy on file Fort Laramie National Historic Site, Wyoming).

Haines (1991) reported he found several rock breastworks constructed by the Nez Perce warriors at the Big Hole Battlefield. They were located on a bluff overlooking the village site attacked by Gibbon's soldiers and volunteers.

Another instance of rifle pit use is documented in the Cow Island Affair of September 23, 1877. A sergeant, twelve soldiers, and three civilians who were guarding supplies, heard the Nez Perce were coming, and dug riflepits around their tents (Beal 1971:224). These defensive features did not deter the Nez Perce from capturing and destroying many of the expedition supplies during their attack on the steamboat landing.

The final event of the 1877 Nez Perce War was the Battle of the Bear Paw, where Chief Joseph surrendered. Here the Indians took advantage of the naturally rugged terrain and dug shelter pits for the women, children, and old people. They also dug what have been termed foxholes with interconnecting tunnels for defense. An un-named Nez Perce woman stated "we digged the trenches with Camas hooks and butcher knives. With pans we threw out the dirt" (Beal 1971:242). The Nez Perce also used trowel bayonets, captured at Big Hole, to dig their riflepits (Beal 1971:237). Likewise the attacking soldiers dug rifle pits and artillery emplacements to protect them while they kept an unrelenting fire up on the Nez Perce positions until their surrender. The visible riflepits, artillery emplacements, and other entrenchments were archaeologically mapped during some assessment work (Scott 2001).

An unusual instance of the use and construction of trenches is recorded during the turbulent 1870s on the Southern Plains. During 1878, in Greer County Texas, Captain Nicholas Nolan of the famed Tenth Cavalry, had his men dig trenches to protect a band of Kiowas from being attacked by Texas Rangers. One Kiowa, killed by the Rangers earlier, was buried in the trenches on their abandonment (Nye 1962:237).

In late 1878 the Little Wolf and Dull Knife bands of Cheyenne were trying to return to their northern home from their hated Oklahoma reservation. The two bands separated with Little Wolf and his band heading north and evading soldiers trying to locate then until they reached Montana. In late March Lt. Philo Clark found the warriors and their families "harbored in a natural fortress which they had strengthened by breastworks of stone and dirt" (Greene 2020:176). Clark, who knew Little Wolf, persuaded the band to disarm and surrender without firing a shot.

The Dull Knife band was far less lucky. Dull Knife's band surrendered on October 25, 1879 in northeast Nebraska. Dull Knife surrendered after some tense negotiations, but not before he and his band fortified a naturally strong landscape feature. The soldiers surrounding the camp also dug in, creating earthworks and entrenchments in case hostilities broke out (Greene 2020:30-31). The Indians surrender was obtained. Ostensibly disarmed the Indians were escorted to Fort Robinson and housed in an empty cavalry barracks. They had concealed some firearms beneath the women's clothing, and once in the barracks they tore up some floorboards and hid the firearms beneath the barracks floor.

By early January 1879 tensions were running high and the band's warriors retrieved the hidden firearms and ripped up some additional floorboards and dug a pit for protection in case they were attacked. The pit was subsequently excavated and recorded during an archaeological project prior to reconstruction of the building (Greene 2020: endnote Chapter 2, 45). On the night of January 19-10 the Cheyenne Breakout, as it is known, occurred when nearly all 149 prisoners broke out of the barracks and ran for their lives across a snowy cold landscape. Soldiers responded immediately and at least 30 Indians including women and children were killed, a numbered wounded, and most recaptured. About 60 were unaccounted for. A few were killed but the bodies never found, more were recaptured but most made it to the new Pine Ridge Indian Agency and were taken in by the Lakota residing there.

One group that was not recaptured, numbering about 20, mostly women and children, and protected by a few warriors under the leadership of Little Finger Nail eluded the pursuing soldiers until late January. On two occasions Little Finger Nail's group was found by the soldiers, but they had controlled good natural high ground on which to protect themselves. They enhanced their natural protection with timber and rock breastworks, as well as hastily prepared rifle pits. Each time the Cheyenne slipped through the soldier cordon at night to continue their northern journey (Greene 2020:115-120). In one instance the Indian occupied rifle pits were assailed by nearly 20 volleys of cannon fire from a 12-pounder Napoleon smoothbore cannon. This is one of the few instances that artillery were used against Indians during the late nineteenth century.

Little Finger Nail's last stand occurred on January 22. The small band took shelter in a ravine on Antelope Creek. They intended to hide out until nightfall then proceed on toward Pine Ridge Agency. The warriors and women dug pits in the ravine to provide additional shelter should the army overtake them again. Indeed they did. This time the soldiers were able to surround the entrenched ravine and in the ensuing fight all the warriors and several women and children were killed or wounded. The Indian survivors used the dug pits to good advantage. The soldiers lost eleven men killed and a number wounded in this multiday pursuit (Greene 2020: 131-145). The tragedy of the Cheyenne Breakout was over. Superior Indian marksmanship and the use of enhanced natural features prolonged the inevitable for the Cheyenne escapees, but it gave them about twelve days freedom before the violent end to their bid to return to their Montana homeland.

Later in 1879 a number of dissident Utes killed Indian Agent Nathan Meeker, his wife, and a several other White River agency employees. An army column on the way to aid the agency personnel was attacked by the dissident Utes. The Mill Creek fight began on September 27. Major Thomas Thornburg's column was pinned down for several days on Mill Creek in western Colorado. Thornburg was killed early in the battle. The surviving officer corralled the wagons and had a triangular pit dug in the center for protection of the wounded. The Fifth Cavalry defenders utilized the wagon boxes, hardbread boxes, and ration barrels as fortifications. In addition seventeen riflepits were dug two feet deep at points around the perimeter. Each pit held two men (Riddle 1966:288; Sprague 1980:210-3; Miller 1997). The Milk Creek entrenchments were disturbed by relic collectors and not properly documented (Edwards 2002; 2007).

Figure 24. An imaginative sketch of the trench and earthworks at the Battle of Milk Creek during the Ute Campaign of 1879 (after Sumner 1891).

The Utes built stacked rock breastworks to protect themselves during the multiday siege of the entrenched soldiers. The breastworks were initially recorded as prehistoric stone structures by Huscher and Huscher in the 1930s (Huscher and Huscher 1943:16). They were told by a local rancher that a large number of cartridge cases had been found in and around the features, but they chose to ignore the possibility that the rocks features were breastworks due to their strong prehistoric bias.

"Although the words "breastworks," "fortifications," or "forts" come so naturally to mind upon our first examination of such sites as these, the evidence is all against an actual military origin for the buildings. Such explanations spring from our thinking in terms of powder and shot, and when we put our Indians back in the prehistoric where they belong we find much less use for the "fortifications." A knee-high wall does not lend itself to the ready handling of a bow and arrow, and as for the "loopholes" and "embrasures" always pointed out at such sites, it is an absolute physical impossibility to shoot an arrow effectively through a loophole placed low in a stone wall, or through any small hole, for that matter."

