

**“THE BATTLE RAGED...WITH TERRIBLE FURY:”
BATTLEFIELD ARCHEOLOGY OF PEA RIDGE NATIONAL
MILITARY PARK**

By
Carl G. Carlson-Drexler, Douglas D. Scott, and Harold Roeker

Midwest Archeological Center
Technical Report No. 112



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**United States Department of the Interior
National Park Service
Midwest Archeological Center
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This report has been reviewed against the criteria contained in 43CFR Part 7, Subpart A, Section 7.18 (a) (1) and, upon recommendation of the Midwest Regional Office and the Midwest Archeological Center, has been classified as

Available

Making the report available meets the criteria of 43CFR Part 7, Subpart A, Section 7.18 (a) (1).



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1. INTRODUCTION

The first years of the Civil War in the west focused on the question of the allegiance of Missouri. Southern sympathizers in the state wished to secede and join the pro-slavery cause, but were prevented from doing so by a large Unionist population focused in St. Louis and in other areas of the state. The August, 1861 battle of Wilson's Creek did little to settle the question, as neither side gained complete control of the state. A strong Union military presence, centered in St. Louis, governed that city and the Missouri River Valley (Shea and Hess 1992:1). The southwest corner of Missouri, on the other hand, remained under the sway of the Missouri State Guard (MSG), the state's militia, under the command of Major General Sterling Price, a Mexican War general and former governor. The MSG was, on the surface, endeavoring to maintain Missouri neutrality by keeping Missouri free of a strong presence of either combatant. In actuality, the Guard and its command structure were pro-Confederate, and, from the outset of hostilities actively sought and received assistance from the Confederate government (Piston and Hatcher 2000:33). The Federals began a campaign in early 1862 bent on dispersing the Guard or driving it from the state. That campaign would carry over into Arkansas, where it would culminate at the battle of Pea Ridge.

Pea Ridge was one of the largest battles to take place west of the Mississippi River, and certainly the most important strategic victory in the western South during the war (Figure 1). The Federal victory there secured Missouri for the North, and safeguarded St. Louis, a major transshipment point and a base of supply for later campaigns down the Mississippi River. The defeated Confederates shifted their attention away from Arkansas towards Tennessee and Mississippi, draining the region of most of its troops. Much of the fighting in Arkansas later in the war took place either between small armies, or between groups of partisans loyal to either side. In both Missouri and Arkansas, these partisan groups initiated a brutal form of warfare that closely resembles more recent episodes such as the conflict in the former Yugoslavia and Iraq.

Human occupation of northwestern Arkansas began by 5,000 years ago and continued uninterrupted until the present. This project focuses on one aspect of that occupation, the March, 1862 battle between Federal and Confederate armies. The detritus of battle, the physical evidence for conflict, is a wellspring of archaeological data that can greatly further our understanding of the battle. This effort describes the findings of a multi-year inventory of those artifacts relating to the March, 1862 battle.

Briefly, the Battle of Pea Ridge (Figure 2) began on the morning of March 7, 1862. The Confederate Army under the overall command of Major General Earl Van Dorn, including the Missouri State Guard, attempted to swing around the Federal right flank and fall upon the Union supply wagons parked near Elkhorn Tavern. Fatigue and poor roads forced a separation between the MSG and Major General Benjamin McCulloch's Confederate division, forcing the latter to take an alternate, shorter route to reconnect with Price's Missourians.

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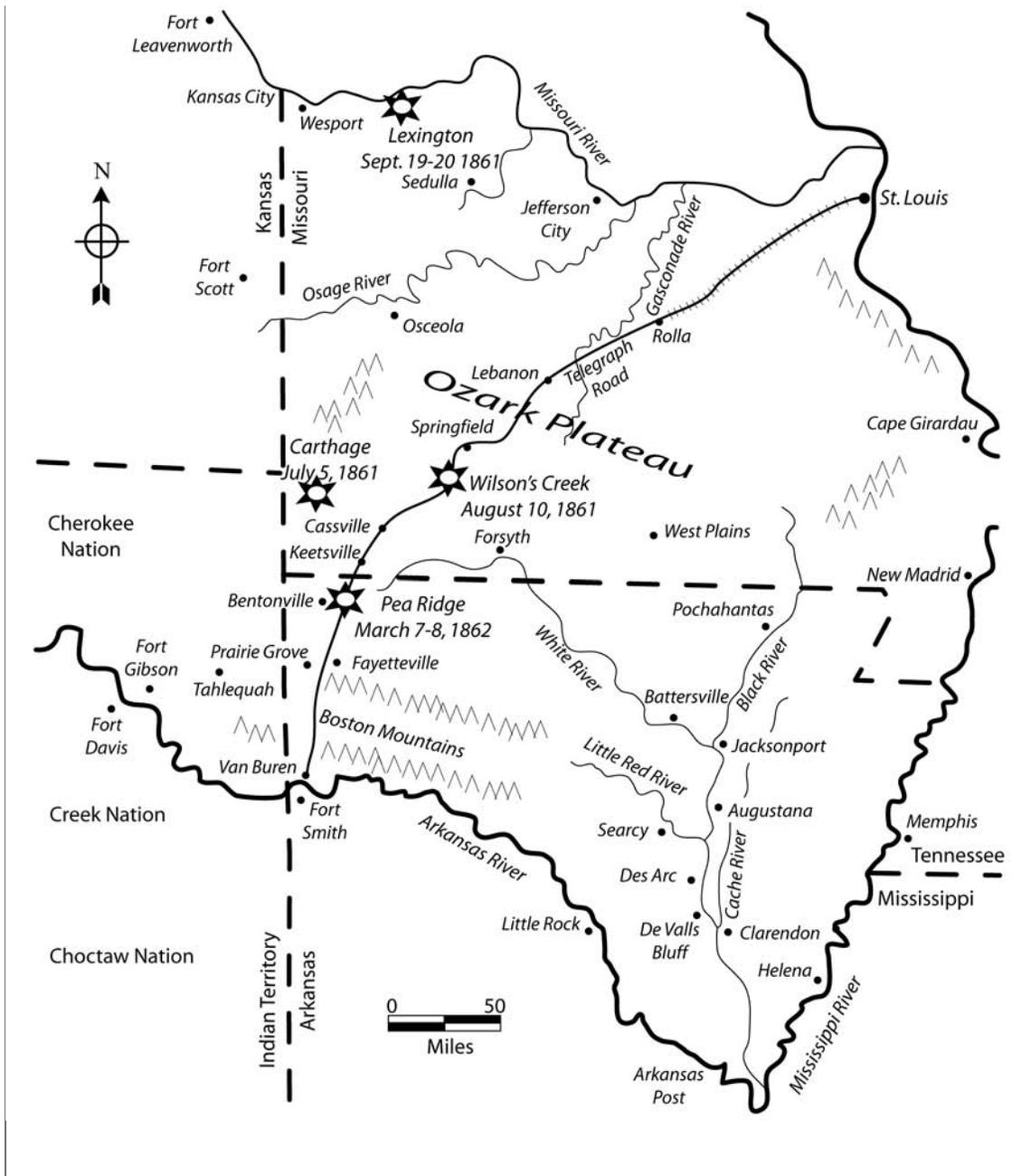


Figure 1. Pea Ridge National Military Park and the 1862 campaign.

McCulloch's men were discovered while traveling their shortcut and drawn into battle in the fields north of the small farming village of Leetown. Though possessing a marked numerical superiority, the Confederate attack stalled due to the loss of McCulloch and the second in command, Brigadier General James M. McIntosh. One disjointed Confederate advance by Col. Louis Hebert's brigade through Morgan's Woods made initial progress, throwing back two Illinois regiments, but was stymied and then broken up by Federal reinforcements. As the sun set, the Confederate troops, effectively leaderless,

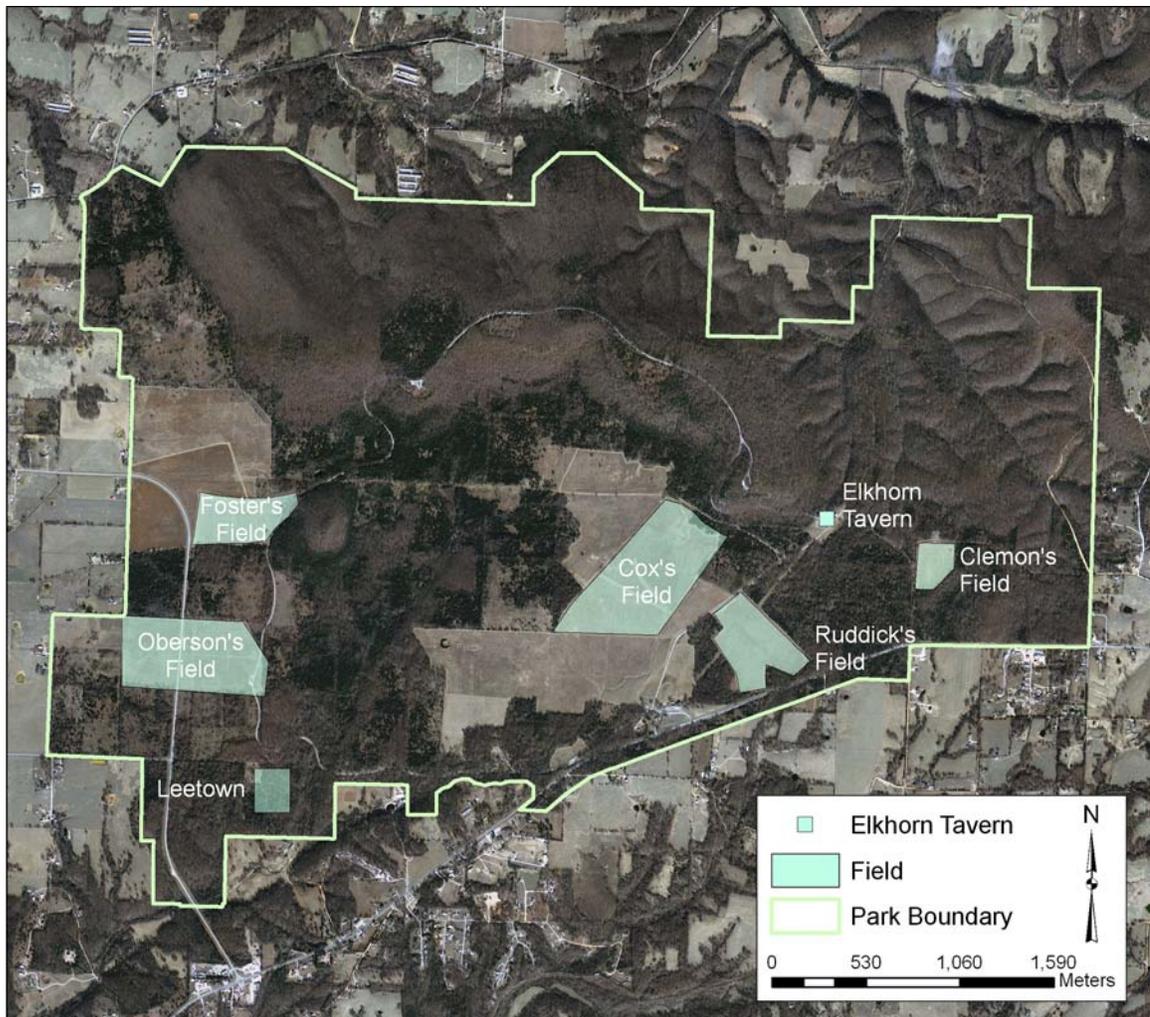


Figure 2. Pea Ridge National Military Park with major features noted.

marched away from the battlefield, some units marching to join Price and others moving back towards the crossroads where the flanking march began.

Further east, Price's men were on the verge of taking the Federal supply trains at Elkhorn Tavern when they were surprised by a Federal artillery battery sent to check their advance. After reducing that battery with a massive barrage, the Confederates continued their advance, only to run into arriving Federal infantry. Throughout the day, the Confederate's superiority in numbers allowed them to steadily push the Federals back from positions at Elkhorn Tavern and at Rufus Clemon's Farm. Darkness ended hostilities for the day, as the two sides settled in for a frigid night.

An artillery exchange broke out the next morning as the Missourians positioned themselves to renew their advance. A lack of ammunition caused the Confederate batteries to drop out of the fight early, leaving the Federals free to concentrate their fire on the Rebel infantry. For many Confederates, who had rested little and eaten almost nothing over the past three days, and without ammunition with which to return fire, this was simply too

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much to be endured, and Van Dorn ordered a withdrawal that became a rather disorganized retreat. A Federal infantry advance pushed away the remnants of the Confederate forces.

The Pea Ridge National Military Park Archeological Inventory

The National Park Service (NPS) has had an important role in preserving and protecting the nation's cultural heritage since its inception. Archeological resources, which are an important part of this cultural heritage, are present in most units of the National Park System, and many units have been created specifically to interpret and preserve archeological resources. Like all federal agencies, the NPS is obligated by the National Historic Preservation Act [section 110 (a)(2)], Executive Order 11593, and section 14 of the Archeological Resources Protection Act to identify, evaluate, preserve, and protect historic properties, of which one type is archeological sites. A 1991 Management Control Review of the Service's archeological program identified a critical high-risk material weakness in the basic inventory accountability of archeological resources on park lands. In short, the review indicated that the NPS simply does not know what its archeological resources consist of—their numbers, their locations, their significance—and consequently, NPS personnel cannot make informed judgments about their proper management.

Under the National Archeological Survey Initiative, an NPS task force created SAIP, the Systemwide Archeological Inventory Program (Aubry et al. 1992), a long-term approach to the objective of inventorying archeological resources on park lands. The program is intended to provide a framework for systematic, scientific research that locates, evaluates, and documents archeological resources. The importance of the SAIP is that it emphasizes research within a cultural resources management framework.

In Fiscal Year 2000 a park-wide archeological inventory was initiated at Pea Ridge National Military Park. The program was funded for a five-year cycle that ended in Fiscal Year 2004. The first year of the project was dedicated to developing a park-wide inventory research design in concert with park management needs. The research design (Scott 2000a), developed for both Pea Ridge and Wilson's Creek National Battlefield, called for an archeological inventory in each park, to identify, record, and evaluate for the National Register of Historic Places each site found. Prehistoric archeological inventory and non-Civil War related site inventory was conducted as a separate element under a separate research framework. In order to accomplish the non-Civil War archeological site inventory a cooperative agreement for the study of both parks was developed with the Department of Anthropology, University of Arkansas and directed by Dr. Marvin Kay. His inventory results are reported in a separate document. The Civil War battlefield was inventoried by the Midwest Archeological Center under the direction of Dr. Douglas Scott.

The Midwest Archeological Center's element of the project plan and research design had as its goals the study of each parks' historic resources, particularly those dating to the Civil War. The project goals were to use the historical record and existing archeological collections as baseline information, then conduct park-wide archeological inventory with

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a view to identifying and recording the historic archeological sites with a focus on those dating to the Civil War in order to build a comprehensive understanding of the battles' events and movements.

The use of prescribed fire to reduce unwanted vegetation types and encourage a more natural plant succession is well known in the natural resource arena. The effects of natural or wild fire and prescribed burning on archeological resources is well known, (Saylor et al. 1989) and has been shown to of little consequence in many cases where the fuel load is limited. Recent experimentally based research on the effect of fire on archeological resources by Buenger (2003) has confirmed and enhanced the earlier studies. Cool season prescribed fires in grassland and riparian habitats will not normally affect buried archeological sites, features, or artifacts. The current work at Pea Ridge confirms the validity of these studies and provided an additional case for the use of prescribed fire as a means to conduct more efficient archeological inventories.

During Fiscal Years 2001 through 2003 MWAC conducted metal detecting and visual inventories of the accessible areas of Pea Ridge. Today much of the park is covered with trees and dense underbrush. This vegetative regime has developed since 1956 when the area became a park (Figures 4, 5). Today park managers are actively reducing the underbrush and tree density through the use of prescribed fire and mechanical means in an attempt to restore the landscape and associated vistas to an 1862 appearance, at least in terms of the view shed. The battlefield inventory was limited to those areas open enough to allow metal detectors to efficiently sweep the landscape for battle evidence. Some large block areas were inventoried, such as Cox's and Oberson's Field, while Morgan's Woods and the belt of trees between Oberson's and Foster's fields was too densely packed with trees and underbrush to be able to use metal detectors effectively. The inventory efforts focused on those areas open enough to use metal detectors effectively, thus a substantial area of the core battlefield was successfully inventoried, but some areas were only covered at a reconnaissance level and others not at all, resulting in a bit of a patch work of inventoried zones. The inventoried areas are depicted on (Figure 3).

Pea Ridge National Military Park is located in northwest Arkansas about 40 miles north-northwest of Fayetteville. The battlefield, located in Benton County, includes the 4,300-acre site of the battle. Pea Ridge National Military Park was created by act of Congress on July 20, 1956. The Civil War battle is the primary interpretative emphasis of the park. However, several prehistoric sites have been documented within the park boundaries as well.

The entire battlefield and remnants of trenches overlooking Little Sugar Creek, both parts of the NPS property, are designated as 3BE184. The battlefield was listed on the National Register of Historic Places on October 15, 1969. No site or structure within the park bounds are so listed.

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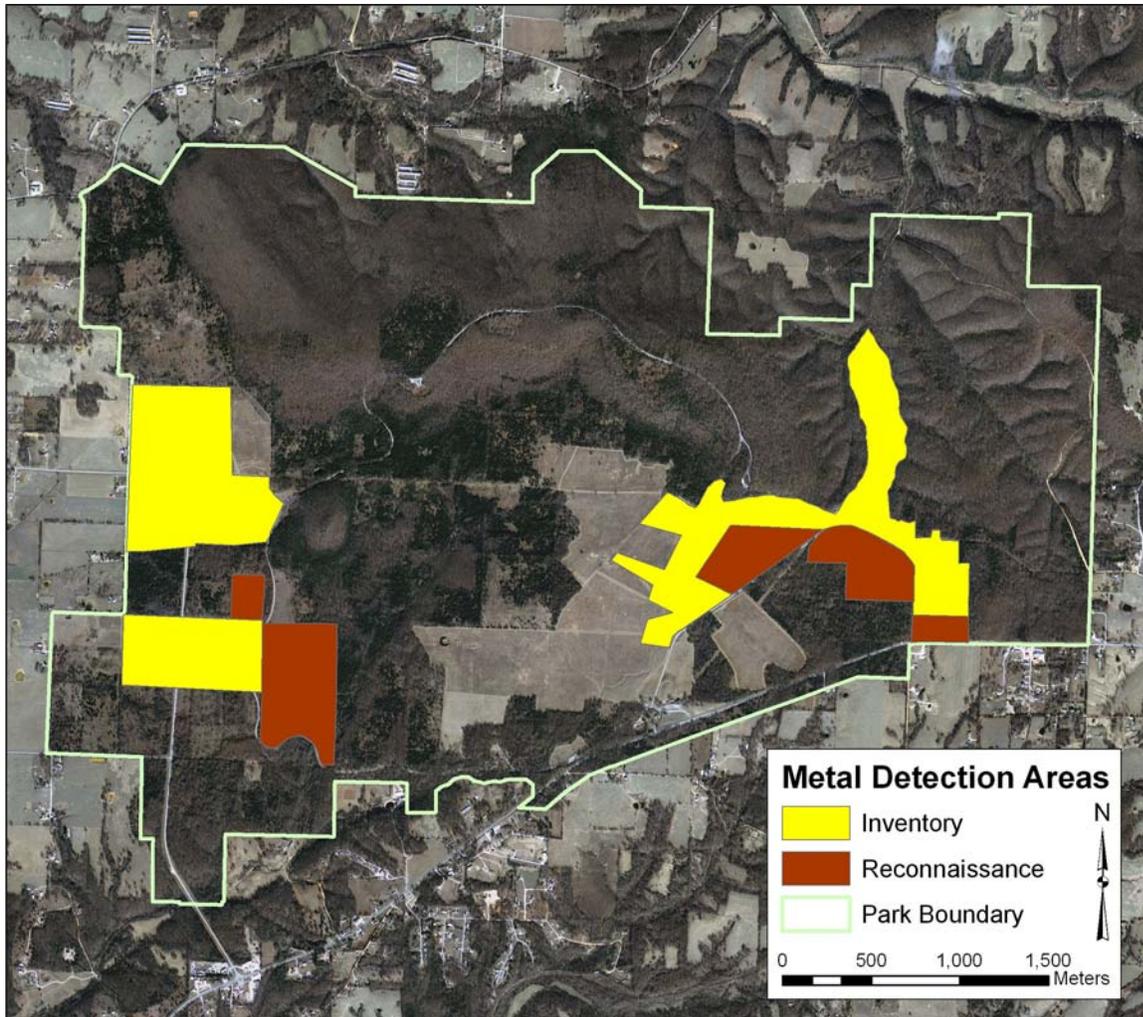


Figure 3. Metal detected inventory areas at Pea Ridge.

There are five archeological sites recorded in the park. Besides the battlefield entire, mentioned above, the other sites are prehistoric in age, three lithic scatters (3BE512, 3BE513, and 3BE589) and Winton Spring (3BE305), a small pool where lithic materials have been recovered.

Previous Archaeological Investigations in Pea Ridge National Military Park

Leetown Excavation

The first formal archaeological investigations to take place at Pea Ridge National Military Park was performed under the direction of Rex Wilson in 1965 under the aegis of the National Park Service's Southeast Regional office in Richmond. Wilson focused on identifying Leetown, the small farming hamlet south of the fields where McCulloch's Confederates and Osterhaus's Federals stumbled into each other on March 7th.



Figure 4. A 1903 plat map of the Pea Ridge battlefield showing land ownership.



Figure 5. A 1940 aerial photograph of the Pea Ridge area showing farmsteads and the significant amount of clearing that occurred prior to establishment of the park.

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Wilson had two research goals, to identify remnants of structures that would isolate the location of Leetown and to identify possible graves in a small abandoned cemetery. Union surgeons operated a field hospital in Leetown during and after the battle, and may have interred some soldiers who died of their wounds in the cemetery. Wilson was not able to conclusively identify structure footings, but did find ample evidence for buildings once standing in the study areas. Wilson identified, through trenching, 17 possible grave shafts, oriented east-west. 13 of the 17 (76%) showed depressions that Wilson attributed to the bodies being removed for reburial. This could mean that they were soldier graves that were later moved to other cemeteries. Two of the supposed civilian grave shafts are presumed to be burials for children, in that they are “much shorter” than the other grave shafts (Wilson 1965:7). Wilson also notes that a freedman named Ike might be interred in one of the non-disturbed graves. No effort was made to actually expose human remains, as Wilson only identified the bounds of the shafts. Wilson did not have access to the Fayetteville National Cemetery records of disinterments from the Pea Ridge battlefield. Although a number of burials were recovered in the vicinity of Leetown there is no specific statement in those records indicating that the remains were removed from a cemetery (Appendix 1). Geophysical investigation of the cemetery coupled with limited test excavations could help to resolve the question without actually disturbing any burials that may remain in the cemetery at Leetown.

Other attempts to find buildings associated with Leetown and evidence for the road that once passed through it proved unsuccessful. Similarly, excavation units in the backyard of Elkhorn Tavern yielded only post-Civil War artifacts. A search for a mass burial



Figure 6. Rex Wilson’s 1965 excavations in Tanyard hollow.

trench near Curtis’s headquarters identified only a pit used to bury trees felled by a storm in 1963, which may have obliterated the mass grave. It is important to note that the bodies were removed after the battle for reburial, and that it is, as Wilson notes, unlikely that the trench made in 1963 disturbed actual burials, but may have destroyed the remains of the pit. Wilson also identified three clay-lined tanning vats in Tanyard Hollow (Figure 6), which were marked with steel reinforcing rods prior to backfilling (Wilson 1965:11).

Wilson’s method of investigation employed two foot wide test trenches that were 100 feet long usually placed at right angles or parallel to one another. This “slit” trenching method was in common usage by

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archeologists practicing in the 1940s through the 1960s. While effective on prehistoric sites it was not as useful in defining historic features, although that was generally not recognized until later in the decade of the 1960s.

During the 2003 field season, William Volf (2004) conducted an electrical resistivity survey of portions of the Leetown site (Figure 7). He was able to locate several anomalies that are consistent with house and outbuilding sites. Subsequently Jason Hermann (2004), a master's student at the University of Arkansas reinventoried the area using other geophysical instruments. He also enlarged the search area. He confirmed the anomalies noted by Volf and located additional features including a possible road alignment.

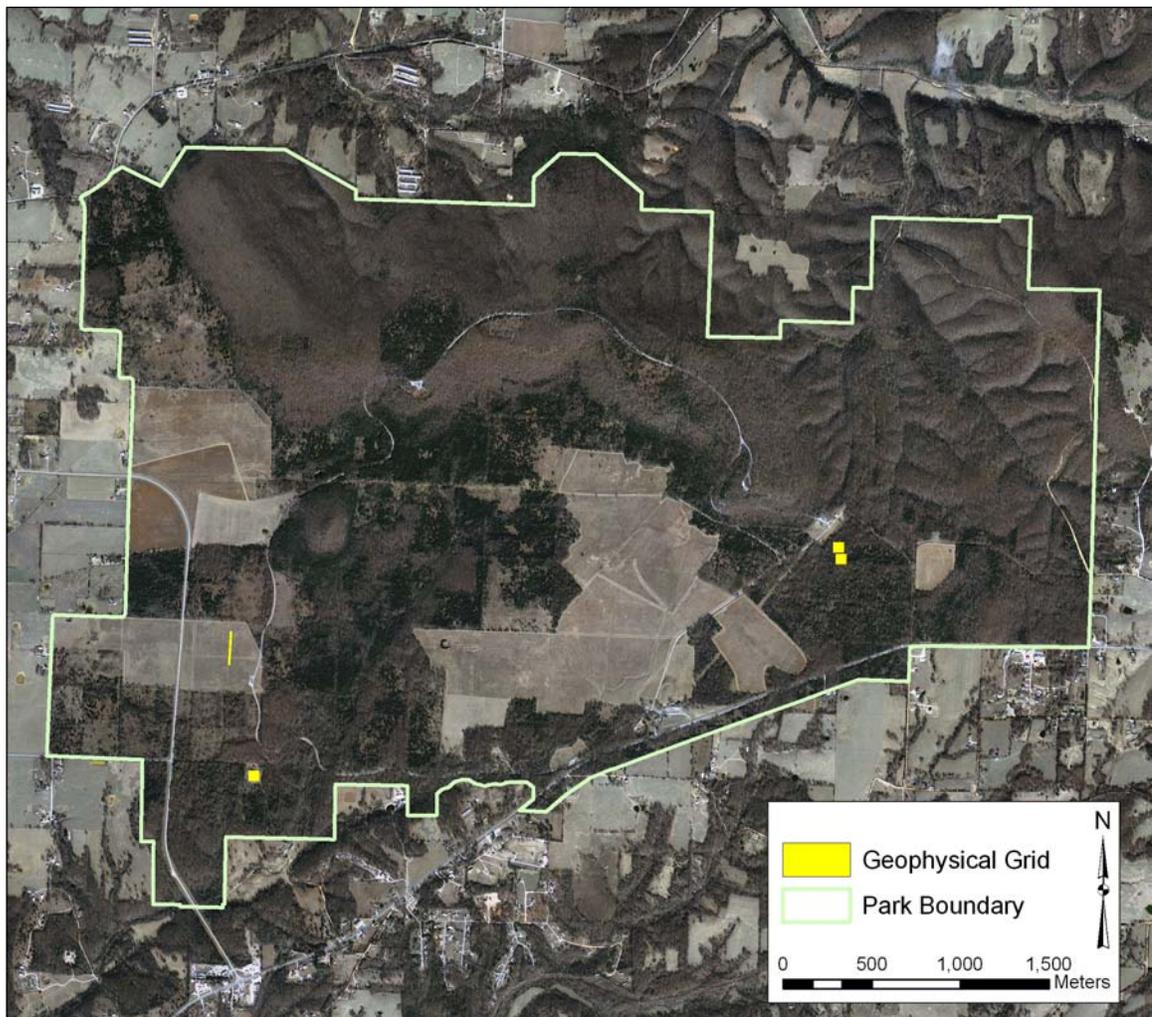


Figure 7. Locations of geophysical remote sensing grids at Pea Ridge.

In 1987, Roger Coleman, then of the Southwest Regional Office in Santa Fe, conducted an inventory of site of a paved trail to be constructed between Elk Horn Tavern and the two Civil War commemorative monuments west of the tavern site. Coleman (1988) conducted an intensive visual inventory of the trail route and shovel tested the alignment in 10 foot intervals. He located only six historic artifacts associated with the occupants of

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the tavern. He also located two prehistoric sites (3BE12 and 13). He considered the sites disturbed and eroded to the point they were not eligible to the National Register.

The National Park Service decided to construct a small equipment shed near the visitor's center in 1993. In April of that year, James P. Harcourt of the Arkansas Archeological Survey, under contract with the park service, conducted a Phase I cultural resources survey of the proposed construction site, measuring 90x50m. This was done to comply with section 106 of the National Historic Places Act of 1966. Harcourt (1993) performed a records check on the parcel of land, then excavated shovel test holes in a 5 meter grid across the entire survey area (southeast corner of Section 35), recording and bagging recovered artifacts separately.

Harcourt uncovered no artifacts related to the battle, which was unexpected given the proximity of the site to the battlefield. Extensive surface collecting from the time of the close of hostilities through the establishment of the park may have removed a substantial amount of material from the project area. Additionally, studies of battlefields have repeatedly indicated the inability of shovel testing to recover significant amounts of battle related materials. Cornelison and Cooper (2002) dramatically illustrated this during their investigations at Chalmette Battlefield in Louisiana. Harcourt did locate a few pieces of prehistoric lithic debris, but determined them ineligible to the National Register.

A planned expansion of the park maintenance facility in the spring of 2004 caused the park to clear some of the brush and trees to the west of Harcourt's inventory area. A small field stone marker was located that appeared consistent with a grave. An upright stone slab had the letters SAM scratched on one side. The area was confirmed, by a former land owner, to be the site of the burial of his favorite cat, Sam.

Oberson's Field Remote Sensing

In March 2002, Dr. Kenneth Kvamme and students from the Department of Anthropology's Archo-Imaging Lab at the University of Arkansas conducted a magnetometer survey of a 20x200m swath of the Leetown battlefield (Kvamme 2002). Using a Geoscan Research FM-36 fluxgate magnetic gradiometer, Kvamme and his students took readings every 0.25 meters along transects spaced 0.5 meters apart. The data collection took place in the northeast corner of Oberson's Field (Figure 7) on March 10 and 27, 2002. The project identified a number of anomalies, including point anomalies which Kvamme believed were metal artifacts, broad anomalies (2-7m in diameter), which could either represent large pieces of iron or long metal objects running parallel to the direction in which the gradiometer was carried, or "prairie mounds", which are natural features stemming from aeolian deposits (Kvamme 2002:3).

Douglas Scott and his field crew swept the survey area with metal detectors during their 2002 field session, recovering a number of Civil War artifacts associated with point anomalies. While Kvamme's data appear to clump into three groups of data, the

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identification of those clusters as skirmish lines is at best a hasty conclusion to draw, due on the narrowness of the survey tract, a point which Kvamme notes (Kvamme 2002:6). Of the point anomalies identified and excavated by Scott's crew, 37% (16 of 43) could be associated with the battle. Expanded sampling of the area, particularly areas already swept with metal detectors, could test the relative effectiveness of each technology. Additionally, archeological testing of the gradiometer data through limited excavation of areas within the survey area could provide valuable insight in developing the methodology of battlefield archaeology.

ARPA Investigations

Since Pea Ridge National Military Park was added to the Midwest Region in the mid-1990s, three violations of the Archeological Resource Protection Act of 1979 (ARPA) have been responded to by Midwest Archeological Center staff. The first such violation occurred over the Labor Day weekend, 1999. Dr. Vergil Noble traveled to Pea Ridge and documented a dozen small holes dug by a looter near the western park boundary near Highway 72. Dr. Noble reopened the looter's holes, finding a few ferrous artifacts likely discarded by the looter, and evidence (rust-stained soil) of some artifacts being removed. Working in cooperation with Law Enforcement Rangers Robert Still of Pea Ridge NMP and Sam Martinson of Wilson's Creek National Battlefield, and Archeologist David Hayes of Buffalo National River, Dr. Noble collected soil, iron objects, and a small piece of whiteware to be used as evidence.

On January 23, 2000 Dr. Douglas Scott was contacted by Ranger Still regarding another ARPA related investigation. Scott traveled to the park and assisted by then Buffalo River archeologist David Hayes aided Rangers Still and Martinson in the identification of 99 Civil War era artifacts taken from the Clemons field area and areas to the south of the field. The investigation team was able to identify 104 looter holes. One Robert Beeson was convicted of the theft on June 1, 2001. Mr. Beeson was sentenced to four months in federal prison, a year's supervised probation, 400 hours of community service and required to pay \$16,508.00 in restitution to the National Park Service (NPS Morning Report, June 22, 2001).

Another incident was reported on November 13, 2001, this time with Scott responding. Officer Still led Scott to six recently dug holes near tour stop 4, which commemorates the involvement of Native Americans in the battle. Again, some scraps of iron which were likely discarded by the looter were in the area, which were documented, as well as the dimensions and contents of the holes, which were carefully re-excavated. A value of \$10,227.25 was placed on the damage done to the archeological record.

Student Research Projects

To date, three research projects have been performed on elements of the Pea Ridge archaeological collection. In 2002, Don Arp, a graduate student in the University

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of Nebraska's Department of Anthropology and Nebraska Wesleyan University's Forensic Science Certificate Program analyzed two anomalous conical bullets. These bullets exhibited parallel angled incised striations, which Arp terms "scoriations" (scoring + striation = scoriation), running around the skirt of the ball (Arp 2002:2). Arp determined that these "scoriations" represent an experimental batch of prewar ammunition that was hurried to the front as to answer the army's ammunition needs. The striations, more properly termed roulettes, were likely used to improve the adherence of cartridge paper to the ball during manufacture, making the round less likely to disintegrate in transit or to fall victim to moisture (Arp 2002:5). While statements to the effect that both bullets were "scoriated" on the same machine are not well supported, and some confusion in terminology is noted, Arp's conclusions as to the function of the "scoriations" are likely correct.

In 2003, Alicia Coles, Joel Masters, and Carl Drexler analyzed the microstructure of a series of artillery shell and case shot fragments from Wilson's Creek National Battlefield and Pea Ridge using thin sectioning, trace element analysis and the principles of fracture mechanics samples (Coles 2004). They were able to determine that while all the artillery fragments examined were made of gray cast iron, there was much more uniformity in the manufacturing process of the Union artillery rounds studied as opposed to the fragments originating with the Confederates. Uniformity was somewhat greater at Pea Ridge than at Wilson's Creek for both armies, although the Union artillery was of nearly complete uniformity by Pea Ridge. This was most likely due to the fact that much of the ordnance fired at Wilson's Creek, the earlier and one of the first Western battles in the war, probably was obtained from many sources, possibly even from stocks as far back as the war with Mexico in 1848. This suggests that foundries were following established manufacturing procedures in making shot and shell for the army.

By the time of the battle at Pea Ridge, enough ordnance would have been fired in the war that the ordnance found at Pea Ridge was likely manufactured just before the battle and would have been procured from fewer suppliers thus providing more uniformity. They also found that the metal of the Union artillery fragments showed evidence of being undercooled during the manufacturing process. They concluded that this may be due to the presumed season of manufacture. Pea Ridge was fought in the spring and the ordnance was likely produced within the few months before the battle. They believe the ambient temperature of the foundry in the winter may have assisted in the retention of heat in the mold. The artillery fragment analysis demonstrates the potential for additional research of artillery shell and case shot fragments from archeological contexts.

Finally, in 2004, Carl Drexler, a graduate student in the University of Nebraska's Department of Anthropology, completed a study of artillery artifact standardization for his Master's thesis (Drexler 2004b). By measuring the diameters and weights of canister balls and the uniformity of thickness in shell fragments recovered from the battlefield, Drexler found that there was a statistically significant difference in the level of standardization exhibited by Union and Confederate/Missouri State Guard ammunition. These differences were attributed to infrastructural differences between the combatant cultures (Drexler

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2004b). Elements of this work were presented in papers at the Society for Historical Archaeology meetings in St. Louis (Drexler 2004a), the Society for American Archaeology meetings in Montreal (Drexler, Coles, and Masters 2004), and at the 123rd Nebraska Academy of Sciences (Drexler 2003).

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2. A BRIEF BATTLE HISTORY

In order to properly frame the artifact analyses presented here, a short history of the Battle of Pea Ridge is needed. Not only does this provide a historical context, it is also a description of the depositional event. This is perhaps the great luxury of battlefield archaeology in that, due to the historical record, more than any other area of archaeological research when and how the artifacts entered the archaeological record.

The Battle of Pea Ridge occurred at the end of one of the most arduous campaigns conducted by either side in the west during the Civil War. Rife with political violence prior to the war and hotly contested during the summer of 1861, Missouri was largely devoid of organized Confederate military forces by January of 1862. Only Major General Sterling Price's Missouri State Guard, a pro-Confederate militia force, remained. If Price could be defeated and his army broken up, Federal forces would be free to invade Arkansas, Louisiana, and Mississippi. Price had to go (Shea and Hess 1992).

The man chosen to break up the Missouri State Guard was a West Point-trained Iowa congressman named Samuel Curtis. On January 25, 1862, the 12,000 strong Army of the Southwest, commanded by Curtis, stepped off from its base of operations at Rolla, Missouri, heading south. The Guard, now camped around Springfield, Missouri (Shea and Hess 1992:5), numbered around 8,000 poorly disciplined, badly provisioned, but ardently secessionist men. The Guard's commander, Major General Sterling Price, realized that his force could not contend with the Federals without Confederate assistance. The nearest that could be had was General Benjamin McCulloch's 8,700 man army, camped at Cross Hollow, Arkansas, just over the state line, north of Fayetteville. McCulloch could not be induced to march north to support the Guard without approval from Major General Earl Van Dorn, newly appointed commander of the Trans-Mississippi Department, which included Arkansas, the Indian Territory, most of Missouri, and Louisiana north of the Red River (Hartje 1967:104). Since the Confederates would not come to the Missourians, the Missourians went to the Confederates. The Guard joined McCulloch's men at Cross Hollow on February 17.

The land that both Northern and Southern troops had to traverse is part of the Ozark Plateau, an uplift found in western Arkansas and southern Missouri. The area is covered in pine and hardwood forests, whose timber made a select few very rich in the antebellum years (Brandon, et al. 2000). Settlement at the time was sparse, with only 435 surnames listed in the 1850 census for Benton County, where Pea Ridge was fought (U.S. Bureau of the Census 1987). The majority of the population lived in dispersed settlements, producing little more than was needed for survival (Cutrer 1993).

Consequently, the region could not provide enough forage to support an army for a long period of time. Because of this, Curtis had to halt his advance at Cross Hollow amidst the smoldering remains of the winter quarters burned by the Confederates as they fell back to the Boston Mountains around Fort Smith. To move any farther from the railhead

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at Rolla would have overtaxed the supply chain, which was almost 250 miles long at this point (Shea and Hess 1992:51). See Figure 1 for a map of the campaign region.

Taking refuge in the Boston Mountains, the Missouri State Guard and McCulloch's Division were combined under the command of Major General Earl Van Dorn, a bold if somewhat reckless cavalier. Van Dorn, even before he arrived at Fort Smith, ordered an immediate lunge north against the Federals (Shea and Hess 1992:57). After a series of forced marches that afforded the troops little rest, Van Dorn's army had succeeded in maneuvering Curtis out of Cross Hollow and forcing the Federals to retire to the safety of their entrenchments overlooking Little Sugar Creek, near the Missouri line. As darkness fell on March 6, it was clear to both sides that battle would commence in the morning.