Fred Werner, a relic collector interested in Indian War battles metal detected the site and these features. Werner (1985:162) locates this feature, and at least three others, on a hill south of Milk Creek approximately 800 to 1000 yards from the soldiers' entrenchments from the 1879 fight. Werner metal detected the area but found nothing. He does note (Werner 1985:162) that his informants, had previously worked the area and found many Indian type cartridge cases and unfired cartridges dating to the 1879 era.

The Huschers dismissed the idea the features were breastworks because they assumed them to be prehistoric in age. They also dismissed the idea that loopholes they observed could be associated with a defensive site because they could not be effective using bows and arrows. They also summarily dismissed the idea that quantities of cartridge cases were found in and around the features. The Huschers' preconceived notions of what they observed likely skewed their analysis of the features function. It is possible that one or more of the features maybe prehistoric in age, but given their location and the fact that both the Huschers and Werner report cartridge cases being found in the immediate vicinity strongly support the interpretation that the stone features on the south side of Milk Creek are breastworks built or at least used by the Ute warriors as they fired on the entrenched soldier positions during the 1879 fight (Scott 2008).

Figure 25. Not all rifle pits and breastworks were Native American, or soldier constructed. This Frederick Remington painting, Holding up the Pay Escort, depicts bandits using a rock breastwork to ambush an army paymaster and his escort in 1889. Despite gallant efforts by the escort the bandits succeeded in capturing the payroll amounting to about $28,000.00. Image courtesy of Bank One, Arizona.

The final battle of the Indian Wars, the Wounded Knee Massacre of December 1890, also involved the construction of trenches. General Nelson Miles took command of the field after the massacre, relieving the commander of the Seventh Cavalry. While tensions were running high Miles had the soldiers dig defensive entrenchments covered with boards. These entrenchments were never used for combat (Johnson 1962:290; Greene 2016).

Figure 26. Like the practice earthwork illustrated in Rickey (1963) they were used during after the Wounded Knee Massacre. General Nelson Miles had his troops did defensive earthworks in case of attack by the Sioux at Pine Ridge. Courtesy History Nebraska.

Archeological Investigations of Field Fortifications

Prehistoric and early contact ephemeral fortifications are perhaps among the most difficult to identify archaeologically. There are several fortified sites affiliated with the 1680 Pueblo Revolt and the so-called Reconquista. In the southwest some Puebloan groups found and fortified areas on small mesas using stone walls and natural barriers to minimize any weapons advantage the Spanish had over the Pueblos bows and arrows, knives, and clubs. This included creating piles of stone cobbles at high choke and access points that could be hurled down on the Spanish and their allies.

As early as 1952 White (1952) and Malouf (1963) contemplated the “battle pits” as they termed them mentioned in the ethnographic record of the Northwest Great Plains and particularly in the area of western Montana were not being properly identified. They noted archaeologists were finding and recording the sites, but were describing them as eagle catching pits rather than as possible conflict related features. They called upon those recording these features to be more cognizant of the ethnographic descriptions of these features and to be more careful in ascribing a cultural function to these sites.

That advice has been heeded to a certain extent in the Great Plains and the Pacific Northwest. Schaepe (2006) documented a series of stone walled features in the Fraser River Canyon. He suggests that these were built not as individual defensive features but as part of an interconnected network of breastworks that served to protect a larger social group as they came together for their yearly fishing in salmon runs. The distribution of the breastwork features across the landscape suggests the defenders understood the concept of overlapping fields of fire. However, this interpretation does not take into account that some features may not chronologically contemporaneous. Nevertheless, the concept of defense in depth is clear in looking that the terrain and breastwork locations.

White (1852) and Malouf's (1963) admonitions to critically assess stone pit features as to function is not always heeded. A re-examination of stone feature form and distribution on the Northwest Plains (Amundsen-Meyer and Leyden 2020) describes circular stacked stone features, about 1.5 to 3 meters in diameter with excavated central areas. They note the features are usually found on hills or ridges. They suggest these are vision quest sites, which they may well be, but do not assess them in terms that they could be what White and Malouf termed battle pits or breastworks for observation.

Stone walls and piles of stone projectiles are one thing to find and document archaeologically, but wood features rarely survive. One recorded survival is a mixed wood and stone redoubt sized feature in central Wyoming (Schroeder 2018). The redoubt is situated on an isolated sandstone butte. The site of some 120 meters by 53 meters consists of stacked sandstone and juniper branches and logs. The sandstone wall has a series of small bastions that allowed defenders to see over the butte edge and create an enfiladed zone of fire for bows and arrows. It is believed the site dates to the early contact period, circa 1600-1700 based on the artifacts type found in the site.

Few historic field entrenchments in the trans-Mississippi west have been excavated or tested. One is at the site of the 1836 Battle of the Alamo, another at Fort Larned, Kansas, a third is at Fort Dilts, North Dakota, and the fourth is at Fort Laramie, Wyoming. The Alamo defensive trench was cross-sectioned and was found to have a relatively flat bottom about five feet wide and a remaining depth of two feet. Fox et al. (1976) interpreted this ditch as a part of the earthen fortification ditch and rampart mounting artillery that protected the front gate of the ill-fated Alamo command.

At Fort Larned, Kansas two or three trenches were dug in 1864 or 1865 to protect the Federalized volunteer troops guarding the post from possible attack. The trenches were closed

by order of General W. S. Hancock in May 1867 as he believed they were of more danger to the defender than any attacker (Scott 1974:303). The fort is set in a bend of the Pawnee River. The bend forms a natural barrier on the north and west sides with an abandoned river meander forming an eastern barrier. The southern side was open to the prairie.