Instead of assaulting the entrenchments head-on, Van Dorn ordered the army to set out immediately on a march around the Federal right flank. If successful this maneuver would sever the Federal communication and supply lines, force the Federals to try and break out, and put the Confederates at a distinct tactical advantage.

A daring plan on paper, it collapsed when implemented. First, the Confederates had been on the march almost constantly for the past two days, barely pausing to eat or sleep. Many who had not already dropped from the ranks were on the brink of collapse. This was particularly a problem for the men of McCulloch's Division, who were in winter quarters until recently and were out of shape. To add to their troubles, there was no bridge over one of the creeks that had to be crossed, meaning that all 16,500 men in the army had to traverse a single log, creating a tremendous bottleneck (Shea and Hess 1992). Finally, Union general Grenville M. Dodge felt that such a move might occur, and ordered his men to fell trees across the road, creating further obstacles.

As a result, when dawn broke, the Confederates were split in twain. The Missouri State Guard was nearing the Telegraph Road, which would take them due south into the Federal rear. McCulloch's Division, on the other hand, lagged far behind. In an attempt to save time and make up the distance, McCulloch ordered his men to turn south at Twelve Corner Church, and to follow the Ford Road around the south side of Elkhorn Mountain, rather than following the Guard on the Bentonville Detour (Figure 2), which passed around to the north (Cutrer 1993:296).

Leetown

Federal commanders had been receiving word from nervous pickets and scattered cavalry scouts all night about a large body of troops moving on the Bentonville Detour. Curtis remained convinced, however, that the main threat was still lingering somewhere in front of the trenches overlooking Little Sugar Creek. To be thorough, he sent a brigade-sized (roughly 2,000 men) force north under the command of Colonel Peter Osterhaus to check for a raiding party or possible diversionary force that might be operating in the Federal rear (Shea and Hess 1992). Osterhaus, moving at the head of the force with parts

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of two cavalry units and Capt. Gustavus Elbert's 1st Missouri Flying Artillery, emerged from a wood on the southern edge of Foster's Field, and caught site of McCulloch's entire division moving in columns around the base of Elkhorn Mountain, less than a mile distant. Osterhaus described the scene by saying "debouching from this timber [into Foster's Field], I came in sight of a large force of the enemy, mostly cavalry. All the open fields to my front and right were occupied, and the road from Bentonville was filled with new regiments arriving" (Osterhaus 1971[1883]:217).

Shocked, Osterhaus, who had perhaps 2,000 men to pit against McCulloch's 7,000, ordered the 1st Missouri Flying Battery to unlimber and open fire while he rode south and ordered the infantry and other artillery batteries to form a line in Oberson's Field, just south of Foster's. The first rounds from the Missouri battery crashed directly amid McCulloch's men, none of whom seem to have noticed the Federal gunners unlimbering in the field just a short distance away (Cutrer 1993:298). McCulloch ordered Capt. John Good's Texas Battery to return fire. Good's men sent only one shell towards Elbert's men before their field of fire was blocked by a party of cavalry. Meanwhile, the bulk of McCulloch's cavalry, almost half of his total force, wheeled into position and charged across Foster's Field, riding down the artillerymen and their meager cavalry support (Shea and Hess 1992). At the same time, General Albert Pike's brigade of Native Americans swooped down from the north, contributing to the taking of the battery (Cutrer 1993:298).

Only a few of the Confederates pursued the Federals into the woods that separated Foster's Field from Oberson's. As they emerged in the north side of the latter field, they saw for the first time the Federal infantry and artillery falling into line there. They reported such to McCulloch, who decided that he could not leave the field with such a large force so near at hand, and would have to break them up before proceeding to meet with Price. As his men formed lines of attack in Foster's Field, McCulloch rode forward to survey the ground and plan the attack. As he did, he ordered Good to re-deploy and to shell Oberson's Field. Unbeknownst to him, a group of skirmishers from the 36th Illinois Infantry lay close by, watching for movement in the trees. McCulloch rode right to them, and was dropped from the saddle with a ball through the heart. His second in command, Brig. Gen. James McIntosh, was killed not fifteen minutes later, leading one of the Arkansas regiments into battle.

This left Colonel Louis Hebert in command. Unfortunately, McCulloch had ordered Hebert to the east before meeting his demise, with orders to advance when Hebert heard the gunfire that would signal the rest of the division's attack. Hebert misinterpreted the shots that killed McCulloch as being that signal, and ordered his men forward, crashing through the tangled thicket known as Morgan's Woods. Consequently, he could not be reached with the news that he was in command of the entire division. The next in the chain of command was General Albert Pike, who failed to take control of the situation. Few other commanders knew that McCulloch was dead (the general's staff tried to suppress the news for fear of harming morale), so no one took the tactical initiative. Hebert's men would attack without the support of the rest of the division, meaning that over half of the

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Confederates on the field did not fire a shot during the entire day (Cutrer 1993:306; Shea and Hess 1992:143). Their overwhelming numbers would likely have brushed Osterhaus's men aside readily.

Additionally, none thought to order more artillery forward. Good's men fired a long-range, but ultimately ineffective barrage at the Federals in Oberson's Field, but the other batteries present, Hart's, Provence's, and Gaines's Arkansas units, took no part (Good 1971). Some histories of the battle (Bears 1962) indicate that Hart's battery fired a few rounds to cover the retreat of Hebert's men, but this would not have happened until late in the day, if it did in fact happen.

Federal batteries on the field, however, played a very prominent role in the engagement. While the 1st Missouri was being overrun in Foster's Field, Hoffman's 4th Ohio Battery and Welfley's Independent Missouri Battery deployed in Oberson's Field. Following the death of McCulloch, the two batteries began shelling Foster's Field, firing blindly over the belt of trees that separated it from Oberson's. Welfley laconically noted in his after action report that his battery "kept up a steady fire on the enemy for about four hours, after which the firing ceased" (Welfley 1971[1883]:236). The lack of description bespeaks the relative dearth of fighting in Oberson's Field, where Welfley's Battery stood. Unlike Good's bombardment, occurring at the same time with just as little direction, most of Hoffman's and Welfley's rounds fell amidst the massed Confederate troops, creating confusion and casualties that further unbalanced the situation for the Rebels, who stood under "the continued fire of ball, shell, and shot from the enemy's guns" (Stone 1971[1883]:303). Additionally, when Hebert's attack through Morgan's Woods was detected, both Federal batteries opened with "a heavy fire of shell and grape [canister]" (McNair 1971[1883]:294) into the advancing Confederates, helping to slow and confuse their advance.

One other Federal battery arrived later in the day, just in time to be overwhelmed by Hebert's men. Captain Peter Davidson's Battery A, 2nd Illinois Light Artillery deployed on the edge of Morgan's Woods and Oberson's Field, firing into Hebert's advancing soldiers (Shea and Hess 1992). The Federals were not in the field for long before being overrun.

Further reinforcements helped to retake Davidson's guns and to push Hebert's surviving men, minus those who had passed out from fatigue, back north to their starting position, thus ending the Leetown fight. Many of the Confederates, including Hebert and a large number of his men who had passed out from fatigue, were captured. Part of the Confederate command drifted with Pike back towards the point where the march began the night before, and the other portion following Colonel Elkanah Greer around the north side of Elkhorn Mountain to meet up with Price during the night (Shea and Hess 1992).

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Elkhorn Tavern

Price's command had made it to the Telegraph Road early in the morning, heading south towards Elkhorn Tavern, a two story clapboarded log structure surmounted by a pair of elk antlers. In the fields south of the tavern lay the Federal supply wagons, carrying food and ammunition, both of which the Confederates were desperately in need.

Curtis realized when couriers arrived from frantic commanders of his scouting units to the north that Van Dorn was indeed moving around his flank. Curtis sent Grenville Dodge's brigade to Elkhorn Tavern to hold off the Confederates until more troops could be brought in from Little Sugar Creek. Command of the force was given to Colonel Eugene Carr, Dodge's division commander, who realized that this small force could not hold out long against such long odds and felt his best option was to mount a spoiling attack in the hopes of confusing Price long enough to allow support to arrive (Shea and Hess 1992). To do this, he sent Captain Junius Jones's 1st Iowa Battery forward to a position on Narrow Ridge, north of Elkhorn Tavern, from where they fired on the head of the Missouri State Guard. The plan worked, much to the elation of the Iowans. Van Dorn, who was riding with Price's force, did not expect significant resistance, as he believed his advance had yet to be detected. Finding an artillery battery in place, waiting for his troops was a nasty surprise, and gave him reason to pause and consider his next move (Shea and Hess 1992).

Rather than trying to dislodge the Union gunners with an infantry attack, Price ordered twenty one of his cannon to take position on Broad Ridge, a rise just east of Narrow Ridge (Shea and Hess 1992). The Confederate gunners opened a perfect maelstrom upon the two Federal guns just a few hundred yards away. The Iowans, whose previous exuberance dissipated quickly under galling fire, could barely hold their own in such a lopsided fight. When Capt. Jones ordered the 1st Iowa's other two guns into the fight, little changed. "The fire of the rebels was galling in the extreme," noted Jones, whose report on the battle, complete with descriptions of the wounds suffered by his men, bespeaks the chaos and terror his men endured (Jones 1971[1883]:265). Two of the guns were almost immediately disabled by enemy fire. One ammunition chest was hit, causing the team tied to the adjacent limber to bolt, dragging it into a nearby ravine. These losses were compounded by the human toll as nearly half of Jones's Iowans were killed or wounded during the engagement. After thirty minutes, the 35th Illinois Infantry arrived and provided sufficient cover to allow the Iowans to drag their wounded and remaining guns south to the line being established around Elkhorn Tavern (Shea and Hess 1992).

For the next few hours, the Federals fought a close, mauling engagement against the numerically-superior Confederates. The Federal line, stretched thin, held out on the high ground until the Missouri State Guards turned their right flank by moving undetected up Winton Springs Hollow to the east. The Federals compensated by refusing their line, extending it down the western edge of Clemon's Field, which was briefly held through a sharp, close-quarters fight. Eventually, the Federals were compelled to retire under the weight of the Confederate advance. They regrouped on the southern margin of

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Ruddick's Field, just to the south of Clemon's Field and to the east of Telegraph Road (Shea and Hess 1992).

During the night, Curtis moved the bulk of the forces at Leetown towards the rest of the army, now seeking warmth (it was a bitterly cold night) in Ruddick's and Cox's Fields. Captain Martin Welfley, whose battery of Missouriians had fought at Leetown the day before, posted his battery atop a small knoll in Cox's field, which gave his gunners a commanding view of the field. The rise still bears his name. On the other side of the field, Van Dorn organized a line consisting of Price's Division and the units that had chosen to follow Colonel Greer after the fighting abated at Leetown the day before.

In the early morning light, Federal soldiers in Ruddick's Field perceived the white uniforms of the First Missouri Brigade moving around in the woods on the north side of the field. To probe the position, Davidson's battery fired twenty rounds of canister and case shot into the woods, scattering the Missouriians. After Davidson's guns stopped firing, the field fell into a tense quiet. Then, with a crash, the woods where the Missouriians had been seen exploded in smoke and flame (Shea and Hess 1992). The Confederates had wheeled several batteries into position, masking them in the undergrowth, before opening "a tremendous fire of grape and canister...[from] not over 150 yards away" (Pattison 1971[1883]:248) on the exposed Federal infantry and artillery.

Startled, the Federals fell back, allowing the Confederates to repost their batteries in the open to allow them to fire on other targets. Good's Texas Battery anchored the west end of the line and was supported by Wade's Missouriians to the east, followed by Tull's Missouri State Guard battery, a total of fourteen guns. The other fifty-one Confederate artillery pieces remained parked and inactive in the fields near Elkhorn Tavern to the north, either lacking sufficient ammunition to join in, or simply overlooked by Van Dorn.

After overcoming the initial shock, the Federals regrouped, posting batteries on Welfley's Knoll and in Cox's and Ruddick's Fields. The Federal guns, twenty-seven in number, opened a two hour artillery barrage, first on the Confederate gunners, who were quickly battered off of the field, then on the surrounding woods where the Confederate infantry vainly sought shelter. Federal guns also began to play upon the Point of Rocks, the southeastern tip of Elkhorn Mountain, where members of John Q. Burbridge's 2nd Missouri Brigade sought shelter among thirty-five foot tall sandstone outcrops (Shea and Hess 1992). Federal gunners concentrated their fire on these formations, shattering the stone into razor-sharp shards, which literally cut the Missouriians to pieces. During archaeological investigations, a number of solid shot were found near the Point of Rocks bearing witness to the brutal reality of this event.

Early in the artillery duel, Van Dorn called for the ammunition train to re-stock the caissons. It was at this point that Van Dorn realized that no further ammunition was to be had, because he had neglected to order his supply wagons to follow the army when it began its night march (Shea and Hess 1992). What little ammunition they had at hand was

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virtually exhausted, and many infantrymen waited with empty cartridge boxes to fight a re-supplied enemy who was rapidly gaining the upper hand, as first Good's, then Wade's, and finally Tull's batteries had to quit the field due to lack of ammunition.

Fatigue, lack of ammunition, and the hail of Yankee lead and iron proved too much for many Rebels to endure. After marching almost non-stop for the past four days, fighting a tangled, confused battle over difficult terrain, and having little to eat, many Confederates began to trickle away from the battlefield in groups of six or twelve. As Federal artillery fire slackened, and General Sigel's Yankee infantry advanced across the open fields, bearing down on the Confederate positions, many more joined in the retreat. This quickly developed into a rare instance in which a Civil War army quit the field in almost complete disorder. Some marched up Telegraph Road to the Bentonville Detour, and thence to the jumping-off point at Camp Stevens. Perhaps half of Van Dorn's army headed east down the Huntsville Road, stopping for the night at a saw mill owned by Peter Van Winkle, a New Yorker who had moved to Arkansas in the 1820s and soon became established in the lumber industry and a leading citizen in the region, but had fled to Texas at the outbreak of the war (Brandon, et al. 2000). The Confederates who paused there scrounged what little they could find, even eating horses that had expired from fatigue. After a few days pause, Van Dorn and his army regrouped in the Boston Mountains, near Fort Smith, in preparation for their next campaign. In mid-March, the Army of the West was ordered to Corinth, Mississippi, to augment the army being amassed under the command of General Albert Sidney Johnston. Early in April, Johnston's army would fall upon General Ulysses S. Grant's army at Pittsburgh Landing, Tennessee, resulting in the battle of Shiloh.

Curtis's men would not follow the Confederates to Tennessee. The Army of the Southwest remained on the battlefield for some time, burying the dead, arranging transport for the wounded, and accomplishing the myriad tasks that such a large engagement created. By late March, it was on the move again, headed north into Missouri, thence east and south, arriving at Helena, Arkansas, on June 16, 1862. From there, the veteran units of Pea Ridge were dispatched to bolster the numbers of other armies, fighting at most of the major engagements of the war in the west, including Vicksburg, Stone's River, Franklin, Nashville, Chattanooga, Corinth, Iuka, and the siege of Atlanta.

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3. ARCHEOLOGICAL PROJECT METHODS

In archeology it is not enough to know where artifacts are found, but also where artifacts are not found. A primary research goal of the Pea Ridge Battlefield Archeological Project was to define the limits of the battlefield. The first requirement, then, was to develop field procedures that were capable of examining the entire extent of the battlefield. Faced with examining a large area, and assuming that most surviving artifacts of war are either metallic or associated with metal, metal detectors were employed as an inventory tool based on the success of the technique at Little Bighorn Battlefield National Monument (Scott and Fox 1987; Scott et al. 1989). The use of metal detectors operated by knowledgeable people has overwhelmingly proven its value (Connor and Scott 1998; Espenshade et al. 2002) and is now a common tool employed in archeological investigations of battlefields and campsites.

Locational control was accomplished through the use of a Global Positioning System unit and electronic data collector. Each item or location recorded on the data recorder was identified by unique UTM coordinates and a previously established identification code. At the completion of a given day's work the recorded data was down-loaded onto a laptop computer containing the software program. The raw file was processed by the computer and a map of that day's finds was then generated.

Field Data Collection Methods

Inventory Phase

The inventory phase included three sequential operations: survey, recovery, and recording. During survey artifact finds were located and marked. The recovery crew followed and carefully uncovered subsurface finds, leaving them in place. The recording team then plotted individual artifact locations, assigned field specimen numbers, and collected the specimens.

Inventory operations were designed primarily to locate subsurface metallic items with the use of electronic metal detectors. Visual inspection of the surface was also carried out concurrently with the metal detector survey. Volunteer operators furnished their own machines. Metal-detector operators were aligned at approximately 5 meter intervals (Figure 8). The operators walked transacts oriented to cardinal directions or, as necessary, oriented by topographic feature orientation. The daily composition of the detector crew ranged from six to twelve operators. Detector operators proceeded in line, using a sweeping motion to examine the ground.

Recovery

The recovery crew excavated artifact locations marked by pin flags and left the artifacts in place for recording. This team consisted of excavators and metal-detector

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Figure 8. The metal detector and inventory team at work.

operators. The number of operators and excavators varied from day to day depending on the workload.

Hand tools, such as spades and trowels were used to expose subsurface artifacts. Excavators were assisted by metal detector operators to ensure in-place exposure. Detector operators provided pinpointing and depth information to the excavator, thereby allowing a careful and accurate approach to the artifact. After exposure the pin flag was left upright at the location to signal the recording crew.

Recording

The recording crew assigned field-specimen numbers, recorded artifact proveniences, and collected the specimens. Recorders backfilled artifact-location holes upon completion of recording duties. Artifacts were assigned sequential field-specimen numbers beginning at 1000. The collections are assigned park accession number 156, and MWAC accession numbers 925 (2001 season), 970 (2002 season), and 1011 (2003 season).

4. METAL DETECTED ARTIFACTS - DESCRIPTION AND ANALYSIS

The metal detector investigations at Pea Ridge yielded a wide variety of artifacts. The majority of collected specimens can definitely be attributed to the battle, although some items of unknown function or date were also collected in the field, and through subsequent laboratory analyses were determined to date to the post-battle occupation. These latter artifacts represent items lost or discarded by occupants of the area and visitors to the field. Post-battle artifacts that could be definitively identified as such in the field were not collected during metal detecting efforts.

This section consists of a description of the artifacts recovered during the metal detector inventory. The emphasis of these descriptions focuses on the battle-related artifacts. Interpretation of the relationship of these artifacts will be found in the next section. The majority of artifacts recovered are bullets, and the majority of these are battle-related artifacts. Because of the large quantity of firearms related artifacts recovered the description and analysis emphasizes that artifact type. The Pea Ridge collection is part of park accession number 156 and is also listed as Midwest Archeological Center accession numbers 925 (for the 2001 work), 970 (for the 2002 work), and 1011 (for the 2003 work).

Analytical Procedures

The methods employed in cleaning and analyzing the artifacts are the standard laboratory procedures of the Midwest Archeological Center. Essentially they consist of dry brushing or washing the accumulated dirt and mud from each artifact and then determining the condition of the artifact to see whether it requires further cleaning or conservation. For analysis and identification purposes some metallic items required a treatment in to remove oxides that had built up on them during the years in which they were in the ground. After it was cleaned each artifact was rebagged in a self-sealing clear plastic bag with its appropriate Field Specimen (FS) number and other relevant information on the bag. The artifacts were then identified, sorted, and analyzed.

The identification, sorting, and analysis consisted of dividing the artifacts into classes of like objects and then subsorting the artifacts into further identifiable discrete types. Sorting and identification of the artifacts were undertaken by personnel experienced with artifacts of this period, who compared the artifacts with type collections and with standard reference materials.

Presently the artifacts and original supporting notes, records, and other documentation are held at the National Park Service's Midwest Archeological Center.

Firearms Identification Procedures

A primary analytical tool of the project is Firearms Identification cases (Harris 1980; Hatcher, Jury, and Weller 1977). The comparative study of ammunition components

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is known as firearms identification analysis. Firearms, in their discharge, leave behind distinctive metallic fingerprints or signatures on the ammunition components. These signatures, called class characteristics, allow the determination of the type of firearm (i.e., model or brand) in which a given cartridge case or bullet was fired. This then allows determination of the number of different types of guns used in a given situation. This capability is very important because coupled with the precise artifact locations, the class characteristics can be used to identify specific combat areas and the weapon types used in that location. With this information, patterns of movement can be established and sequences of activity can be more precisely interpreted.

All cartridges, cartridge cases, bullets, and other ammunition components were analyzed utilizing these firearms identification procedures. The specific results of the analyses are discussed in the artifact analysis and interpretation chapters.

Artifact Descriptions

Percussion Caps

Four percussion caps were recovered during the inventory efforts. Two (FS2866, 3725) are modern demonstration or reenactment pieces. The other two (FS4202, 4217) are consistent with being of the Civil War era. All caps are the top hat or military musket style percussion cap (Hunt 1989:334-349). A tin lid fragment (FS3136) with embossed rays in the center may be a part of a percussion cap tin.

.36-Caliber Bullets

Twelve .36-caliber conical pistol bullets were recovered. Two (FS4642, 4660) are too damaged by impact and subsequent agricultural activities to determine any details, but the others are in good shape. Nine bullets (FS3045, 3062, 3225, 3275, 3420, 4048, 4056, 4331, 4452) are the so-called St. Louis style conical bullet. In the years preceding the Civil War and during the war St. Louis Arsenal produced a uniquely shaped bullet type for the Colt revolver (Thomas 2003:15), although it could be used in any .36-caliber pistol. Most of the fired bullets retain impressions of the land and groove rifling of the weapon that fired them. Four bullets (FS3225, 3275, 3420, 4331) have a 5 land and 5 groove right hand twist configuration consistent with being fired in a Remington manufactured revolver, and two of those have load lever impressions on the nose of the bullet.

One bullet (FS3045) is fired .36 caliber pistol bullet. It has evidence of rifling marks on it but suffers from distortion because of impact damage. The rifling pattern is not distinct enough to identify the pistol type with certainty, but may be a Colt Navy pistol.

Four of these St. Louis bullets in .36-caliber (FS4048, 4056, 4452) exhibit 6 lands and grooves impressions with a right-hand twist indicating it was fired from a Starr Navy

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revolver. Another Starr fired .36-caliber bullet is FS4453 but it a solid base two lubricating groove style rather than the St. Louis style bullet. One bullet (FS3062) does not exhibit clear enough rifling characteristics to assign it to a firearm type.

.44-Caliber Bullets

Seventeen of the recovered artifacts (FS2170, 2759, 3077, 3231, 3287, 3318, 3412, 3466, 3547, 3558, 4028, 4269, 4323, 4369, 4443, 4449, 4488) are .44-caliber conical bullets. Eight (FS3231, 3287, 3318, 3412, 4323, 4443, 4449, 4488) are too damaged to identify further. Three retain the unique 7 land and groove configuration of being fired in Colt revolvers (FS3077, 3466, 3547, 3558). FS3077 is a single groove bullet while the others are typical arsenal style production. Two .44-caliber bullets, both unfired (FS2170, 2759) are two different styles of the older model Colt Dragoon pistol bullet (McKee and Mason 1995:27), although they could be fired in any .44-caliber pistol. Two bullets (FS4028, 4269) exhibit 5 land and groove rifling impressions that are consistent with being fired in a Remington revolver. One those bullets (FS4269) has two lubricating grooves and appears to be a contractor produced bullet.

.50-Caliber Bullets

A single identifiable .50-caliber bullet (FS4250) was recovered. This bullet was a component of a self-contained cartridge that was used in the Maynard breach loading type carbine. The bullet was fired and retains standard government 3 land and groove rifling. This weapon has been described as, "The Maynard carbine, a rugged and well made light weight breach loading firearm of .50 caliber that was manufactured from before the Civil War and continued through the war"(Coates and Thomas 1990:43). A second .50-caliber bullet (FS4511) is too damaged to identify with certainty, but it also appears to be a Maynard style bullet.

Sharps .52-Caliber Bullets

The Sharps firearm was patented in 1852 and was a very popular military and commercial firearm for the next 50 years. It was produced in percussion and after the Civil War in cartridge styles. Its popularity was due to its accuracy and its reputation for having effective stopping power. Particularly in the larger calibers it was the favored gun of big game hunters on the plains and in the west in the years after the Civil War (Gluckman 1965:230,268; Barnes 1989:139). The Sharps was favored by both Union and Confederate cavalry. The weapon utilized a paper or linen cartridge firing a .52-caliber bullet (Coates and Thomas 1990:45-46). FS3145, 3167, 3242, 3285, 3383 are .52 caliber Sharps tie-ring base bullets that have been fired and have the distinct 6 land and groove impressions of the Sharps made guns. One bullet (FS4163) is a .52-caliber but too damaged to otherwise identify.

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.54-Caliber Bullets

One caliber of Minié ball recovered is the .54-caliber (Figure 9a, b). Nine .54-caliber Minié balls (FS2072, 2097, 2102, 2113, 2172, 2180, 2218, 2260, 4065) are unfired. There are 12 three groove standard U.S. type .54-caliber fired Minié balls (FS2753b, 2927, 3005, 3294, 3335, 3480, 3731, 3821, 3826, 4235, 4674, 4687, 4721). Two (FS3821, 4235) have 7 land and groove rifling impressions with a right hand twist indicating they were fired in the Model 1841 “Mississippi” rifle. Two (FS3249, 4445) have impressions of 4 land and grooves with a left hand twist that is consistent with being fired in the Austrian Lorenz rifled musket. Two bullets (FS2096, 3826) have 3 land and grooves, but are otherwise unidentified as to the weapon from which it was fired. The remaining bullets do not retain clear enough impressions or are too impact damaged to identify further. One bullet (FS2097) has unique rouletting around the base (Figure 10a), which is probably a device for increasing the surface area to allow the paper cartridge to better adhere to the bullet surface (Arp 2002).

.56-Caliber Bullet

An impact damaged .56-caliber solid base conical bullet (FS3069) has impressions of 7 land and groove rifling that is consistent in style with the Colt .56-caliber revolving rifle bullet (McKee and Mason 1980:26-27).

.58-Caliber Bullets

The standard military .58-caliber Minié ball was recovered from most areas of the battlefield. According to Coates and Thomas (1990:14) The Model 1855 Rifled Musket was the first gun produced by the United States to fire the famed .58-caliber Minié ball. One hundred twenty-five .58-caliber bullets or Minié balls found, of these, 98 appear to have been fired and 66 have residual rifling marks. The other 32 fired bullets were identified as being fired by the distortion or the flattening of the bullet by impact, and have obliterated the rifling marks, or the bullets may represent guns that were excessively fouled with black powder residue causing the bullet to become spin destabilized as well as fail to imprint the rifling’s land and groove marks. Only seven of the fired bullets have ramrod marks still evident on the bullet nose, some very distinct suggesting that more than normal pressure was required to load the round. This might be due to a fouled bore or could simply be the expression of highly charged emotional event for some soldiers. Thirty of the Minié are unfired or dropped bullets.

Two of the bullets (FS2183, 4157, 4437) are consistent with the English pattern .577-caliber and represent two types of British Enfield pattern bullets. One is the standard Enfield pattern and the other is the Enfield-Pritchett pattern. The bullets could be fired in either the Model 1855 .58-caliber U.S. made rifled musket or the Pattern 1853 British made Enfield rifled musket.

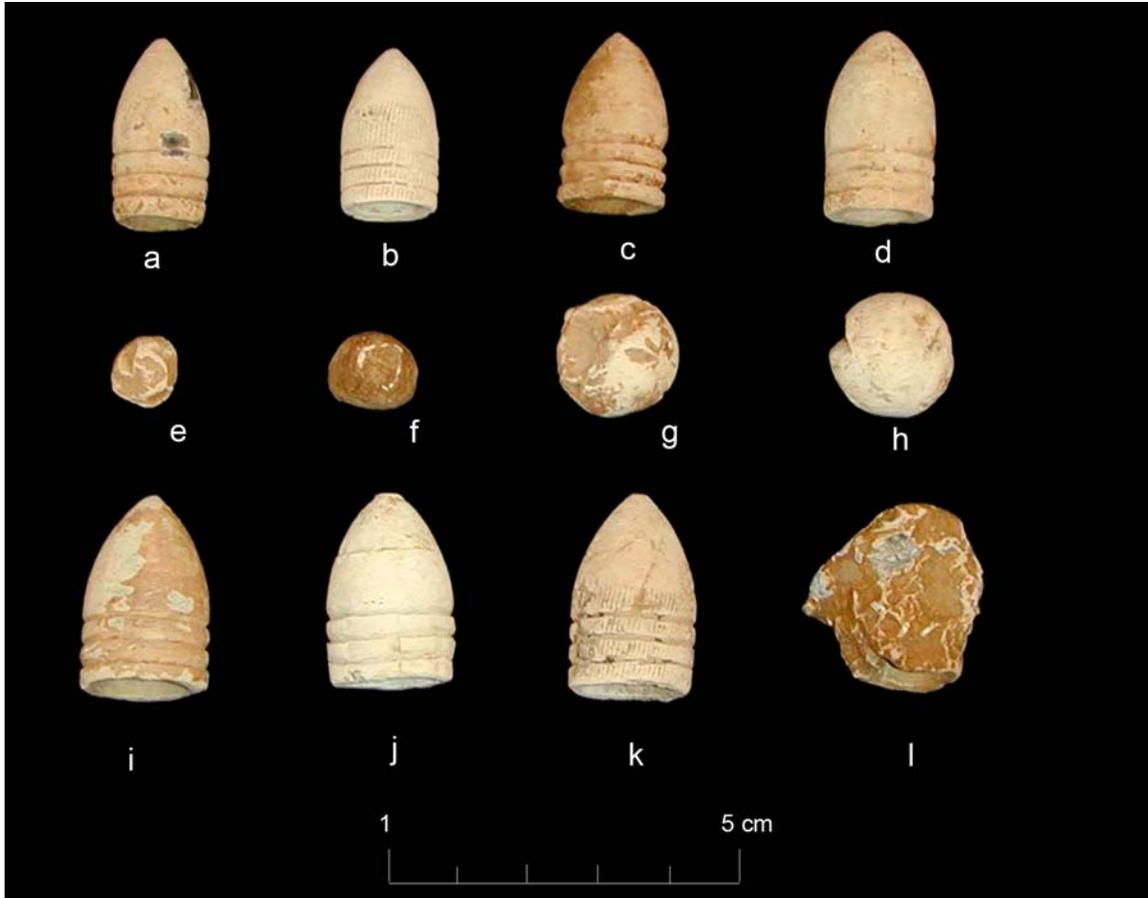


Figure 9. Various calibers of small arms bullets. a., b. .54-caliber Minié balls, c, d. .58-caliber Minié balls, e. .30-caliber buckshot, f. .36-caliber spherical ball, g, h. .54-caliber spherical balls, i, j, k, .69-caliber Minié balls, l, .69-caliber impacted Minié ball.



Figure 10. Minié balls with rouletting around the base. a. .54-caliber Minié ball (FS2097), b. .69-caliber Minié ball (FS2044).

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Two Minié balls (FS3237, 4570) appear to have been hand cast from some kind of harder lead/tin alloy. The alloy could be some kind of metal like the common tire weight. One specimen was dropped the other fired and has rifling impressions. Both are believed to be a modern cast bullet that are intrusive.

FS 2772 is somewhat unusual in that it has a recessed ring cast into its base cavity. No comparable bullets were identified in the relevant literature consulted.

Fired: FS2030, 2117, 2141, 2156, 2165, 2167, 2168, 2171, 2176, 2178, 2181, 2188, 2201, 2222, 2233, 2236, 2263, 2360, 2365, 2528, 2560, 2632, 2772, 2859, 2901, 2929, 2937, 2943, 2949, 2968, 3029, 3068, 3075, 3202, 3206, 3213, 3220, 3224, 3226, 3237, 3258, 3263, 3306, 3350, 3398, 3425, 3440, 3447, 3454, 3464, 3472, 3493, 3508, 3513, 3516, 3517, 3527, 3533, 3535, 3537, 3541, 3546, 3550, 3553, 3751, 3894, 4112, 4120, 4121, 4140, 4157, 4176, 4241, 4365, 4372, 4403, 4411, 4420, 4426, 4431, 4437, 4448, 4457, 4553, 4598, 4646b, 4676, 4698, 4699, 4706, 4711, 4722, 4735, 4745, 4773, 4779, 4833, 4841.

Dropped: FS2011, 2099, 2174, 2183, 2204, 2225, 2250, 2253, 2264, 2763, 2764, 2892, 2959, 2967, 2999, 3063, 3252, 3434, 3384, 3476, 3496, 3515, 3520, 3529, 3532, 3549, 3740, 3801, 4131, 4261, 4570.

.69-Caliber Bullets

According to Coates and Thomas (1990:8) the first U.S. .69-caliber rifled musket was the Model 1842 that was designed to fire the hollow based conical Minié ball. The Model 1842 rifled musket replaced the Model 1816 series and its variations and the Model 1842 smoothbore musket. The smoothbore muskets were retained in federal arsenals as second class arms and were regularly distributed to state militia and guard units in the years preceding the Civil War.

There are 129 fired and 27 dropped or unfired .69-caliber Minié balls recovered from a variety of locations across the battlefield (Figure 9i, j, k, l). These recovered .69-caliber Minié balls are listed below:

Fired: FS2010, 2031, 2075, 2086, 2110, 2115, 2145, 2146, 2151, 2182, 2186, 2193, 2200, 2202, 2203, 2211, 2221, 2224, 2270, 2278, 2303, 2306, 2323, 2327, 2348, 2355, 2361, 2370, 2422, 2455, 2553, 2559, 2563, 2591, 2693, 2709, 2737, 2738, 2748, 2749, 2753a, 2757, 2760, 2762, 2775, 2778, 2786, 2842, 2846, 2852, 2863, 2867, 2869, 2871, 2879, 2881, 2882, 2948, 2964, 2990, 3014, 3017, 3083, 3084, 3133, 3201, 3234, 3240, 3243, 3272, 3299, 3305, 3308, 3313, 3336, 3339, 3342, 3395, 3457, 3473, 3720, 3737, 3832, 3837, 4024, 4083, 4107, 4109, 4113, 4119, 4122, 4193, 4316, 4369, 4389, 4444, 4451, 4463, 4465, 4490, 4497, 4507, 4512, 4520, 4531, 4539, 4546, 4547, 4560, 4619, 4635, 4641, 4644, 4646a, 4647, 4654, 4683, 4665, 4681, 4683, 4690, 4691, 4692, 4694, 4700, 4737, 4743, 4768, 4777.

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Dropped: FS2044 (rouletting), 2103, 2149, 2246, 2346, 2808, 2888, 2895, 2941, 3120, 3241, 3244, 3259, 3262, 3324, 3353, 3354, 3500, 3528, 3536, 4077, 4079, 4081, 4084, 4246, 4441, 4477.

Many of the fired .69-caliber Minié balls cannot be identified to weapon type, except to say that one or more rifling impression(s) is evident on the bullet body. Many have sustained significant impact damage that has obscured the remaining rifling impressions. Of those that retain clear rifling impressions two different land and groove patterns are evident, one is a 3 land and groove impression typical of U.S. rifled muskets (FS2110, 2211, 2221, 2303, 2455, 2553, 2738, 2869, 2879, 3457, 3473, 4122, 4465, 4644, 4654, 4768) and the other has 4 land and groove impressions which is typical of several European import rifles including French and Austrian rifled muskets (FS2145, 2306, 2778, 2786, 2852, 2882, 2990, 3014, 2017, 3083, 3084, 3308, 3336, 3720, 3737, 4083, 4193, 4641). Of the European fired bullets five (FS2749, 2786, 4547, 4647, 4777) have a triangular shaped hole in the bullets' base identifying them as intended for French muskets (McKee and Mason 1995:49, 54). A few, sixteen, conical bullets have ramrod impressions on the nose of the bullet, most of which indicate they were loaded in Model 1842 rifled muskets or at least guns using a cone shaped ramrod commonly found with that model of rifled musket. Some marks are too indistinct to clearly identify which type of ramrod was used to load the bullet. One .69-caliber bullet has rouletting around the base (FS2044) (Figure 10b) and is described by Arp (2002).

Undetermined Caliber Bullets

There are 21 impacted bullets that are too deformed to identify as to caliber, but through remaining lubricating grooves or a visible hollow base they can be identified as fragments of Minié balls. The FS numbers are: 2027, 2166, 2238, 2313, 2328, 2400, 2872, 2974, 3031, 3227, 3245, 3451, 3964, 4551, 4581, 4615, 4630, 4638, 4650, 4651, 4682.

.32-Caliber Spherical Ball

A single .32-caliber spherical ball (FS2915) was recovered. It was fired and has impressions of a 6 land and groove rifling. It was probably fired in civilian rifle commonly referred to as a squirrel rifle. Whether it is associated with the battle or not is open to question.

.36-Caliber Spherical Balls

Twenty-one .36-caliber round balls (FS2938 [cloth patch impressions], 2972, 3044, 3072 [cloth patching impressions], 3137, 3236 [cloth patching impressions], 3239, 3276 [dropped], 3304 [ramrod mark], 3311, 3394 [cloth patching impressions], 3405 [cloth patching impressions], 3416 [dropped], 3443 [cloth patching impressions], 3502, 4344, 4442, 4450, 4756, 4772, 4775) represent small caliber revolvers used in the battle (Figure

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9f). All exhibit either impact scars or rifling marks. Those with clear rifling impressions indicate they were fired in Colt revolvers.

.44-Caliber Spherical Balls

There are sixteen .44-caliber round balls in the collection (FS2978, 3008 [cloth patch impressions], 3302, 3307, 3347 [cloth patching impressions], 3363, 3366, 3423, 3534, 3543, 4127, 4366 [cloth patching impressions], 4434, 4462, 4806, 4845). Most are impact damaged and only one (FS3423) has land and groove marks distinct enough to determine it was fired in a Colt M1860 Army revolver. The other spherical balls with rifling impressions evident were consistent in width with Colt and/or Remington revolvers.

.50-Caliber Spherical Balls

Four approximately .50-caliber round balls were found during the investigations. All are fired and exhibit impact damage (FS3221, 3256, 3385, 3539). All appear to be cast balls that were fired in rifled guns. The rifling marks are not clear but those noted are consistent in width with being fired in either the Model 1833 or Model 1840 Hall carbine which was nominally .52-caliber (Gluckman 1965:336; Frasca and Hill 1995).

.54-Caliber Spherical Ball

Forty-one .54-caliber spherical balls were recovered (Figure 9g, h). Most are fired and impact damaged (FS2033, 2035 [cloth patching impressions], 2070, 2083, 2101, 2109, 2173, 2198, 2206 [ramrod mark], 2245 [ramrod mark], 2497, 2505, 2624, 2626, 2669, 2686, 2743, 2809 [dropped], 2886, 2945, 2985, 2993 [dropped], 2996, 3277, 3481, 3589, 3540, 3548, 3555, 3559, 3560, 3756, 3813 [cloth patching impressions], 3815, 4159, 4262, 4338, 4557, 4738, 4744, 4848), although a few appear to unfired and dropped rounds. Some exhibit 6 right land and groove rifling marks indicating they were fired in the Model 1841 "Mississippi" rifle. Others have no visible rifling marks and may have been fired in a .54-caliber horse pistol. Nine (FS3481, 3539, 3540, 3548, 3555, 3559, 3560, 4262, 4338) have clear 16 land and groove rifling impressions indicating they were fired in M1819 Hall rifles. Microscopic examination of these balls determined that a minimum of five individual M1819 Hall rifles are represented by these bullets. More guns may be represented by the recovered balls, but several (FS3560, 4262, 4738) were excluded from analysis due to lack of distinct land and groove markings.

.69-Caliber Spherical Ball

The oldest, most fundamental, projectile used in the Civil War by both sides was the round ball (Thomas 1997:98). It was fired in various small arms, the .69-caliber smoothbore musket being the classic and probably the most common caliber represented at Pea Ridge. There are a number of models of smoothbore muskets that could have fired these balls, the most common would be the Model 1816 or one of many variations including

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those converted from flintlock to percussion ignition system. As a matter of reference for size the .69-caliber round ball can be fired in a 12-gauge shotgun.