Figure 27. A test trench across the Civil War era entrenchment located on the south side of Fort Larned National Historic Site, Kansas. The trench bisected the terminal end of the entrenchment.
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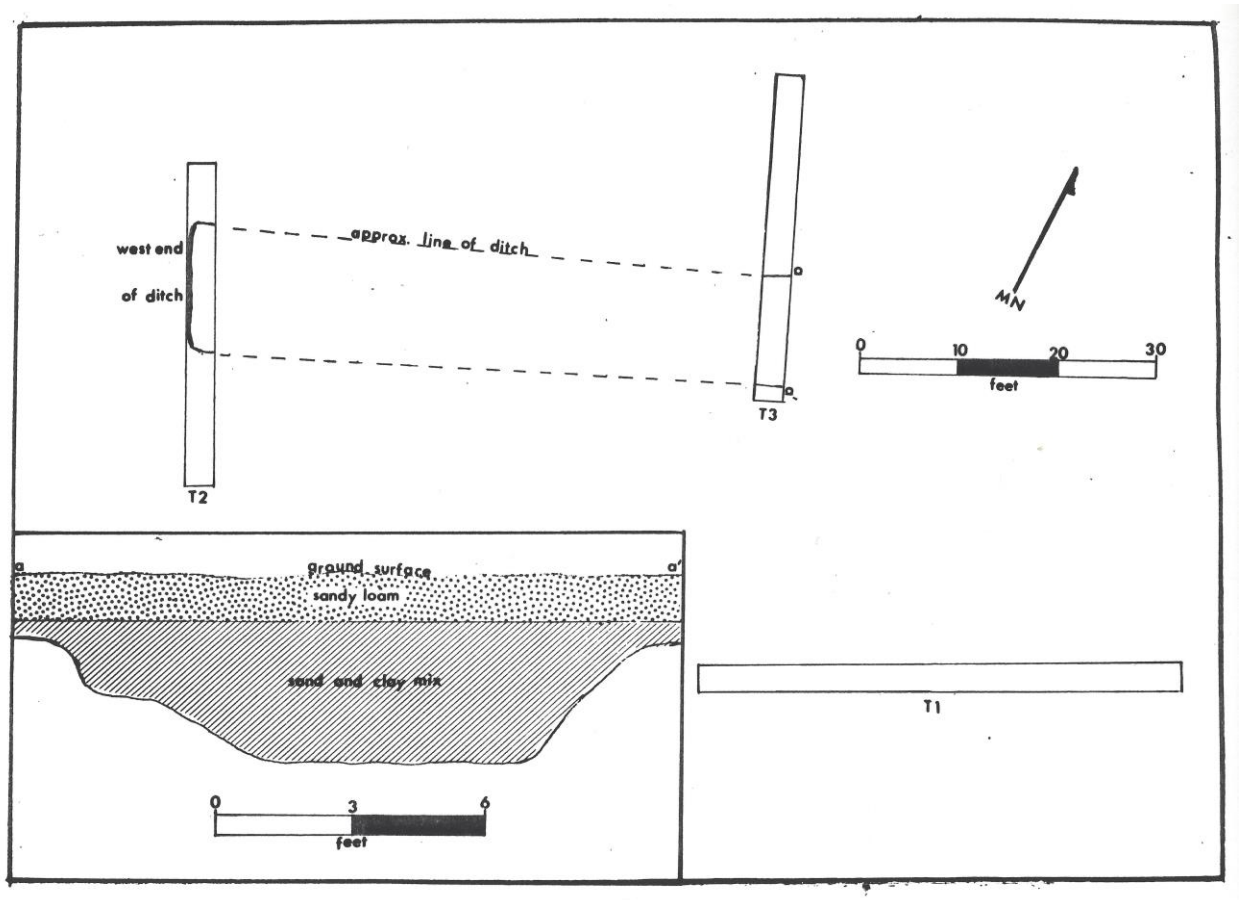

Figure 28. Plan and profile drawings of Test Trench 2 that cut across the Civil War era entrenchment at Fort Larned. Note the profile is consistent with guides of the era as to the construction of an earthwork trench.

During 1973 archeological investigations the western trench was cross-sectioned in two places, one near the eastern terminus and the other about 50 feet west. The trench was found to be between 11 and 15 feet wide with a depth of four to five feet. The bottom of the trench was three feet wide and flat (Scott 1974:303-4).

Fort Dilts is the site of Santee Sioux attack of a civilian wagon train in 1864. The train of 97 wagons accompanied by a 12 pound howitzer was besieged for sixteen days (Haury 1989). The train was harried by Sioux for several days until the wagon master encircled the train on a commanding ridgetop. The men of the train constructed a six foot high earthen breastworks outside the wagon circle along with several riflepits. Topographic mapping work at the 1864 Fort Dilts site identified at least six depressions, some with associated earth embankments. Feature 1 is about thirty feet in diameter, and may be a redoubt or other defensive structure. Feature 2 is a

pit about 24 feet in diameter and six feet deep. Based on documentary evidence it is interpreted as an aborted well excavation. Features 3 through 6 are roughly six feet long by three feet wide oval pits with small earthen embankments to one or more sides (Haury 1989:16-25). Archeological testing of the earthwork identified a soil stratigraphy roughly reverse to the natural deposits (Haury 1989:28-30). Only two historic artifacts were found in the excavation units.

A fortification ditch at Fort Laramie that was constructed in February and succeeding months of 1865 to counter a real threat that Indians might attack the fort (Chappell 1974:68-71). Major Thomas Mackey ordered the fort entrenched on its exposed sides. Initially three artillery battery emplacements were constructed and likely linked with trenches. Apparently teams of horses possibly using a slip were used to dig the trenches and sacks of corn were used to form barricades on the trench fronts. No map nor further historical documentations is known that describes the placement of the trenches.

The Fort Laramie entrenchment is one of the few to be examined by geophysical equipment and archaeologically tested (Walker and De Vore 2004). The feature protecting the open approach to the fort, was clearly defined using geophysical equipment, but was also visible on the ground surface in several locations. The earthwork was cross-sectioned in seven locations. The testing work found the trench had a flat floor with vertical outer walls with the interior wall sloping slightly depending on the local topography. Walker and De Vore (2004:14-16) also found plank flooring in one area, remains of a structure or what they call a sentry box, and what is described as an artillery position. The artillery position is in a bastion (Wheeler 1882:42-43) where two fortification ditches join and provide a wider field of fire for the defenders regardless of the type of weapons at hand. The so-called sentry box is probably a bombproof shelter or a powder magazine (Wheeler 1882:135-150).

The Alamo, Fort Larned, and Fort Dilts, as well as the Fort Laramie fortification ditches and attendant features conform very closely to field fortifications construction profiles described by Mahan (1847). They conform in construction and interior feature arrangement and closely follow the organization and layout advocated in the field guides of the era (Wheeler 1882).

Walker (2017) conducted a comprehensive geophysical survey of the Fort Union, New Mexico star fort or Second Fort site using a multi-instrument approach. Their work coupled with LIDAR coverage of the second fort area makes the site one of the most intensely studied earthworks in the west. Walker's team employed ground penetrating radar, magnetic survey, electrical conductivity survey, magnetic susceptibility survey, and electrical resistance survey techniques to non-intrusively identify a large number of historic features that had been presumed not to have survived the post-Civil War abandonment and salvage of the Second Fort. The use of

geophysical studies of earthworks and entrenchments at Forts Union and Laramie demonstrate the potential of non-intrusive studies to define the size and nature of these works as well as being a guide for future archaeological testing or excavations.

Figure 29. A LIDAR image of the Civil War star fort and portions of the Third Fort at Fort Union National Historic Site, New Mexico.

Riflepits and stone defensive breastworks are not an unknown feature of the Indian Wars, but they are not well described in the archeological literature. Stone breastworks, particularly those constructed and employed by Indian warriors have, until recently, been overlooked by archeologists. Stone breastworks are known to have been used by the Apache in Texas, Arizona, and New Mexico during engagements with the Spanish, Mexican, and US Army (Charles Haecker and Chris Adams, personal communication, Jan. 28, 2007) and by the Nez Perce during the 1877 campaign (Stephan Matz, USFS Archeologist, Salmon-Challis National Forest, personal communication Jan. 10, 2003), as well as others .

A series of rifle pits and artillery emplacements dating to the early days of the Civil War have been investigated in central and southwest Missouri. An 1861 Missouri State Guard encampment associated with the site of Owen Mill was mapped and by Klinger et al. (1989). They recorded at least one prepared artillery emplacement and a number of what are presumed to be rifle pits constructed on a bluff overlooking the Sac River. The pits were situated so as to be able to defend the artillery position if it was attacked.