Soft lead was desired in the manufacture of ammunition fired in small arms like round balls. To a certain extent, the round ball became compressed and distorted making the ball look more cylindrical thereby sealing the barrel even in the smooth bore musket. Some of the lead round balls have very definite attributes indicating that they were a fired as a buck and ball load (Thomas 1997:10). These balls have three distinct dimples or what actually looks like a smiley face on one surface of the ball where three buckshot (.33-caliber) balls resided (Thomas 1997:112). The reason for the addition of three buckshot to the standard musket ball load was to multiply the effectiveness of this weapon by increasing the number of projectiles fired per given round expended. The .69-caliber smoothbore muskets are notorious for their poor accuracy beyond 100 yards (Coggins 1990:38), but at close range the smooth bore musket could be a deadly and efficient weapon because they were fast to reload and the lead ball was heavy enough to carry quite a punch (Thomas 1997:104).

There were 409 fired round balls, 20 balls with buckshot impressions, and 66 unfired or dropped round balls recovered. One hundred-five .69-caliber balls were manufactured by being cast in molds with remainder having no clear evidence of how they were manufactured although many were likely pressed. It is possible some of the .69-caliber spherical balls are actually case shot, but they retain no clear evidence on them to suggest being fired in a musket or being dispersed as part of a case shot burst. A number of fired and unfired balls show evidence of teeth marks and chewing. With one possible exception (FS4816) all of the tooth marks are attributable to pigs or rodents. The recovered .69-caliber balls are listed below:

Fired: FS2001, 2007, 2012, 2014, 2016, 2019, 2022, 2024, 2041 [cast], 2047, 2051 [ramrod mark], 2057, 2064, 2074 [chewed], 2077 [cast], 2082 [cast], 2098, 2100, 2124, 2125 [chewed], 2127 [chewed], 2128 [chewed], 2129, 2138, 2140 [chewed], 2142, 2143, 2144, 2147, 2152, 2154, 2212, 2223, 2240, 2247, 2252, 2255, 2301, 2308, 2317, 2324, 2383 [cast], 2418, 2421, 2432 [cast], 2442, 2454, 2463, 2464, 2477, 2496, 2501 [cast], 2511, 2512, 2519, 2522, 2558, 2561, 2570, 2581, 2590, 2601, 2602, 2618, 2625 [cast], 2663, 2667, 2674, 2739, 2752, 2755, 2769, 2841, 2843, 2848 [chewed], 2849, 2850, 2851, 2855 [cast], 2860, 2861, 2862, 2865 [cast], 2870, 2874, 2876, 2877, 2880, 2891, 2893, 2899, 2900, 2902, 2917, 2918, 2919, 2920, 2926 [cast], 2930 [cast], 2932, 2936, 2946, 2947 [cast], 2950, 2958, 2960, 2963, 2965, 2966, 2969, 2970 [cast], 2971, 2977 [chewed], 2986 [cast], 2987 [cast], 2991, 2992, 2994, 3009, 3010 [cast], 3011, 3013 [cast], 3015, 3019, 3023 [cast], 3030 [cast], 3036, 3037 [cast], 3040, 3049, 3056 [cast], 3070 [cast], 3073 [cast], 3074 [cast], 3078, 3080, 3088 [cast], 3090 [cast], 3091 [cast], 3092, 3100 [cast], 3103, 3122, 3125, 3141 [cast], 3143 [cast], 3151 [cast], 3152 [cast], 3155 [cast], 3156, 3164, 3204, 3205, 3207, 3212, 3216, 3218, 3219, 3222, 3229, 3248, 3261, 3266, 3268, 3269, 3270, 3271, 3273, 3279, 3290 [cast] 3312, 3316, 3319, 3220 [cast], 3321, 3322, 3326, 3330, 3331, 3343, 3348, 3349, 3365 [cast], 3368, 3389, 3390, 3399, 3401, 3402 [cast], 3406 [cast], 3408, 3409 [cast], 3414, 3421 [chewed], 3427 [cast], 3428

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[cast], 3430 [cast], 3442 [cast], 3446 [chewed], 3459 [cast], 3465, 3467 [chewed], 3471, 3475, 3483 [cast], 3485 [cast], 3486 [cast/chewed], 3487, 3488 [cast], 3489, 3490, 3491 [chewed], 3506, 3507, 3514, 3518, 3519 [cloth impressions], 3523, 3524, 3526, 3531, 3538, 3551 [cast], 3552, 3554, 3563, 3715, 3724, 3760, 3772, 3784 [cast], 3786, 3831, 3833, 3858, 3861, 3868 [cast], 3873, 3935 [cast], 3971, 3981 [cast], 4000, 4002, 4008, 4013 [cast], 4043, 4044 [cast], 4052, 4068, 4073, 4075, 4078, 4089, 4092 [cast], 4094, 4118 [cast], 4135 [chewed], 4196, 4207, 4215, 4219 [cast], 4221 [chewed], 4222, 4225, 4226, 4256, 4271, 4280 [cast], 4281, 4285, 4286, 4287, 4290, 4296, 4304, 4318 [cast], 4333, 4340, 4348, 4352, 4357, 4362, 4363, 4376 [cast], 4381 [cast], 4407, 4410, 4428, 4435, 4439, 4447 [chewed], 4455, 4460, 4467, 4471, 4472, 4473, 4482 [cast], 4483 [cast], 4485, 4486, 4494, 4498 [modern], 4499, 4500, 4504, 4513, 4514, 4515, 4516, 4517 [cast], 4523, 4524, 4532, 4533 [cast], 4535, 4537, 4542 [cast], 4543, 4545, 4552, 4556 [ramrod mark], 4559, 4565, 4566, 4568, 4571, 4573, 4576, 4579, 4580, 4586, 4594, 4594b, 4600, 4603, 4609, 4611, 4612, 4613, 4616, 4618, 4626, 4628, 4637, 4659, 4669, 4679, 4685, 4686, 4688, 4689 [chewed], 4702, 4703, 4704, 4705, 4708, 4717, 4718, 4724, 4725, 4726, 4727, 4728 [cast], 4730, 4734, 4739, 4741, 4742, 4748, 4750, 4751, 4752, 4754, 4757, 4766, 4769, 4780, 4782, 4784 [cast], 4786 [chewed], 4789, 4790, 4791, 4797, 4798, 4799, 4802, 4805, 4808 [cast], 4809 [cast], 4810, 4811 [cast], 4812 [chewed], 4813, 4814, 4815, 4816 [chewed], 4821, 4823, 4824, 4831, 4832, 4834, 4835, 4837, 4838, 4839 [chewed], 4852.

Buck and Ball: FS2004, 2020, 2042, 2131, 2132, 2137, 2148, 2150, 2368 [cast], 2787, 2840, 3329, 3445, 3734, 3945 [4 lands & grooves], 4364, 4378, 4382, 4720, 4723.

Dropped: FS2005, 2006, 2009, 2015, 2017, 2023, 2046, 2049 [cast], 2092 [cast], 2123 [cast], 2135, 2169, 2312, 2340, 2465, 2751, 2856, 2873, 2904 [cast], 2905 [cast], 2906 [cast], 2907 [cast], 2908 [cast], 2909 [cast], 2910 [cast], 2911 [cast], 2912 [cast], 2913 [cast], 2914 [cast], 2916 [cast], 2931 [chewed], 2935 [cast], 2939, 3033 [cast], 3046 [cast], 3053 [cast], 3054 [cast], 3108 [cast], 3111 [cast], 3124, 3211, 3214 [cast], 3217 [cast], 3267 [cast], 3289 [cast], 3293 [cast], 3295 [cast], 3297 [cast], 3298 [chewed], 3301 [chewed], 3361 [cast], 3410 [cast], 3426 [cast], 3429 [cast], 3433 [cast], 3450 [cast], 3469 [cast], 3703 [cast], 3746 [cast], 3796 [cast], 4227 [cast], 4243 [cast], 4251 [cast], 4522, 4541, 4636.

Only two of the fired balls retain ramrod marks indicating they were fired in Model 1816 .69-caliber smoothbore muskets using the button type ramrod or the M1842 smoothbore musket using a cone type ramrod. The remainder of the fired balls are either too distorted by impact or do not have clear ramrod marks to ascertain the type of weapon from which they were fired.

One .69-caliber ball with distinctive buckshot impressions on one surface indicating it was a buck and ball load also had 4 land and groove impression on the body. The land and groove impressions are consistent with being fired in a European, French or Austrian, made rifled musket. Rifled muskets were not intended to fire buck and ball loads. It is possible the round was picked up by mistake and fired or the individual was short of ammunition and fired what was available to him.

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Buckshot and Shotgun Shot Pellets

Thirty-eight (FS2095, 2121, 2176, 2875, 2898, 2939, 2961, 3111, 3158, 3169, 3235, 3278, 3303, 3375, 3386, 3387, 3400, 3414, 3422, 3431, 3442, 3499, 4412, 4421, 4422, 4464, 4495, 4604, 4605, 4625, 4652, 4653, 4709, 4710, 4714, 4729, 4731, 4732) buck shot sized pellets were recovered in a number of locations at Pea Ridge. These buckshot (Figure 9 e) are consistent in size, near 00 (approximately .33-caliber) (Anon. 2001:7-13) that are associated with .69-caliber buck and ball rounds. Oxidation on most pieces is consistent with known Civil War era bullets and spherical balls recovered at Pea Ridge, but post-battle hunting as source cannot be ruled out for a few specimens due to lack of significant oxidation or patina.

Unidentified Lead

One hundred twenty-nine pieces of lead were recovered that are fragments of bullets, case shot balls, or otherwise unidentified pieces of lead. They are too deformed or fragmented to identify further. They are:(FS2021, 2025, 2029, 2039, 2073, 2111, 2118, 2119, 2120, 2134, 2136, 2164, 2184, 2185, 2191, 2194, 2196, 2209, 2214, 2217, 2228, 2242, 2261, 2268, 2269, 2296, 2299, 2304, 2310, 2311, 2318, 2329, 2332, 2342, 2364, 2371, 2373, 2382, 2384, 2502b, 2508, 2520, 2533, 2546, 2574, 2580, 2606, 2621, 2661, 2662, 2672, 2750, 2773, 2774, 2796, 2807, 2810, 2854, 2889, 2890, 2944, 2962, 3095, 3228, 3233, 3265, 3274, 3250, 3281, 3282, 3300, 3309, 3310, 3314, 3327, 3333, 3338, 3413, 3439, 3474, 3525, 3707, 3732, 3738, 3739, 3753, 3802, 3810, 3943, 4063, 4097, 4258, 4260, 4305, 4324, 4327, 4328, 4351, 4360, 4367, 4375, 4459, 4466, 4469, 4475, 4496, 4555, 4561, 4572, 4582, 4584, 4585, 4587, 4593, 4597, 4599, 4602, 4606, 4608, 4610, 4614, 4620, 4621, 4622, 4623, 4624, 4631, 4633, 4634, 4640, 4658, 4668, 4680, 4696, 4736, 4776, 4787, 4800, 4819, 4822, 4850, 4853).

Cartridges

Four copper (Bloomfield Gilding Metal) Civil War era cartridge cases represent two weapon types and two different calibers. One cartridge case is for the .50-caliber Maynard rifle or carbine (FS4004). The other cartridge cases are 12mm pin fire type pistol rounds (FS2845, 3560, 3887, 3888) commonly used in the LeFauchaux pin fire revolver. The pinfire cartridge and its arms were a relatively new feature to firearms at the beginning of the Civil War. Some officers and men procured their own pinfire guns, usually revolvers, well before the Union purchased some for field trials and uses (Curtis 2002).

Artillery-Related Artifacts

Artillery Shell and Case Shot Fragments

Smoothbored cannon fired one of four types of rounds, solid shot, shell, caseshot, or canister, all constructed of gray cast iron. Solid shot, as the name implies was a solid iron ball of a prescribed weight and diameter that corresponded to the gun caliber, e.g.

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6-pounder, 3.58 inches in diameter; 12-pounder, 4.52 inches in diameter (Melton and Pawl 1994:50-51). Spherical shell are hollow cannon balls of the same diameter as the solid shot. Shell had an opening into which the powder was placed as a bursting charge in the hollow interior, and the opening was fitted with a time delay fuse that allowed the shell a certain number of seconds of flight before bursting and spreading shrapnel at its target. Caseshot was also a hollow ball with slightly thinner walls than shell. Caseshot were filled with .69-caliber lead balls, then the interstices filled with either pine resin or a sulphur matrix to hold the balls in place, and finally a hole was drilled into the matrix from the fuse hole and filled with a charge of gunpowder. The fuse hole was fitted with a time delay fuse like that of the shell. Caseshot was the invention of a British Lieutenant, Henry Shrapnel, in 1787 and was also called the "Shrapnel Shell" (Dickey and George 1993:16). Canister rounds are described below.

Gibbon (1970: appendix:27) states that 12-pounder shell walls ranged from 0.66 inch to 0.74 inch thick with 0.70 inch as the average. Case shot wall thickness is listed from 0.4250 inch to 0.475 inch with the mean dimension as 0.45 inches. The majority of the specimens recovered did fit the identified ranges, although there was some variation in the shell fragments being somewhat thinner and the caseshot slightly thicker than the historic documents noted. During the analysis it was decided to use 0.6 inch wall thickness or thicker to identify 12-pounder shell as opposed to thinner case shot. The 6-pounder caseshot was separated from shell also by wall thickness. Gibbon (1970:appendix 27) identified 6-pounder case thickness as between 0.335 and 0.385 inch, with the average thickness of 0.36 inch.. The 24-pounder cannon shell had a wall thickness ranging from .085 inch to 0.9 inch, and the case shot was .0525 to 0.575 inch thick Gibbon (1970: appendix:27). A diameter template for each shot size was also used to determine what cannon association a fragment had.

Three hundred eighty-two shell and case shot fragments were recovered during the field work. There were 39 6-pounder caseshot fragments, 188 12-pounder shell fragments, 136 12-pounder case shot fragments, one 24-pounder caseshot fragment, and 18 unidentified spherical shell fragments.

6-pounder Caseshot Fragments: FS2232, 2298, 2315, 2334, 2367, 2394, 2407, 2417, 2460, 2499, 2524, 2547, 2548, 2576, 2584, 2589, 2652, 2685, 2725, 2730, 2887, 3705, 3750, 3775, 3794, 3819, 3990, 3997, 4012, 4030, 4088, 4111, 4373, 4564, 4569, 4575, 4588, 4818, 4836.

12-pounder Shell Fragments: FS2319, 2345, 2347, 2390, 2484, 2498, 2542, 2552, 2568, 2586, 2596, 2598, 2617, 2639, 2656, 2740, 2779, 2780, 2781, 2857, 2988, 2989, 2997, 2998, 3001, 3018, 3020, 3039, 3047, 3050, 3052, 3057, 3059, 3061, 3081, 3082, 3102, 3121, 3126, 3130, 3131, 3132, 3138, 3139, 3140, 3142, 3180, 3181, 3182, 3189, 3190, 3195, 3197, 3328, 3332, 3362, 3372, 3391, 3444, 3456, 3458, 3460, 3478, 3479, 3494, 3497, 3503, 3512, 3722, 3744, 3745, 3748, 3759, 3773, 3774, 3780, 3785, 3853, 3882, 3883, 3906, 3911, 3913, 3921, 3928, 3985, 3986, 4015, 4016, 4058, 4059, 4099, 4102, 4104, 4110, 4114, 4129, 4130,

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4142, 4143, 4145, 4148, 4151, 4158, 4167, 4168, 4171, 4173, 4175, 4177, 4181, 4192, 4194, 4201, 4203, 4204, 4205, 4206, 4209, 4210, 4212, 4213, 4214, 4220, 4223, 4224, 4228, 4229, 4307, 4310, 4331, 4315, 4317, 4322, 4334, 4336, 4343, 4345, 4349, 4350, 4374, 4379, 4388, 4390, 4393, 4394, 4395, 4396, 4397, 4398, 4400, 4402, 4406, 4408, 4413, 4414, 4416, 4430, 4432, 4436, 4493, 4503, 4519, 4521, 4525, 4540, 4548, 4549, 4554, 4562, 4590, 4596, 4629, 4643, 4649, 4655, 4666, 4673, 4677, 4701, 4747, 4760, 4783, 4801, 4803, 4826, 4827, 4829.

12-pounder Caseshot Fragments: FS2235, 2244, 2281, 2290, 2291, 2292, 2307, 2314, 2321, 2344, 2352, 2357, 2374, 2375, 2378, 2380, 2392, 2427, 2431, 2435, 2437, 2457, 2495, 2540, 2541, 2582, 2585, 2587, 2588, 2611, 2628, 2660, 2677, 2678, 2696, 2704, 2706, 2714, 2721, 2722, 2723, 2731, 2732, 2734, 2735, 2736, 2761, 2777, 2793, 2802, 2805, 2878, 2956, 2957, 2973, 2975, 3043, 3058, 3065, 3066, 3086, 3089, 3096, 3097, 3098, 3104, 3105, 3112, 3115, 3118, 3146, 3148, 3149, 3159, 3160, 3183, 3200, 3404, 3407, 3419, 3461, 3482, 3505, 3556, 3562, 3602, 3605, 3854, 3856, 3901, 3924, 3948, 3950, 3952, 3976, 4019, 4021, 4031, 4046, 4047, 4050, 4057, 4072, 4085, 4093, 4108, 4117, 4152, 4156, 4169, 4187, 4195, 4253, 4289, 4308, 4329, 4335, 4355, 4404, 4417, 4429, 4456, 4476, 4487, 4489, 4505, 4583, 4601, 4667, 4763, 4792, 4795, 4807, 4830, 4847, 4849.

24-pounder Caseshot Fragment: FS2651.

Unidentified Shell Fragments

Eighteen spherical shell fragments were too small to determine caliber and are identified simply as shell fragments. These are: FS2309, 2419, 2448, 2527, 3182, 3376, 3380, 3418, 4036, 4045, 4055, 4133, 4144, 4153, 4278, 4491, 4534, 4672.

Fuse Rings and Underplug Rings

One hundred twenty-two fuse rings with threads for Bormann fuses and underplugs were also recovered. They were identified to gun caliber (6-pounder = 27; 12-pounder = 68) but not beyond that level. Some were too small to identify as to caliber (27). The vast majority of fragments exhibit a flat undersurface consistent with the Hubble Patent of 1858 (Melton and Pawl 1994:15) developed to provide a stronger support for the Bormann fuse and greater flight stability.

6-pounder Fuse Rings: FS2199, 2285, 2320, 2349, 2634, 2659, 2665, 2716, 2719, 2726, 2728, 2883, 3021, 3076, 3618, 3637, 3968, 3701, 3972, 4066, 4197, 4265, 4341, 4368, 4480, 4684, 4774,.

12-pounder Fuse Rings: FS2108, 2257, 2316, 2363, 2476, 2480, 2532, 2564, 2607, 2609, 2610, 2657, 2729, 2758, 2782, 2797, 3003, 3004, 3009, 3117, 3129, 3161, 3178, 3199, 3358, 3360, 3379, 3415, 3498, 3509, 3510, 3557, 3604, 3736, 3763, 3766, 3988, 4035, 4067, 4069, 4082, 4100, 4134, 4162, 4179, 4184, 4188, 4216, 4232, 4259, 4267, 4314, 4354, 4358, 4385, 4386, 4399, 4418, 4419, 4470, 4479, 4510, 4529, 4607, 4746, 4817, 4820, 4843.

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Undetermined: FS2401, 2443, 2567, 2614, 2776, 3055, 3099, 3128, 3134, 3521, 3701, 3713, 3716, 3717, 3898, 4014, 4070, 4071, 4101, 4200, 4238, 4303, 4321, 4371, 4383, 4753, 4759.

Complete Artillery Projectiles

The metal detecting efforts also recovered seven intact artillery rounds. Four of those are solid shot, three 6-pounder shot (FS2783, 2793, 4639) (Figure 11a), and one 12-pounder solid shot (FS4501) (Figure 11c). In addition four fragments of impacted and broken solid shot were found (FS3824, 3871, 3977, 4018). Two unexploded 6-pounder case shot (FS4595, 4781) (Figure 11b) were also recovered as was one Type 1 James shell (FS4060) (Figure 11e). All three unexploded rounds were deactivated by having an expert drill the rounds and flush the powder from the bursting chamber. Both case shot still contained some of their bursting charge. Elements of the matrix holding the case shot balls in place oozed out of the drill hole. It was determined to be a pine tar resin or pitch. The James shell was particularly interesting as there was no powder in the bursting chamber. The shell was apparently never loaded with powder.

Each of the intact rounds was radiographed by the Ford Conservation Center in Omaha after deactivation. The case shot balls are clearly visible in the interior of the 6-pounder spherical rounds (Figure 12). The James shell radiograph shows the percussion ignition slider in the detonated position, lodged against the brass nose cap (Figures 13, 14). The percussion nipple or cone is also clearly visible. The shell was recovered nose down buried about one foot deep. The position of the percussion detonator against the nose cap indicates the shell's detonator functioned properly and would have exploded the shell had there been powder in the chamber.

Conical Shell Fragments

Fifty conical shell and case shot fragments were recovered during the investigations. They can be attributed to two types of conical shell, the James Pattern (Figure 15a-d) and the Hotchkiss pattern (Figure 16a-d), although some unattributed body fragments are also included in the total.

Andrew Hotchkiss developed the Hotchkiss elongated projectile, first patenting his invention in 1855 and refinements in 1861. The early smooth-bodied projectile, often called the Type I, is a three part piece. A rounded iron base was fastened to the iron body by a thick band of lead. The pressure of the cannon discharge was meant to push the base forward against the lead band or sabot expanding it to fit the rifling of the gun and impart spin to the projectile (Bell 2003:238). In flight the lead sabot often broke up and fell away from the iron components, usually within 50 to 150 yards of the gun, although individual fragments could travel much further (Fitts 1988).

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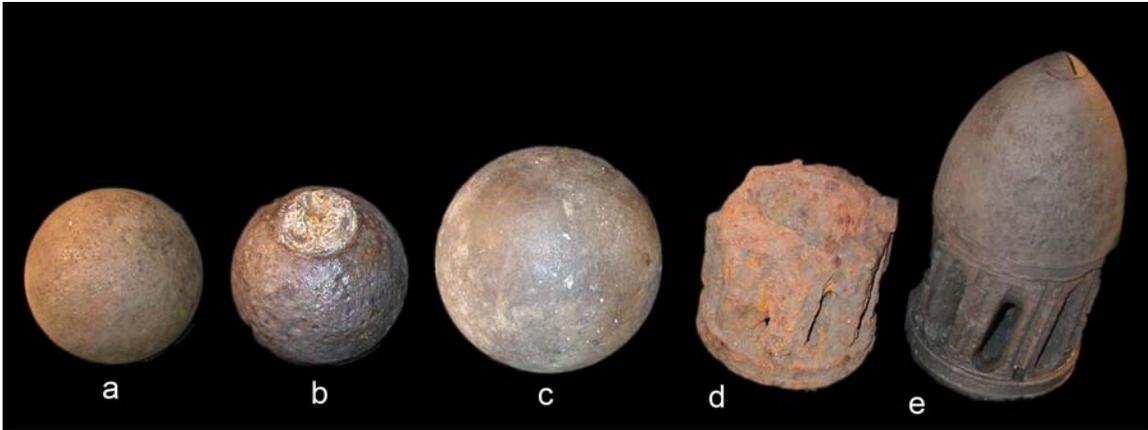


Figure 11. Artillery projectiles. a. FS4369 solid 6-pounder shot, b. FS4781 6-pounder case, c. FS4501 solid 12-pounder shot, d. FS5419 base and portion of burst body of James shell, e. FS4060 unexploded James shell.

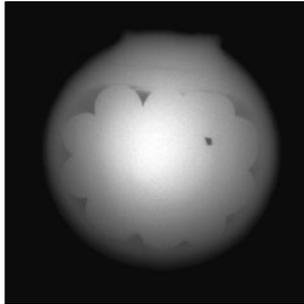


Figure 12. Radiograph of a 6-pounder case shot showing the lead balls in the hollow sphere.



Figure 14. Detail of the James fuse radiograph showing the percussion slider in the fired position against the nose cap.

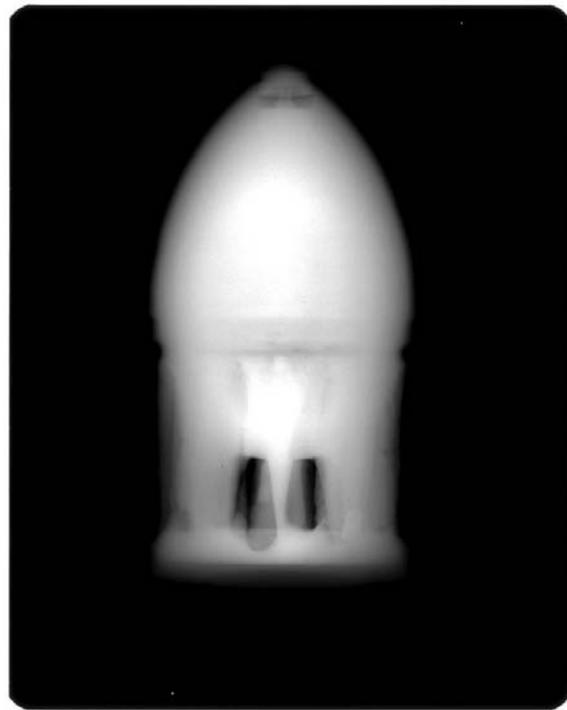


Figure 13. Radiograph of a James shell showing the hollow interior and nose fuse system.

PEA RIDGE

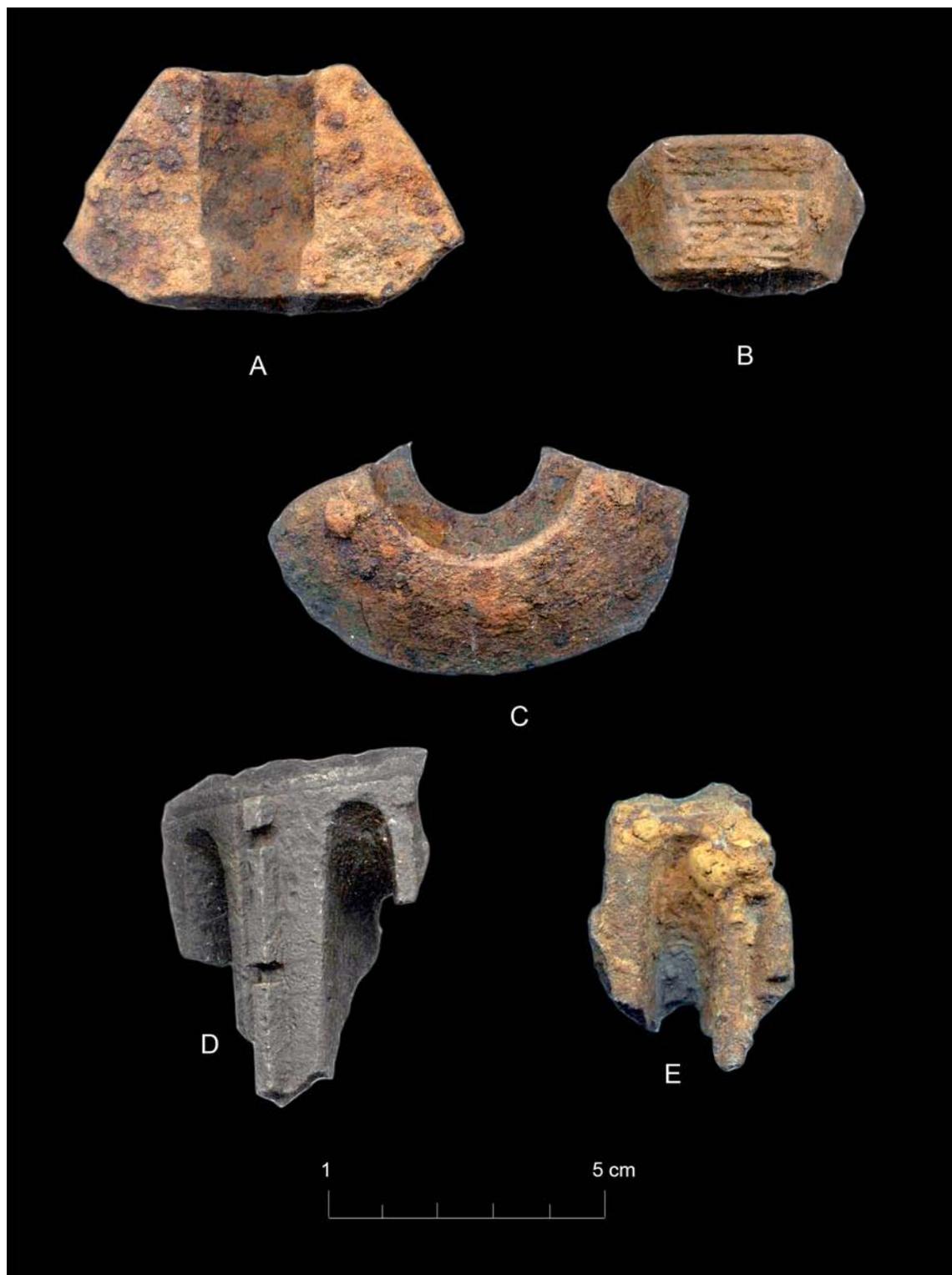


Figure 15. Artillery shell fuse rings. a. FS4617 James nose fragment showing nose cap threads and slider way, b. FS4546a spherical shell fuse ring with Bormann fuse and underplug threads visible, c. FS4607 exterior of spherical shell fuse ring, d, e. FS2768 and FS2356 James shell base vanes fragments.



Figure 16. Hotchkiss shell fragments. a., b. FS4425 and FS3060 shell body fragments, c. FS4567 base fragment, d. FS3396 interior of Hotchkiss base.

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Retired army general Charles James developed the famed James rifling system and the counterpart projectile. James developed a system to rifle smoothbore cannons using a 15 land and groove system. The projectile he developed in 1856 was unique in its design, having an iron body or upper section with a series of vanes or openwork on the lower section. This lower section was covered with sheet lead over which was a layer of sheet tin, covered by a layer of oil canvas. The canvas and tin were designed to protect the guns bore on firing, and the lead band or sabot was intended to grip the rifling and impart spin to the projectile (Bell 2003:255). The lead sabots were prone to break up on exiting the gun, subjecting close by troops to the detriments of friendly fire (Dickey and George 1993:14-15). The shell is generally believed to have been relatively unstable in flight because the center of gravity was too far to the rear, in part caused by the lead covering of the vanes, although the projectile was purchased in quantity by the army through 1864 (Dickey and George 1993:15; Bell 2003:226).

Hotchkiss shell fragments: FS2514 [fuse ring], 3060, 3093 [fuse ring], 3378, 3382 [fuse ring], 3396 [base], 3424 [fuse ring], 3910 [base], 3967 [base], 4146 [base], 4236 [fuse ring], 4254 [fuse ring], 4291 [fuse ring], 4377 [base], 4384 [base], 4425, 4478, 4567 [base], 4632 [base], 4656 [base], 4678 [base with sabot fragment], 4796 [body with sabot fragment], 4851 [fuse ring].

James shell fragments: FS2279 [nose] 2288 [nose], 2356 [skirt], 2768 [skirt], 2769a [fuse ring], 2803 [nose], 3729, [fuse ring], 3904 [fuse ring], 3915 [nose], 4509 [fuse ring], 4574 [skirt], 4577 [skirt], 4578 [skirt], 4591 [fuse ring], 4592 skirt], 4617 [fuse ring], 4719 [complete skirt], 4749 nose].

Unidentified conical shell body fragments: FS2622 [fuse ring], 3714, 4405, 4458, 4468, 4563, 4661, 4662, 4840.

Case Shot Balls

The hollow interior of case shot was filled with .69-caliber lead or iron balls. Since the lead case shot ball and the .69-caliber musket ball are one and the same they are difficult to differentiate. The criteria used in this investigation was either evidence of the lead ball being drilled as part of placing the bursting charge process, or having multiple randomly situated dimples or facets on the surface of the ball formed by being in contact with other balls in the case shot or having occurred during the dispersal of the balls at the time the bursting charge scattered the pieces. Ninety-seven lead case shot balls were identified having one or more of the required characteristics with thirty-three exhibiting evidence of being drilled: (FS 2351, 2366, 2372, 2386, 2410, 2767, 2847 [drilled], 2853 [drilled], 2894 [drilled], 2981, 2982 [drilled], 3022, 3024 [drilled], 3101, 3107 [drilled], 3188 [drilled], 3223 [drilled], 3250 [drilled], 3356, 3357, 3417 [drilled], 3605, 3710 [drilled], 3727, 3735, 3761 [drilled], 3778, 3797 [drilled], 3806, 3811, 3839 [drilled], 3843, 3844, 3848, 3859 [drilled], 3865, 3878, 3881 [drilled], 3899 [drilled], 3905, 3923, 3931 [drilled], 3970 [drilled], 3984, 3987 [drilled], 3989, 4001, 4009, 4086, 4091, 4096 [drilled], 4103, 4105

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[drilled], 4106 [drilled], 4115, 4123, 4125, 4128, 4136, 4138, 4139, 4230, 4247 [drilled], 4276, 4282, 4299 [drilled], 4326 [faceted], 4438, 4474, 4481, 4484, 4492, 4502, 4508, 4518, 4526 [dilled], 4527, 4544, 4550, 4657, 4671, 4693, 4695, 4697, 4707, 4713, 4733 [drilled], 4758 [drilled], 4761 [drilled], 4762 [drilled], 4764 [drilled], 4765, 4767, 4771, 4785 [drilled], 4788, 4844.

Forty-six iron case shot balls were also recovered at Pea Ridge. (FS 2065, 2227, 2271, 2293, 2294, 2305, 2326, 2350, 2362, 2409, 2353, 2451, 2452, 2462, 2526, 2536, 2554 [with flashing], 2555 [with sprue], 2556, 2565, 2566, 2578, 2583, 2595, 2637, 2641, 2643, 2647, 2671, 2684, 2687, 2697, 2701, 2707, 2708, 2710, 2712, 2733, 2742, 2784, 2792, 2795, 2804, 3730, 4080, 4440, 4506.

Artillery Fuses and Underplugs

Artillery fuses during the Civil War came in three varieties, timed, percussion, and combination. Timed fuses were prepared to detonate after a fixed time of flight, with the intent being to explode the shell in the air near a cluster of enemy troops, showering them with numerous pieces of shrapnel.

Percussion fuses, on the other hand, were designed to detonate whenever they struck a hard surface (Jones 2001). These could only be used with rifled guns firing oblong projectiles, as spherical projectiles would tumble in flight and were not likely to land with the fuse in a striking position. Some late-war percussion fuse types were usable with spherical ammunition, but they were not developed until 1863, well after the battle.

Combination fuses, as the name suggests, combine aspects of percussion and timed fuses. If the fuse struck something hard before the timed fuse burned through, the round would detonate. No combination fuse types were recovered at Pea Ridge. Only one type of timed fuse and one type of percussion fuse were identified in the archaeological record.

Bormann Fuses System

The Bormann fuse system was developed in Belgium during the 1830s, and was a closely guarded military secret. Leaked to Britain and the U.S. in 1851, it rapidly replaced paper fuses in the army's caissons (Jones 2001:22). It consisted of a horseshoe-shaped powder train, encased in a circular disc of tin/lead alloy and covered with a metal index plate, marked in quarter-second intervals. On the battlefield, a gunner would judge the distance to a target, calculate the flight time required to reach that distance, and, using a small metal tool, punch through the index plate at the graduation for the desired amount of flight time. The discharge of the gun would ignite the powder train, which would burn through to a small magazine of powder held in the center of the fuse, and thence into the shell, bursting it. Both sides adopted the fuse during the Civil War, and it saw service in both land and sea operations.

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The following twenty-three (23) FS numbers are pieces of Bormann type artillery fuses (Figure 17g, i):

2295	2420	2575	2979	3000	3006	3035	3113	3135	3186
3359	3364	3708	3879	4098	4189	4237	4301	4325	4454
4530	4755	4794	4846						

Three Bormann type fuses (FS 4595, 4781) were recovered with their index plates intact, and two are still in place on the unexploded 6-pounder case shot balls. Although both are damaged by oxidation and possibly impact neither appears to have had the fuse cut (Figure 11b). Close inspection revealed that the one exploded example (FS 2295) had been cut near the graduations for 2.25 or 2.5 seconds of flight time (Figure 17j). If fired from a howitzer, this would correspond with a distance from gun to target of around 800 yards. If fired from a gun, that same distance would be nearly 1100 yards.

In order to keep the soft lead/tin alloy fuse from being forced into the shell at the moment of discharge, each spherical shell designed to use the Bormann fuse was outfitted with a small circular iron underplug to support the body of the fuse (Figure 17a, b). A hole through the middle of the underplug allowed the flame from the fuse to communicate to the shell. Most underplugs recovered are made of iron and were screwed into the shell with a wrench that fit two small holes in the disc's face.

The following sixteen (16) FS numbers are iron Bormann type underplugs:

2450	2569	2620	3025	3176	3381	3767	3912	4095	4284
4401	4528	4648	4712	4793	4828				

In addition, four copper or brass underplugs (Figure 17c, d) were recovered. Instead of being outfitted with wrench holes, they were slotted so that a simple screwdriver could be used to affix them. Jones (2001:26) attributes these copper slotted Bormann underplugs to Confederate forces. As all of these were recovered on Narrow Ridge in an area known to have been shelled extensively by Confederate and Missouri State Guard batteries, the archaeological record offers no reason to reject this Confederate attribution.

The following four (4) FS numbers are copper slotted underplugs, most likely produced by the Confederate Army.

2408	2545	2572	2695						
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James Percussion Fuse System

Elements of a single percussion fuse system were recovered at Pea Ridge. The James type percussion fuse employed a "West Point" style slider mechanism that was the standard for the artillery in 1861 (Jones 2001:30). Inside the shell, a cylindrical slider made

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Figure 17. Artillery fuses and fuse rings. a., b., c., d. underplugs, FS4793 iron top view, FS2450 iron base view, FS2645 brass CS top view FS brass CS base view, e. FS2275 brass James shell noes cap, f. FS4780 iron Hotchkiss percussion cap g. FS4301 magazine of bottom of Bormann fuse, h. FS3157 zinc Hotchkiss slider deformed by impact, i, FS4846 Bormann fuse with index plate gone, j, FS2295 Bormann fuse with index plate cut at 2.5 seconds.

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of brass (though iron and various white metals were also used) with a small musket cone and percussion cap fixed to the top sat at the bottom of a small channel, sometimes held in place by a brass safety wire inserted through the side of the shell (Dickey and George 1993:459). At the other end of the channel was the nose of the shell, into which a small brass anvil cap (Figure 17e) was screwed. When the gun discharged, the safety wire would snap, and, upon impact, the slider would lurch forward and impact upon the anvil cap. This impact would detonate the percussion cap, sending a stream of sparks shooting into the powder chamber, detonating the shell (Dickey and George 1993:459). This system was prone to jamming and misfires, however, and the system was taken out of service by mid-war (Jones 2001:30).

The only slider recovered is encased in FS4060, an unexploded James Type I shell found in the woods just north of Cox's Field on the west side of the tour road (see Artillery Projectile section for a complete description). Two of the brass anvil caps were recovered (FS2275, 4538), one in the woods just south of the Huntsville Road, and the other on the Point of Rocks at the southern end of Elkhorn Mountain. FS2275, the anvil cap near the Huntsville Road, could have been fired by either side, but no Confederate battery is documented as firing on the Point of Rocks or on the woods near Ruddick's and Cox's Fields.

Hotchkiss Fuses

Curiously absent from the archaeological collection recovered at Pea Ridge are any quantity of Hotchkiss type fuse pieces, although Hotchkiss projectile fragments were recovered (see Artillery Projectile section for further discussion). Only two pieces FS 3157, a zinc slider tube for a West Point style percussion fuse (Figure 17h), and FS 4180 (Jones 2001:92), an iron, slotted anvil cap (Figure 17f), can be identified as being an elements of Hotchkiss pattern fuses. No brass time fuse adapters (Jones 2001:86-89) were recovered, nor were other parts of percussion fuses. Given that Hotchkiss and James shell fragments were recovered with similar frequency, it would appear that fuse parts for the former are underrepresented. Dickey and George (1993:165) note that some early Type I shells used wooden fuse adapters and paper time fuses, which were supplanted by brass screw-in adapters early in the conflict. They note that the few rare battlefield finds of such rounds relate to early sites in Virginia. If they were used at Pea Ridge, they would not have survived in the archaeological record, and could account for the lack of Hotchkiss fuses recovered during this project. However, most of the Hotchkiss nose shell fragments recovered are threaded, indicating that brass adapters or percussion time fuses and not wood were probably being used during the battle.

No Civil War era friction primers were recovered during the investigations. However, several modern friction primers (FS 2158, 2160, 2161) were collected as specimens representing modern artillery demonstration and reenactment firings.

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Artillery Lead Sabots

With the introduction of rifled cannon in years immediately preceding the Civil War a need arose to develop a projectile that would perform in a ballistically acceptable manner, one that would reach its target with accuracy and enough remaining kinetic energy to achieve its intended purpose. One of the means developed to obtain spin stabilization of the new conical or elongated projectiles was the lead sabot or what might be called today a rotating band. In essence a mass of lead was added to the tail or body of the projectile so that on firing the lead would expand and engage the guns rifling thus imparting spin to the projectile.

Two types of lead sabots were recovered at Pea Ridge and along with the iron shell fragments themselves identify the James type shell (Figure 18a-c) and the Hotchkiss shell (Figure 19a-c) as the two conical projectiles used in rifled cannon during the battle.

Only six Hotchkiss shell sabot fragments were recovered (FS 3067, 3411, 3495, 3951, 4347, 4387, 4740).

James shell sabot fragments include ninety-three pieces of lead with distinctive vane impressions and some still have rusted tin coverings adhering to one surface:

FS3741, 3743, 3747, 3758, 3771, 3790, 3791, 3793, 3795, 3799, 3800, 3803, 3807, 3808, 3809, 3817, 3818, 3823, 3825, 3827, 3830, 3836, 3838, 3841, 3842, 3846, 3852, 3863,



Figure 18 James shell sabots. a. FS3795 lead side, b. FS3893 tin side note impressions of narrow land and groove rifling, c. FS3896 lead side

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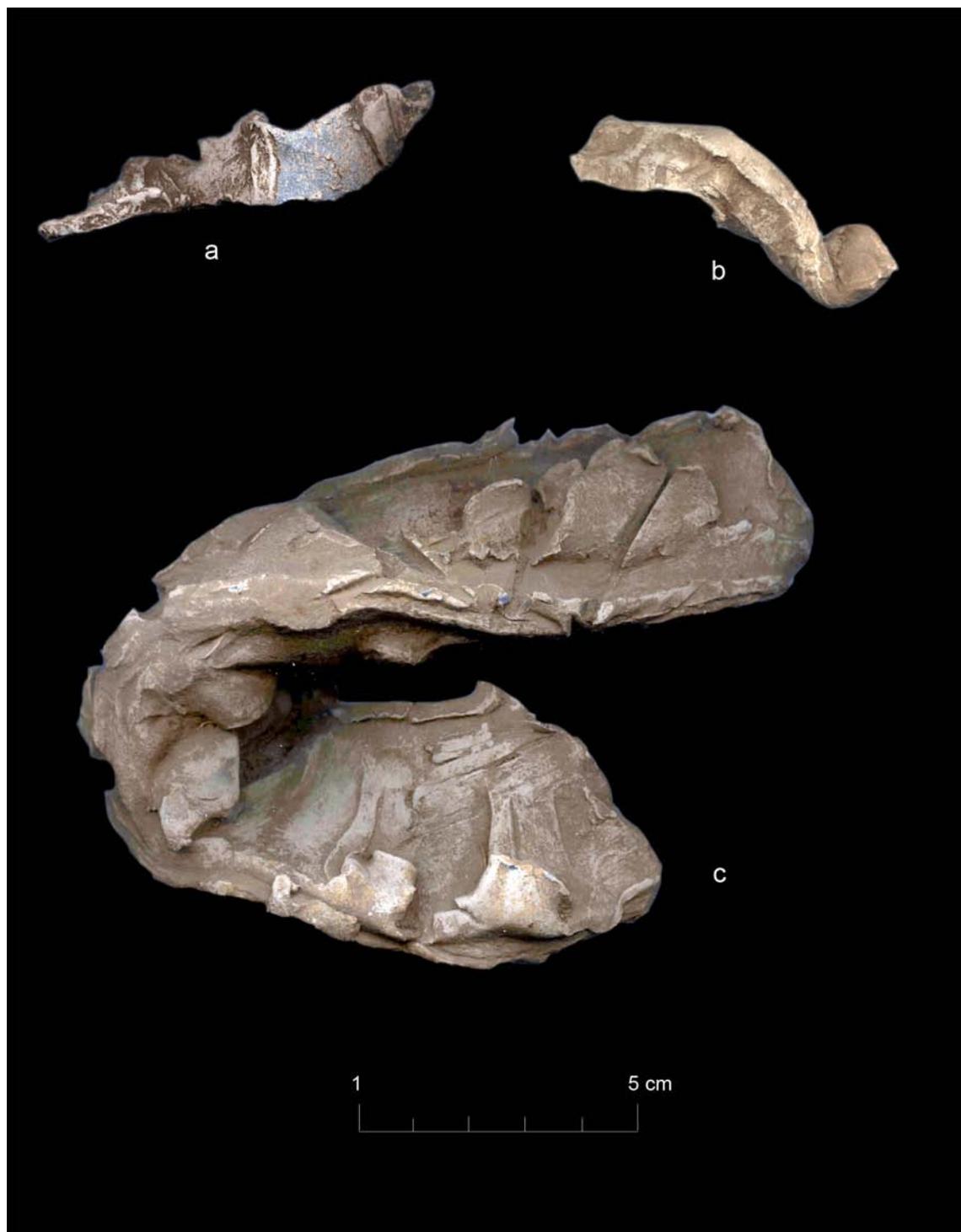


Figure 19 Hotchkiss shell sabots. a., b. FS3411, FS1425, c. FS3951 nearly complete, twisted, shows interior and rifling marks with wide land and grooves impressions.

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3864, 3867, 3872, 3874, 3876, 3877, 3880, 3884, 3885, 3886, 3889, 3893, 3895, 3896, 3900, 3907, 3908, 3909, 3914, 3916, 3917, 3927, 3930, 3932, 3933, 3934, 3936, 3942, 3944, 3949, 3953, 3954, 3955, 3956, 3957, 3959, 3960, 3963, 3969, 3974, 3975, 3978, 3979, 3980, 3982, 3983, 3991, 3992, 3993, 3995, 4003, 4011, 4022, 4025, 4026, 4029, 4033, 4037, 4042, 4049, 4051, 4252, 4293, 4302, 4306.

Two small thin lead fragments (FS3208, 3367) are too small to identify beyond the probability that they are sabot fragments.

Canister

Canister rounds are usually lead or iron balls placed in a tin container that were fired from cannon at a short range (less than 500 yards for field guns) as an antipersonnel device. Canister rounds performed as a large shotgun blast, sending large numbers of balls toward an on-coming enemy. The normal round was filled by the process of placing a layer of shot in the can and then packing the voids with dry sawdust and packing the components firmly. The sawdust had a two-fold purpose-to give more solidity to the mass, and to prevent the balls from crowding upon each other when the gun was fired (Dickey and George1993:17).

The inventory work recovered 238 canister balls representing three gun calibers, 6-pounder gun, 12 pounder gun and howitzer, and 24-pounder gun as well as expedient canister projectiles made from iron bar and rod stock (Figure 20a-h). Several of the spherical canister have sprues remaining and some are misaligned (Figure 21) indicating quality control for the production of canister was, at times, limited.

The 1862 Army Ordnance Manual noted that 6-pounder gun canister balls were to be between 1.14 and 1.17 inches in diameter, 12-pounder gun canister balls to be between 1.46 and 1.49 inches in diameter, 12-pounder howitzer canister balls to be between 1.05 and 1.08 inches in diameter, and 24-pounder gun canister balls between 1.84 and 1.87 inches in diameter. The recovered iron canister balls range in diameter between 1.07 and 1.85 inches in diameter and are consistent with being fired in the 6-pounder guns, 12-pounder howitzers, although a few fall into an intermediate range between the 12-pounder gun and howitzer, and the 24-pounder gun.

The following FS numbers fall within the diameter range of the 6-pound gun size: (n=86) FS2026, 2061, 2071, 2076, 2088, 2093, 2190, 2205, 2210, 2213, 2219, 2231, 2241, 2248, 2249, 2369, 2376, 2388, 2393, 2402, 2413, 2423, 2438, 2439, 2440, 2445, 2447, 2449, 2458, 2459, 2461, 2466, 2473, 2474, 2478, 2479, 2488, 2490, 2500, 2507, 2509, 2517, 2521, 2525, 2538, 2543, 2551, 2571, 2612, 2623, 2627, 2640, 2655, 2664, 2675, 2683, 2688, 2694, 2700, 2718, 2790b, 3012, 3051, 3079, 3085, 3094, 3106, 3114, 3123, 3165, 3166, 3168, 3170, 3174, 3184, 3185, 3187, 3196, 3315, 3752, 3764, 3781, 3925, 3966, 3999, 4039, 4191, 4231, 4233, 4297.

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Figure 20. Canister balls. a. round bar stock expedient canister, b. lead canister ball deformed by pressure of firing and impact, c. square bar stock iron expedient canister, d. small iron canister variant, e, f, g. variations in 6-pounder canister, h. 12-pounder canister, i. 6-pounder canister top plate, j. 6-pounder canister base plate.



Figure 21. Misaligned canister balls resulting from poor mold alignment.

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Those FS numbers falling within the diameter of the 12-pound howitzer size are: (n=146) FS2036, 2040, 2060, 2068, 2078, 2081, 2114, 2220, 2226, 2229, 2230, 2239, 2256, 2258, 2262, 2266, 2267, 2272, 2359, 2379, 2381, 2385, 2398, 2399, 2406, 2411, 2412, 2414, 2416, 2425, 2426, 2429, 2430, 2441, 2446, 2453, 2467, 2469, 2470, 2471, 2472, 2489, 2491, 2493, 2502, 2503, 2504, 2506, 2510, 2513, 2516, 2523, 2530, 2531, 2537, 2544, 2550, 2557, 2562, 2603, 2604, 2605, 2608, 2613, 2615, 2616, 2619, 2638, 2645, 2666, 2668, 2670, 2673, 2679, 2680, 2681, 2689, 2690, 2691, 2692, 2703, 2705, 2711, 2713, 2720, 2765, 2770, 2955, 2976, 3038, 3032, 3034, 3038, 3041, 3048, 3064, 3071, 3153, 3163, 3173, 3177, 3179, 3191, 3193, 3194, 3198, 3501, 3522, 3706, 3709, 3721, 3787, 4010, 4090, 4124, 4137, 4172, 4174, 4182, 4190, 4199, 4218, 4234, 4239, 4242, 4245, 4255, 4257, 4263, 4264, 4266, 4268, 4270, 4272, 4273, 4275, 4277, 4279, 4288, 4292, 4294, 4295, 4536, 4715, 4716, 4825.

Three field specimens fall into the 24-pounder gun range: FS2377, 2399, 2434.

Two canister ball fragments (FS2366, 3666) were also recovered. The fragments are too small to measure for diameter.

Another artifact related to canister is several canister base and top plates (Figure 20i, j). These plates formed the top and base to the tinned iron container holding the canister. The container disintegrated during firing and the top and base plates, made of heavier stock, fell away from the cluster of canister balls during flight. Fourteen 6-pounder top plates, three 6-pounder base plates, and nine 12-pounder top plates were recovered. The field specimen numbers are: 6-pounder top plates: FS 2038 (folded and crumpled by firing), 2045 (fragment), 2067, 2079, 2084, 2094 (fragment), 2259 (may be a tincan), 2646, 3757 (fragment), 3779 (fragment), 3930, 4298, 4356, 4424; 6-pounder base plate: FS2654 (fragment), 3388, 4249; and 12-pounder top plates: FS2048, 2063 (fragment), 2089 (fragment), 2133, 3920, 3946, 3996, 4312, 4313 (fragment).

Expedient Canister

Among the more interesting canister artifacts are six expedient canister projectiles. It is well documented that Guibor's battery of the Missouri State Guard manufactured canister projectiles and tins after the battles of Carthage, Wilson's Creek, and Lexington, Missouri (Patrick 1997). These canister projectiles are well-known in southwestern Missouri and northwestern Arkansas and are locally referred to as barshot, but are more properly termed expedient canister. The projectiles were made from bar stock found in local blacksmith shops. Five of the projectiles (FS2277, 2404, 2633, 2635, 2785) are cut from square bar stock (Figure 20c) measuring approximately 5/8 inch by 3/4 inch on a side. One piece (FS2287) is round stock about 5/8 inch in diameter and 1 1/4 inches long (Figure 20a). The individual pieces range from 1.45 to 1.79 inches long. The cut ends indicate the round stock was cold cut using heavy blacksmithing shears (Bealer 1969: 89). The rods were probably handheld as some exhibit angled cuts and twisting to snap the rod from the cut piece as would likely occur without the stock being jigged in place.

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Firearms Parts and Gun Tools

Fifteen firearm parts were recovered at Pea Ridge during the archaeological investigations. Most of these are associated with military type weapons, although a few appear to relate to the pre and post-battle occupation of the site, or may, perhaps, stem from men who joined the armies as they entered northern Arkansas, carrying with them arms brought from home. While historical accounts mention such men joining ranks just prior to the battle, many did not arrive armed, as evidenced by the 19th and 20th Arkansas regiments. Newly formed, the bulk of their soldiers did not come bearing arms, and were issued cast-offs from the Missouri State Guard just 36 hours prior to the battle (Shea and Hess 1992:58). They were not able to be equipped in time to join the fight. Archeologically, investigations of the battlefield of Wilson's Creek, Missouri indicate that the ratio of civilian to military weapons used on the battlefield is much lower than popular memory would indicate (Scott, Roeker, and Carlson-Drexler 2005:103-104).

Two military weapon hammers were recovered at Pea Ridge and are from the U.S. M1816 Springfield musket (Figure 22e, f). Produced between 1816 and 1840, the M1816, also referred to as the M1821 or M1822, was originally a flintlock weapon. In the 1830s and 40s, the U.S. Army converted many of these weapons to use percussion caps, providing a new lock plate, and altering the barrel with the addition of a cone. The percussion hammers used in this refitting process are distinctive in that they bear a small gap in the front of the striking face to facilitate the removal of stuck percussion caps. Neither the M1842 nor M1855 and its variants bear a similar mark.

One of the M1816 hammers recovered at Pea Ridge was an unaltered, flintlock example (FS2090), while the other is a percussion conversion (FS2322). The flintlock hammer was recovered in the woods northeast of Elkhorn Tavern, where the Missouri State Guard overran Carr's men on the first day of battle. The percussion hammer, on the other hand, was found on the western edge of Clemon's Field. In excellent condition to begin with, cleaning in the lab revealed the reason for the hammer's discard. The portion of the tumbler over which the hammer fits broke from the lock plate, remaining attached to the hammer by the hammer screw.

Two more pieces of M1816 muskets were found in Clemon's Field. Near the barricade where the 4th Iowa crouched while repelling the assault of the Missouri State Guard, two M1816 side plates (Figure 22b) were found (FS2058, 2059). These metal straps connected the lock plate screws, preventing them from damaging the stock as well as providing some level of ornamentation. Both of the side plates were damaged to some extent, one being bent near the hole for the forward lock plate screw, the other being broken in half.

It is interesting to note that almost all of these artifacts are damaged in such a way as to render them unserviceable. Both of the M1816 side plates are damaged either through bending or through breakage. A possible sideplate is represented by FS3397. The percussion M1816 hammer has a portion of the tumbler screw lodged in it, and a



Figure 22. Gunparts. FS2903 Enfield brass nipple protector, b. FS2059 M1816 sideplate, c. FS2744 M1816 mainspring, d. FS2254 small flintlock hammer missing top jaw, e. FS2090 M1816 flintlock hammer, f. FS2322 M1816 percussion hammer.

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fragment of large military musket trigger guard was recovered nearby (FS 2112). The only undamaged parts of military firearms on the field are the flintlock M1816 hammer and a band spring (FS2330) that was found north of the hammer on the narrow ridge north of Elk Horn Tavern.

Two other possible M1816 parts are mainsprings (FS 2744, 2934). These are large heavy mainsprings (Figure 22c) for gun locks and are consistent in size with those found on M1816 muskets as well as those on the M1842 muskets. Other military gun parts include a fragment of musket barrel band (FS2343) and a broken flintlock frizzen spring (FS 2676), both found on narrow ridge north of Elk Horn Tavern.

Another gun hammer was recovered west of Clemon's field. It is a small flintlock hammer (Figure 22d), less the top jaw and screw (FS2254). It is relatively flat and is consistent with a civilian type pistol hammer, as opposed to the heavier and more rounded military horse pistol type. The hammer is more delicate in appearance than the single shot flintlock military hammers of the early nineteenth century.

Other firearms parts include a civilian style trigger guard plate (FS2980), a back action lock (FS 2799) with the forward side lock screw still in place. The lock is typical of those found on inexpensive shotguns and rifles of the mid-nineteenth century. A fragment of a civilian style iron trigger guard (FS3470) in pistol size was found during the 2003 field season.

Firearms related tools include various gun maintenance tools and a brass nipple protector (Figure 22a) from a P53 Enfield rifled musket (FS2903) was also recovered (McKee and Mason 1995:73). Two Model 1841/1842 combination nipple wrench and 2-bladed screw drivers (FS2702, 3238) (Figure 23c) were recovered. Shaffer et al. (1992:155-156) identifies these tools as musket takedown or disassembly and maintenance tools issued to soldiers to carry in their cartridge boxes. One Model 1816 Type III .69-caliber cleaning worm (FS3127) or gun wiper (Figure 23b) (Shaffer et al. 1992:102), carried by each soldier issued a .69-caliber musket, was also recovered. Two less common gun tools were also found. One is a screwdriver and nipple wrench combination tool (FS2897) produced for the Prussian musket (Figure 23d) and is known to date to as early as 1855 (Shaffer et al 1992:215). The other is also a combination screwdriver and nipple wrench (FS2105), but is for the Savage and Savage and North revolver (Figure 23e). Only 11,248 of these pistols were procured by the Army during the Civil War (Shaffer et al. 1992:187). The last gun related item recovered is a brass top (FS3994) of a barrel tompon (Figure 23a) for the British P53 Enfield rifled musket (Shaffer et al. 1992:335).

Battle-Related Personal and Equipment Items

The investigations yielded relatively few definitively battle-related non-firearms related artifacts. The few items that can be clearly associated with the battle are pieces of equipment, buttons, camp gear, utensils, and a few miscellaneous items.



Figure 23. Guntools. a. FS3994 Enfield tompon cap, b. FS3217 Type III gunworm for M1816 musket, c. FS3298 1842 combination tool, d. FS2897 Prussian musket tool, e. FS2105 Savage pistol tool.

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Five definitive military equipment items were recovered. One is a mid-section of a U.S. triangular bayonet (FS2631) (Figure 24g). The second is a bayonet scabbard tip (FS2698). The brass tip (Figure 24f) was fitted to a leather scabbard for a musket bayonet and is a typical U.S. type used from well before the Civil War until 1872 (Reilly 1990). The third item is a brass closing stud (FS2529) (Figure 24c) for a leather cartridge box. The fourth item is a canteen stopper ring (FS3284). The ring (Figure 24d) once held the cork stopper which has disintegrated, although the square iron nut is still in place (Sylvia and O'Donnell 1983; Phillips and Rila 1989). The final item is a tinned iron strap cup handle (FS2644). The handle (Figure 24e) is consistent with Civil War era pint sized drinking cups commonly issued to soldiers (Hedren 1992; L. Scott 1979).

One other item, a brass buckle frame (FS2054) (Figure 25c) for a $\frac{3}{4}$ inch strap is consistent in size with spur or saddle bag buckles dating to the mid-nineteenth century and sometimes associated with Confederate saddle tack (Knopp 2001).

Three non-military, but probably battle associated items are a brass side knife scabbard throat (FS2159) (Figure 24a), a brass side knife crossguard (FS4391) (Figure 24b), and an iron spur (FS2756). The spur has one arm broken off, but still has the iron rowel in place. The spur is a mid-nineteenth century civilian style (Dorsey 2000).

Three brass gromets (FS3341 – 1 inch, 3345 – 1 inch, 3728 – $\frac{3}{4}$ inch) are of undetermined origin, but may associate with tenting or tarpaulins used during the battle. The gromet style is ubiquitous enough that dating them is difficult.

Uniform buttons are the only remains of uniforms recovered. Three $\frac{13}{16}$ inch diameter brass Federal eagle coat buttons were found during the investigations. One General Service button (F2273) (Figure 25a) has a partially readable backmark that includes the word “Waterbury”, a famed center of button production for over a 150 years (Tice 1997:53). Another General Service button (FS3283) is unmarked, and the final Federal eagle coat button (FS2896) has the infantry “I” in the shield. The back has separated from the front and no marking are evident.

Several other buttons were also recovered, but they are either modern replica military buttons or from working garb such as modern overalls. FS2858 is an brass Infantry Federal eagle button. It is backmarked “Waterbury Cos. Inc./Conn.” This mark is a twentieth century mark for the Waterbury Button Company (Tice 1997:50-51). FS 2158 is a copper General Service overcoat button of the 1910 through 1920 period. Two four-hole sew-through trouser or suspender buttons (FS3719, 4261) are modern alloyed white metal that resembles but does not duplicate the nineteenth century styles. One flat brass button (FS4359) is $\frac{1}{2}$ inch in diameter and has the remains of omega style loop on the back (Figure 25b). It is consistent in style with nineteenth century cuff buttons and could be from a homespun Confederate uniform or from the coat of a soldier who wore civilian clothes. The remaining buttons (FS2157, 2746, 2747, 3344) are post-battle civilian clothing buttons, most probably associated with overalls or workingman clothing.



Figure 24. Equipment. a. FS2159 brass scabbard throat, b. FS4391 brass knife guard, c. FS2529 brass stud from cartridge box, d. FS3284 canteen stopper ring, e. FS2644 tin cup handle, f. FS2698 brass bayonet scabbard tip, g. FS2631 bayonet blade fragment.

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Figure 25. Personal items. a. FS2273 General Service button, b. FS4359 plain brass flat button, c. FS2054 D-shaped brass buckle, e. FS3334 brass suspender clip, 3f. FS254 harmonica tone plate.

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One other clothing item may associate with the soldiers' clothing. It is a suspender adjustment device (Figure 25d). FS3334 is a 2 inch wide stamped brass slide. It has three prongs for holding a strap in place and has a floral design stamped on one surface.

Two footwear toe or heal clips (FS2629, 2806) are both well worn brass artifacts with multiple nail holes covering the wear surface. Some holes were punched in during the manufacturing process, but most are expedient holes indicating that the clip loosened during wear and was repeatedly renailed to hold it in place.

Personal items are represented by musical instruments and utensils. Musical instruments are represented by two (FS2599,3254) brass harmonica tone plates (Figure 25e). Among the utensils are two iron three tined forks with a flat shanks (FS2492, 2745), an iron spoon handle fragment (FS3246), an iron spoon bowl (FS3492), three iron table knife handle or blade fragments (FS 2952, 3147, 4319), an unidentified iron utensil fragment (FS4446), and an iron side knife blade (FS3264). The blade is slightly curved and 4 ¼ inches long with a two-inch long slightly rectangular shank. The knife appears to be a homemade or blacksmith made item.

Several cast iron pieces are fragments of cooking pots and were recovered on Narrow Ridge north of Elk Horn Tavern, the scene of intense fighting on the first day of the battle and an area occupied by Confederate troops on the night of March 7. Two fragments of cast iron frying pans are represented by FS 2483 and FS 2594. Cast iron kettles or cooking pots are represented by numerous fragments (FS2475, 2485, 2468. 2482, 2486, 2515, 2592, 2597, 2715, 2921, 2984, 2951) found on Narrow Ridge among many battle-related artifacts. FS 3947 is also a cast iron kettle or cooking pot fragment, but was found in the Cox's field area. The style of vessels represented by the fragments are consistent with mid-nineteenth century types. They are likely associated with the battle, but could be pre-war or post-war trash deposited by the residents of the area.

Miscellaneous Post-Battle Artifacts

A few horse and wagon items were recovered during the investigations. They are ubiquitous enough that they cannot be directly associated with the battle. They were found in a variety of places around the battlefield, however, the context is unclear enough to state they are from the battle era given the long usage of horses and wagons as a means of conveyance. A wide variety of other materials were recovered during the field investigations. Most items were reburied if they could be positively identified in the field as post-battle in age, but some were collected if identification or affiliation was uncertain. Subsequent analysis determined them to be post-battle in origin. These items include bits of farm machinery, internal combustion engine parts, nails, fence staples, modern coins, overall buttons, horseshoes, horse tack and harness, shed door hooks, nuts, bolts, and a variety of personal items like buttons and pocket knives. Some bullets that could not be clearly identified during field investigations were also collected for later analysis that

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proved to be modern in origin. These materials were fully described and cataloged as part of the project collection, but are not listed here for the sake of brevity.

5. INTERPRETING THE ARCHEOLOGICAL EVIDENCE

For convenience interpretations of the evidence and how it relates to the battle are divided into a number of segments. The initial discussion focuses on the historical record of firearms used in the battle and then the archeological evidence is presented showing where the historical documents and participant recollections meld or are at odds. The physical evidence of firearms use, studied using firearms identification procedures, provides new insight into the range of guns used by the battle participants. Then this evidence is used to interpret the three elements or segments of the battle examined through archeological investigation. Although two segments occurred nearly simultaneously the information is divided for clarity of presentation into the fight at Leetown, the fight around and north of Elk Horn Tavern, and the second day's fight in Cox's field.

Firearms Types at Pea Ridge – The Historical Accounts

The rich historical records and accounts of the Battle of Pea Ridge are replete with references to cannon and small arms use. As rich as those records may be they are also relatively obtuse regarding the identification of weapon types used by specific units. There are many references to the use of muskets, shotguns, rifled muskets, and country rifles, but frustratingly little on specific types or models in the hands of the soldiers. Most references to small arms use are non-specific and anecdotal in nature as exemplified in the following discussion.

Prior to the Civil War state militia companies received arms from the federal government on a routine basis. Missouri troops are known to have received 400 Hall rifles (Schmidt 1996:120) prior to the war. Some of those may have been confiscated by General Nathaniel Lyon's troops during the Camp Jackson affair, but others remained in the hands of the Missouri State Guard. As of October 1860 the Little Rock Arsenal and the Baton Rouge Arsenal are reported to have had 2,684 and 2,287 Hall rifles on-hand respectively (Schmidt 1996:121).

The army kept most of its old model muskets, particularly the Model 1816 .69-caliber musket, in the various arsenals as second or third class arms. They became, in essence, back-ups in case war broke out and local and state militia units needed to be raised and armed in the event of a national emergency. Beginning in 1855 at least 20,000 Model 1816 muskets were converted from flint ignition system to the percussion ignition system at various federal arsenals and armories. At least 2,000 Model 1816 smoothbore muskets were rifled with a standard 3 land and groove rifling at Harpers Ferry Armory between 1856 and 1857. Others were rifled at other arsenals and by contract in the years before the Civil War (Schmidt 1996:139).

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Artillery

From his headquarters in the field on April 1, 1862 Gen. Curtis filed his report of the battle at Pea Ridge. In that report he mentions that he had forty-nine pieces of artillery in his command (OR, Series I, Volume VIII, pg. 196). According to Shea and Hess (1992:330-334) Union artillery consisted of four 6-pounder rifled guns and two 12-pounder howitzers with the 4th Independent Battery, Ohio Light Artillery; three 12-pounder howitzers and two 12-pounder guns with Welfley's Independent Battery, Missouri Light Artillery; four 6-pounder rifled guns and two 12-pounder howitzers with the 1st Missouri Flying Battery, four 6-pounder guns and two 12-pounder howitzers with the 2nd Independent Battery, Ohio Light Artillery, two 6-pounder rifled guns, two 6-pounder guns, and two 12-pounder howitzers with Battery A, 2nd Illinois Light Artillery; four 6-pounder rifled guns and two 6-pounder guns with the 1st Battery Indiana Light Artillery; four 6-pounder guns and two 12-pounder howitzers with the 1st Independent Battery Iowa Light Artillery; and four 6-pounder guns and two 12-pounder howitzers with the 3rd Independent Battery Iowa Light Artillery.

The rifled guns fired conical projectiles, usually shell or case shot, although solid shot or bolts and canister could be fired as well. The smoothbore guns and howitzers fired spherical solid shot, case shot, shell, or canister. Little is known of the side arms carried by the artillerymen, however, Baumann (1989:24-26) notes that the 2nd Illinois had cavalry sabers, artillery sabers, and .36-caliber and .44-caliber revolvers. Although a contemporary newspaper account simply signed by L.R.W. stated "In justice to the command of Capt. Davidson of the Peoria Battery, and in partial explanation of ...[the] capture by the enemy at the great battle of Pea Ridge, Ark., (but subsequently retaken by our troops) I desire to state that Capt. D's men have never been provided with side arms, so necessary to protect themselves and their cannon, since they volunteered for service" (Peoria Daily Transcript, March 18, 1862). Baumann's sources include official state records and other documented archival sources and may well be the more accurate account, while the contemporary newspaper account may be one trying to excuse the temporary loss of the guns due to the lack of proper armament. Regardless of the accuracy of either account a disparity is evident in the historical record than requires an independent line of evidence for corroboration and validation.

Cavalry Small Arms

On December 18 1861, Brigadier General George Stoneman, Chief of Cavalry, noted that most volunteer cavalry units were armed with pistols and sabers and only ten carbines per company due to a shortage of carbines and his fear that it would be unwise to put carbines in the hands of inexperienced men. Whether the limit of ten carbines per company was strictly adhered to or not is unknown, particularly in the western units, although the extant records do show there was a true shortage of carbines during the first two years of the war. (McAulay 1996:11-12).

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McAulay's (1996:19-21) research in National Archive records allowed him to identify the recorded small arms in the cavalry regiments as of December 31, 1862. Since this date is some eight months after Pea Ridge it is necessary to assume that some units may have been rearmed in the intervening months, but since this is the earliest formal record of troop armaments known it provides, at least, a glimpse into the arms in the hands of the troops. McAulay (1996:11) reports that in September 1861 Colonel Eugene Carr of the 3rd Illinois Cavalry requested 1st Model Maynard carbines for his unit, probably based on his experience with them as Captain of the Company D, 1st Cavalry, but was issued Hall carbines by the Ordnance Department due to a shortage of the arms requested.

The 3rd Illinois Cavalry were armed with 44 Hall Carbines, 135 Colt .44 Army Revolvers, 5 Colt .36 Navy Revolvers, 5 Pettingill Revolvers, 11 Savage .36 Revolvers, 125 .54 horse pistols as reported in the December 1862 ordnance reports (RG 159, Summary Statements of Quarterly Returns of Ordnance and Ordnance Stores in the Hands of Regular and Volunteer Army Organizations, 1862-1871, National Archives and Records Administration, M1281, Roll 2 – Cavalry for the 4th Quarter 1862, hereinafter cited at RG159 Ordnance Summary Statement M1281 and roll number).

The 4th Missouri Cavalry reported they were armed with 82 Hall Carbines and ten Model 1855 .58-caliber Pistol Carbines (McAulay 1996:11). The 1st Missouri, 5th Missouri, and Bowen's Missouri Cavalries either failed to report their armament or that information has not survived. Maj. Osterhaus in his after action report of the Leetown fight mentions the 1st Missouri Cavalry armament as: "I therefore ordered the three pieces of the flying battery to form, supporting them by companies from the First Missouri Cavalry, provided with revolvers and revolving carbines, forming the remainder of the cavalry in line of attack" (OR, Series I, Volume VIII, pg. 217) indicating they had some model of revolver and the Colt revolving carbine.

The 3rd Iowa Cavalry appears to be somewhat better armed with 70 Sharps carbines than some of the Missouri units (McAulay 1996:11). Cavalry normally carried revolvers or horse pistols as side arms, but only one reference to side arms for the 3rd Iowa is known. H. M. Dysart (nd:84) noted the serial number of his pistol as 117162 (likely a Colt revolver) that he was issued as a member of the 3rd Iowa Cavalry on January 1, 1862.

Infantry Small Arms

Like the cavalry records there is frustratingly little information regarding the shoulder arms in the hands of troops at Pea Ridge. Once again we must rely, in part, on the December 1862 report as to how the units may have been armed. A few participant recollections aid in filling out the record, and by and large reinforce the official reports of arms in the hands of troops.

Corbin (1972:92-95) recalled that the 9th Iowa Infantry, Company D were issued "eleven pound Dresden rifles, which some rated as a true shooting rifle." He also recalled

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that Company B was armed with old Tower muskets in October 1861, and Company C thought the world of their new Minié guns, although the model was not mentioned. The Ordnance Summary Statement (RG159, M1281, Roll 5) lists Enfield rifled muskets for companies A, B, D, and F, G, H, I, and K but no data for companies C and E.

The 4th Iowa Infantry report for December 1862 is scanty at best, showing Companies C, D, E, F, G, H, and K with M1816 conversion muskets and Company I with Belgian rifled muskets (Ordnance Summary Statement RG159, M1281, Roll 5).

No contemporary accounts of the arms of the 25th Illinois Infantry or the 35th Illinois Infantry were noted, but the December 1862 (Ordnance Summary Statement RG159, M1281, Roll 5) records show the 25th armed with a mixture of M1842, M1855, and Enfield rifled muskets as well as Company K armed with rebored M1841 rifles. The 35th had a less diverse armament by December 1862 with a mixture of M1842, M1855, and Enfield rifled muskets as well as some Dresden rifled muskets in Company B.

Companies A and B of the 36th Illinois Infantry were armed with Miniés and Enfields with the remainder of the Companies armed with remodeled (converted?) Springfield muskets according to Bennett's and Haigh's (1876:59; Baumann 1989:112) recording of the unit history. Again models were not specified, but the British Enfield was .577-caliber and most of the converted Springfields would have been .69-caliber. Although the December 1862 statement shows that Companies A had Enfields; C had Enfields and 2 M1885 rifled muskets; D, I, and K had a mix of M1816 conversions, M1855 rifled muskets, and Enfields; Company E had M1842 rifled muskets; and Company F had M1855, M1842, and Enfield rifled muskets (Ordnance Summary Statement RG159, M1281, Roll 5).

The 37th Illinois Infantry was also reported armed with Springfields but with the addition of Colt revolving rifles (Payne 1903:4; Baumann 1989:115). Former unit member Mullins (1990:11) recalled the Fremont Rifles (37th Illinois Infantry), Companies A and K were issued 200 Colt Revolving rifles while the remainder of the regiment were issued Austrian and English muskets as well as Harper's Ferry muskets, and perhaps a few Belgian rifles. While caliber was not mentioned, the types are likely to have been .58-caliber and .69-caliber for the muskets and the Colt Revolving rifles could have been one of three different calibers. The December 1862 statement (Ordnance Summary Statement RG159, M1281, Roll 5) identifies Company A with 50 Colt Revolving rifles and Enfield rifled muskets, Company B with 2 Colt revolving rifles and .69-caliber Belgian muskets, Company C with 4 Colt revolving rifles and .69-caliber Belgian muskets, Company F with M1842 and Belgian rifled muskets, Company G with M1855 and Belgian rifled muskets, Company H with 5 Colt revolving rifles as well as Enfield and Belgian rifled muskets, Company I with 8 Colt revolving rifles as well as M1842, Enfield, and Belgian rifled muskets, and Company K with 43 .54-caliber Colt revolving rifles.

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Little information exists for the armament of the 44th Illinois Infantry. Only two companies, A and C, reported in December 1862 (Ordnance Summary Statement RG159, M1281, Roll 5) that they were armed with Dresden rifled muskets (Baumann 1989:125).

The 59th Illinois Infantry was reportedly armed with Harpers Ferry rifles (Lathrop 1865:6-7; Baumann 1989:144), probably in .69-caliber. The December 1862 statements (Ordnance Summary Statement RG159, M1281, Roll 5) support this in part, showing then that the unit had a mix of M1842, M1855, and Enfield rifled muskets as well as Belgian rifled muskets and M1816 smoothbore muskets.

The remainder of the Union units participating in the Battle of Pea Ridge have no contemporary reports of armament available. The only source is the December 1862 statement (Ordnance Summary Statement RG159, M1281, Roll 5) that shows the following:

8th Indiana Infantry

Co. A no data

Co. B “

Co. C “

Co. D “

Co. E M1855 and Enfield Rifled Musket

Co. F M1855 and Enfield Rifled Musket

Co. G. Enfield Rifled Musket

Co. H Enfield Rifled Musket

Co. I M1855 and Enfield Rifled Musket

Co. K M1855 and Enfield Rifled Musket

18th Indiana Infantry

Co. A Enfield Rifled Musket

Co. B Enfield Rifled Musket

Co. C M1855 Rifled Musket

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Co. D M1855 Rifled Musket

Co. E Enfield Rifled Musket

Co. F Model 1855 Rifled Musket

Co. G. Enfield Rifled Musket

Co. H “

Co. I “

Co. K “

22nd Indiana Infantry

Co. A no data

Co. B “

Co. C M1841 Rifle

Co. D M1841 Rifle

Co. E Enfield Rifled Musket

Co. F Model 1841 Rifle

Co. G. Model 1841 Rifle

Co. H no data

Co. I Model 1841 Rifle

Co. K “

2nd Missouri Infantry

Co. A Enfield Rifled Musket

Co. B no data

Co. C “

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Co. D “

Co. E “

Co. F Enfield Rifled Musket

Co. G. no data

Co. H “

Co. I “

Co. K “

3rd Missouri Infantry

Co. A no data

Co. B M1842 Rifled Musket

Co. C M1842 and 1855 Rifled Musket

Co. D no data

Co. E M1842 Rifled Musket

Co. F no data

Co. G. Model 1842 Rifled Musket

Co. H “

Co. I no data

Co. K “

12th Missouri Infantry

Co. A Belgian Rifled Musket

Co. B Belgian Rifled Musket

Co. C Belgian Rifled Musket

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Co. D Belgian Rifled Musket

Co. E Belgian Rifled Musket

Co. F Belgian Rifled Musket

Co. G. Belgian Rifled Musket

Co. H no data

Co. I “

Co. K Belgian Rifled Musket

15th Missouri Infantry

Co. A no data

Co. B Enfield Rifled Musket

Co. C no data

Co. D “

Co. E “

Co. F 8 Model 1855 and Enfield Rifled Musket

Co. G. no data

Co. H “

Co. I “

Co. K “

17th Missouri Infantry

Co. A no data

Co. B Enfield Rifled Musket

Co. C M1855 and Enfield Rifled Musket

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Co. D no data

Co. E “

Co. F Model 1855 Rifled Musket

Co. G. Model 1855 Rifled Musket

Co. H M1855 and Enfield Rifled Musket

Co. I “

Co. K “

24th Missouri Infantry

Co. A M1841 Rifle

Co. B M1855 Rifled Musket

Co. C M1855 Rifled Musket

Co. D M1855 and M1842 Rifled Musket

Co. E M1841 rebored and Enfield Rifled Musket

Co. F Model 1855 Rifled Musket

Co. G. M1816 conversion Musket

Co. H no data

Co. I M1855 Rifled Musket

Co. K no data

Confederate Artillery

The Confederates had 65 artillery pieces at the battle but only four were rifled guns. The reported numbers are: Hart's Arkansas Battery with four 6-pounder guns, Provence's Arkansas Battery with two 6-pounder guns and two 12-pounder howitzers, Gaines Arkansas Battery with two 12-pounder rifled guns and two 12-pounder howitzers, Good's Texas Battery with four 12-pounder guns and two 12-pounder howitzers, Wade's Battery with two 6-pounder guns and four 12-pounder howitzers, Clark's Missouri Battery

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with four 6-pounder guns, Landiss' Missouri Battery with two 12-pounder howitzers and two 24-pounder howitzers, Jackson's Missouri Battery with four 6-pounder guns, Kneisley's Battery Missouri State Guard (MSG) five 12-pounder and 6-pounder guns, Tull's Battery MSG with two 6-pounder rifled guns and two 6-pounder guns, Kelly's Battery MSG with five 12-pounder and 6-pounder guns, Gorham's Battery MSG with four 6-pounder guns, Guibor's Battery MSG with two 6-pounder guns and two 12-pounder howitzers, MacDonald's St. Louis Battery MSG with one 6-pounder gun and two 12-pounder howitzers, and Bledsoe's Battery MSG with four 12-pounder guns (Shea and Hess 1992:334-339).