A similar river bluff encampment was more extensively investigated by Garrow et al. (2000; Garrow and Holland 2005) that dated to a Union movement in early 1863 through the Ozarks. Archaeological remains of an extensive encampment were excavated and documented, along with one artillery emplacement.

Archeological investigations at the Reno-Benteen defense site, Little Bighorn Battlefield National Monument in 1958 (Bray 1958) focused on the excavation of the redoubt and several riflepits so that their contours could be reconstructed for interpretive purposes. The redoubt was archeologically tested and was noted prior to excavation as a prominent depression. As tested it was found to be approximately 10 feet in diameter with an original depth of two feet. The parapet was thrown up on the west and south sides (Bray 1958).

Two of the rifle pits investigated by Bray (1958:16-20) were oval-shaped. One was about four feet long and three feet wide. Its depth was not determined. The second pit was about six feet long and three and one-half feet wide. It was assumed to be about five inches deep due to the presence of a fired .45-55 caliber army cartridge case found at that depth. Three other presumed riflepits were also excavated in the immediate vicinity.

Two larger entrenchments were excavated on the Company H line. Entrenchment A, as restored, is about 27 feet long and two and one-half to three feet wide. The soil profiles and artifacts indicated an original excavation no deeper than 20 inches. Entrenchment B is 50 feet east of A. It is similar in dimension to A. This entrenchment's depth was from 19 to 21 inches.

Figure 30. An extended rifle pit as restored by Robert Bray and Don Rickey in 1958 at the Reno-Benteen defense site, Little Bighorn Battlefield National Monument, Montana (after Bray 1958).

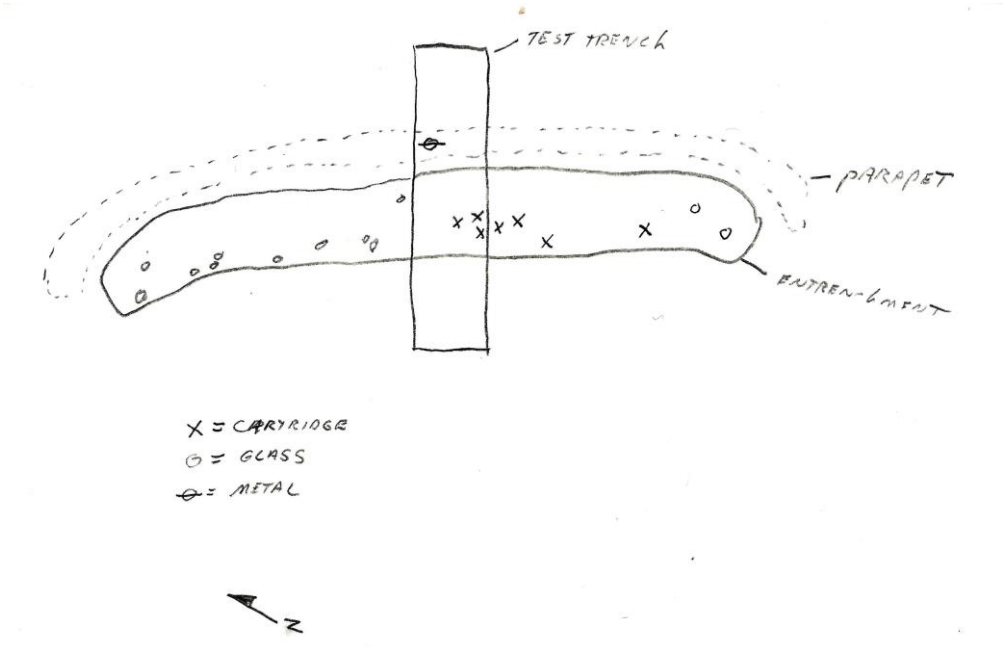

Figure 31. Bray's (1958) field map of the plan and profile of one of the restored rifle pits. The O's and X's mark the location of cartridges or cartridge cases deposited during the 1876 battle, and some fragments of glass bottles.

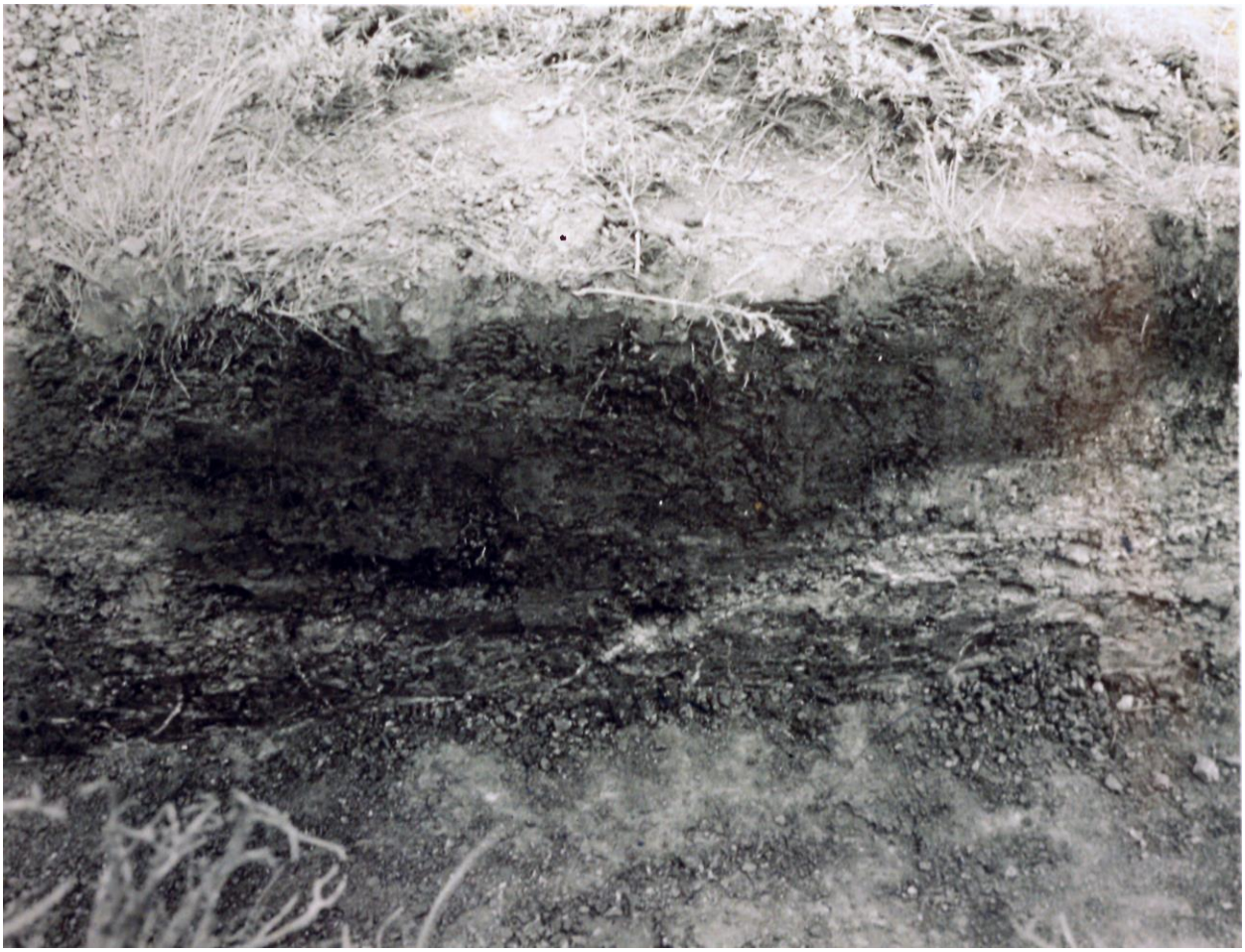

Figure 32. A photograph of the profile of a rifle pit at the Reno-Benteen defense site. Note the general lack of clear stratigraphy below the grass root layer (Bray 1958).

Another pit was also excavated on the Company H line. The so-called L-shaped pit contained two disturbed burials of soldiers killed during the battle. The shelter-pit description and drawings of Farrow (1881) are consistent with the L-shaped rifle pit excavated by Bray (1958) at the Reno-Benteen defense site. These descriptions and drawings also accurately describe the other reconstructed riflepits excavated at Reno-Benteen.

Bray found the pits difficult to define archeologically. The presence of slightly darker earth and/or the presence of some live or spent cartridges signaled the limits of the pits. In one case, designated the L-shaped pit, two burials of soldiers remains were encountered. Bray speculated that the reason why the pits were not clearer in profile was due to the fact that they were dug into a stratigraphically undefined soil. In fact, the soil is a moderately deep Pleistocene terrace remnant with little or no stratigraphic definition for nearly a meter's depth. Thus the soils thrown

out of the pit excavation were literally undifferentiated and when they washed back in there were few organic deposits to create a mottled soil so often seen in other archeological contexts. Bray believed the only sure way to identify a pit is if a depression still exists, was the presence of battle debris in the fill, a fire built in the pit that burned the soil or left behind charcoal, or where human remains were buried in the pit.

The years since Bray's 1958 excavations have seen new non-intrusive technology develop that changes his conclusions. A 2005 ground penetrating radar and electrical conductivity remote sensing study of portions of the Reno-Benteen defense site was conducted by Steven De Vore (2006) as part of the tour road rehabilitation mitigation project. That work did identify soil anomalies that are consistent in size with rifle pits. It appears that modern refined remote sensing techniques can locate these ephemeral shallow features in some circumstances.

Mud Springs, Nebraska was the site of a Pony Express and Overland Trail stopping point and road ranch. In 1865. It was occupied by Ohio volunteers guarding the Overland Trail during the Civil War. When tensions between Plains tribes and the army boiled over after the 1864 Sand Creek massacre Lakota and Cheyenne warriors attacked a number of ranches and military installations along the trail. Mud Springs station was attacked in early February and was besieged for two days. Archaeological investigations at the site (Bleed and Scott 2009; Bleed et al. 2014; Scott et al. 2016) located among other things a depression or pit on the top of the hill south of the Mud Springs Station. Surviving examples of Civil War era rifle pits are quite rare. For these reasons, the existence of a rifle pit at Mud Springs was judged to deserve careful investigation and documentation.

The observed depression was roughly circular, approximately 2 m in diameter and about 20 cm lower than the surrounding ground level. A test unit opened to assess the depression was laid out across what appeared to be the western margin of the original pit. The profile of the south wall of the text unit, however, did not reveal a clear excavated edge. Below the thin layer of matted vegetation, the pit fill consisted of mixed gray sand that contained charcoal flecks and artifacts including both stone debris and an unused percussion cap. There was no apparent edge to this level that might reflect the excavated edge of a rifle pit, but it was thickest toward the center of the depression. Below the gray sand layer, the soil consisted of more solidly compacted sandy loam. The divide between this layer and the mixed sand was distinct enough to potentially reflect an artificial surface. No artifacts were found below this level. The top of the undisturbed sandy loam seems to form a gentle depression that at its deepest point is some 60 cm below the current soil surface. Test of the potential rifle pit indicated that it was a shallow artificial feature that was excavated to have sloping sides.

Given the lack of definitive evidence that the Mud Springs feature functioned as a rifle pit it seemed appropriate to reassess the documentary and oral history resources from a different angle. The approach chosen was viewshed analysis that employed the power of Geographic Information System computer based programs. In military parlance this is known as terrain analysis or weapons fan analysis. Cumulative viewshed analysis is simply a means to identify those parts of a landscape that are visible from a given set of points. The term "viewshed" means those areas of a landscape that can be seen by a person from a given point on that landscape.

The Mud Spring rifle pit viewshed as calculated was based on the functional range of the firearms available at the time, thus the calculations are technically a weapons fan that is the viewshed of a person employing the rifle pit and taking the fighting range of his firearm into account. The field of view was calculated on a height of .5 meters above the ground surface and with a range of 700 meters. A separate viewshed was also calculated for that same person in the same position, but as a picket or lookout being able to scan the surrounding terrain up to 3000 meters (approximately 3,300 yards). The analysis demonstrated that an individual stationed in the rifle pit could easily see the areas to the north, south, and east giving effective warning time for anyone approaching from those directions. However, very little could be seen to the west, which from the archaeological evidence shows that warriors used that landscape to fire on the occupants of the Mud Springs station complex.

The terrain analysis gives a clear picture of what could and could not be seen. The station complex and the area to the south and east were visible. The approach from the west was much more vulnerable to surprise attack. If the rifle pit was occupied by soldiers after breaking the siege then other pickets or guards must have covered the western approaches. If the pit was constructed by the besieging warriors then they had an excellent tactical position to pour fire into the station and corral while maintaining excellent protection for the pit occupants. Given their warrior kinsmen were on their western flank, a view of that area was not necessary.