Confederate Small Arms

Information pertaining to the types of arms in Confederate hands is even less specific and less numerous than that of the Union troops. The seizure of the U.S. arsenal at Liberty, Missouri allowed a few cannon and 1,500 stand of arms to fall into Missouri southern sympathizer hands as reported by Benjamin Farrar to Simon Cameron, Secretary of War on April 21, 1861 (OR Series I, Volume I, pp. 649-650), and much of this armament was employed at Wilson's Creek in August 1861. Prior to the Pea Ridge battle Snead (1956:273) reports that Price secured a substantial array of arms with the capture of Lexington in September 1861. There Price captured five pieces of artillery, two mortars, 3000 stand of small arms as well as sabers, horse equipments, ammunition, and other military stores. It is likely these were distributed among the Missouri troops. At least some of the Missouri troops were armed with military muskets and rifles as A. M. Payne of the 1st Missouri Regiment recalled the capture of sutler's goods at Pea Ridge and mentions the boys using their fixed bayonets to impale and carry away wheels of cheese (Alvord 1942:5).

Ammunition was in short supply at Pea Ridge because Van Dorn failed to have the ordnance wagons brought up on time for the second day's fight. However tight the supply was on the field, there may have been good stocks in the reserve wagons. According to Eakins and Curtis (2002: 98-99) the lead mining and smelting operation of Blow and Kennet in Granby, Missouri was appropriated by Price's forces after Wilson's Creek. The mine manager, Peter Blow refused to turn over pig lead and ore to the southern forces, but they confiscated the available pig lead for southern use and took over the smelter and mining operation for a period in 1861 and 1862. According to a letter from the firm's attorney, Thomas Richeson, dated March 14, 1862 and seeking the U.S. government indemnification of the firms losses, southern forces captured about 3500 pigs of lead and around 200,000 pounds of lead ore. At the time the letter was written Blow had been forced to leave the area due to his northern sympathies, and Price's men had processed 50,000 pounds of the available ore into another 1500 pigs of lead. Presumably much of the 5000 pigs of lead found their way south to be made into bullets for Price's Missouri forces as well as of Van Dorn's command in time for Pea Ridge.

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Capt. John Lavender (Worley 1956:5) recalled that the 4th Arkansas Infantry was armed with flintlocks, double barrel shotguns, and other old guns. The specific arms of the 4th Arkansas are open to question, but at least some of the men had some type of military musket or rifle fitted with a bayonet. Capt. Bailey (Massey 1995:26) recalled that a passing cavalryman wanted a shoat or piglet for his dinner and a Sergeant Rush stuck his bayonet through the pig and held it up to the passing cavalryman.

Company C of the 16th Arkansas Infantry is noted as having 60 Minié rifles and equipments including 3 thumb vices and 20 screwdrivers (Confederate Ordnance Stores issues to Company C, 16th Arkansas Infantry, November 5, 1861, Microfilm roll 317-150 A-H, Pea Ridge National Military Park). He also notes that the 16th was on the right of the MSG and left of the Missouri Brigade on the second day at Pea Ridge.

Barron (1908:27, 35, 65) and Rose (1960:17) state that the Third Texas Cavalry were armed with a variety of weapons including a pair of holster pistols (possibly single shot horse pistols), shotguns, rifles of any kind, double barrel shotguns, squirrel rifles, and some men had Colt revolvers with Company A having Colt revolving rifles. The company was formally known as the Texas Hunters of the South Kansas Texas Cavalry (Piston and Hatcher 2000:21). This unit charged the Iowa Battery in Foster's Field.

Col. Elkanah Greer's cavalry had three companies armed with Colt revolving rifles and Sharp's carbines with the remainder armed with shotguns and hunting rifles. When ordnance supplies from the captured San Antonio Arsenal were distributed, Greer's men received horse pistols, some two and some only one (Piston and Hatcher 2000:123).

On March 13, Gen. Curtis reported that Confederate Indian forces under the command of Brigadier General Albert Pike used bows and arrows, and tomahawks, as well as rifles at Pea Ridge. (Gen. Samuel Curtis to Asst. Adj. Gen. J. C. Kelton, OR, Series 1, Volume 8, pg. 195). However, this may be apocryphal data as Curtis was never on that portion of battlefield to make a direct observation of Confederate Indian forces armament.

Pvt. John Larson, 3rd Iowa Cavalry, recalled that "On the 8th of March I saw about 2,000 Indians, said to be under the command of Albert Pike and Martin Green, marching toward the battle-ground in good order, These were all mounted, armed with shot-guns, rifles, and large knives" (OR, Series I, Volume VIII, pg. 207).

Firearm Types at Pea Ridge Derived from the Archeological Record

Analysis of the recovered archeological firearms related artifacts provides a wealth of evidence regarding the weapons actually used during the battle. Using firearms identification techniques, as described elsewhere, weapon calibers and types can be identified and placed on the battlefield. Firearms identification procedures provide a powerful tool to enable us to state what weapon types were used during the fierce fighting on the field. More important is knowing where the firearms related components were found

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on the battlefield, because knowing what was used where allows, in combination with analysis of the documentary evidence of the battle, the development of a greater precision in placing units accurately on the landscape.

Small arms - Pistols, Muskets, Rifled Muskets, Rifles, and Shotguns

Small arms are those firearms carried by individual soldiers and as an artifact class constitute the largest number of recovered artifacts, reflected primarily by lead bullets.

Pistols

The archeological record of handguns includes seven types of pistols. Conical .36-caliber bullets with distinctive land and groove rifling impressions confirm that Colt revolvers, Remington revolvers, and Starr Navy revolvers are represented. Among the .36-caliber spherical balls only the Colt could be identified with certainty. Two conical bullet types, one manufactured at St. Louis Arsenal and one of a generic style indicate the diversity of sources for ammunition supply even this early in the war.

The use of the .44-caliber Colt Model 1860 Army revolver and the Remington Army revolver are confirmed in the archeological record by the presence of fired conical bullets based on the distinctive 7 land and groove and 5 land and groove rifling impressions respectively on many of the conical bullets. The recovery of Savage or Savage and North gun maintenance tool also confirms the presence of this revolver type at the Leetown fight although no bullets were recovered that could be identified as having been fired from a Savage revolver. The only known unit issued the Savage revolver was the 3rd Illinois Cavalry and they were not present at Leetown.

The majority of the .36 and .44-caliber pistol bullets were found at the Leetown fight area, and most of those were found on the eastern side of Oberson's field, in Morgan's woods, and east of Highway 72 in Foster's field. These bullets probably denote the area of the cavalry engagements.

The remainder of the .36 and .44-caliber bullets were found in the Cox's field fight area and near the face of the mountain indicating the use of handguns during the late phase of the fight as Union troops forced the Confederates to flee the field of battle.

A few fired spherical balls in .54-caliber were recovered that had no rifling marks indicating they were fired in smoothbore guns. There are several possibilities for this caliber, but in all likelihood these rounds were fired in one of the many models of single shot pistol also called a horse pistol that is often associated with mounted troops and officers. These single shot pistols were obsolete by the mid 1850s but were still carried on arsenals and depots inventories as second-class arms. The .54-caliber spherical balls were found on all areas investigated.

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The recovery of four fired 12mm pinfire cartridge cases attests to the presence of these revolvers at the battle. They were found both at Leetown on the Union line in Cox's field.

Shoulder fired arms

Shoulder fired muskets and rifles are well represented in the artifacts recovered during the archeological investigations, indicating at least eighteen types of guns were used in the battle. A single Maynard style .50-caliber bullet and a Maynard cartridge case indicate the presence of that early breechloading carbine at the battle in Cox's field.

Sharps .52-caliber bullets were recovered on the Leetown battlefield indicating that firearm type was present at the battle. Another .52-caliber gun is represented by fired spherical balls (circa .50-caliber) at the Leetown battlefield that are consistent with being fired in the Model 1833 or Model 1840 Hall carbines, and nine spherical balls have 16 land and groove rifling impressions indicating they were fired in M1819 Hall rifles. Most were found on the Leetown battlefield but two were recovered in Cox's field.

Fired and land and grooved impressed .54-caliber spherical balls and conical bullets indicate the presence of the Model 1841 "Mississippi" rifle. They were recovered on all areas investigated but most were found in Clemon's field and around Elk Horn Tavern. A few were located in the Leetown area.

Three .54-caliber bullets were recovered with 3 and 4 land and groove rifling impressions. These bullets represent one of the many models of shoulder arms imported from Austria, Germany, France, or Belgium to equip militia companies prior to the outbreak of hostilities and after the war began (Noe et al. 1997). The 4 land and groove impressed bullets were likely fired in the Austrian Lorenz rifled musket. The 3 land and groove impressed bullet could not be definitively associated with a specific rifled musket type.

A single .56-caliber bullet found on the Leetown battlefield is consistent in style with the Colt .56-caliber revolving rifle bullet (McKee and Mason 1980:26-27). Although consistent in type and style with the Colt revolving rifle, its assignment to that firearm type is only probable.

The Model 1855 Springfield rifled musket is well represented in the archeological collection. One hundred and twenty-four Minié balls, conical hollow base bullets, were found in .58-caliber. Most were of pressed manufacture although a fair number were made by casting. The land and groove rifling impressions as well as distinctive ramrod marks on a number of the bullets confirm the presence of this rifled musket during the battle. Two .58-caliber conical bullets are smooth sided and consistent in style with the British Enfield pattern rounds. The presence of an Enfield pattern nipple protector and the brass top of

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an Enfield tompion (muzzle plug or protector) attest to the presence of the British Enfield rifled musket.

The .69-caliber Model 1842 rifled musket is clearly represented by fired 3 land and groove impressed Minié balls. A number of these bullets also retain ramrod or loading rod impressions that further reinforce the identification of the Model 1842 rifled musket. Five .69-caliber Minié balls have a triangular shaped recess in their hollow bases. This base type is believed to be of French origin and was intended as ammunition for French manufactured .69-caliber rifled muskets and carbines. Land and groove impression on the five recovered conical bullets are not distinct enough to determine what gun type fired them.

The smoothbore .69-caliber musket is represented by 409 .69-caliber spherical balls, the largest number recovered in any caliber. Both single ball and buck and ball loads are represented among the spherical balls recovered in this caliber. There is a variety of U.S. musket models and European import muskets that could have fired these rounds. A recovered segment of a Model 1816 bayonet, barrel band, barrel band spring, a complete flint hammer, as well as a percussion hammer used on converted flintlock muskets attests to the presence of the Model 1816 or one of its many variations. Further confirmation of the use of the Model 1816 is seen in the fact that some of the .69-caliber balls have ramrod impressions evident that are consistent with the convex head of the Model 1816 button or mushroom shaped tipped ramrod. A Prussian Pattern 1855 musket tool found on the Leetown battlefield attests to the presence of this import type musket at Pea Ridge.

One .69-caliber spherical ball has 3 land and groove rifling impressions as well as a ramrod mark consistent with it being fired in a Model 1842 rifled musket. One buck and ball round is quite unusual in that it has 4 land and groove rifling impressions. No U.S. made shoulder arm was manufactured with a 4 land and groove rifling system, but several European countries manufactured weapons with this rifling pattern, including Germany and France. What is particularly unusual about the bullet is that as a buck and ball round it was designed to be fired in a smoothbore weapon not a rifled weapon. Whether fired by mistake or purposefully in a rifled musket cannot be determined given the evidence at hand, but it is a most unusual occurrence.

The country rifle or personally owned rifle may or may not have been present at Pea Ridge. Only one .32-caliber non-military spherical ball with 6 land and groove rifling impressions was recovered during the investigations, and its context is not clear enough to definitively associate it with the battle. It could well be representative of the earlier or later civilian use and occupation of the battle grounds. Two .50-caliber spherical balls found in at Leetown may reflect the presence of a country rifle there. The context is sufficient to associate the bullets with the battle.

The same can be said for the presence of shotguns. A back action lock, an iron trigger guard, and probably some of the 38 recovered buckshot attest to the presence of one

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or more shotguns, but whether the two gun parts are directly associated with the battle is open to question. A single small flint hammer found near Clemon's field is from a civilian type pistol or small rifle. It may well be battle associated given its context of recovery, but this is not indisputable either.

In summary there are twenty-six types of small arms represented in the archeological artifacts recovered from Pea Ridge battlefield.

Seven pistol types include the .54-caliber single shot horse pistol and the .36-caliber and .44-caliber Colt, Remington, Starr, and Savage revolvers. Shoulder fired guns include the .50-caliber Maynard carbine, .52-caliber Sharps carbine, .52-caliber Model 1819 Hall rifle, and the Model 1833 or Model 1840 Hall carbine, .54-caliber Model 1841 "Mississippi" rifle, .54-caliber Austrian Lorenz imported rifled musket, .56-caliber Colt revolving rifle, .58-caliber Model 1855 rifled musket, .577-caliber Pattern 53 Enfield rifled musket, .69-caliber Model 1816 and its variations smoothbore musket, .69-caliber Model 1842 rifled musket, and smoothbore musket, .69-caliber imported European rifled muskets, perhaps a .32-caliber and a .50-caliber "country rifle" or personal rifle, and possibly shotguns.

The archeological investigations recovered 1010 conical bullets and spherical balls that can be associated with the battle, but only one bullet represents a non-military type weapon and three gun parts represent non-military small arms. A review of the park's small arms bullet collection show that similar proportions of military to non-military bullets are present in those collections as well, so the archeological sample appears to be representative of what was fired by the participants during the battle.

The historic record is correct that shotguns and country rifles were present and used during the battle, but the archeological record clearly demonstrates they were present in very small numbers. The archeological record also clearly shows that both sides relied on military issue firearms as the main troop armament. While many of these guns were older models such as the smoothbore variations of the Model 1816 and the Model 1842 smoothbore musket, as well as the Model 1819 Hall rifle, and variations of the Hall carbine, the .58-caliber Minié ball, the one used in the Model 1855 rifled musket, the most recent issue infantry weapon developed for the Army was also present, but in smaller numbers.

The historic record and participant accounts are correct that shotguns and personally owned rifles were used in the battle, but the historic record is entirely incorrect and gives a biased picture and places a disproportionate emphasis on the numbers of those weapons used during the battle.

If there is one myth the archeological record can aid in dispelling it is that these western troops, whether northern or southern, were poorly armed with the dregs of the U.S. arsenal system. The archeological evidence is compelling and clearly shows that both sides had Model 1855 rifled muskets, Model 1842 rifled muskets, Sharps and Maynard carbines and rifles, as well as the older second class arms like the Hall rifle and carbine, flintlock

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percussion conversion Model 1816 muskets, and the Model 1842 smoothbore musket. These weapons were present in quantity at the battle. Another myth that the archeological record dispels is that the southern troops were heavily armed with shotguns and rifles taken from the mantle of the home fireplaces and brought to defend states rights and their southern heritage. Indeed they were present, but in very small numbers, accounting for far less than 1% of small arms used in the battle.

Artillery at Pea Ridge – The Archeological Evidence

Cannon played a significant role at Pea Ridge. The armies that fought there deployed both smoothbore and rifled guns in two calibers, 6-pounder and 12-pounder howitzer as well as the Missouri State Guard had a battery of two 24-pounder smoothbore guns. The gun types fired solid shot, shell, case shot, and canister. Fragments of 6-pounder case shot as well as 12-pounder shell and case shot confirm the presence of these artillery gun types, a fragment of 24-pounder case shot confirms the presence of that gun type. A metallurgical analysis of the microstructure of a small sample of the Pea Ridge shell and case shot fragments was undertaken by Coles et al. (2004) to determine if differences in manufacturing techniques could be seen between the Union and Confederate artillery ordnance. Her study demonstrates the potential for microstructure analyses on artillery fragments. It also shows that among the samples tested from Pea Ridge that there are some differences in the manufacturing process as seen in the metallurgical examination. One striking feature of the analysis was that artillery fragments from both sides showed a differential cooling process. This is taken to mean that the majority of shells and case shot fired at Pea Ridge were manufactured during the winter months prior to the battle, thus indicating that both armies were supplied with artillery projectiles that were recently manufactured.

The artillery projectiles and projectile fragments recovered from Pea Ridge include spherical types, solid shot; all found near the rock face of Pea Ridge, shell and case shot. Two intact 6-pounder case shot were also recovered at the base of the rock face of Pea Ridge. Both had their Bormann fuses in place, but neither fuse had been cut for detonation. Whether this was an oversight by the gunners or intentional is unknown. Given where the two case shot were found it is possible that the gunners who fired these particular projectiles intentionally did not cut the fuses intending them instead to act as solid shot being fired at the mountain's rock face with the intent of scattering rock debris among the Confederate forces huddled there during the last phase of the battle.

Conical projectiles for rifled guns were also recovered at Pea Ridge. One intact Type I James shell was found near the presumed location of a confederate battery on the north side of Cox's field. The shell was fired but failed to explode when it struck. Following standard safety procedures the shell was drilled to deactivate it by removed the bursting charge, but when it was drilled it was found to be empty. No powder was ever put in the shell. A radiograph of the shell shows the percussion slider in the full forward position with the nipple resting against the nose cap. There is no doubt the shell functioned

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properly on impact, but the absence of a bursting charge in the chamber precluded it from exploding as designed.

Other James Type I shell fragments were found around Elk Horn Tavern and Cox's field. Hotchkiss Type I shell fragments were found there as well and in Oberson's and Foster's fields.

Both the James and Hotchkiss shell systems used lead around the exterior of the shell as a sabot, meant to grip the lands and grooves of the rifled guns to give the shells greater spin stability and accuracy in their flight. These lead driving bands or sabots generally separated from the iron shell during flight, and in these earlier type designs they separated so early as to endanger friendly troops as the shell passed overhead. The sabots generally separated and fell to earth between 100 and 200 yards from the gun position (Fitts 1998:28). These early sabot designs may have separated and fallen as close as 50 yards from the gun. Thus the find location of lead sabot fragments from the James and Hotchkiss projectiles provides a means to approximate the rifled gun positions.

The recovered fuse system elements associated with the James shells indicates the standard James percussion fuse system was employed in these rounds. No Hotchkiss percussion fuses were recovered thus it appears that the Hotchkiss rounds were likely using the wooden or paper time fuse that would leave no evidence in the archeological record. On the other hand all of the spherical case and shell recovered, or at least those elements having portions of fuse rings evident indicate that the Bormann fuse system was used exclusively for spherical projectiles during the battle. The recovery of a significant number of Bormann fuse parts, as well as, iron and brass underplugs indicate both sides employed this fusing system.

Canister

Canister rounds are lead or iron balls placed in a tin container that were fired from cannon at a short range (less than 500 yards for field guns) as an antipersonnel device. Canister rounds performed as a large shotgun blast, sending large numbers of balls toward an on-coming enemy that could be devastating to an infantry charge. Like a shotgun the range of canister is limited and was not intended for use beyond 400 to 500 yards, and never beyond 600 yards according to nineteenth century artillery manuals (Scott 1864; Benton 1867).

The 1862 Army Ordnance Manual recorded that 6-pounder gun canister balls were to be between 1.14 and 1.17 inches in diameter, 12-pounder gun canister balls to be between 1.46 and 1.49 inches in diameter, 12-pounder howitzer canister balls to be between 1.05 and 1.08 inches in diameter, and 24-pounder canister 1.84 to 1.87 inches in diameter. The inventory work recovered 238 canister balls representing three gun calibers, 6-pounder gun, 12-pounder howitzer, and 24-pounder gun as well as three cast iron canister bases, 22

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sheet iron canister top plates, and six expedient canister projectiles made from iron bar and rod stock.

The recovered iron canister balls range in diameter between 1.07 and 1.85 inches in diameter and are consistent with being fired in either 6-pounder guns, 12-pounder howitzers, or 24-pounder guns. A few oversized canister balls may represent some that were simply outside the range of variation for 6-pounder guns and 12-pounder howitzers or the diameter measurement was inaccurate due to vagaries of the thickness of oxidation on the balls.

Among the more interesting canister artifacts are the six expedient canister projectiles. It is well documented that Guibor's battery of the Missouri State Guard manufactured canister projectiles and tins after the Battle of Carthage (Patrick 1997:32). These canister projectiles are well known in southwestern Missouri and northwestern Arkansas and are locally referred to as barshot, but are more properly termed expedient canister. The projectiles were made from iron bar stock found in Carthage's local blacksmith shops. One of the projectiles is cut from rectangular bar stock measuring approximately 5/8 inch by 3/4 inch on a side. The ends exhibit evidence of being hot cut, probably using a blacksmith's cutting chisel and hardy. The remaining five expedient canister specimens are all constructed of round iron stock. They range in diameter from approximately 7/8 inch to 1 inch and in length from 1 inch to 2 1/4 inches, with the majority being 1 1/4 to 1 1/2 inches long. The cut ends indicate the round stock was cold cut using heavy blacksmithing shears. The rods were probably handheld as some exhibit angled cuts and twisting to snap the rod from the cut piece as would likely occur without the stock being clamped in place.

Historical records provide some background and evidence of the use of these expedient canister. Barlow (Patrick 1997:32) one of Guibor's lieutenants states that after the Battle of Carthage his guns were,

furnished a few loose, round shot. With these for a beginning, Guibor established and 'arsenal of construction.' A turning-lathe in Carthage supplied sabots; the owner of a tin-shop contributed straps and canister; iron rods which a blacksmith gave and cut into small pieces made good slugs for the canisters; and a bolt of flannel, with needles and thread, freely donated by a dry goods man, provided us with material for our cartridge bags. A bayonet made a good candlestick; and at night... the men went to work making cartridges; strapping shot to the sabots, and filling the bags from a barrel of powder placed some distance from the candle... my first cartridge resembled a turnip, rather than the trim cylinders from the Federal Arsenals, and would not take a gun on any terms, but we soon learned the trick and, at the close range at which our next battle was fought, our homemade ammunition proved as effective as the best.

Guibor was short of ammunition after Wilson's Creek and he made use of his time in Springfield and after the Battle of Lexington to again use local resources to manufacture

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supplies of ammunition. Barlow (Patrick 1997:44) mentions that they took possession of a foundry in Springfield after the battle where they cast 6-pounder spherical shot, “cast iron rods cut into slugs for canister and in two or three weeks, well rested and equipped, we started north for the Missouri River,” and after Lexington Gubior’s battery camped at the fair grounds and spent a week manufacturing ammunition, including solid shot and grape [*sic* canister] cast in a local foundry (Patrick 1997:45).

All of the expedient canister was found on the east side of Narrow Ridge north of Elk Horn Tavern and were undoubtedly fired from the Missouri State Guard artillery positions on Broad Ridge. The location of the expedient canister as well as of spherical canister balls allows extrapolation, by virtue of the limited range of canister, to approximate the gun positions on Broad Ridge.

The artifacts and their context provide an independent line of evidence to weigh against the official accounts and individual recollections. Comparing the data sets or lines of evidence provides a series of independent sources or threads from which can be woven a richer and more detailed tapestry of the history of the Battle of Pea Ridge. Here we weave those independent data threads into a cohesive story of the battle.

The First Day’s Fighting, March 7, 1862

Gen. Earl Van Dorn planned a bold move to skirt the north side of Elk Horn Mountain and attack Curtis’ federals from the rear. Van Dorn’s column did reach Telegraph road and the rear of the Union lines north of Elk Horn Tavern. The eastern flank of the mountain breaks into a series of ravines and ridges that trend north to south. On the northern end, about one-half mile north of the tavern, is Tanyard Hollow where Van Dorn made his initial command post. From there he deployed Price’s Missouri State Guard units into line of battle.

Telegraph Road runs along a ridge, appropriately named Narrow Ridge south to Elk Horn Tavern. To the west is a ravine called Tanyard Ravine that rises up to a terrace on the eastern flank of Elk Horn Mountain. On the east side of Narrow Ridge is a steep and somewhat narrow ravine called Middle Ravine that rises up to the aptly named Broad Ridge. In 1862 the ridges were timbered but somewhat sparsely and there appears to have been little understory vegetation. The ravines on the other hand were probably more densely timbered and like today had a brushy understory that made transit through them difficult.

These ravines and ridges played prominent roles in the first day’s fighting around and north of Elk Horn Tavern. The tavern itself is situated at the south end or heads of the Tanyard and Middle Ravines where Narrow Ridge widens out into a relatively flat area. Some of the area was timbered but about 10 acres of open ground surrounded the tavern. About a quarter of a mile south along Telegraph road the timber gave way to prairies and open farm fields.

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Just south of the tavern the Telegraph road intersected the Huntsville road that runs in an easterly direction. About one-quarter mile from the tavern the Huntsville road runs north of and past the Clemon's farm on to points east. Below the tavern about one-quarter mile the Telegraph road intersects Ford road. Ford road was the route of march for Gen. McCulloch's column moving on the south side of Elk Horn Mountain to meet Van Dorn at the Tavern.

Gen. Curtis, responding to reports from his Provost Marshall, Maj. Eli Weston, that Confederate forces were converging on his rear, sent Col. Eugene Carr with Dodge's Brigade composed of the 4th Iowa Cavalry, 35th Illinois and 4th Iowa Infantry, and the 1st Iowa Battery to halt what he believed was a Confederate feint on his rear. Carr reached tavern and reconnoitered north along Telegraph Road and Narrow Ridge. Carr saw Confederate infantry arraying in battle order from Tanyard Ravine across the lower slopes of Narrow Ridge, across Middle Ravine and on Broad Ridge. He responded by immediately deploying the 24th Missouri Infantry at the head of Tanyard Ravine, and placed one section of the 1st Iowa Battery about 300 yards north of the tavern on an open area of Narrow Ridge that commanded a good field of fire. He sent the 35th Illinois east along the Huntsville road a few hundred yards while the other section of the 1st Iowa Battery was positioned to play on Broad Ridge. To inhibit the Confederate movements on Broad Ridge Carr deployed the 4th Iowa Cavalry on the Huntsville road just east of the Clemon's farm and the 3rd Illinois Cavalry was deployed a few hundred yards further east.

Carr's force was thinly deployed against massed Confederate lines that began on the west in Tanyard Ravine with Col. William Slack's 2nd Missouri Brigade. Straddling Narrow Ridge was Col. Henry Little's 1st Missouri Brigade, then in Middle Ravine Col. Elijah Gates 1st Missouri Cavalry, and on Broad Ridge most of the units of Missouri artillery and the Missouri State Guard under the command of Brig. Gen. Martin Green.

The fighting became intense and lasted for several hours. Both senior commanders, Van Dorn and Curtis, redeployed units to gain advantage or halt the onslaught. At one point Brig. Gen. Sterling Price moved men of the Missouri State Guard and some of his artillery along Broad Ridge and Williams Hollow to Clemon's farm. There, he was met by forces under the command of Col. Grenville Dodge. Dodge prevented Price from flanking Curtis' line at Elk Horn Tavern, but the fighting was intense and costly and Dodge's men could not hold the flank. They retired from field moving to the south side of Ruddick's, but their action help save Curtis' army from defeat allowing him to disengage and fall back so he could redeploy for the next day's fight.

The archeological record of the March 7 fighting is limited to three areas of investigation, Narrow Ridge (Figure 26) and Middle Ravine and Clemons field (Figure 27). Due to the dense underbrush and timber on Broad Ridge, Tanyard Ravine, and surrounding Clemon's field only those areas open enough for effective metal detecting transects were selected for investigation. Attempts were made to sweep, at least in reconnaissance fashion, the wooded area between Clemon's field and Elk Horn Tavern (Figure 28) as well

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as the southwestern portion of Broad Ridge. By and large the reconnaissance effort in the dense wooded areas only succeeded in finding Civil War items where detector coils could reach the surface. While confirming the presence of Civil War materials in those areas no patterns were observable due to the spotty nature of the recovery effort. It is abundantly clear that these now timbered areas will yield much archeological data and artifact patterns when they can be systematically examined at some point in the future. For now the work in the timbered areas provides us with a tantalizing clue to what lies in those areas, and we must be content to use the data from the areas we could work systematically to see how well it meshes with the historical record of the elements of the battle fought in those zones.

Narrow Ridge North of Elk Horn Tavern

The majority of Narrow ridge, along either side of Telegraph road and the east slope to the bottom of Middle Ravine, was swept with systematic metal detection. Significant numbers of combat artifacts, including artillery fragments, small arms bullets, as well as



Figure 26. A view looking northwest of the wooded Narrow Ridge portion of the battlefield.

bits of military equipment and camp equipment were found on the ridge and its eastern slope (Figures 29-38). The artifacts are not randomly scattered rather they concentrate in one large group about midway along the length of the ridge. There are lighter concentrations of battle debris scattered both north and south of the main artifact cluster. While the combat

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Figure 27. Clemon's field looking north, note the slight rise in the field.



Figure 28. Elkhorn Tavern as seen by visitors today.

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debris appears concentrated in one area and fits the description of the historic record well, it must be kept in mind that later farming activities on the ridge may well have caused some erosion of the topsoil along the crest of the ridge and may cause a bias in the archeological record. Given that caveat the artifact distribution pattern does conform well with the historic record suggesting that subsequent agricultural practices had minimal effect on the general pattern and artifact distribution.

Col. Eugene Carr described his troop deployment around Elk Horn Tavern and Narrow Ridge as:

On arriving at the tavern I found that the enemy were trying to flank around to the east beyond Clemens' house. I sent out the cavalry, under Major McConnell, to skirmish them, followed by Colonel Dodge, with his regiment and two pieces;

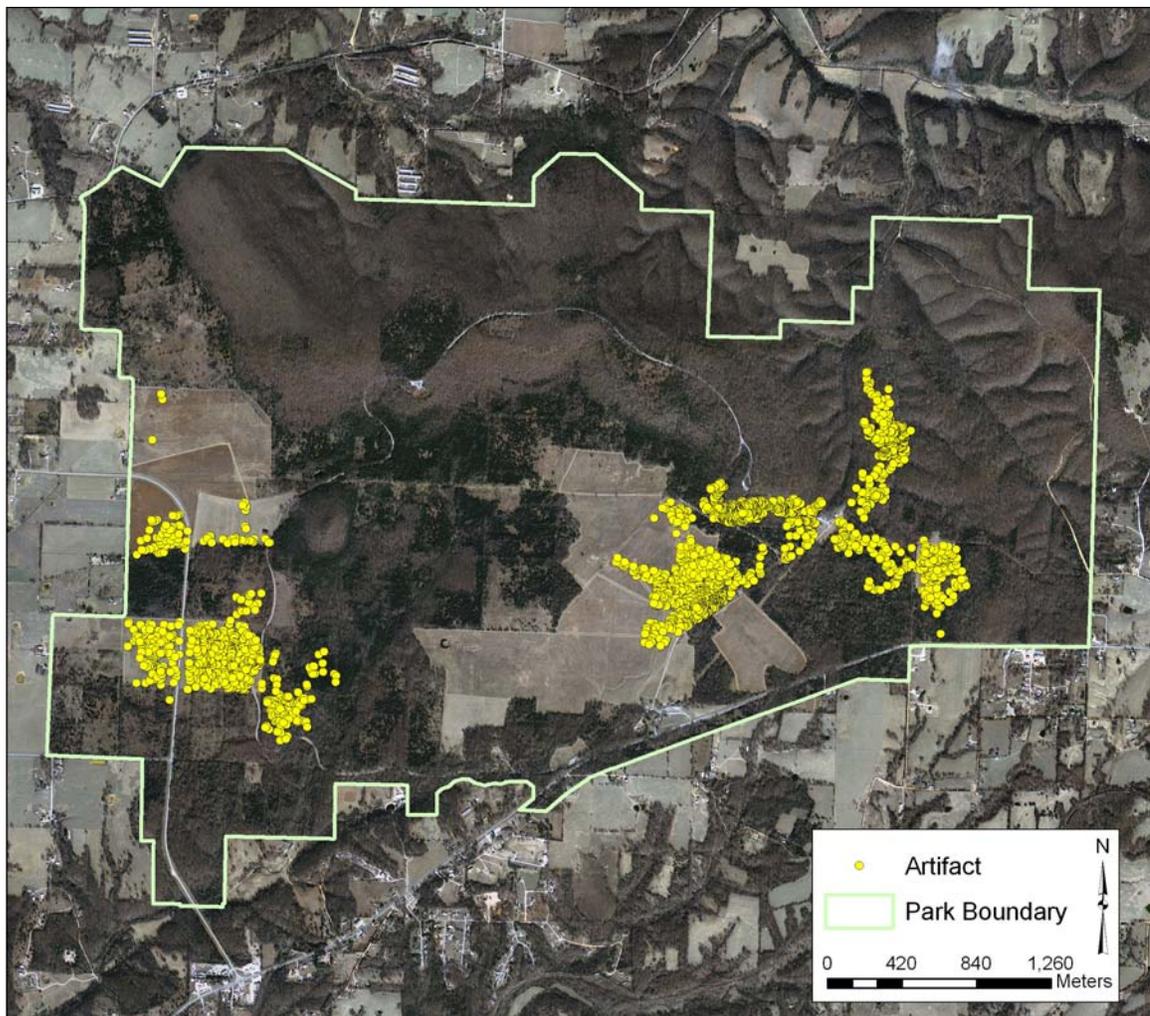


Figure 29. Locations of all artifacts recovered during the metal detecting inventory.

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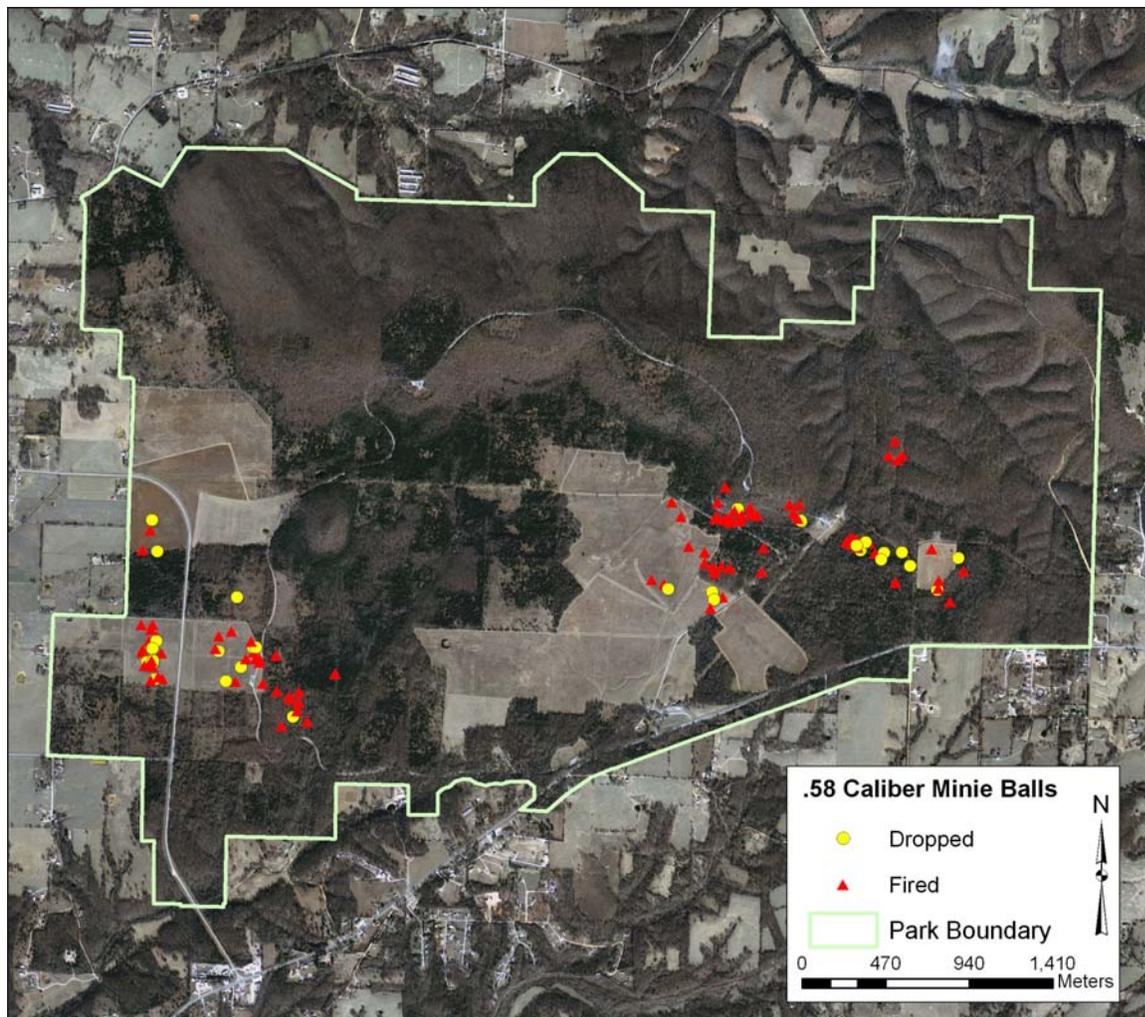


Figure 30. Distribution of .58-caliber Minié balls on the battlefield.

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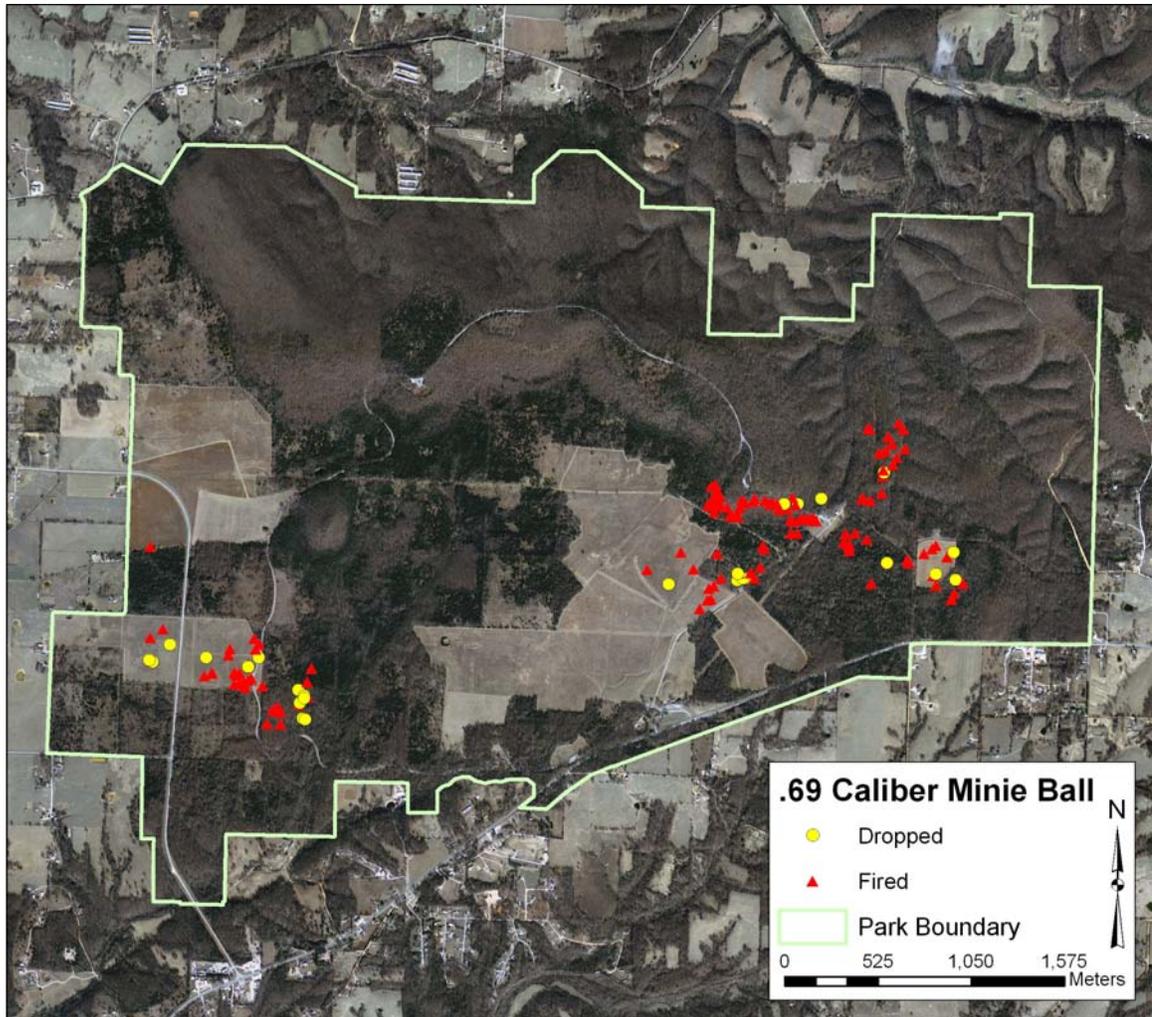


Figure 31. Distribution of .69-caliber Minié balls on the battlefield.

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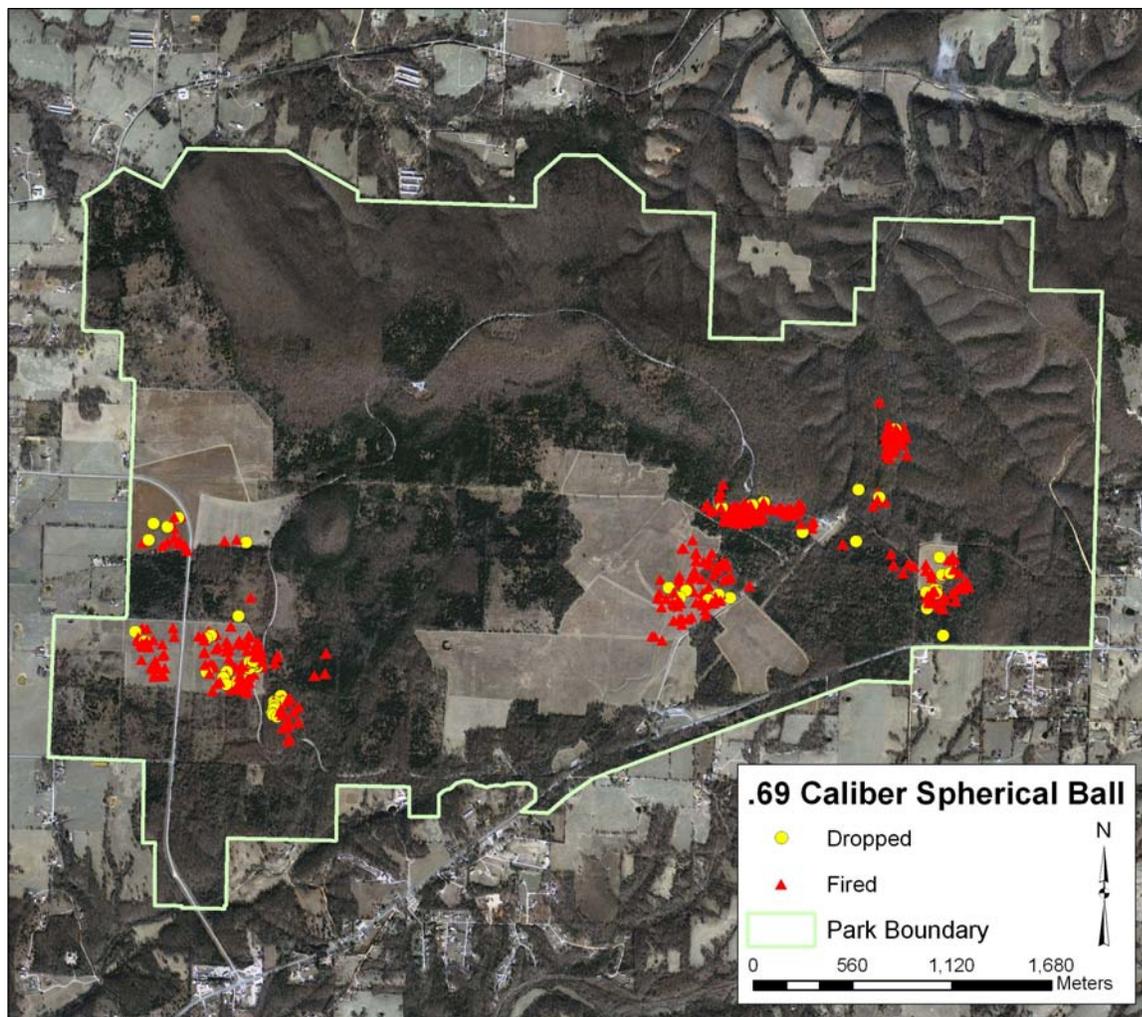


Figure 32. Distribution of .69-caliber spherical balls on the battlefield.

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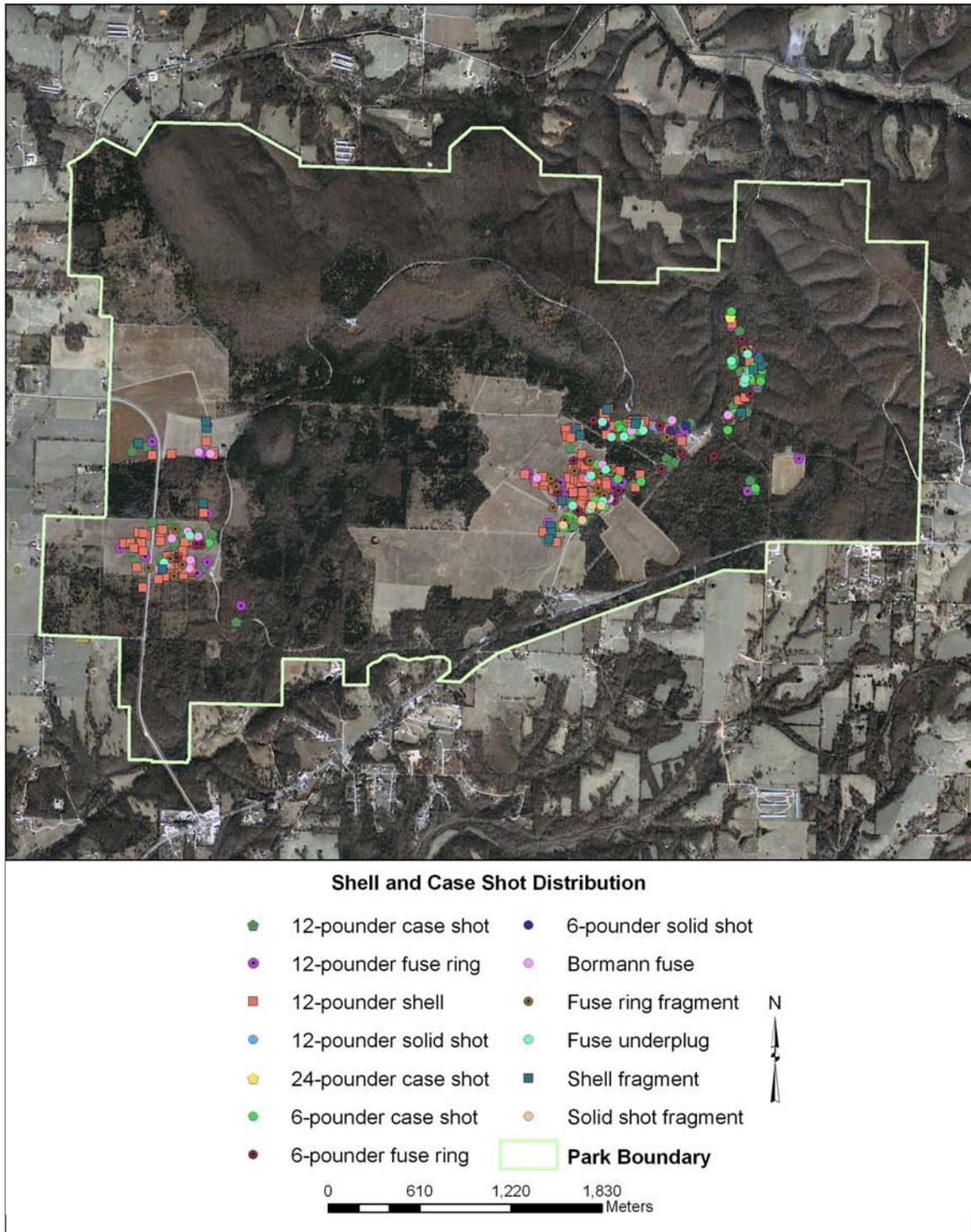


Figure 33. Distribution of artillery spherical shell and case shot fragments.

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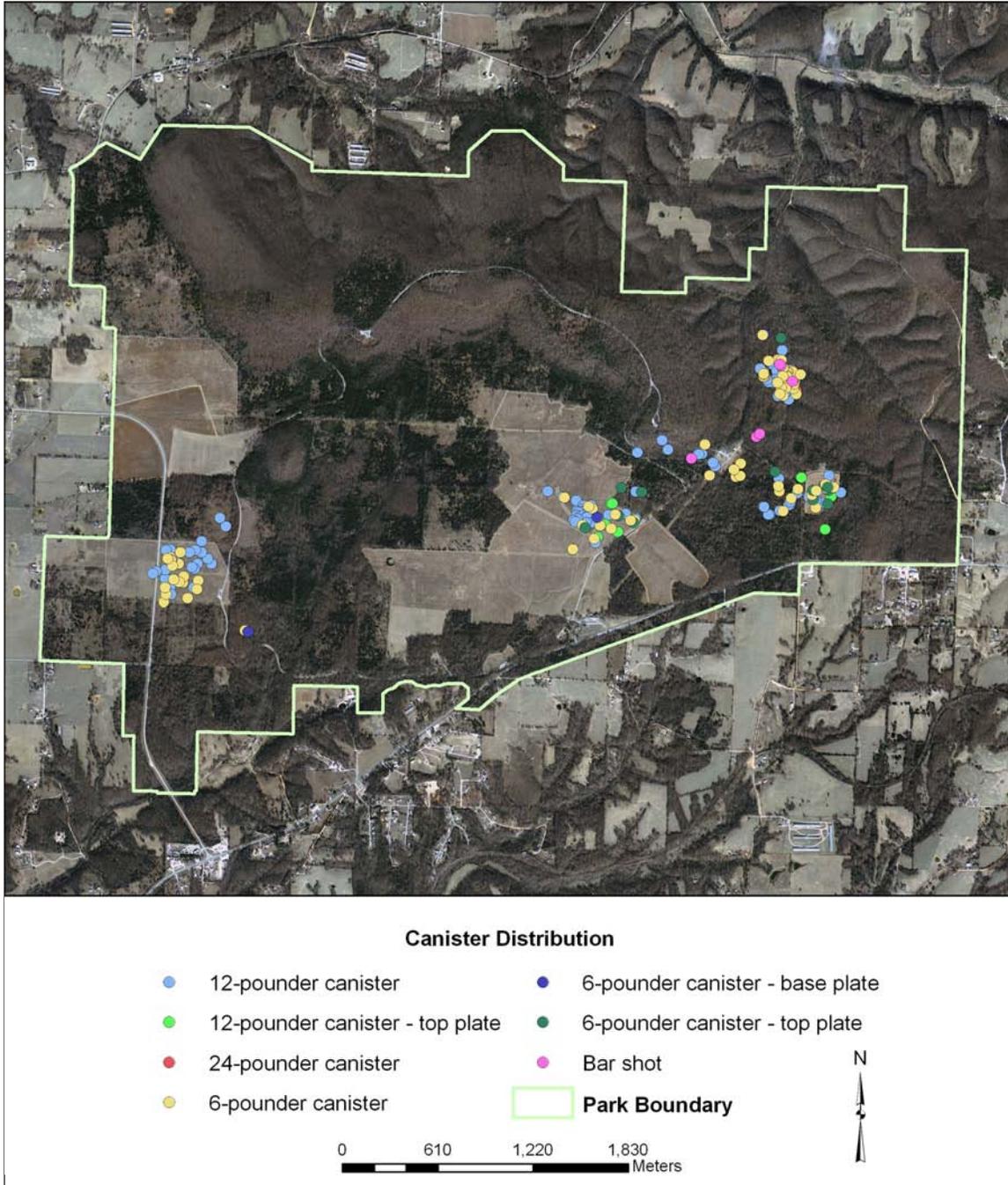


Figure 34. Distribution of artillery fired canister balls on the battlefield.

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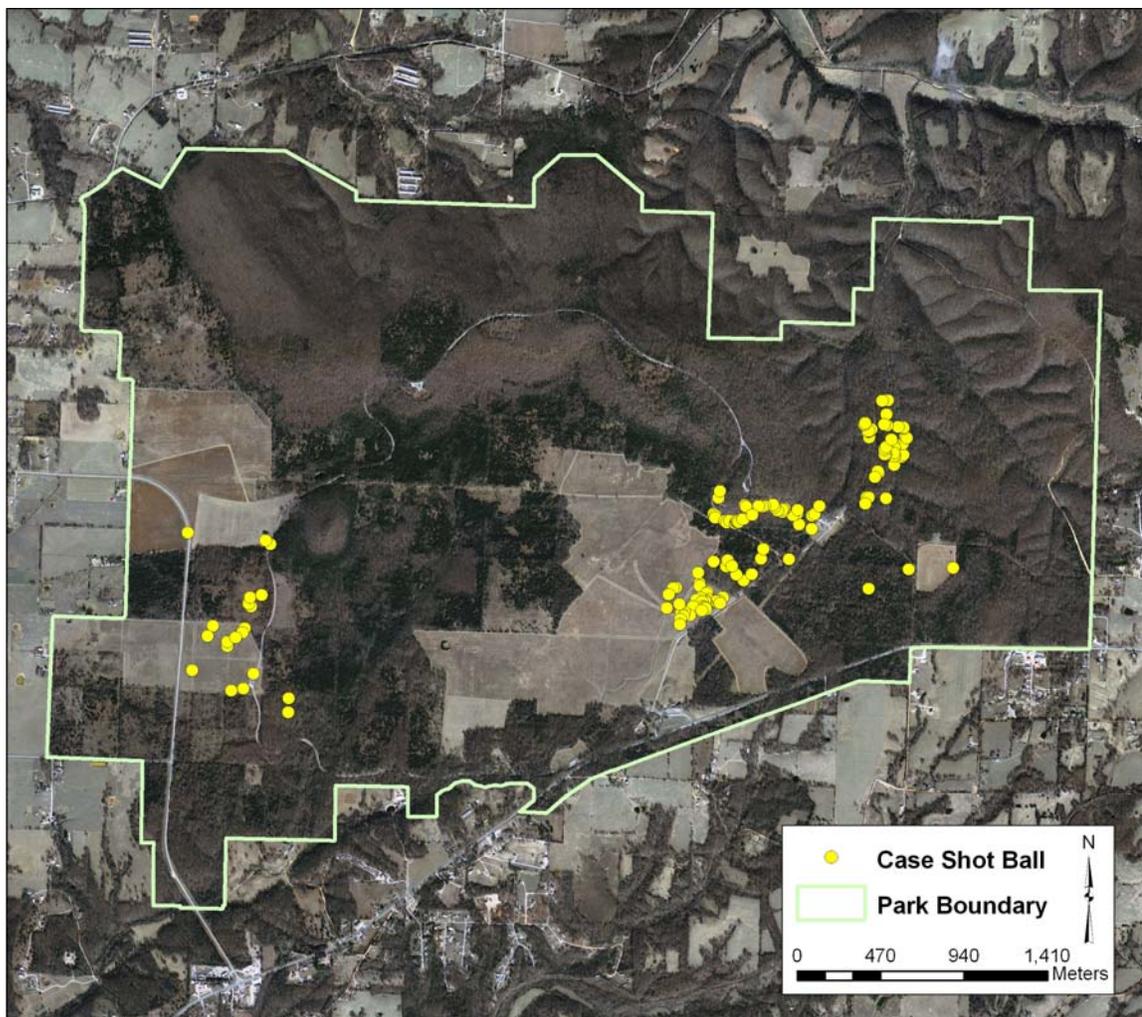


Figure 35. Distribution of case shot balls on the battlefield.

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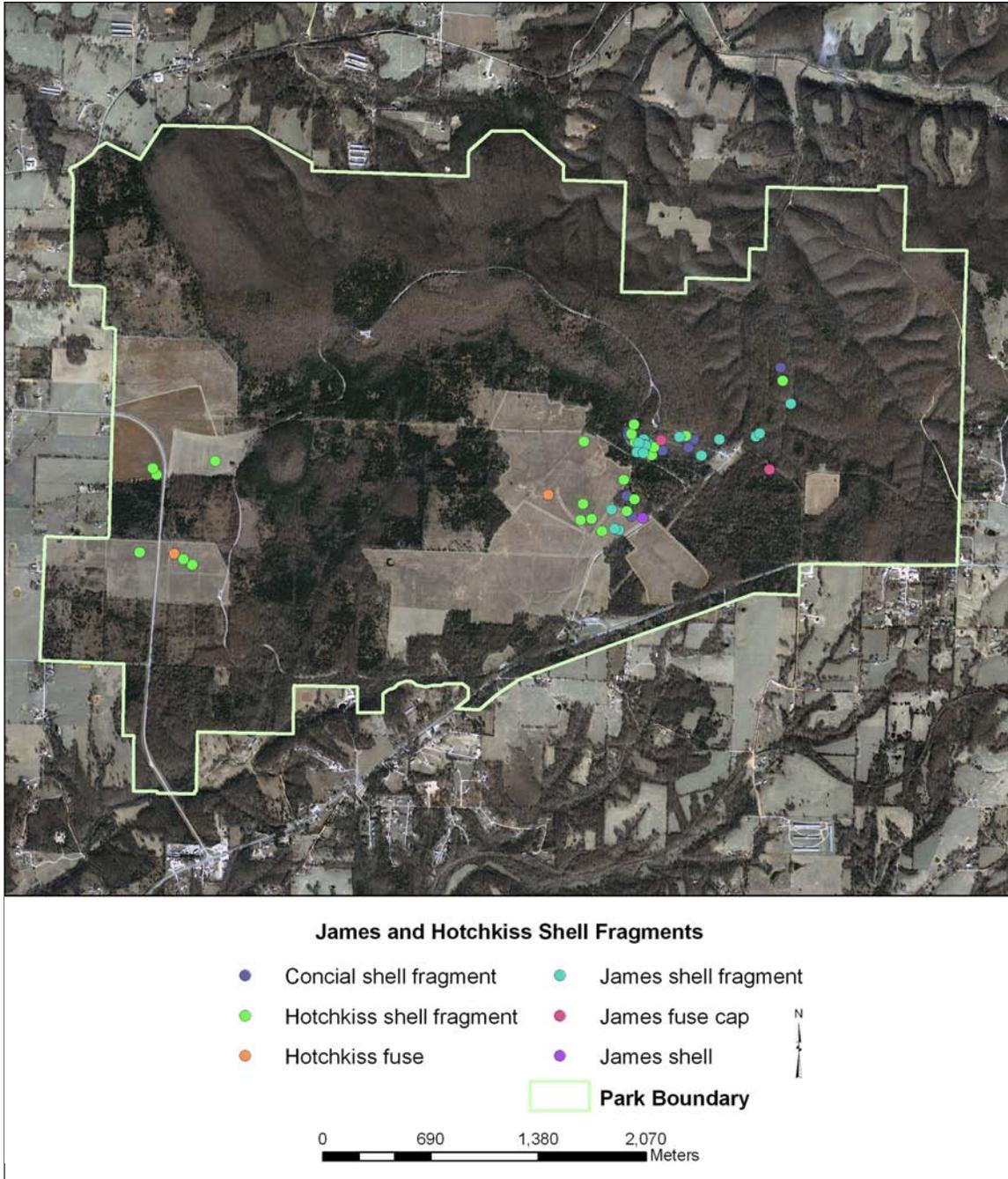


Figure 36. Distribution of conical artillery shells and fragments.

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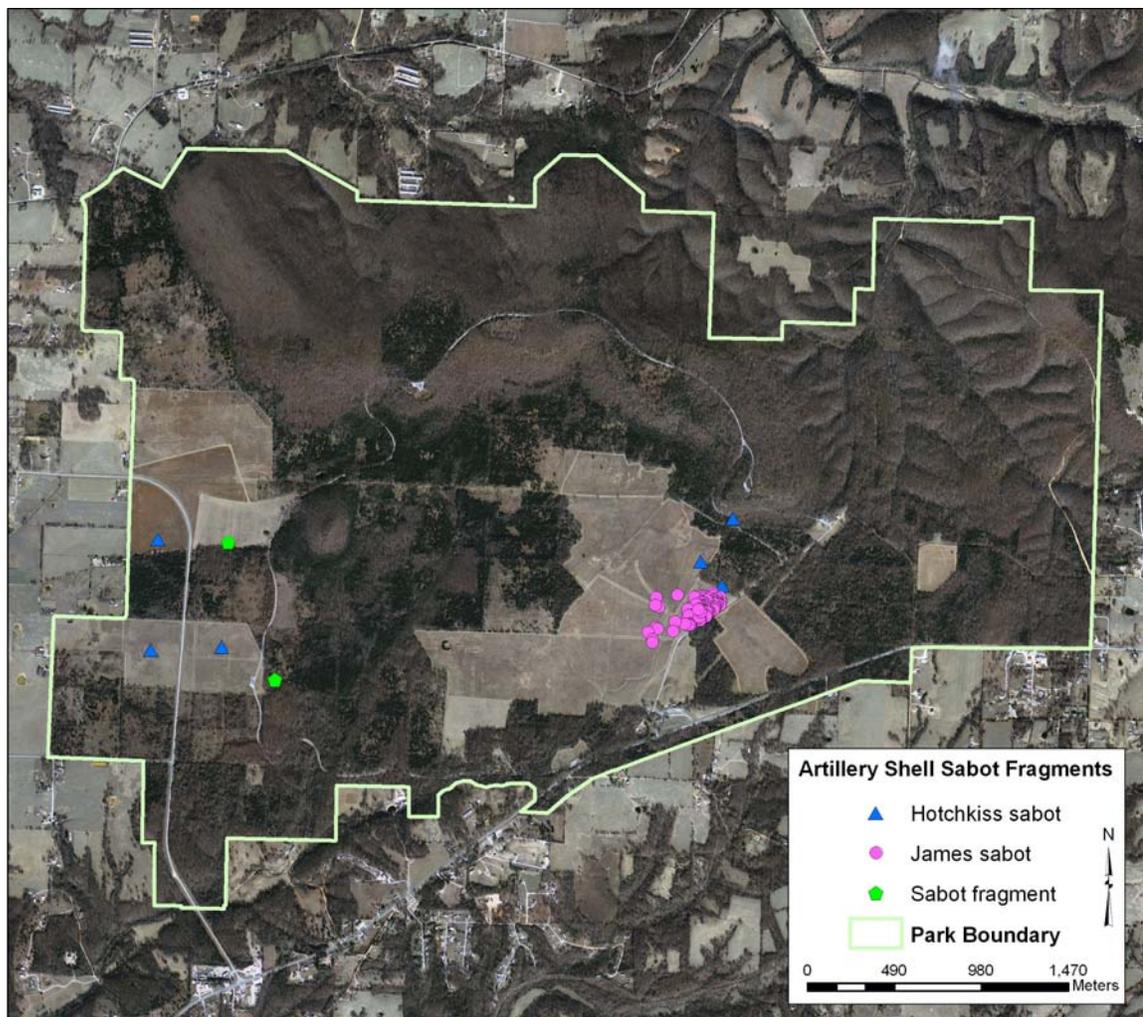


Figure 37. Distribution of conical artillery shell lead sabots.

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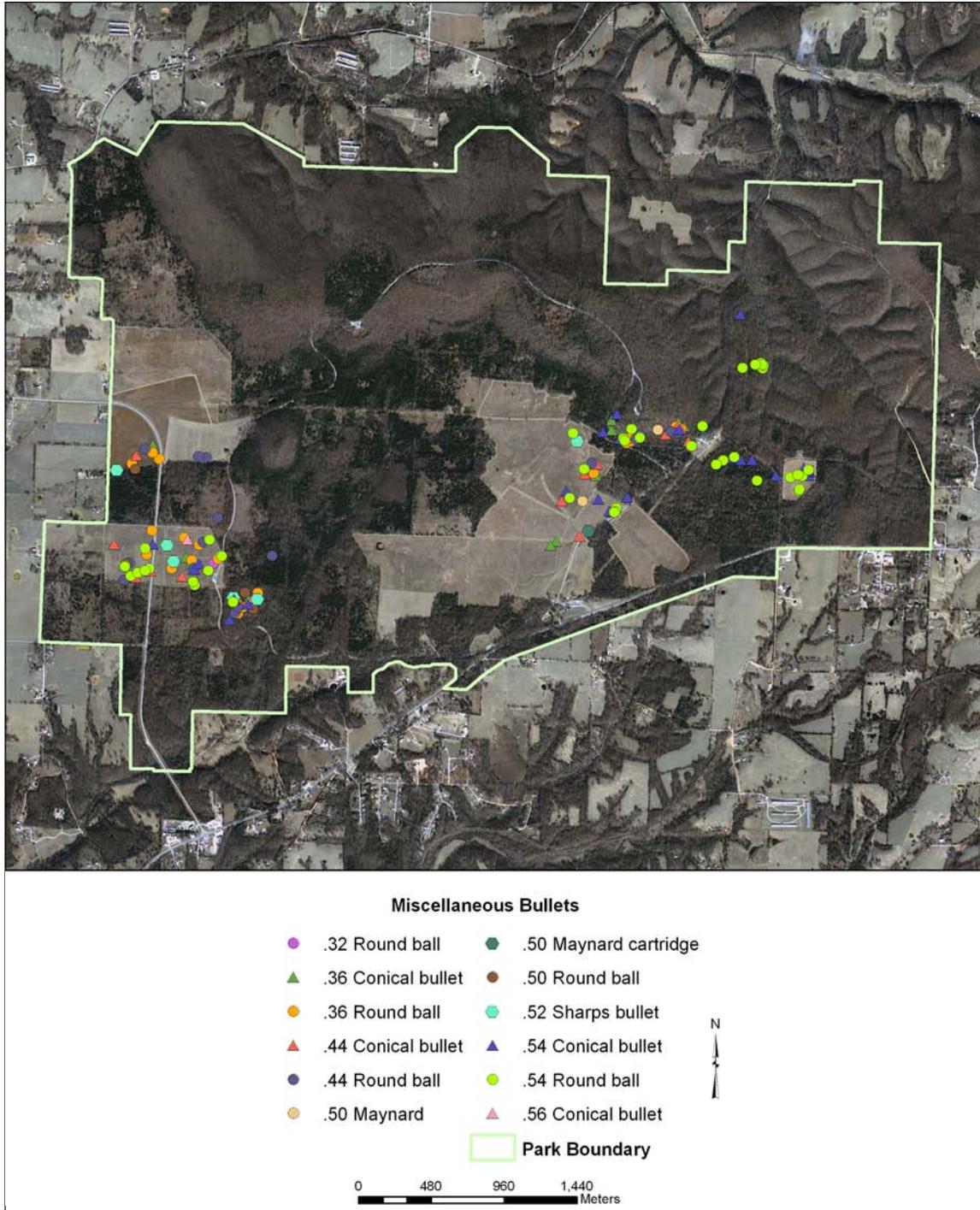


Figure 38. Distribution of miscellaneous small arms spherical balls and conical bullets.

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ordered Captain Jones to remain with two pieces as a reserve at the tavern, and took two other pieces myself down the road, which led down the hollow 300 or 400 yards to where the bushes were open enough to see a little to the front and to the right, bringing Colonel Smith, with the Thirty-fifth Illinois, to support the battery, and opened fire on a battery on a bluff on our right front. They immediately replied, and as long as my guns staid there was a perfect storm of shot, shell, and grape.... The enemy seemed to have the range exactly. Colonel Smith, Thirty-fifth Illinois, was wounded in the head by a shell, which took off a part of his scalp. He received a bullet in his shoulder and his horse was killed all about the same time. Colonel Smith and his regiment showed the utmost gallantry, and deserve great credit for their steadiness in supporting the battery as well as for their conduct. Subsequently, when fighting the enemy's infantry near the same point, just before Colonel Smith was wounded, five or six ammunition chests burst, one after the other. Captain Jones and Lieutenant Gambell were wounded by my side, and all but one of the pieces were disabled. This one piece was commanded by Corporal Leebert, First Iowa Battery, and was the only gun which was in the action from beginning to end, and both Corporal Leebert and his cannoneers deserve great credit for coolness, gallantry, and activity through the entire action (OR, Series I, Volume VIII, pg 259).

The report of Captain Junius A. Jones, First Independent Battery Iowa Light Artillery adds graphic detail to the counter battery fire his section sustained from the Missouri artillery batteries stationed on Broad Ridge:

In accordance with my duty I beg leave to report that on the morning of the 7th instant I proceeded to your camp with my battery, and by your order sent Lieutenant David, with the first section, to the head of the column. Upon arriving at the Elkhorn Tavern, by order of Colonel Carr, commanding division, I sent Lieutenant Gambell, with the left section, some 200 yards farther north, on the Springfield road, to take position against the rebels, and proceeded on the road to the right and easterly from the tavern some 800 yards to take position against the same force. Just as I was ready to go into action the firing of the right section having ceased, and a messenger arriving telling me Lieutenant David had advanced, I limbered up and moved to join the left section, which commenced action as I reached the Elkhorn Tavern. I immediately joined Lieutenant Gambell and took position on his right and commenced on the rebel batteries forthwith. I found Lieutenant Gambell actively engaged, the rebel guns having him in perfect range of grape, shell, and shrapnel. The fire of the rebels was galling in the extreme. Just as I delivered my second round Reese Parkhurst, acting as No.3, was killed, a cannon-ball taking off his left leg and a piece of rock striking him in his head. I then had the prolonges fixed to fire retiring when necessary. Shortly after this event one of my caissons was exploded by a shot from the rebels, and another was lost to me by a runaway team running into the caisson team, which took fright, and they in running away capsized it down a slope, breaking the pole and otherwise disabling it. The team

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escaped. Two of the horses were subsequently recovered by Lieutenant David, as was by him two of my ammunition-chests and contents. By this time the rebels' fire began to tell on my men, Kirk W. Henry was disabled by a piece of shell striking him in the mouth; Sergt. H.R. Horr was severely hurt by a spent round shot striking him in the groin; W.F. Conner was slightly wounded in the hand; D.J. Duval was struck over the eye with a piece of shell, disabling him for a time; Thomas Brown was injured by a piece of shell, wounding him in the right side; I.B. Nelson was wounded in the right hand and back; Clark Woodmansee was wounded in the right shoulder by a grazing ball; Samuel Black was wounded slightly in the ankle by a grazing solid shot; James Molesworth was disabled by a spent round shot striking him in the hip, and John Easton, detailed from Company -, Fourth Iowa, was wounded in the right arm slightly by a grape shot. After these casualties the limber of a second caisson was exploded by the rebels, burning severely E. Skivinki, the driver of the wheel team.

About this time Lieutenant Gambell was disabled by a grape shot passing through his leftleg above the knee and between the bone and tendons. My ammunition becoming exhausted, I began to fire retiring. The second piece had nearly reached the road when I was hit by a spent round shot below the groin on the left leg, which compelled me to retire from the field, being unable to sit on act of retiring. We were keeping up the fire, waiting to be relieved by the Dubuque battery. Lieutenant Williams kept the field with piece, and afterwards (OR, Series I, Volume VIII, pp265).

These graphic participant accounts are greatly expanded and presented in a lucid narrative of the fight on Narrow Ridge in Shea and Hess (1992:170-184). Simply, Carr's thinly distributed lines and guns were no match for the massed Confederate batteries and lines of infantry. The archeological record of the action on Narrow Ridge is equally graphic and on the whole supports the historic accounts.

Archeologically combat artifacts were found in a significant concentration on the top of Narrow Ridge and on its eastern side from about 600 yards north of Elk Horn Tavern to about 700 yards north (Figures 29-38). Artillery shell and case shot were found in abundance in this zone (Figures 33-35). 6-pounder and 12-pounder case shot fragments as well as case shot balls were recovered throughout the area as well as a few fragments of shell scattered further north along the ridge. More were found south and closer to Elk Horn Tavern.

The only evidence of the use of the Missouri State Guard 24-pounders, case shot fragment and canister balls, was found on the eastern flank of Narrow Ridge. The same is also true of expedient canister or bar shot fired by the Missouri State Guard's Guibor's battery at the Iowans on Narrow Ridge.

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The expedient canister and the 24-pounder artifacts were found on the east face of Narrow Ridge (Figure 34). Along with the 6-pounder and 12-pounder artifacts found in the same area the artifacts allow for a reconstruction of the MSG artillery's position on Broad Ridge. Canister was not fired beyond 400 to 500 yards as it became ineffective against troops beyond that range. Extrapolating back from the artillery artifact find locations to no more than 500 yards places the MSG artillery on relatively flat ground that rises above the heads of the ravines that dissect the western flanks of the ridge. In addition to the flat ground found there an historic road trace runs through the area, making the movement of artillery along the ridge possible.

Some shell and caseshot fragments were also found scattered along the length of Narrow Ridge south of the main concentration, particularly the few fragments of shell fired from rifled cannon. Some may reflect fire from Carr's second and defensive line established perpendicular to the line of the Telegraph Road at Elk Horn Tavern, perhaps fire from the 3rd Iowa Battery that was deployed on Telegraph Road just north of the tavern.

Bullets from shoulder fired muskets and rifled musket were also recovered in this same area, some 600 to 700 yards north of the tavern. The types of small arms represented are limited to M1816 and M1842 muskets; M1842 and M1855 rifled muskets, M1841 rifles. Most of the rifled musket and musket balls were found in the same area as the artillery shell and case shot fragments. Some may have originated with the 35th Illinois others from Little's Division, and yet others from firing from the Missouri State Guard.

The majority of soldiers' equipment items and personal items, such as a cartridge box fastener, a bayonet scabbard tip, uniform buttons, harmonica tone plates, tin cup fragments, and camp kettle fragments were also found on Narrow Ridge. Some of these were likely lost by men of the 35th Illinois during the initial stage of the fighting. Others could have been lost by Confederate soldiers as they moved south after the Union troops pulled back to the vicinity of Elk Horn Tavern.

The archeological record meshes very well with the historic accounts. Both artillery fire and small arms fire was substantial and sustained according to the historic accounts and the archeologically evidence substantiates the ferocity of the gunfire on the Union line. The relative paucity of artillery artifacts or small arms bullets between the heavy artifact concentration and Elk Horn Tavern is also consistent with the historic accounts. The archeological record clarifies the location of the Union line during the initial stage of the battle showing that it was at one of the widest and highest points on Narrow Ridge along the Telegraph road and one ideal for artillery and troop deployment using tactics commonly employed during the early stages of the Civil War.

Using the find spots of Confederate canister aids in confirming that the MSG artillery was placed on Broad Ridge, probably along a road or track, and most likely on a relatively flat terrace just above the westward trending ravines that cut the slope of

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Broad Ridge. Indeed, this location would have been to the right front of the Union line as described in the participant accounts.

Elk Horn Tavern

As Union troops fell back along the Telegraph road north of the tavern, Confederate forces followed. Carr redeployed around Elk Horn Tavern. Here he was reinforced by Curtis with cavalry and two 12-pounder Mountain Howitzers, and later infantry. Carr shortened his lines with troops arrayed in battle order on either side of Telegraph road. Fighting was intense.

Archeological investigations around Elk Horn tavern and to the south, east and, west were frustrated by two conditions. The wooded areas to the south and west of the tavern site were so dense as to preclude effective metal detecting efforts. Little was found during the sweeps that were attempted in the woods west and south of the tavern (Figure 29). The artifacts that were recovered simply represent spot finds where a metal detector could sweep the ground. Some patterning is evident in the spot finds, but this may be a function of the sampling rather than a true military combat pattern. The fact that a wide variety of artillery fragments and small arms bullets were recovered along a 100 yard wide strip south of the Huntsville road between Clemon's field and Elk Horn Tavern indicates that much more remains to be revealed when those timbered areas can be cleared of the understory and systematic metal detecting can be undertaken there. The distribution of Civil War era materials is consistent with the final Union lines, specifically the 35th Illinois Infantry and 3rd and 1st Iowa Batteries as they fell back at the end of the first day's fighting.

The second confining condition is the disturbance of the cleared ground around the tavern proper. Metal detecting transects in the cleared areas around the tavern revealed only modern debris. Excavating the signals showed the artifacts were deposited in subsoils and not within the normal humic plowzones or forest soils seen elsewhere in the park. This suggests that much of the area around the tavern has suffered a loss of topsoil at some point in the past. William Volf's (2004) geophysical inventory in the rear yard of the tavern and on Telegraph road immediately in front of the tavern indicated similar results. Most likely various restoration and recontouring efforts through time have destroyed much of the physical evidence of outbuildings and specifically the Civil War component of the archeological record immediately adjacent to the tavern.

Due to the disturbance around Elk Horn Tavern, tour road construction, construction of parking lots, and the memorial monuments much of the area at the east end of Elk Horn Mountain fought over by the Union 24th Missouri, 25th Missouri and 9th Iowa Infantries and by Rosser and Greene's Confederate Divisions little in the way of meaningful archeological patterns emerged from metal detector sweeps west of the tavern. Like the areas east and south of the tavern artifacts were found to the west, but little patterning is clear due to the disturbance in the immediate vicinity of the tavern and from the fact that the vegetation

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in Tanyard Ravine and on its slopes precluded any work by the detectors to the north. The recovered small arms bullets and artillery shell and case shot fragments once again offer tantalizing clues to the richness of the archeological record that remains intact beyond the disturbance zone and the potential for further interpretation of the fighting in Tanyard Ravine when it can be systematically investigated.

Clemon's Field

In a bold move on the afternoon of March 7, Gen. Price marched much of the Missouri State Guard and three of its artillery batteries along the road through Williams Hollow, west of Broad Ridge swinging his column on to the Huntsville road and then south through Clemon's field in an attempt to flank the right side of Carr's line extending east from Elk Horn Tavern. Price's movement was observed by a Union cavalry scouting along the Huntsville road and reported to Carr. He ordered Dodge to meet the flank attack.

Dodge left the 35th Illinois on the Huntsville road to meet any threat from the north, while he deployed two guns of the 1st Iowa battery at the northwest corner of Clemon's field. Along the lane running south along the west side of the field he placed the 4th Iowa Infantry and used some recently removed timber and dismantled fences as impromptu breastworks. The 3rd Illinois Cavalry was sent south along the lane to the south side of the field and were reinforced by the 8th Indiana Infantry during the ensuing fight.