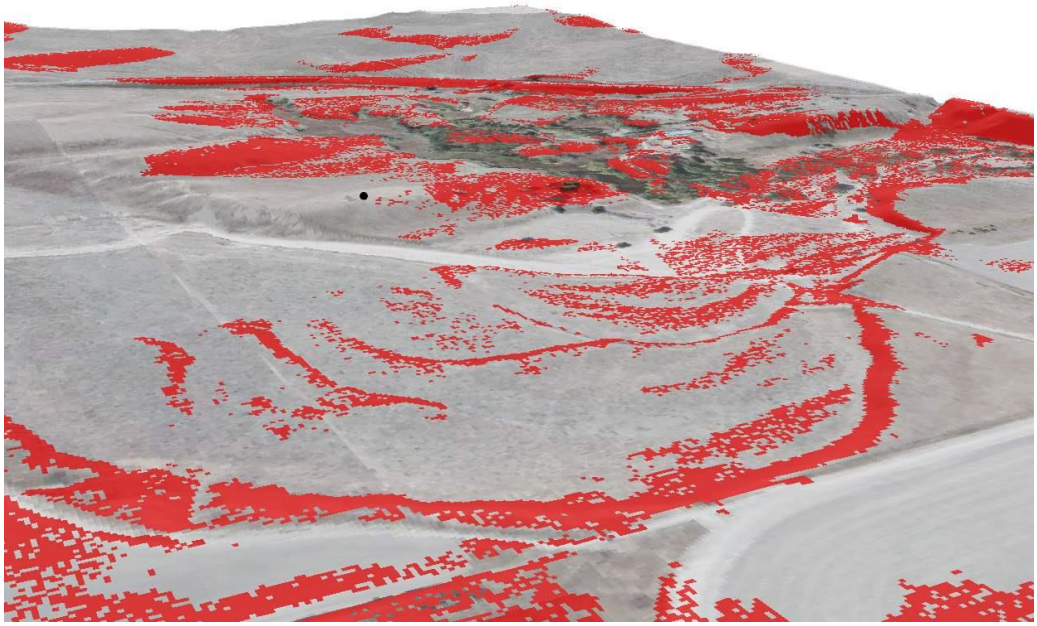

Figure 33. Viewshed or weapons fan analysis of the Mud Springs rifle pit (black dot) illustrating what could (red) and what could not be seen (gray) by an occupant of the feature (after Scott et al 2016).

The terrain analysis did not provide clarification as to who likely constructed the pit, but it did demonstrate what can and cannot be seen from the feature site itself. This alone is a valuable assessment tool. The converse is what could the soldiers and civilian stockmen see from the Mud Springs building they occupied. Assuming they were firing at their opponents from windows, probably crouching for maximum protection from incoming small arms fire, a terrain/weapons fan analysis using a 700 meter field of fire shows that the building occupants had an excellent field of fire in all directions with the exception to the ground as it dropped off from the hill to the south.

Coupling the two terrain/weapon fan analyses together may lend credence to the idea that the rifle pit was dug by army personnel after the siege was lifted. Pickets or guards stationed near the building complex would have had a good general view of all areas with the exception of the southern-most approach beyond the south hill. The rifle pit feature allows coverage of that area, minimizing the element of surprise by any attacker from any direction. While warrior construction cannot be ruled out, the overlapping viewshed and field of fire provided by guards walking their beat at the Mud Springs station and that provided by the rifle pit strongly argue for its origin with the army.

Just a few days after the Mud Springs affair the same warriors and soldiers fought at the Battle of Rush Creek. Here the soldiers were quickly surrounded by Cheyenne warriors sniping at them from 100 to 1000 yards away. The soldiers responded to the attack by corralling their wagons and creating a fighting perimeter by scooping out a series of riflepits in the sandy soil. The site was metal detected during two separate seasons of the University of Nebraska-Lincoln Archaeological Field School (Scott et al. 2011; Scott et al. 2016). Metal detecting located clusters of fired cartridge cases from Spencer rifles and F. Wesson carbines. The artifacts were found on the ground surface to as deep as eight inches. These clusters were located in spatially discrete areas and were postulated to have been riflepit locations. When LIDAR imagery became available it confirmed the supposition concerning the riflepits. The imagery clearly delineated at least seven slight earth mounds and depressions that were barely visible when standing on the ground surface. These seven areas probably represent several individual or extended riflepits in each of the seven areas. Natural taphonomy, including winds and the lack of grass growth, and early twentieth century agricultural grazing and very limited plowing had nearly obliterated the riflepit features. These very subtle remains were only seen in the LIDAR imagery.

Riflepits have also been investigated archeologically at Big Hole battlefield. The Big Hole battlefield riflepits are still visible today. A number of depressions are scattered across the terrace where the soldiers were besieged. A magnetometer survey was conducted in 1987 (Scott 1987). The results were negative in locating additional pits. The minimal amount of soil disturbance required to dig a pit as well as the absence of significant soil altering activities, or the inclusion of large metallic deposits precludes the likelihood that riflepits can be readily discovered through magnetometry. Advances in Ground Penetrating Radar and Electrical Resistance instruments and software suggest these techniques have a greater potential to define anomalies consistent with riflepit construction than does magnetometry.

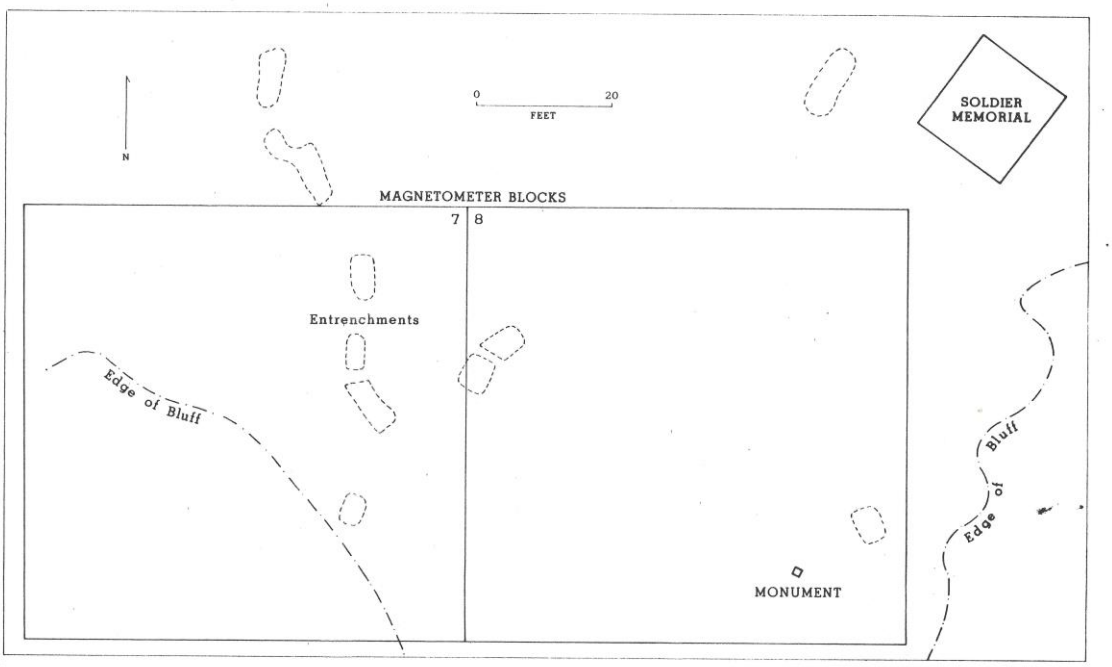

Figure 34. Plan view of the distribution of rifle pits and the geophysical grid at Big Hole Battlefield National Historic Site, Montana.

A single isolated riflepit, north of the main Siege Area riflepit concentration, was selected for test excavation during a park-wide metal detection survey (Scott 1994:36-39). The feature was defined as a shallow depression approximately three feet long and two feet wide. A two foot wide and eight feet long test trench was laid out diagonally across the depression.