Price placed from north to south on the military crest of a small rise about mid-field Clark's Battery, Bledsoe's Battery, and MacDonald's Battery consisting of six 6-pounder guns and seven 12-pounder guns and howitzers. Behind them along the east edge of the field he placed Col. John Clark Jr's. 3rd Division of the Missouri State Guard. The 3rd Division made two determined charges through the cannon and across the field after artillery had softened the Union position. But Clark's men were met with equal determination by the Iowans behind their expedient breastworks, and Clark's Division suffered substantial losses.

Further to the south Col. Elijah Gates' 1st Missouri Cavalry and Lt. Col. James Cernal's Missouri Cavalry Battalion attempted to flank the Union line sweeping south and west around the south end of Clemon's field.

Col. Grenville Dodge's report of his fighting first north of Clemon's field then on the east side of the field is another graphic participant account of the intense fighting in that sector of the battle.

On the morning of the 7th I was ordered to take position with my brigade near Elkhorn Tavern, on the Springfield road. On my arrival I discovered the enemy in the timber about half a mile to the right, and brought up one section of the First Iowa Battery, which opened the battle, doing considerable execution. The enemy fled to the hollow, when I deployed my line, covering as much ground as possible,

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placing Major McConnell, commanding one battalion of the Third Illinois Cavalry, on the center sending forward a company of skirmishers from the Fourth Iowa, who soon became sharply engaged, causing the enemy to open on us with shell, solid and grape shot. Four pieces of the First Iowa Battery were planted on the Springfield road near the tavern, which opened on the enemy's batteries to the right. Captain J.A. Jones and Lieutenant Gambell were wounded here. Soon after this the Thirty-fifth Illinois Infantry became engaged in the attack made in the morning on the left, and fought with great bravery. Colonel Smith fell wounded and the regiment lost severely.

As soon as the engagement had fairly begun I closed up my line to the left and awaited the attack, keeping the section of the battery at work with my skirmishers until near 2 o'clock, when the enemy ceased firing and drew back. I soon discovered that the enemy were preparing for a general attack, and changed front to the right, covering my men with a rail fence, forcing the enemy to cross an open field to reach me. I formed my line and opened fire with one section of my battery, the other four pieces having left the field for want of ammunition. The enemy answered with eight pieces of artillery, and advanced on my right, left, and front. I brought up the skirmishers and placed them on the left, and held the position for more than two hours with at least 6,000 infantry and eight pieces of artillery against me, the artillery playing upon us at short range with canister. My section of the battery left the field early, having exhausted all their ammunition.

Near the last of the engagement three rifled pieces of German battery were sent to me and took position on my left, which after firing three or four rounds, was compelled to retire from the field, being flanked by a regiment of the enemy. I then ceased firing, to discover the position of the enemy's forces on my right, when they immediately advanced to within 100 feet of my lines, when I ordered my men to fire, which they did so effectually that the enemy fled along the whole line in confusion. Fresh regiments immediately filled their places. Finding that the enemy were outflanking me on the right and that my forces were insufficient to extend my lines, I sent for re-enforcements, and obtained five companies of the Eighth Indiana Infantry, which I placed on my right. The firing becoming more terrific, the enemy having placed a battery on my left that enfiladed my line, the ammunition of the Fourth Iowa beginning to fail, the Thirty-fifth Illinois being forced to give way, I ordered Colonel Chandler to rally his men, which he did with great gallantry, driving the enemy back a short distance on the left, but he was soon surrounded and taken prisoner, with 40 men.

I noticed at this time that the Second Brigade, which was on my left, ceased firing. I sent my adjutant to ascertain the cause. He informed me that they had retired. At this time the ammunition of the Fourth Iowa had almost entirely given out, and I ordered them to fall back, which they did in splendid order in line of battle, the enemy running forward with their batteries and whole force. I halted fell back and

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took a position on the open field in my rear, the division at this time having been strongly re-enforced. General Curtis ordered the Fourth Iowa to fix bayonets and advance, though they were out of ammunition. They did so, and moved briskly over the field, but found no enemy. General Curtis then ordered us to halt, it being dark. I then took the brigade back to camp to replenish their ammunition and clean their guns, which they did, and at 12 o'clock took another position on the left of the road (OR, Series I, Volume VIII, pp. 263-264).

Brig. Gen. James S. Rains, commanding Eighth Division, Missouri State Guard stated in his report

when they concentrated their forces on their right wing, and took a strong position on the west and south sides of an open field, where they were protected by a breastwork of fence rails and logs.

From this point they opened a well-directed fire of artillery as our advancing column deployed along the east side of the same field. This was promptly replied to by Colonel Bledsoe, who, along with Captains MacDonald and Clark, dashed forward in the face of a murderous fire into the field itself. Our infantry, sustained by Brigadier-General Price's division, with other forces on the left, were also formed in the field. Here an order was received, through Colonel Clay Taylor, to move the batteries forward by hand, which was handsomely executed. Then came the battle. Fiercely was it fought, nobly was it won, under the very eye of their leaders. For a moment the infantry wavered and staggered under the fire of the enemy; but their ranks were soon closed and their hearts nerved by the rallying cry of their old veteran chief himself, who had so often led them to conquest, as, with his majestic form, he rode along the lines and bade them onward to victory. Like a "hurricane of steel" swept that infantry over the field, drove the enemy from his strong position, routed and pursued him through the woods until night closed the chase (OR, Series I, Volume VIII, pg. 327).

These two reports epitomize the nature of the fighting in around Clemon's field. In the end Dodge's troops were outfought and forced to retire through the woods in their rear and to the south into Ruddick's field. Here, they were reformed as part of battle line by Gen. Curtis who attempted to retake the tavern and Carr's earlier position. It failed and night descended on the battlefield.

The archeological record of the fight in Clemon's field is good, but was compromised somewhat by an episode of illegal relic collecting in 2000. The perpetrator was caught with over 90 artifacts in his possession and was tried and convicted of violations of the Archeological Resources Protection Act. Regardless of the satisfaction derived from seeing a guilty looter punished his illegal activities removed bullets, artillery shell fragments, and Bormann fuse fragments from their context in Clemon's field and the wooded area

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to the south, thus skewing the data set collected during the archeological investigation. Nevertheless, the remaining record is rich and detailed.

Small arms bullets (Figures 30-32) included .54-caliber round ball and conical ball probably fired in M1841 rifles. These were found near the center of the field and were probably fired by the 4th Iowa at the charging MSG division. A few .58-caliber Minié balls were found in the field with most to the southeast side. This suggest either some company of the 4th Iowa or more probably some of the 8th Indiana armed with the M1855 rifled musket fired at the southerner cavalry flanking attempt. The majority of small arms bullets found in the field and to the southwest side were .69-caliber spherical balls and some .69-caliber conical balls. Both unfired and fired were recovered in the field and along the southeast and western margins. The distribution of the unfired or dropped rounds suggest the MSG 3rd Division had both M1816 muskets and M1842 muskets. Indeed M1816 musket parts were found in Clemon's field including a flintlock musket hammer. So some of the MSG were likely armed with unaltered M1816 flintlock muskets. The fired rounds indicate that both the MSG and the 4th Iowa were armed with M1816 muskets and M1842 rifled muskets, as well as the 8th Indiana and perhaps elements of the two Missouri Confederate cavalry units.

Evidence of the intense artillery fire is seen in the distribution of 6-pounder and 12-pounder shell, case shot, and canister (Figures 33-35) found on the field and in the wooded area to the west of the 4th Iowa position. Only a few pieces of shell or case shot were recovered during the archeological investigations. A few more were seen in the confiscated materials taken from the convicted looter. The majority of artillery related artifacts are canister balls, canister bases and top plates in both 6-pounder and 12-pounder. The presence of 6-pounder and 12-pounder artillery artifacts is entirely consistent with the historical record of cannon composition among the Union and Confederate batteries dueling each other across Clemon's field. Canister was an anti-personnel round and normally not fired at ranges beyond 500 yards. Top plates and base plates are believed to have dropped from the charge's flight about 50 to 150 yards from the gun that discharged them. Most of the base and top plates were found on either side of the slight rise near the center of Clemon's field. This suggests that the guns were with 50 to 150 yards of those find locations, and that is entirely consistent with the descriptions of gun positions found in the historic record. The fact that canister is the majority archeological artillery artifact is also consistent with the historic record and the documented use of artillery to mow down the infantry, both the Union troops covered by their expedient breastworks and Clark's 3rd Division charges across the field where he suffered so many casualties. Several of the M1816 firearms parts were found in Clemon's field and one sideplate is bent and twisted perhaps by a canister fragment. Regardless it bears testimony to the savage nature of the fighting in Clemon's field.

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Leetown

The fight at Leetown can be divided into three distinct areas bounded by modern features for reference. The first phase of the fight took place in Foster's field, located south and east of Round Prairie, south of Ford Road, west of Little Round Mountain, and north of a band of dense woods. This band of timber forms the northern border of Oberson's field the scene of the second phase of fighting at Leetown. Oberson's field lies west of the current park tour road and Morgan's woods. It is a roughly 80 acre field divided roughly in the middle by the north south running Arkansas Highway 72. The southern side of Oberson's field is defined by another dense band of second growth timber.

The archeological inventory covered the entirety of Oberson's field (Figure 39), most of Foster's field and much of the area north of Ford road. The band of woods



Figure 39. Oberson's field viewed to the west southwest.

separating Foster's and Oberson's fields could not be effectively metal detected due to the dense undergrowth that prevented effective use of the detectors. The woods on the southern side of Oberson's field were not detected for the same reason. The Morgan's wood area was burned during a prescribed burn effort with mixed results (Figures 40, 41). The archeological team made a concerted effort to metal detect the woods, but the

density of trees and unburned undergrowth prevented more than a reconnaissance level of detecting effort.

When Major Peter Osterhaus reached Oberson's field he sent his cavalry and the 1st Missouri Flying Artillery north on a track that worked its way through the woods separating Oberson's from Foster's field. As the artillery and cavalry cleared the timber near Foster's farmstead they saw General McCulloch's confederate column marching eastward along Ford Road on the north side of Foster's field. Osterhaus had the three 6-pounder rifled guns unlimber and fire on the unsuspecting column. Bearss (1962:9) suggests the artillery moved north about 200 yards before unlimbering and bringing its guns into battery. One company of the 1st Missouri Cavalry deployed right and one left of the guns. Osterhaus sent two companies of the 3rd Iowa Cavalry north along Foster's Lane to intercept the rear of the Confederate column that he presumed would be near Twelve Corner Church while the remainder of the 3rd Iowa Cavalry and the 5th Missouri Cavalry deployed behind and right of the guns while two companies of the 4th Missouri Cavalry had not yet emerged from the treeline (Shea and Hess 1992:96). Osterhaus also sent one section of Welfley's

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Figure 40. Superintendent John Scott and former Chief Ranger Mary Davis working in Morgan's woods after a prescribed burn.



Figure 41. The dense understory and brushy nature of Morgan's woods prevented detailed metal detecting in this part of the battlefield.

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Battery forward to support the 1st Missouri Flying Artillery, but they did not reach the scene of the fight before the Union troops were overrun by Confederate cavalry.

Reportedly the Missouri guns fired up to eighteen rounds of solid shot causing confusion in the Confederate column, although the few participant accounts from the Confederate column indicate the artillery rounds were probably shell not solid shot (Shea and Hess 1992:97). Before further damage occurred McCulloch ordered the Confederate cavalry to charge the guns. In the meantime Captain John Good unlimbered his Texas battery and wheeled into line to fire on the Union gun position (Fitzhugh 1971:162-163). He managed to fire one shot before the cavalry charge blocked his target. McIntosh's cavalry swept the gunners from their position and overwhelmed the Union cavalry causing them to break ranks and flee back through the woods to Oberson's field or be killed or captured.

The Union cavalrymen and artillerists fled the field in a chaotic and disorganized manner as their tactical organization disintegrated. They streamed across Oberson's field through the ranks of Union infantry and two other artillery units that Osterhaus had wisely decided to deploy on the southern side of Oberson's field. The Union troop disposition at the south edge of the field included the 36th Illinois Infantry on the left of the line, followed on the right by the 4th Ohio Independent Battery, then the 12th Missouri Infantry, and the remaining section of Welfley's Independent Battery supported by one detached company of the 36th Illinois. The section of Welfley's battery that moved north on Foster's Lane also retreated losing one gun to a breakdown of the cassion during the retreat. That gun was recovered a short time later and placed into action with its battery.

As the pursuing Confederate cavalry broke the tree line of the timber on the north they were met by a concentrated artillery fire as Osterhaus stated in his after action report:

The enemy soon made his appearance with colors flying on the opposite side of the field which I occupied. Our batteries opened their fire on him, sweeping everything from our sight. I ordered skirmishers from the Twelfth Missouri Volunteers to advance and scour the woods on our right and front and sent one company of Benton's Hussars (which had reassembled) to our left. On approaching the wood they were received by the enemy with a heavy musketry fire, to which the infantry replied so successfully, that they were able to bring back (from a very exposed position) the piece of Captain Welfley's artillery which had been disabled. This piece afterwards did very good service (OR Series I, Volume VIII, pp. 218).

The archeological evidence of the brief fight in Foster's field is limited but very patterned (Figures 30-38). There is a variety of artillery shell and case shot fragments scattered across Foster's field, but this material is more likely associated with the later cannonading of the artillery in Oberson's field on the confederate column than the 6-pounder rifled gun fire of the 1st Missouri Flying Battery. The recovered artillery fragments in

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Foster's field are consistent with Captain Louis Hoffmann, Fourth Independent Battery Ohio Light Artillery after action report that stated:

"The four 6-pounder rifled guns threw on that occasion 221 shots and the two howitzers 72 shells and spherical case" (OR, Series I, Volume VIII, pg 237).

No fragments of conical shell were recovered along Ford's road and the line of the Confederate advance that could be associated with Missouri battery artillery fire. In fact there were no Civil War era artifacts found along the Ford road alignment or north of it. One reason for the lack of evidence in along Ford road and north of that area is probably due to extensive land leveling and later road construction disturbance in those areas that quite likely have obliterated or buried evidence of the battle beyond the range of metal detectors. However, south of the road small arms bullets as well as artillery projectile fragments were recovered indicating this area has suffered less disturbance and still retains good integrity for Civil War era artifact deposition.

Pistol, musket, and rifled musket bullets (Figures 30-32, 38) were recovered in Foster's field with the majority found just west of Highway 72 and scattered along a strip parallel to the northern edge of the timber band separating Foster's from Oberson's field. The northern two-thirds of Foster's field east of Highway 72 was only sampled during the metal detecting inventory due to time constraints of that field season. More information is likely to be recovered when further systematic metal detection can be done in that area.

The area along the northern edge of the timber as well as that area west of Highway 72 yielded .36-caliber spherical balls, .36-caliber conical balls, and .44-caliber conical bullets all fired from pistols, the majority of which are Colt revolvers. Interspersed among the pistol bullets is one .69-caliber Minié ball, two fired and one unfired .58-caliber Minié balls, and five unfired and twelve fired .69-caliber spherical balls. A single .50-caliber country rifle ball was found at the edge of the timber. The distribution of the bullets appears random as plotted on the artifact distribution maps and probably reflects the Texas cavalry's charge against the Missouri guns and their support units. The bullet types indicate that the units participating in the fight in Foster's field were armed with smoothbore muskets perhaps M1816 variations or M1842, M1842 rifled muskets and Model 1855 rifled muskets or foreign made muskets firing US standard calibers, as well as .36-caliber and .44-caliber Colt revolvers. The single country rifle ball may represent a privately owned rifle or a pre or post battle deposition.

As the units engaged in the Foster's field fight were exclusively cavalry according to all accounts the presence of fired revolver rounds is consistent with mounted unit armament. On the other hand the presence of fired and lost musket and rifled musket rounds is a bit surprising as cavalry were not normally armed with these long barreled firearms as they were unwieldy to fire and load from horseback. Their presence may mean that some of the Confederate cavalry or Union units were armed with whatever firearms were available or that the musket caliber bullets related to other fighting and skirmishing

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in the timber later during the Oberson field phase of the fight. However, the distribution of the bullets whether revolver or musket caliber is consistent with the Confederate cavalry attack on and limited Union defense of the Missouri Flying Artillery Battery. Colonel Albert Pike's Indian brigade were reported to have been armed with bows and arrows, knives, tomahawks, rifles, and shotguns (Gen. Samuel Curtis to Asst. Adj. Gen. J. C. Kelton, OR, Series 1, Volume 8, pg. 195; Pvt. John Larson, 3rd Iowa Cavalry, OR, Series I, Volume VIII, pg. 207). If the Indian brigade fighting in Foster's field were armed so eclectically it seems reasonable to conclude that other Confederate units were armed with a variety of available firearms.

The small arms artifact distribution pattern in Foster's field suggests the 1st Missouri Flying Battery initially deployed not 200 yards north of the timber, but only a few yards north of it and probably on or quite near the present alignment of Highway 72 (Figure 42). The majority of musket, rifled musket, and pistol rounds were found just west of the highway and south of Round Prairie. The reported deployment of Union supporting units was behind and right of the Missouri guns. The artifact distribution pattern is consistent with the interpretation of the guns on or near the highway alignment with the Union cavalry to the southwest perhaps 100 to 200 yards and just north of the timber.

The fight in Oberson's field went on for several hours and is somewhat more complex than Major Osterhaus' after action report would imply:

For several hours the enemy repeatedly attempted to advance, on each occasion bringing fresh troops into action. However, they invariably had to give way to the unflinching courage of my men. McCulloch and McIntosh led their troops in person and both fell-the former by a ball from a soldier of the Thirty-sixth Illinois Volunteers, Peter Pelican. The enemy's cannon played for a time pretty severely on our ranks, and it became necessary to silence them. My instructions to that effect were so well executed that the rebels were unable even to carry away the three pieces of the flying artillery abandoned by our cavalry in the early part of the day. They had to leave them on the field (OR Series I, Volume VIII, pg. 218).

The action in Oberson's field can be divided into three episodes, the first being the retreat of the cavalry from Foster's field through the newly formed artillery and infantry ranks on the south side of Oberson's field, the second being the infantry assaults by the 36th Illinois and 12th Missouri Infantries, and the third the artillery duel between the Union and one or more Confederate artillery batteries.

The first two episodes are described in Colonel Nicholas Greusel, Thirty-sixth Illinois Infantry, after action report as the:

Thirty-sixth Illinois on the left, Hoffmann's battery next on the right, Twelfth Missouri next on the right, and three pieces of Welfley's battery, supported by Company E, Thirty-sixth Illinois, on the extreme right. While forming this line we

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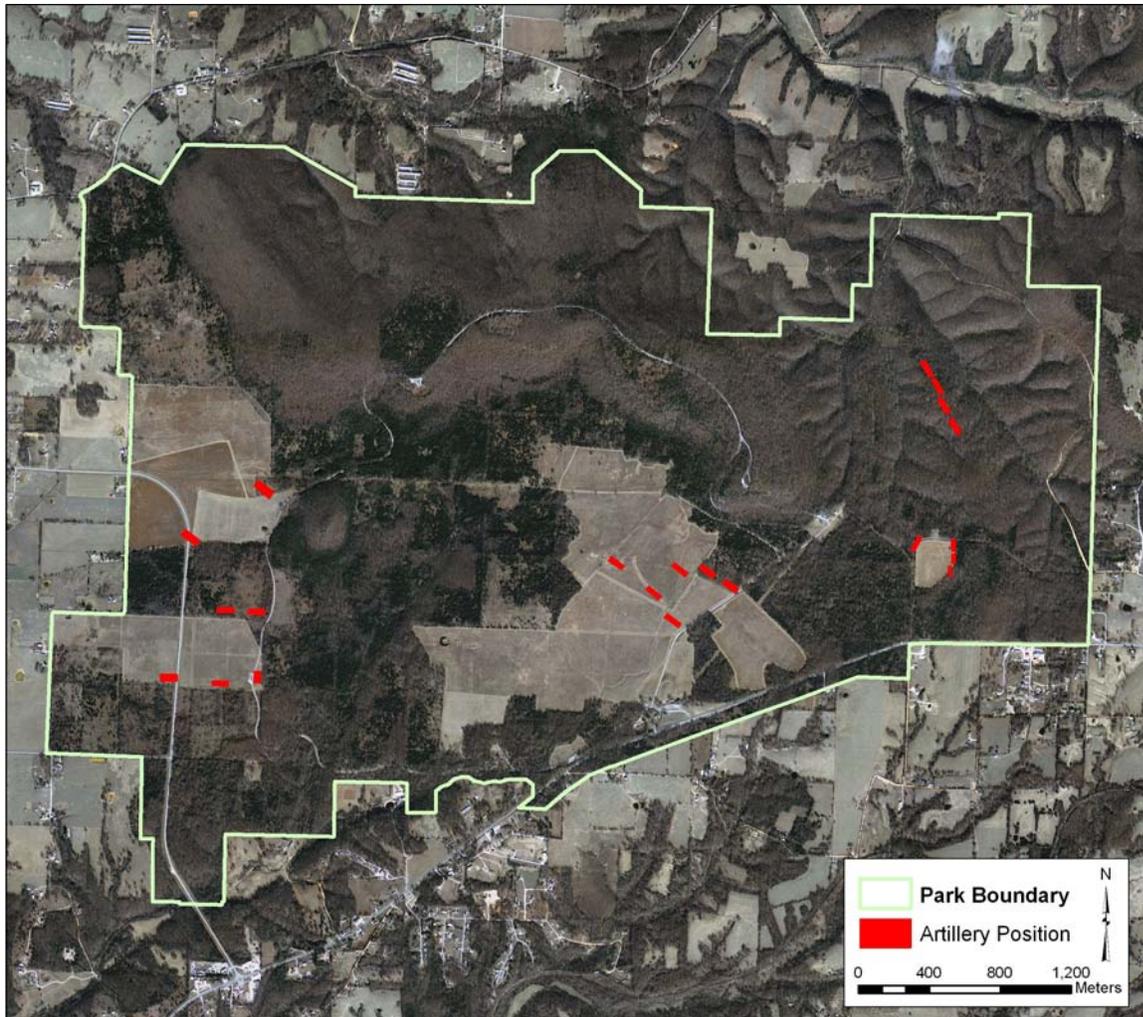


Figure 42. Postulated artillery positions based on historical records and archeological evidence.

were surprised with a precipitate retreat of cavalry, but my command stood like veteran soldiers, and just as the enemy made his appearance behind the cavalry I opened up a brisk fire from the artillery, which prevented his following up the retreat. Soon after this I directed Lieutenant Bencke's section of Welfley's battery to throw three shells to a high and steep hill on our right and about a mile in advance, which appeared to be occupied by officers, directing the movements of the enemy. These shells dispersed them. After this I threw out Companies B and G of the Thirty-sixth Illinois Volunteers-Company B to skirmish and Company G to cover. These companies soon discovered three regiments of the enemy's infantry lying in ambush and one formed in square, whom they engaged for about fifteen minutes, retiring in good order, but with the loss of 20 wounded-13 in Company G and 7 in Company B. It was during this skirmish that the officer supposed to be General Ben. McCulloch was shot by Peter Pelican, of Company B, Thirty-sixth Illinois Volunteers. I then directed the artillery to fire upon the ambushed enemy,

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and moved forward the Thirty-sixth Illinois, but the enemy retreated in great confusion, when I retired to my first position (OR, Series I, Volume VIII, pg. 226).

The precipitous cavalry retreat cannot be teased out of the archeological record as it is too ephemeral, with one possible exception. The Union cavalry and artillerymen were pursued by elements of the 6th Texas Cavalry. When the mounted Confederates emerged from the timber the 4th Ohio Battery opened fire on them (Shea and Hess 1992:105). Two fragments of Hotchkiss conical shell and sabot from a rifled cannon shot were found in the northwestern part of Oberson's field. Local metal detectorist Chris Whitehead found and reported an intact Hotchkiss Type I shell just outside the park boundary in the extreme northwest corner of Oberson's field. He also reported he and a friend found several 12-pounder spherical shell fragments, iron canister balls, lead case shot balls, and a .58-caliber Minié ball in the same area (email, Aug. 1, 2003 Chris Whitehead to Douglas Scott). A few conical and spherical pistol bullets in .44 and .36-calibers were found scattered across the field as well. The rifled artillery projectile fragments are consistent with the 4th Ohio firing on the 6th Texas. The presence of revolver bullets suggests that either the Union cavalrymen fired a few shots at their pursuers or the 6th Texas emerged from the woods firing at the fleeing Union cavalry. It is possible that some of the pistol rounds reflect Union infantry officers firing their side arms at the Texans or even during a later part of the fight in Oberson's field.

Even though the cavalry retreat is not well supported by physical evidence there is ample physical evidence for the 36th Illinois action and perhaps for the 12th Missouri skirmishing, and there is significant physical evidence for the artillery duel that took place between the combatant parties. The historical documentation places the 36th Illinois Infantry on the extreme left of the Union line in Oberson's field. Assuming the 4th Ohio battery on their right was on or near the alignment of Highway 72 this places the 36th's line west of Highway 72. Tradition also places the approximate death site of General McCulloch at the northwest corner of Oberson's field at the south edge of the timber separating Oberson's from Foster's field.

Company B with Company G as reserve was sent to the near the north end of the field to act as skirmishers in case Confederate troops tried to push through the belt of timber. It was somewhere along a fence in the north part of the field where they fired on and killed General McCulloch (Appendix 2). Some members of the company rushed forward to loot the body, but were repulsed by skirmishers from the 16th Arkansas Infantry who had moved forward with McCulloch. The 2nd Arkansas Mounted Rifles were on their right with General McIntosh, probably on or just north of Foster's lane near where it made a 90 degree turn to the east.

The archeological record of the firefight between Companies B and G, 36th Illinois and the 16th Arkansas is abundant (Figures 30-32, 38, 43). The area west of Highway 72 yielded 29 fired and two unfired .69-caliber musket balls, two fired and three unfired .69-caliber Minié balls, six fired and 16 unfired .58-caliber Minié balls, two .36-caliber

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spherical balls, three .44-caliber conical pistol balls, two .44-caliber pistol balls, five .54-caliber Hall rifle balls, one .54-caliber Minié ball, and one .50-caliber country rifle ball.

As noted earlier some of the pistol caliber bullets may reflect the fighting between the Union cavalry and the pursuing 6th Texas Cavalry during the early part of the fight in Oberson's field. However, the presence of the bullets from shoulder fired rifles and muskets suggest most of these bullets originated during the fight between Companies B and G, 36th Illinois and the 16th Arkansas Infantry. The dropped or unfired bullets probably represent the 36th Illinois lines as they retreated across the field after the death of McCulloch. These unfired rounds could have been lost as men moved or fumbled and lost during reloading on the skirmish line. The fired and impact damaged bullets represent the actual fire-fight in the field.

Whether fired or dropped the bullets form a linear pattern of distribution. However, the linear pattern is not aligned east to west at the north end of the field with subsequent lines falling back north to south to the southern side of the field. Rather the alignment is northeasterly to southwest.

The dropped or unfired rounds indicate that Company B and Company G were armed with rifled muskets and smoothbore muskets. The historical records indicate that Company B was armed with Miniés and Enfields. The archeological evidence indicates that is basically correct. The Miniés could have been either the M1855 rifled musket or the M1841 rifle rebored to .58-caliber. The P53 Enfield was a .577-caliber that accepted the .58-caliber US cartridge without modification. A bullet purportedly recovered from McCulloch's body is also a .58-caliber Minié ball and is consistent with the recovered archeological bullets believed to be associated with the Company B action (Appendix 2) Company G, according to historic records was armed with the old converted muskets. The archeological evidence supports this and is consistent with the likelihood they were armed with some variation of the .69-caliber M1816 converted from flint to percussion ignition.

The fired bullets found impacted around those dropped rounds indicates the 16th Arkansas was armed with a mixture of rifled muskets firing the .58-caliber Minié ball, either the M1855, the rebored M1841 rifle, or P53 Enfields. The most commonly found fired bullet was the .69-caliber spherical ball. This indicates the 16th Arkansas was armed primarily with smoothbore muskets, probably a variation of the M1816 or the M1842 musket. Two impacted .69-caliber Minié balls probably reflect firing by Company G, 36th Illinois at the 16th Arkansas as they appeared near the wood line. However the presence of a few M1842 rifled muskets in the Arkansas line cannot be ruled out.

The northeast to southwest linear distribution pattern of the dropped and fired bullets goes against the convention of how the 36th Illinois and the 16th Arkansas were deployed. Rather than an east to west alignment in skirmish order the bullet distribution pattern allows us to posit that the 36th Illinois was likely aligned southwest to northeast

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along the northwestern side of Oberson's field, perhaps forming an L-shaped formation at the fence line in the northwestern corner of the field. Such an alignment would have allowed the men to observe the woods to their north as well as see any movement that might come from the northwest where Confederate troops could skirt the south side of Round Prairie and slip up on the western edge of Oberson's field.

The bullet impact pattern suggests that as the 36th Illinois companies fell back from McCulloch's body there was some disorder as many of the bullets are clustered, suggesting some type of tactical disorganization. As the line moves easterly and southerly tactical organization is reestablished and a strong linear pattern once again emerges in the bullet dropped and fired pattern. Interestingly enough impacted and fired bullets were found in a natural low spot in the southern section of Oberson's field west of Highway 72. This may be the spot where the men lay down while Hoffman's 4th Ohio Battery fired on the 16th Arkansas. The presence of 12-pounder shell and case shot fragments as well as conical shell fragments north of this area may attest to this part of the fight, but suggests that the 16th Arkansas may have pursued the two 36th Illinois companies part way across Oberson's field and not just beyond the edge of the woods as seems to be implied in the historic record.

About the time the 36th Illinois moved north the 12th Missouri Infantry sent skirmishers to the north side of the field to support some of Welfley's cannoners recovery of their disabled gun. As Major Hugo Wangelin, 12th Missouri (OR Series I, Volume VIII, pg 228) reported he

deployed on a large field, protecting Captain Hoffmann's battery. After a while two companies were ordered to deploy as skirmishers towards the woods, about a quarter of a mile in front of us, to protect some horses and drivers who were sent to recover a cannon which had been lost in a previous engagement of the day, which order was executed in gallant style. The gun was recovered and brought back.

During this forward movement the 12th skirmished with some elements of the 2nd Arkansas Mounted Rifles probably positioned along Foster's Lane.

There is no definitive archeological evidence for this portion of the fight, although a few unfired and fired bullets found east of Highway 72 cluster in the only east to west pattern observed in this area and may well be the only evidence of this fire fight. The majority of the bullets are .69-caliber spherical ball and were likely fired in M1816 or M1842 muskets. A few bullets fired from .36-caliber Colt revolvers and one .56-caliber Colt revolving rifle may also be associated with the cannon recovery skirmish.

After Generals McCulloch and McIntosh were killed the Confederate attack on the Union line in Oberson's field lost focus and settled into a slug fest with artillery. The traditional view of this element of the fight is one of the Union artillery firing blindly over the timbered strip between Oberson's and Foster's fields toward the Confederate column,

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with only Good's Texas battery returning counter battery fire. The archeological record suggests a somewhat more determined resistance by the Confederate artillery than the surviving documentary records suggests.

The documentary record clearly indicates sustained artillery fire by the Union batteries. Capt. Louis Hoffman (OR Series I, Volume VIII, pg 237) stated that his "battery remained at the battle ground from 10 o'clock a.m. to 3 o'clock p.m., and although the fight was a very hot one, compelled the enemy's batteries to cease their firing, and did not change its position until the enemy left his position in the woods and retired." This statement is supported by that of Capt. Martin Welfley regarding his battery's contribution to the fight (OR, Series I, Volume VIII, pg 236) "We kept up a steady fire on the enemy for about four hours, after which the firing ceased."

It is generally believed that only Good's Texas battery returned fire from Foster's field, firing equally blind with his 12-pounders. However, the archeological distribution and pattern of 12-pounder and 6-pounder shell and case shot fragments as well as case shot balls, and some 6-pounder canister indicate the artillery fire was far from one sided (Figures 33-35, 36, 37).

The archeologically recovered artillery shell and case shot fragments divide into two distinct groupings or clusters in Oberson's field east of Highway 72. One artillery fragment cluster is in the north half of Oberson's field and consists of conical Hotchkiss shell and sabot fragments undoubtedly fired from Hoffman's 4th Ohio rifled 6-pounders (Figures 36, 37). In this same area are a significant number of 12-pounder shell fragments, 12-pounder case shot fragments, 6-pounder case shot fragments, Bormann fuse fragments, and fuse underplugs (Figure 33). Case shot balls were also recovered in this area (Figure 35) as well as during the limited work in the timber at the north edge of Oberson's field. A few 12-pounder shell and case shot fragments were recovered there as well. These artillery projectile fragments are consistent with fire by the Union batteries toward Confederate positions on the north side of the field, but at a range of less than 400 yards away. Some of this fire may have been directed at Confederate troops assembled along Foster's lane, but another explanation is also plausible.

Another cluster of artillery projectile fragments was found in the south half of the field held by the Union troops supporting Hoffman's and Welfley's batteries. As these fragments (Figure 33) were recovered less than 100 yards from the Union positions or actually within those positions it is unlikely they originated with the Union guns. The fragments are the remains of 12-pounder shell and case shot bursts as well as a few 6-pounder case shot bursts. Given the known range of 6-pounder and 12-pounder smoothbore artillery (Gibbon 1970:40-42) these projectiles could have originated from Confederate guns firing from Foster's field, some 800 yards away. However, another set of physical evidence mitigates against that interpretation, the presence of canister balls.

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Once again there are two clusters or grouping of canister balls in Oberson's field (Figure 34). One cluster of 6-pounder and 12-pounder canister shot in the north half and one in the south half of the field. All were found east of Highway 72. Canister had a maximum range of 500 yards. The canister balls found in the north half of the field are within 300 to 400 yards of the Union gun locations. Those in the south half of the field have two possible points of origin. In one possible scenario the canister could have originated from the guns of the 2nd Illinois Battery after they were captured during the Morgan's woods fighting and turned on the federals in Oberson's field. The second scenario would place Confederate batteries on Foster's Lane just west of its intersection with the Leetown road, well within canister range of the Union lines.

If the this second scenario is accepted as the likely source of the canister found in the Union lines then the traditional view of the limited role the Confederate artillery played during the Leetown fight requires reevaluation.

Good's Texas battery is the only recorded Confederate artillery known to have fired on the Union position. Good wrote to his wife on March 11, 1862 (Fitzhugh 1971:163) that he moved from his initial position of firing on the 1st Missouri Flying Battery to a position to support McCulloch's command. This suggests that Good moved into the woods along with the 16th Arkansas Infantry, perhaps between it and the 2nd Arkansas Mounted Rifles. Good's battery had only 12-pounder cannon and thus cannot be the source of the 6-pounder canister found in the southern half of the field. Therefore, some other unit of Confederate artillery with 6-pounder guns must have been in a position to fire on the Union lines. With this in mind it becomes necessary to reinterpret the historic sources regarding the role of Hart's Arkansas battery that was armed with four 6-pounder guns.

A single mention of Hart's battery being on the field from Col. Elkanah Greer is the key to reinterpreting their role in the fight. Late in the Leetown engagement Col. Greer, Third Texas Cavalry, found he was the senior officer on the field. He reported (OR, Series I, Volume VIII, pg 293)

Being unexpectedly placed in command and having had no intimation of the general plan of attack, seeing but few troops on the field, and not knowing the whereabouts of the remainder, I took a view of the field and its surroundings. I discovered Captain Hart's battery of four pieces on a hill in close proximity to the enemy, unsupported by any of our troops.

Greer's mention of Hart's battery being located on a hill led to an assumption that this was Little Round Mountain (Bearss 1962:5). If Hart went into battery on the hill or its flanks he was out of canister range. There is, however, a slight rise to the ground at the northeast side of Oberson' field in the strip of woods. Good also mentioned that he moved to a hill on his right to shell the Union lines, but stated Hart's battery did not fire a round (Fitzhugh 1971:163). Given the archeological distribution of 6-pounder and 12-pounder shell and case shot fragments as well as 6-pounder and 12-pounder canister on

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the south side of Oberson's field it appears that Good's Texas battery with 12-pounders and Hart's Arkansas battery with 6-pounders did go into action, not on the north side of the timber separating Oberson's and Foster's fields or on Little Round Mountain, rather they deployed from Leetown road along Foster's lane at the northeast side of Oberson's field (Figure 42). The guns were probably in the treeline and masked from direct observation from the Union lines. The archeological record does support the historic accounts that the Union and Confederate artillery duel was intense, but it was at much closer range than the recorded observations noted. The artillery artifact distribution in the east half of Oberson's field leaves one with the impression that the counter-battery fire was a real slug fest, and not just the random lobbing of shells over the trees. There is one recently discovered contemporary account that supports this re-interpretation. The late Doug Keller found a newspaper account by D. W. Henderson, 59th Illinois Infantry, in the *Litchfield Journal* (March 26, 1862) describing the battle in Oberson's field. In it Henderson states "Here we attacked two batteries of 6 guns each, supported by eight regiments of Louisiana infantry." Henderson may have exaggerated a bit in his account, and there are inconsistencies in other areas, but his account does square with the archeological record.

The Fight in Morgan's Woods

The participant testimony and after action reports give the impression the fighting was chaotic for the episode in the thickets of Morgan's woods. Both Union and Confederate accounts indicate the soldiers lost unit cohesion and commanders had difficulty maintaining command and control due to the dense nature of the woods and the deadfall scattered about the forest floor that impeded movement by both combatants. The archeological record supports that impression but adds some surprising detail.

Major Osterhaus' account of the Morgan's woods affair indicates that Col. Hebert's attack through the woods was a serious threat to the Union lines.

About 2 o'clock p.m. General Jefferson C. Davis arrived with some of his regiments and was joined by the Twenty-second Indiana, up to this time under my command. The gallant officer deployed his regiments at once on my right, advancing towards any foe who might still be in the timber. The report of musketry which followed told me that a lively fight was going on. To act in concert with him I ordered my trailleurs forward in front, also some cavalry which had partly reassembled. I advanced with my whole line, when the enemy showed his colors again. Cavalry and infantry came around the left of General Davis and opened their fire on my now unsecured right. In double-quick I threw the Twelfth Missouri on this exposed flank, supported them by Captain Welfley's battery, who had wheeled to the right, and forming the Thirty-sixth Illinois in close column on the extreme left of this new position, to be ready for any cavalry attack, protecting at the same time Captain Hoffmann's battery. The enemy's plan being defeated by a raging fire from the Twelfth Missouri Volunteers and Captain Welfley's artillery, they made a feeble attempt to cut off our line of retreat, which was frustrated by skirmishers thrown

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out from the Thirty-sixth Illinois Volunteers. As my infantry force was not equal to the artillery (having only the Twelfth and Thirty-sixth with me), and also to counteract any further attempts of the enemy to outflank me, I thought it judicious to send four pieces of Captain Hoffmann's battery back to Leetown, which affords a very commanding position" (OR Series I, Volume VIII, pg. 218).

Col. Jefferson C. Davis' report of the action adds more detail and shows how confused the action was (OR, Series 1, Volume VIII, pp 246-247)

In the mean time the enemy was rapidly approaching and advancing his forces on the right of the road, and had already lodged himself in large numbers in a thick oak scrub extending to our camp. I immediately ordered the Second Brigade to deploy to the right and engage him. This was done in a vigorous manner by the Thirty-seventh and Fifty-ninth Illinois, assisted by Davidson's battery, which I had put into position for that purpose. I soon became satisfied, from the increasing and excessive fire of the enemy, that he was being rapidly re-enforced, and ordered the Eighteenth and Twenty-second Indiana to make a flank movement to the right and perpendicular to the enemy's lines, and then move forward and attack him. This was accomplished with alacrity, but not, however, until the Second Brigade had begun to recede before the excessive fire of the enemy, who had now concentrated his forces to the number of several thousand, under McCulloch and McIntosh, with a large body of Indians, under Pike and Ross. The Second Brigade being thus overwhelmed, I ordered it to fall back in changed front to rear on its right, and the First Brigade to change front forward on its left, so as to attack the enemy in his rear, who was now exultingly following up his temporary success. The Eighteenth Indiana soon executed the movement as directed, and opened a well-directed fire upon the enemy's rear, which had the effect of drawing his fire and disconcerting his pursuit, so as to enable the Second Brigade to reform their lines as directed, but not until the enemy had succeeded in capturing two guns of Davidson's battery, which, owing to the precipitate advance of the enemy and disabled horses, could not be withdrawn.