The excavation revealed the first five inches of fill consisted of a pine duff and humus layer. Immediately below the duff and humus the pit outline was evident. The sterile soil surrounding the pit was a decomposed bedrock. It was very light in color, and appeared to be a sandy loam mixed with gravels and cobbles. The pit was distinguished by its fill. The fill was a mottled brown sandy loam and humus. The pit was dug into the native soil three to six inches and was 51 inches long and 24 inches wide. The eastern end was nearly straight walled with a depth of six inches. The western end was only three inches deep and the floor gradually rose from the eastern to western end. The feature floor undulated slightly. No artifacts were found in the feature.

The riflepit's excavated dimensions follow field fortification construction guidelines used by the army during the Indian Wars and Spanish-American War. The excavated riflepit feature clearly meets the expectations of how a shelter trench should be configured based on the historic documents.

Figure 35. One of the restored rifle pits found in the soldiers' siege line at Big Hole battlefield.

Figure 36. A trowel bayonet and a remnant of its scabbard recovered during the archaeological investigations at Big Hole battlefield. These tools were used to dig the rifle pits in the soldiers' siege line.

The riflepits used at the Big Hole are typical of entrenchments used throughout the Trans-Mississippi West. They appear to have been dug with a prescribed pattern in mind. The pit excavated in 1990 did not appear to have suffered significant erosion or deflation. The pit backfill appears to have eroded and slumped back into the pit itself. Undoubtedly some soil was washed or blown away, but the pit itself appeared stable and in good condition. The excavated depression provided a sense of what lay beneath the surface. It corresponded roughly in size and shape to the actual pit.

The Battle of the Lava Beds in 1873 saw both the Modoc and soldiers employ stacked rock features. One the Thomas-Wright fight site alone Wilson (2007) recorded and metal detected some 31 stacked rock features associated with both the soldiers and Modoc warriors fighting and defense of the site.

Figure 37. A stacked lava rock breastwork constructed by the soldiers fighting the Modoc at the Lava Beds in 1873.

Figure 38. A natural lava tube cave used by the Modoc as a defensive feature during the Modoc War.

Figure 39. An expedient stacked rock breastwork from the Modoc War. It is designed to blend into the surrounding landscape while providing protection to the defender.

Stacked rock features used as breastworks are not uncommon, but not often recognized by archaeological surveys. The Apache regularly constructed and used stacked rock features in New Mexico, Texas, and Arizona as both offensive and defensive features as exemplified by the 1881 Hembrillo battlefield in New Mexico Laumbach (2001a; b). The Apache had a series of prepared stacked rock breastworks associated with natural features that helped conceal them from casual observation. Army patrol camps in the Guadalupe Mountains, Texas, like Pine Springs, often have stacked rock picket posts or breastworks associated with them (King 2006; King et al. 2005; King 2006; King et al. 2008). These 1878-1880 army patrol camps were established near known Apache watering holes and springs as part of the strategic plan to limit their access to water in order to hasten their surrender. The army patrol camp rock breastworks tend to be larger, usually circular, or oval, and more regularly constructed than the stacked rock features seen in Apache and other Native American sites. The army associated features tend to conform in size to the one or two man shelter pits described in guidelines of the era.

Figure 40. A U.S. Army picket post at Pine Springs, Guadalupe Mountains National Park, Texas. This is a roughly circular stacked rock breastwork designed to provide protection in case of attack but also to serve as a picket post.

Figure 41. An Apache constructed breastwork at the Hembrillo battlefield. Note the use of natural boulders enhanced by the addition of small rock to form a breastwork that blends in with the local rock features. This is typical of Apache stacked rock breastworks. They were used for lookout positions as well fighting positions.

Discussion and Conclusions

The strong similarity in size and construction method of the archeological examples of entrenchments at Fort Larned and the Alamo, as well as in the riflepits at Fort Dilts, Big Hole battlefield, and the Reno-Benteen defense site, and the more formal field fortifications like those at Fort Union to the examples described in the period manuals and guides emphasizes that the term hasty entrenchment does not mean haphazard. Hasty entrenchments were a real type of earthwork that were constructed in a prescribed manner. Organized forces requiring hasty entrenchments to be dug in the presence of the enemy were trained and disciplined, and thus dug their hasty entrenchments in the manner in which they had been trained.

The Alamo and Fort Larned trenches are similar in construction style and were constructed by groups with similar cultural backgrounds, although separated by nearly 30 years in time. It is, therefore, assumed that organized military units will have a prescribed method for the construction of field entrenchments and fortifications. If the units were trained in the European style, then the earthworks are likely to resemble the prescribed pattern of that style.

It can be expected that where riflepits and other earthworks are found in the Trans-Mississippi West that were constructed by troops trained in United States Army techniques there will be a similarity expressed in their archeological remains. They may very well be difficult to define unless they were dug through two or more soil strata or left artifacts behind in the bottom of the entrenchment. Due to the high probability of a rifle pit's subtle surface manifestation, caused by short term usage and lack of depth, they may be very difficult to discern during surface inventory. Riflepits and field trenches will not necessarily be found spaced at regular intervals on battlefields. The essence of a hasty entrenchment was that it was meant to take advantage of any cover the terrain might offer. Deeper trenches and more formal fortifications are more likely to retain a definable archeological character such as mounds of earth representing the parapets or depressions identifying the actual excavated trench, bombproof, etc.

Indian rifle pits, mentioned so prominently in the historical sources, are not well identified. It may be assumed that Native American constructed riflepits will demonstrate less formality and structure than those constructed by formally trained troops. This assumption is based on the knowledge of the less structured tactics and rules of engagement followed by the Native Americans in the Trans-Mississippi west. This assumption requires more formal archeological testing to confirm or revise its basis.

In summary entrenchments in the Trans-Mississippi are not always clearly mentioned in the historic record. Many battle sites may have trenches or riflepits that are not mentioned in the historic record or only referred to in the most casual way. Archeologists inventorying battle sites should be aware that entrenchments may be present regardless of the statements found in the historic source material. Trenches and riflepits were ephemeral and hasty and thus may not receive mention in the source material.

Hastily dug trenches and riflepits are likely to exhibit minimal surface manifestations. Close examination of depressions and surface irregularities is warranted to locate these shallow features. Limited excavation suggests the shallow nature will make their discovery and documentation difficult, but not impossible. The Mud Springs pit fits the hasty rifle pit description very well. The test excavation findings are similar to those known from other western rifle pit sites that have been recorded or tested. The frustrating lack of stratigraphy that allows

clear archaeological interpretation is a function of the shallow purpose-dug short-term use for which the feature was construction. They are subtle features but important ones in understanding tactical use of the terrain in question. The use of LIDAR, other remote sensing techniques, and geophysical instrumentation are the means that are most likely to find anomalies that are consistent with rifle pit and earthwork construction.

Historical and archeological evidence indicate earthworks constructed by organized military forces will be constructed based on a preconceived pattern, in-grained during recruit training. The type and size of a trench, rifle pit, or other hastily dug feature will likely be consistent. The spacing of hasty entrenchments will take advantage of the protection or cover offered by the site's terrain. Spacing will be irregular, but size and shape will be similar between and among hasty entrenchments.

Hasty entrenchments utilized by irregular forces or other cultures are likely to be less formalized in size and shape. It is expected that spatial distribution is likely to be similar to that of organized forces in that the topography will dictate entrenchment placement to maximize protection of the occupants and to afford the greatest view of an enemy's approach.

During William Bent's ownership and use of Bent' New For as a trading post the building had many purposes. The siting of the building on the bluff allowed Bent to see anyone approaching his business from considerable distances. It also served as a clear statement that a post was present in this locale, and like Fort Union Trading Post, North Dakota it may have served as a symbol of dominance (Culpin and Borjes 1984). As a prominent man-made feature on the landscape it represents an example of signaling theory, developed out of an evolutionary framework in ecology, anthropology and biology, and based on the idea of "individuals as strategic decision-maker," who take the costs and outcomes of their actions into consideration to obtain the most advantageous benefits for themselves and their offspring (Bliege, Bird, and Smith 2005:221; Ziska 2013). Anthropology defines "Costly Signaling Theory" as grand displays of status or wealth, which sometimes are disadvantageous to the signaler. Signaling theory better explains the prominent location of Bent's New Fort better than the Culpin and Borjes (1984) dominance concept. Bent's New Fort and his trading business fit the costly signaling model well. The model is often amenable to terrain analysis as in this case.

The bluff is the key terrain element as it affords a marked advantage to the group who controls it. The building built by Bent was around 16 feet (3 meters) in height, which allowed him an additional commanding view of the avenues of approach. From Bent's New fort the occupiers could observe a significant area of the local landscape upwards of three miles (circa 6000 meters) to the east, west, and south, but only a few hundred meters to the north. The building and

earthwork served as cover or protection from enemy fire and was an obstacle that could prevent or delay the movement of military forces. The siting of the fort and earthwork maximized the observation capability of the occupiers but did not conceal it from approaching forces. Quite the contrary, the fort was highly visible as it was intended for its original use. As an Indian Agency it was also highly visible as intended, but as a military fortification it had no concealment features.

Fortifications, earthworks, and rifle pits are built features on a landscape. Their role and function on that landscape must be placed in context of their intended use. Large fortifications and earthworks were designed to signal dominance to an intended attacker. A series of fortifications surrounding an area or strategically placed on a landscape were meant to be interconnected by roads and trails that afforded their occupants means of supply and communication. As such they are models of interconnected sociopolitical organization in an anthropological perspective. They reflect a hierarchical societal organization that can be studied as part of the larger field of conflict studies.

Small, unassuming features such as breastworks and riflepits were constructed to conceal and protect its users rather than be a statement of dominance or control that large fortifications seem to be. These small and often ephemeral features need to be studied in the cultural context in which they were constructed. This may be the context of US Army warfare with Native Americans or the Union versus the Confederacy. These small protective features were dug or built for many different reasons during a conflict situation. That is the context, the conflict situation, in which these features should be studied and documented. A stacked rock breastwork laid among natural rocky terrain should be seen as a place of concealment that provided the user some protection during an ambush or a fire fight. Their presence and use did not often extend beyond the immediate combat action. They are often one time use features and need to evaluated in that context. A series of rifle pits or picket posts, or even interconnect rifle trenches forward of a larger field fortification suggests the points at which an enemy was expected to attack. Such features may well have been dug to conceal and protect their occupants, but their purpose was to provide a line of first warning and defense. These features are often equally ephemeral as those constructed for a battle or in the heat of a combat action.

Methods to predict the presence of an earthwork or fortification, and riflepits or shelter pits should employ terrain or landscape viewshed analysis. The dominate theory is based on military terrain analysis that afford researchers a solid and valuable model of land use. The U.S. Army maintains a regular series of training publications designed to make the conceptual basis of military activities available to its staff. The basic text currently used to introduce entry level officers to the full spectrum of military activities is *FM 3-0 Operations*. It is supplemented by an electronically available *Department of Defense Dictionary of Military Terms*

(http://www.dtic.mil/doctrine/jel/doddict/). These are the basic sources for ideas and vocabulary used in current archaeological studies of conflicted terrain. *FM 3-0* supersedes but clearly grows out of a series of Field Service Regulations presented between 1941 and 1993 and entitled *FM 100-5 Operations*. These publications, not to mention the array of literature that preceded them, can support archeological investigations since they serve as "ethnographic" literature on conflict and warfare. Archeologists have discovered and begun using ideas developed by military planners. The KOCOA system of terrain analysis (the acronym stands for Key Terrain, Observation and Fields of Fire, Cover and Concealment, Obstacles and Avenues of Approach), for example, has been used by archeologists to interpret conflict residues in tactical terms. KOCOA is a military landscape based or terrain analysis model used since World War II, with earlier antecedents, to allow units to critically examine and define landscapes used in battlespace or approaching or moving from combat areas. Military operations, however, cover a much broader range of activities and much more than tactics.

That land use or terrain analysis model that is operationalized using the KOCOA system is advocated and regularly required by the American Battlefield Protection Program of the National Park Service in their grants is widely used today in archaeological conflict studies (c.f. Scott et al. 20146. Beyond the predictive nature of the model comes the field methods to discover and record the nature of defensive and offensive features built on the landscape under study.

Perhaps the most obvious methods are various types of remote sensing ranging from multispectral aerial imaging, LIDAR, and simple aerial photography among others to aid in the identification of on and in ground anomalies that may be consistent with riflepits, shelter pits, breastworks, or earthworks. These data sources coupled with GIS data provide a powerful analytical tool to begin an investigation. Geophysical remote sensing techniques seem to be the best at defining more subtle in ground anomalies that are consistent with the features being sought. The specific technology employed in a given situation is dependent on the what instrumentation will provide the investigator the best contrast in the soil and environment being studied.

For historic conflict sites the metal detector is always a good choice of a simple geophysical instrument to deploy quickly and easily. Good quality VLF machines will reach a depth of about 30 centimeters in most soil types. For riflepits this is certainly very adequate. For deeper searchers Pulse Induction or Zero Voltage Technology are better choices for metal detecting instruments. They can reach as deep as one meter in depth and detect very small metal objects.

The tired and true test trench, test excavation, or block excavation is always a technique of value in the archaeologist's toolkit. Excavation of any sort will aid in determining the width and depth

of an anomaly, but as cautioned riflepits, shelter pits, and breastworks can have very subtle stratigraphic profiles. Excavators should be cognizant of that possibility when considering testing or excavation of a small defensive or offensive feature.

Archaeologists need to cognizant of the history of an area as well as have a knowledge of its prehistoric past. They need to be aware of the historic sources available to them to assess an earthwork, trench depression, rifle pit or breastwork in the proper context. A fire base in Viet Nam or in Iraq or any other modern conflict situation has many of the features that are associated with Civil War and other past conflict situations. There is a similarity and continuity in the construction of military protective features from the past to the present. Weapons systems have evolved, but the need to protect troops from enemy fire and attack is the same now as it was in the past.

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