The Eighteenth Indiana pushed rapidly forward and drove the enemy from this part of the field, and, advancing to the open ground, found three pieces in the hands of the enemy; charged and routed him with a heavy loss from them. The Twenty-second Indiana during this time engaged a large portion of the Arkansas troops and Indians, and after a sharp engagement put them to flight.

Col. Thomas Pattison, Eighteenth Indiana Infantry adds yet another Union view to the confused nature of the fight (OR, Series 1, Volume VIII, pp 249-250)

About 2 p.m. I received your order to proceed with the Eighteenth to the scene of action, which order was executed with dispatch by Lieutenant-Colonel Washburn. On arriving I found the Twenty-second in line of battle on the left and rear of

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Davidson's Peoria battery, which was in position in the southeast corner of a large open field. We immediately formed on their right. Here I took command of both regiments. Colonel White's brigade being warmly engaged with the enemy in the woods on the right of the clear land, I was ordered to his support. Moving in double-quick time by the right flank and passing through the timber to a small hill I found the Fifty-ninth Illinois retiring in disorder, having been overwhelmed by vastly superior numbers and a murderous fire from the Louisiana, Arkansas, and Cherokee troops. I closed up my lines as soon as the Fifty-ninth passed through, and, advancing through the field, changed my line of battle by wheeling to the left until I got about parallel with the right side of the large field first mentioned. Then pressing forward I found the enemy rushing upon Davidson's battery (Colonel White, with the Thirty-seventh Illinois, having retired to change his line), having taken two guns, which they turned on my command with some effect. Here they received a full volley from us, which threw them into the utmost confusion, when they abandoned the guns taken and retreated from the field, a part of them passing to our right rear, and a large force taking immediately through the line of the Twenty-second, which gave way, by order of Colonel Hendricks, and retired from the field, leaving the Eighteenth alone. About this time Colonel Hendricks fell, having received two mortal wounds.

About the time the enemy found I had them flanked Colonel White rallied the Thirty-seventh and nobly seconded my efforts to retake the battery. That portion of the enemy which passed my left flank poured in a desperate volley on the rear of the Eighteenth, which was rendered comparatively harmless by having the men fall flat down. The left wing was promptly faced by the rear rank and returned the fire with terrible effect on the enemy, while the right wing fired to the right front on those who were rapidly retreating in that direction. We then passed through to the open ground in front, having secured a complete victory over a force three times our number of the best Louisiana and Arkansas troops, assisted by a large body of Cherokee Indians, many of whom paid the penalty of the penalty of their base ingratitude to the Government that has so bountifully provided for their welfare. After some little time the Twenty-second returned and took their position on the right of the Eighteenth, where we bivouacked on the same ground where we first formed. Thus ended the battle near Leetown, in which the enemy lost Generals McCulloch and McIntosh, with many other officers of distinction.

For a Confederate view of the affair we have the report of Col. Edward McNair, Fourth Arkansas Infantry who stated (OR, Series 1, Volume VIII, pp 294-295):

I have the honor to report to you the action of my regiment (Fourth Arkansas) and other troops under my command in the battle of Sugar Creek, or Elkhorn, on March 7:

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At about 10.30 a.m. my regiment, constituting the extreme right of Colonel Hebert's brigade, composed of McIntosh's, Hebert's (Third Louisiana), Fourth and Fourteenth Arkansas Regiments, and McRae's battalion, was ordered, with the rest of the brigade, to take a battery which was directly in front, but at some distance, and in the rear of an open field and a strip of woods of dense undergrowth and filled with fallen timber, intervening between us and the field and extending around on the left of the field. Ordering a charge, my men obeyed with alacrity and cheerfulness; but after advancing some 200 yards they were, owing to the nature of the ground and obstacles in the way, thrown into disorder and were halted, and reformed as well as the ground would permit. The enemy discovering us, immediately opened upon us a heavy fire of shell and grape. In a few moments the order was given to renew the charge. I accordingly moved my regiment forward, obliquing, however, to the left, keeping in the skirt of woods that extended around the field, in order to protect my men from the enemy's fire. This I succeeded in doing in a great degree.

While marking this movement, however, another portion of the brigade, moving by the flank, cut off two companies and a half on the left from the main body of my regiment, which did not rejoin it during the day, but, connecting themselves with other troops of the brigade, as I am credibly informed, fought most gallantly through the day. Continuing to move forward, we came upon a body of the enemy's infantry in ambuscade; attacked and drove them back until they were reformed on a second body in the rear. We attacked the whole body and repulsed them again; but, rallying upon their reserves, they made a stand, but were soon driven back again by our brave troops. In this last charge one of the enemy's batteries, at a distance of 200 yards, opened upon us, but we charged and took it in a very short time. In this charge the loss of the enemy was very great.

The enemy, receiving heavy re-enforcements, made a simultaneous attack with cavalry on the left and infantry on the right of our brigade in numbers far superior to our own. After a fierce conflict the enemy were for the fourth time repulsed and with heavy loss.

The after action reports convey a real sense of confusion and chaos that occurred during the fighting in Morgan's woods. Tactical stability in and among units as well as command and control by officers devolved to confusion as the terrain through which the units maneuvered imposed irresolvable conditions on the men. The archeological record ably demonstrates the lack of organization in Morgan's Woods, indeed, the current conditions in the woods today prevented a complete inspection of the area by metal detectors. Thus we have, at best, a reconnaissance level archeological sample within Morgan's woods. Nevertheless the metal detecting work located 6-pounder and 12-pounder shell and case shot, 6-pounder canister, and a variety of small arms bullets (Figures 30-38). The small arms fired bullets are a veritable mix of calibers and weapon types, including horse pistols, M1841 rifles, revolvers in .36- and .44-calibers, Sharps carbines or rifles, M1855 rifled muskets, M1842 rifled muskets, M1842 muskets, and M1816 muskets. The

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artifact distribution in Morgan's woods gives no evidence of organized lines, rather the contrary. The fired bullets are scattered throughout the wooded area with one concentration of dropped or unfired .69-caliber spherical bullets intermixed with fired rounds of the same caliber. This concentration suggests that some type of clustering of men occurred in this area with the loss of unfired rounds by movement or fumbling with cartridges while under fire. Such clustering is evidence tantamount to unit tactical disintegration where the herding instinct takes over. Such a scenario is consistent with the accounts of the fighting in the woods perhaps where the 59th Illinois broke ranks and fell back through the 18th Indiana Infantry line.

The surprising archeological findings relative to the Morgan's woods fight was not in the woods proper but the distribution of fired and dropped bullets on the eastern side of Oberson's field near the Leetown road. Here there are three distinct lines of bullets oriented north to south with one alignment in an L-shape at the southeastern margin of the field (Figure 43).

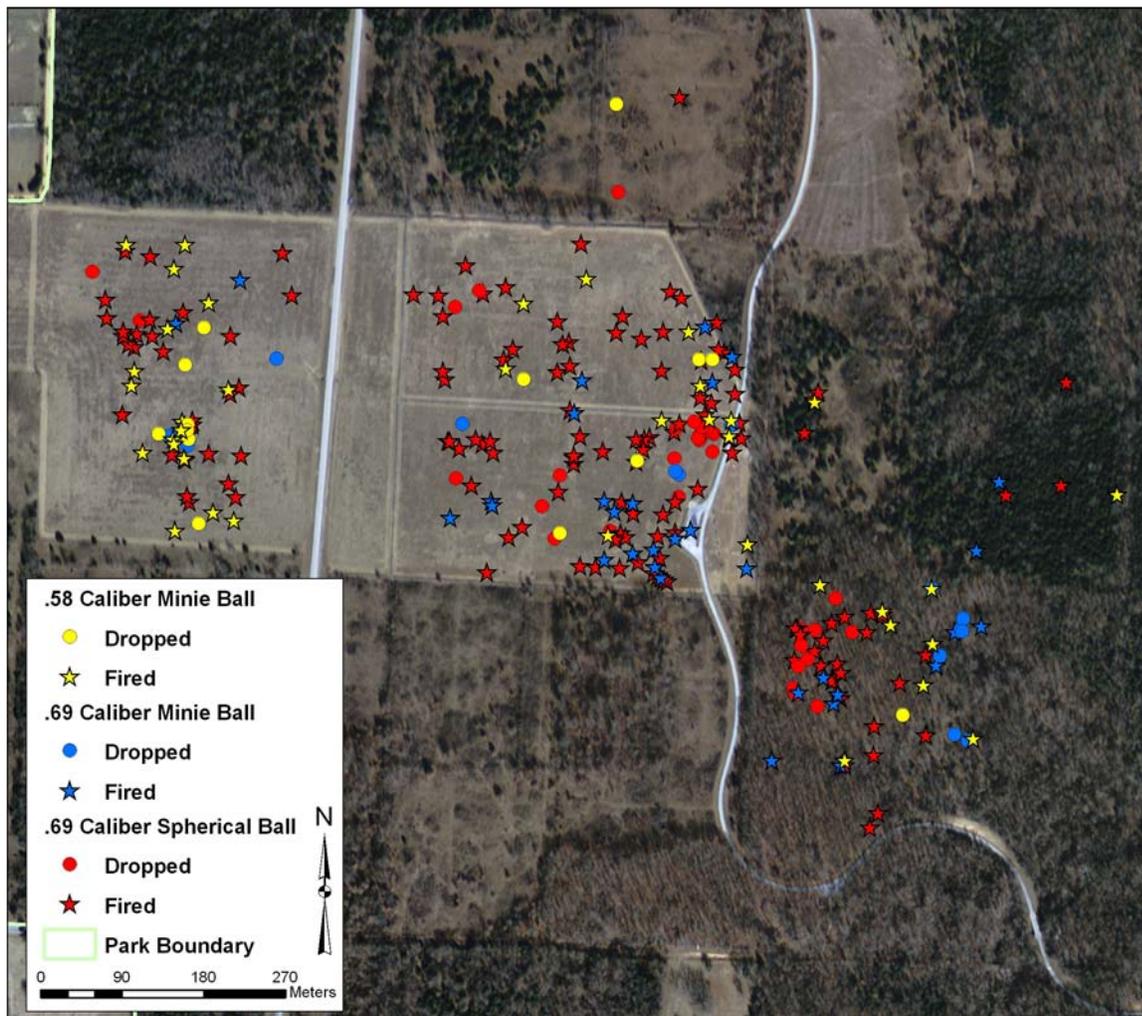


Figure 43. Rifled musket bullet distribution in Oberson's field, note the impacted and unfired dropped bullets alignments.

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The majority of the fired and dropped or unfired bullets are .69-caliber spherical bullets probably fired in M1816 or M1842 muskets. The next largest group consists of .69-caliber conical bullets probably fired in M1842 rifled muskets, then a few .58-caliber conical bullets fired in M1855 or Enfield rifled muskets, and finally there is a scattering of other caliber bullets representing an eclectic variety of guns including M1819 Hall rifles, M1841 rifles, horse pistols, and Colt revolvers.

The eastern most line immediately adjacent to the Leetown road corridor extends the length of the eastern edge of the field and runs westerly for about 100 yards. Near the center of the bullet distribution aligned on Leetown road is a significant cluster of unfired or dropped bullets (.58-caliber and .69-caliber Minié balls and .69-caliber spherical bullets). The second north-south trending line is about 100 yards west of the Leetown road and is comprised primarily of fired .69-caliber spherical bullets, and the third line is 200 yards west of the road contains a mix of musket and rifled musket fired and unfired rounds.

The artifact distribution pattern suggests that the fighting in Morgan's woods spilled over on to the eastern side of Oberson's field, and that area played a much larger role in the fight than previously suspected. The physical evidence allows us to offer a reconstruction of the last phase of the fighting at Leetown suggesting that it was an intense firefight that nearly broke the Union lines.

Morgan's woods was a tangle of downed trees and brush in 1862. It was then and is today dissected by several dendritic ravines. One deeply dissected ravine runs heads to the northwest and runs in a southeasterly direction. Another steep walled ravine heads near the Leetown road across from Oberson's field's southeast corner. Other shallow ravines crisscross the area making walking through the wood difficult even today.

It is clear from the historic record that Hebert's troops moved with difficulty through Morgan's wood with units becoming disorganized. It also appears from the after action reports that the men tried to maintained some order and discipline as they were able to engage the federal forces on two fronts as well as route the Union troops around and capture the 2nd Illinois' guns for a brief time. It is also apparent that the movement through Morgan's woods caused elements of both sides to become disoriented and to some extent disorganized as well.

Combining the archeological record and the historic documentation (Mullins 1990; Bennett and Haigh 1876:149-153; Britton 1899) provides a more comprehensive view of the fight to emerge. Hebert's forces marched south through the woods after deploying in an east to west line south of Little Round Mountain. During their movement south some elements of the Confederate force became disoriented and disorganized due to the tangled nature of the brushy woods. Yet Hebert appears to have maintained enough tactical control to bring the bulk of his troops into a line of battle. Col. Edward McNair states that his 4th Arkansas was on the extreme right of Hebert's line as they moved through the woods, but then later speaks of another unit moving on his flank left cutting off two of his companies

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as he was about to charge a Union gun battery. He also recorded that his men made several charges against the enemy located in an open field, but that the Union troops falling back on their reserves halted the Confederate assault. Adding to the confusion is the fact that some element of the 4th Arkansas captured two of the guns of the 2nd Illinois that was located at the southeastern edge of the field. So in the tangle of Morgan's woods the 4th Arkansas either became separated or moved a considerable distance as they fought at the northeast side of the field and at the southeast side of the field a distance of 400 yards apart.

The Union accounts of the fight also denote confusion in the troop deployment in the woods. Taking the participant accounts and placing them in the context of the physical evidence shows the troop deployment to be more complex and the fight in Morgan's woods to have been more organized than previously suspected.

When Gen. J. C. Davis arrived at Leetown Hebert's Confederates were moving toward the east side of Oberson's field. Davis deployed his Second Brigade, with the 18th and 22nd Indiana Infantry in a roughly east to west line on the east side of Leetown road at the eastern edge of Oberson's field. The 2nd Illinois Battery which faced Morgan's woods was located at the southeast corner of Oberson's field. The 37th and 59th Illinois were deployed in a northwest to southeast trending line from the southeast corner of Oberson's field into Morgan's woods probably along an old road bed running through the woods, thus forming an L-shaped ambush for Herbert's troops. They advanced into the woods and engaged in a sharp firefight with the Confederates.

Hebert angled his Arkansas and Louisiana units either by intent or perhaps by happenstance in a northwesterly to southeasterly line in Morgan's woods facing roughly toward the Leetown road. At some point Herbert must have realized that his left was exposed and ordered some unit to flank left to respond to the threat posed by the 18th and 22nd Indiana regiments creating his own L-shaped line. In the firefight that ensued Herbert's troops forced the 37th Illinois to fall back, regroup, and fall back again.

During the firefight on the Leetown road Herbert sent a mix of cavalry and infantry to cut the Leetown road and block the retreat route for the federals. This mixed Confederate force may have broken the 59th Illinois line or passed between it and the 22nd Indiana at the southeast corner of Oberson's field.

Maj. Osterhaus' grasp of the tactical situation throughout the day's fighting is once again brought into sharp focus as he deployed the 12th Missouri to meet the threat of the Confederate thrust against his right flank sending skirmishers out against the flank maneuver and deploying the remainder of the 12th Missouri on the firing line to support the 37th Illinois. He pulled four of Hoffman's guns out of line and sent them south on the Leetown road to protect them from potential capture. He also redeployed the 36th Illinois from their position on the far left of Hoffman's position to form the left extension of Davis' 2nd Brigade. As the 2nd Brigade fell back from their first position against the concentrated

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Confederate musket fire coming from Morgan's woods some part of the Union line became tactically unstable and men bunched up dropping cartridges. The officers soon re-established order as the men fell back from a second line.

The Confederates, or at least the left end of the line, was able to advance into Oberson's field and capture two of the 2nd Illinois's guns. The captured guns were turned on the retreating Union troops, but Welfley was able to swing his guns from pointing north to east and bring down a rain of bursting case shot on the attacking Confederate line. Some part of the 37th Illinois retreated west across Leetown road and into the 2nd Illinois battery position. As men of the 4th Arkansas and 3rd Louisiana rushed the guns those men of the 37th Illinois armed with Colt revolving rifles fought desperately to save the guns as evidenced by a Colt revolving rifle bullet found by the archeological team in this area. Shea and Hess (1992:124-126) suggest that the 2nd Illinois guns were unsupported when the Confederates rushed the guns except for the effort rendered by the routed 37th Illinois. The archeological evidence suggests the 37th Illinois had indeed fallen back, but the 12th Missouri and 36th Illinois were present in the field well engaged in a fight with Herbert infantry, perhaps having fallen back about 200 yards as they faced the Confederates racing into the field. The fact that four guns were limbered up and driven away and only two were momentarily captured indicates that the infantry support was not really wanting, although it may have not been all that was desired by the artillerymen.

Bennett and Haigh (1876:150-151) describe the role of the 36th Illinois Infantry in the last stages of the fight. They say the Confederates "surged" across the road when Welfley's guns fired a deadly volley into the ranks, but the butternut clad lines kept coming putting Welfley's guns into retreat. With the artillery in retreat the 12th Missouri and 36th Illinois

met the thronging host, greeting them with a terrific shower of lead, which staid the advancing tide until Welfley returned to the field. His guns rained grape and canister into the now wavering Confederate ranks, and they broke and fled in dismay.

In Morgan's woods as the 37th and 59th Illinois' line broke under concentrated Confederate fire as the 18th Indiana and 22nd Indiana came into line behind them and in the confusion of the battle they may have shifted west and north forming a blocking unit for the disorganized Confederates westerly movement away from the fight. With the 18th in place, plus Battery A of the 2nd Illinois going back into battery (Bearss 1962:7) bringing their guns to bear, probably from a slight rise just east of the Leetown road and north of the hamlet, the balance of firepower shifted to the Union. The tangle of downed timber and the brushy conditions in Morgan's wood exacerbated the confusion caused by the fog of battle for both sides. But the Union had the upper hand with its artillery in play from both the east and south as well as, the infantry regaining its position in Oberson's field and in Morgan's woods forcing the Confederates to break off their attack. In the confusion of the woods Herbert and a number of his men were captured, effectively bringing the fight at Leetown to a close.

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In order to verify this scenario, some of which is at direct odds with conventional interpretations of the fight in Morgan's woods (Shea and Hess 1992:120-145), additional archeological metal detecting should be undertaken in Morgan's woods and in the timbered area south of Oberson's field. Extensive metal detecting efforts were thwarted by dense understory in these areas during the 2001-2003 project. Based on the limited work that was accomplished in these areas there should be more evidence near the Leetown road for Hebert's lines as well as the movement to the south and west by Confederate troops in their attempt to flank the Union line and take the 2nd Illinois battery's guns.

The Second Day's Fighting in Cox's Field, March 8, 1862

After suffering through a cold night the men of both sides were arrayed in line of battle on the morning of March 8. The archeological project had only time and resources to cover Cox's field, Welfley's knoll, the wooded area north of Ford road from roughly the Ford farm to Telegraph road, and the lower slopes and south face of Elk Horn mountain below Point of Rocks. The discussion of the second day's battle is limited to the areas investigated. However, the Confederate forces were aligned from Clemon's lane on the east then along the north side of Ruddick's field, then across Telegraph road, and refused in northward angle in the woods on the northeast side of Cox's field up to the Point of Rock on Elk Horn Mountain. The Union lines were stretched on the southern side of Ruddick's field across Telegraph road, along the southern side of Cox's field, and cavalry were placed on Ford road near the eastern side of Ford's farm.

From Telegraph road to the west and arrayed on the southern fence lines of Cox's field were the 59th Illinois Infantry, then the 37th Illinois, 25th Illinois, 44th Illinois, 12th Missouri, 36th Illinois, and 17th Missouri. Behind this line were the 2nd Missouri, 3rd Missouri, and 15th Missouri, although they soon moved west and north. Forward of the Union line in Cox's field was the artillery, with 2nd Illinois Battery's right resting on Telegraph road. This unit had two 6-pounder rifled guns and two 6-pounder guns. Further west was Welfley's Battery with three 12-pounder howitzers and two 12-pounder guns, and the 4th Ohio Battery was on the rise that became known as Welfley's Knoll with four 6-pounder rifles and two 12-pounder howitzers.

The Union artillery in Cox's field was opposed by Wade's Battery with two 6-pounder guns and four 12-pounder howitzers with his left on Telegraph road. The battery was either in or just forward of a timbered area at the northeast corner of Cox's field. Good's Texas Battery composed of four 12-pounder guns and two 12-pounder howitzers was further west at the southwest corner of the wood lot at the north side of Cox's field. Van Dorn placed the Little's Missouri State Guard infantry in the wood lot behind Wade's guns with 4th Texas Cavalry behind Little, and the 1st Arkansas Mounted Rifles at the north edge of wood lot and just south of Ford road. Rosser's Division of the MSG held the west edge of the wood lot and straddled Ford road with his right flank anchored on Elk Horn Mountain.

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The initial shots of the second day's battle were fired by the Union artillery on Telegraph road. These were answered by Confederate guns that forced the Union guns from their forward position in Cox's field back behind the field's southern fences. There ensued a general artillery duel for over an hour. The troops lay flat on the ground or huddled behind fences, but as the Confederate artillery fire slackened due to want of ammunition, Union infantry were thrown forward as well as the 4th Ohio Battery where they forced the Confederates in the timbered lot to withdraw toward Elk Horn Tavern or to the wooded and rocky terraces on the south side of Elk Horn Mountain. Here federal artillery fired on them with devastating effect using the rock of the mountain itself as natural shrapnel when splintered by hits from solid shot from the guns. An infantry assault finally forced the Confederates to withdraw to the tavern.

All along the Confederate line much the same scene was played out. Overwhelming firepower from the Union lines coupled with physical exhaustion and lack of adequate ammunition supplies forced Van Dorn to disengage and retreat easterly along the Huntsville road, leaving the field in federal hand and resulting in a significant Union victory for Curtis.

The archeological evidence for the fight in Cox's field is abundant and varied (Figures 30-38). By far and away the artifact assemblage is dominated by artillery shell, case shot, and canister fragments (Figures 33-37). Canister is the smallest of the artillery assemblages found in Cox's field (Figure 34). The majority of it was found in the southern half of the field and came from 6-pounder guns. These canister projectiles and top plates likely originated with Wade's and Good's batteries and may well have been fired at the advancing infantry lines late in the battle sequence. Good (Fitzhugh 1971:164) reported that he fired all of his shell and shrapnel in one-half hour then retired to be replaced by Hart's battery that was forced to retire due to the storm of Union shells in less than ten minutes.

Such a scenario is described in Col. William Coler's, 25th Illinois Infantry, after action report:

I was ordered to take a position in an open field, under cover of a fence and log barn, about 100 yards in front of Welfley's battery, and not over 900 yards from the batteries of the enemy. This point was gained in excellent order, although to reach it we were compelled to pass through a shower of shot and shell over an open field, in full view of the enemy's batteries. Arrived in position, I ordered the men to drop flat upon the ground, in which manner they remained for one hour and thirty minutes, exposed to a terrible fire from the enemy's guns, aimed principally at our batteries on the rising ground in our rear, which were returning the fire with deadly precision.

As the fire from the enemy's batteries began to slacken, the able and ever-ready tactician General's Sigel ordered the batteries to advance, and at the same time

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ordered me to proceed under cover of a thick underwood to a point within 400 yards of the enemy's line. My left flank opposite the left of the enemy's batteries, and resting upon the Cassville and Fayetteville road, I approached this new position unobserved, moving at a double-quick over the open ground, but at a slow and cautious step through the underwood, keeping well covered, so as not to attract the attention of the enemy's batteries. In our front was an open field, about 400 yards across, immediately beyond which was woodland covered with trees, logs, and an uncommonly thick growth of oak underbrush, from which the leaves had not yet fallen. Here the enemy was posted in strong force a few rods from the fence, so as not to attract the fire of our batteries.

By this time several regiments on my left closely engaging the enemy. The thunders of the artillery and the incessant volleys of musketry from both our own and the enemy's lines argued to me that victory was trembling in the balance.

At this seemingly critical moment General Curtis rode up and ordered me to gain the fence on the opposite side of the field, and at the same time ordered forward the several regiments on my right. We dashed across the field, and reached the place in good order before the enemy could bring his pieces to bear on our line. When I reached the fence I found that the ever-gallant Twelfth Missouri Volunteers were close upon my left, but that I was without immediate support upon my right. I halted for a moment, and sent forward a few resolute skirmishers to find the precise position of the foe. They soon returned, and reported them in large force about 75 yards distant. During this short interval of time the men disencumbered themselves of blankets and knapsacks, saying they would conquer or never leave the brush. My right being now supported, I ordered a movement forward into the brush. We had not advanced over 50 yards when a loud, clear was heard to cry out "Ready." I instantly gave the command, "Cover."

The men had scarcely dropped upon the ground when the enemy from his coverts let loose a terrific volley of musketry, which was promptly returned by our ranks with deadly effect. At the same time Welfley's battery belched forth death into their thinning ranks, yet the greater number stood their ground and fought bravely until about the sixth round, when they all gave way in the wildest disorder (OR, Series I, Volume VIII, pp 222-223).

Canister from the Union guns was found in the wood lot and some along the face of Elk Horn Mountain. These rounds were likely fired from the advanced artillery position as they would have otherwise been out of range if fired from the positions on the south side of Cox's field.

Case shot and shell from 6-pounders and 12-pounders dominate the artillery assemblage. The large number of case and shell fragments, as well as case shot balls recovered in Cox's field and the wood lot, and along the mountain face pointedly

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demonstrate the intensity of the artillery and counter battery fire and support the records of the fight. Captain Louis Hoffmann, 4th Independent Battery Ohio Light Artillery stated that his: “four 6-pounder rifled guns of the battery have thrown 460 shots and the two howitzers 106 shells and spherical case” (OR, Series I, Volume VIII, pg. 238).

The recovered artillery fragments are intermixed in the center of the field to such an extent that identification of a Union or Confederate source is not really possible. However, the rounds found at the south end of the field and those in the wood lot as well as along the mountain face can reasonably be ascribed to Confederate or Union sources respectively.

Rifled guns were placed at the southeast corner of Cox’s field with the 2nd Illinois Battery and with the 4th Ohio Battery on Welfley’s knoll according to the historic records. The distribution of Hotchkiss and James rounds fired from rifled guns is consistent with the historic accounts (Figures 36-37). A large number of thin lead sabot fragments that originated from James projectiles being fired were recovered but only in the eastern portion of Cox’s field (Figure 37). The lead sabot broke away from the James shell during its flight usually within 50 to 150 yards of leaving the cannon’s muzzle. The distribution of James sabot fragments suggests the rifled guns of the 2nd Illinois were not only busily engaged in the fight, but probably located near or south of the east to west fence on the south side of Cox’s field. They may have been farther forward during the very early part of the battle, but were pulled back due to counter battery fire from Wade’s battery in the wood lot. Union counter battery fire is evident there as well, and the only unexploded James projectile recovered was found in the woods immediately behind the probable location of Wade’s Battery. As previously noted this shell never had a bursting charge loaded and due to the lack of powder the shell failed to burst, in effect becoming a dud, only to be recovered by the archeological team 141 years later.

Hotchkiss and James conical shell fragments (Figure 36) were recovered in the wood lot and along the face of the mountain as expected. Several Hotchkiss shell fragments were found on the southern side of Cox’s field near the Union lines, and one Hotchkiss fuse fragment was found on Welfley’s knoll indicating conical shell bursts from rifled cannon in this area of the Union line. It is possible that the various Union rifled cannon positions were further south at one point and the shell fragments are simply from shells bursting early and short of their intended target. Another possibility is that the Confederates put Gaines’ Arkansas Battery’s rifled guns to use, or that rifled guns of Tull’s Missouri Battery were positioned further west than supposed and perhaps brought to bear on the western flank of the Union line.

The only solid shot recovered, in both 12-pounder and 6-pounder, were found along the face of the mountain. These solid shot are the physical evidence to the ferocity of the artillery fire on the Confederate troops as they were forced back to the mountain flanks and are attested to in the documentary sources: Curtis reported the event:

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Meantime the powerful battery of Captain Welfley and many more were bearing on the cliff, pouring heavy balls through the timber near the center, splintering great trees and scattering death and destruction with tempestuous fury (OR, Series 1, Volume VIII, pg. 202).

In his report of the battle, General Sigel also reported on the cannonading of the face of the mountain:

I immediately ordered the two howitzers of the reserve (Second Ohio, under Lieutenant Gransevoort) and the two pieces of Captain Elbert's flying battery to report to Colonel Osterhaus on the left to shell and batter the enemy on the hill. This was done in concert with Hoffmann's battery and with terrible effect to the enemy, as the rocks and stones worked as hard as the shells and shot (OR, Series I, Volume VIII, pg. 214).

That cannonading was also commented on by Col. John Hughes of the Confederate Cavalry,

Our right was now extended to the westward and took position on the west margin of Trott's Hill. A terrific volley of bombs and balls hailed through our ranks; several were wounded pretty severely, but none killed in my command. Several of our brave Confederates in Colonel Churchill's regiment and Major Whitfield's battalion, from Texas and Arkansas, were killed fighting alongside of us on the left (OR, Series I, Volume VIII, pg. 315).

Journalist Henry Knox was another individual recording the devastation wrought on the Confederates taking refuge at the base of the mountain. Knox (1865:143-144) observed the Union artillery cannonade on the Confederate lines as well as the infantry charge that broke the rebel lines at the wood lot. He observed that the effect of the artillery fire as "rocks, trees, and earth attested the severity of our fire."

The solid shot and unexploded case shot rounds, as well as the case shot fragments, case shot balls, and shell fragments are mute but powerful objects that serve as a reminder of that "destruction with tempestuous fury" wrought on the troops along the face of Elk Horn Mountain.

Although overshadowed by the artillery fragments small arms bullets were also found in abundance in Cox's field, in the wood lot, and along the face of the mountain. Miscellaneous small arms bullets representing M1841 rifles, Sharps carbines, M1816 and M1842 muskets, M1842, M1855 and Enfield rifled muskets were found scattered over the area investigated. The .58-caliber and .69-caliber conical balls were found impacted within known Confederate positions for the most part. These tend to be distributed in a linear east to west fashion on the north side of Cox's field and along the mountain face. This distribution is consistent with the historic accounts of the infantry assaults after the

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fierce cannonading diminished (Figures 30-32). The .69-caliber spherical balls in both fired and unfired rounds are found all across Cox's field in several clusters that trend in east to west lines, although the patterned distribution is not strong. The pattern that does emerge suggests that the Confederate infantry, using mostly smoothbore muskets did put up a determined resistance, albeit futile, against the Union infantry assault than moved across Cox's field.

An impressive number of .69-caliber spherical balls were found along the face of Elk Horn Mountain along with the artillery projectiles. This supports the historical accounts that the Union infantry poured musket fire into the Confederate troops assembled there.

Col. Thomas Rosser, 2nd Brigade, Confederate Cavalry stated: "The column had barely deployed into line of battle near the summit of the mountain when we encountered a sharp volley of musket and rifle balls from the enemy, producing but little effect, however, in our ranks" (OR, Series I, Volume VIII, pg. 312).

The infantry assault forced the Confederates back to Elk Horn Tavern, and into a confused mass of tired, hungry soldiers low on ammunition. Amongst this confusion Van Dorn's men began a retreat easterly along the Huntsville road leaving the battle ground in the hands of the victorious Union army.

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6. CONCLUSIONS

It might be said the historical record is accurate in recording the events, but perhaps not precise in its description or detail of where actions occurred on the ground. By the time the Battle of Pea Ridge took place in the early spring of 1862 both armies had been reorganized over the winter, new and experienced commanders put in place, and the men had become members of trained and disciplined armies as compared to the units that fought the earlier battles of the Civil War. This is reflected in the historic record and in the archeological evidence as well. In particular the physical evidence of organized fighting lines with minimal evidence of tactical instability illustrates the level of discipline in both armies engaged at Pea Ridge.

Regardless of the depositional disturbances that have occurred due to farming and relic collecting on the Pea Ridge battlefield, the archeological data recovered there is patterned and is the physical evidence of those events on those cold days of March 1862. The archeological record of the fights at Leetown, Clemon's field, Elkhorn Tavern, and in Cox's field provides a new and independent means of assessing and evaluating the disparate historical record of those events. It certainly does not alter the outcome, but it does provide a physical link, and an interpretable body of data, to a significant episode in the history of the American Civil War.

During the battle hundreds of rounds of artillery shell, case shot and canister were fired. The systematic archeological investigations were constrained by vegetation mosaic on the battlefield today. Nevertheless, the archeological team recovered a significant sample of artillery shell, case shot, and canister pieces. Analysis of the pieces confirms the presence of 6-pounder and 12-pounder howitzer smoothbore cannon, rifled 6-pounder guns on both sides, as well as 24-pounder howitzers on the Confederate side. Metallurgical analysis of a sample of the shell and case shot indicates a strong uniformity in the manufacturing process suggesting that much of the artillery ammunition fired at Pea Ridge followed similar manufacturing methods and processes, and one insight is that it appears much of the artillery ammunition was newly made over the course of the preceding winter months. If this interpretation of the metallurgical analysis is correct this suggests that logistics, while perhaps strained in the Trans-Mississippi theater, were not so poorly organized nor strapped for war material as is often portrayed in the literature.

The expedient canister found confirms the historical record that the Missouri State Guard batteries under Guibor manufactured expedient canister and used it with good effect during the battle. The archeological evidence shows that Guibor's battery fired expedient canister made from round stock or rods and square bar stock. The presence of these canister types aided the project in reconstructing the probable locations of the MSG batteries during the fighting north of Elkhorn Tavern, by placing the Missouri confederates on a relatively flat terrace of Broad Ridge and along a road trace.

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The hundreds of small arms bullets recovered allowed us to identify, using firearms identification procedures, at least twenty-six types of shoulder arms and pistols used by both sides during the battle. The archeological evidence confirms the presence of shotguns and country rifles in the hands of the southern forces, but it dispels the myth that many of the southerners were armed with those guns almost to exclusion. The archeological recovered bullets are overwhelmingly, 99%, associated with military firearms. Bullets fired from the Model 1816 and Model 1842 smoothbore musket and the Model 1842 and the Model 1855 rifled musket or rebored Model 1841 rifle predominate the military shoulder fired arms. There is also clear physical evidence of the use of Model 1819 Hall rifles, various Hall carbines, a smattering of Sharps rifles and carbines, Maynard carbines, and Colt revolving rifles. Van Dorn's Confederate army was undoubtedly armed with a more diverse group of pistols, muskets, rifled muskets, and rifles than Curtis' Union troops, but for the most part those participating in the fighting on the southern side, employed military weapons, albeit many older models, to good effect.

Analysis of the archeological collection and artifact distribution through computerized modeling of the landscape and terrain provides us with a relatively specific location where troops and artillery batteries were positioned on the field. That evidence occurs in the form of impacted bullets and artillery shells, as well as lost equipment items and unfired bullets dropped or lost in the heat of battle. The archeological evidence provides the tangible link with the historic accounts of precisely where actions occurred, and in one case argues for a significant reinterpretation of the historic record of the specific events at the last stages of the battle in Oberson's field and Morgan's woods near Leetown.

Archeological discoveries of linear distributions of small arms bullets, both fired and lost, on the west side of Oberson's field suggests that the 36th Illinois company was not aligned in a east to west line of battle on the north side of the field, rather they were arrayed in an L-shape on the north and west fence lines at the northwest corner of the field. In turn their firefight with the 16th Arkansas was more intense than the historic documents and after action reports record. The 16th Arkansas appears to have pushed the 36th Illinois companies back from the fence line in a line that was oriented northeast to southwest, and indeed may have entered the field itself before the fire of Hoffman's rifled cannon put them to rout.

Likewise archeological recovery of canister balls at the northeast and southeast sides of Oberson's field indicate that the opposing artillery were within canister range of one another. This places the Confederate guns, probably Good's and Hart's batteries, on Foster's lane probably near its juncture with the Leetown road. The finding of Confederate fired canister and the probable location of one or two batteries of Confederate artillery is new information that is not recorded in the historical record of the Leetown fight.

The discovery of three north to south oriented linear distributions of impacted and lost or dropped bullets on the east side of Oberson's field is the physical evidence of a desperate fight in that area of the field that had only been hinted at in the after action

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reports and participant accounts. The fight in Morgan's woods and on the eastern side of Oberson's field is portrayed as a confused melee in the documentary record. The archeological evidence, in contrast, suggests that Hebert's troops were more organized than previously thought and nearly overran the Union 2nd Illinois battery position. Reanalysis of the historic record in light of the patterning evident in the archeological data argues that while the movement through Morgan's woods was difficult and some men became disoriented, Herbert was still able to wheel his line to the south and attack the Union battery and its infantry support at the southeastern edge of Oberson's field. Herbert also appears to have met a threat on his southern flank by refusing a portion of his line to the east creating an L-shaped line.

Union Maj. Osterhaus appears to have had a firm grasp of the tactical situation throughout the fight in Oberson's field and, in particular, he demonstrated clear leadership skills in wheeling his lines from an east to west line of battle to one oriented north to south to meet Herbert's assault from the east. The archeological evidence shows the Union line gave way twice, with some evidence of tactical disintegration, but by the third line, located some 200 yards west of the Leetown road, command and control was regained, and the Union firepower overwhelmed the Confederate assault.

The archeological evidence of artillery and small arms artifact distribution allows the identification of the likely locations of both Union and Confederate artillery batteries during the battle as noted in the interpretations of the evidence. For instance the archeological evidence of the first days' fighting on Narrow Ridge, north of Elkhorn Tavern clearly shows where the Iowan's were deployed and were hit by both Confederate artillery and small arms fire. Given the topography of the area, reverse viewshed analysis allows the approximate location of the Missouri State Guard's artillery batteries on Broad Ridge to be identified.

The same scenario is also true of the small arms and artillery artifact distributions identified in Cox's field associated with the fighting on the second day of the battle. The historic record of these elements of the fight, and the fight in Clemon's field are well documented from official reports and participant accounts from both sides. The archeological record in these areas confirms the accounts and enhances the record with physical evidence that provides a good deal more precision for on-ground interpretation of the specific elements of the battle. The archeological record also confirms the terrific maelstrom of shot and shell that fell on the Confederate soldiers who were arrayed along the south face of Elk Horn Mountain. That archeological evidence is a very poignant reminder of the shower of iron and lead that fell on those men. But that same archeological evidence also shows that shot and shell alone did not dislodge the Confederates. It took a final infantry assault by the Union and a sharp firefight to push the Confederate rearguard out of their positions and off of the Pea Ridge battlefield.

The archeological record has added more to the story of the Leetown fight and allowed for reinterpretation of the historic accounts than in other areas. In part the lack

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of accuracy in the official records and participant accounts of the Leetown battle is due to the loss of McCulloch, McIntosh, and the capture of Herbert on the Confederate side. Without the Confederate commanders' overview of the fight the historic record is lacking in detail and strategic insight from one side. The story is further confused by the significant disagreement of field shapes, road alignments, and feature placement on the surviving maps of the battle. There are nine maps of the battle ranging from personal sketches to professionally rendered versions published in the atlas that accompanies the Official Records of the War of the Rebellion. Although there is general agreement among the maps not one records details of fence lines or field shapes in the same way. The distribution of the archeological data found in Oberson's field appears to correlate best with the Leetown battle map accompanying Col. Peter Osterhaus' report (OR, Series I, Vol. 8, pg 217).

Regardless of the accuracy of the maps or lack thereof, each records the road network that existed at the time of the battle. What is abundantly obvious from the reconstruction of artillery positions based on the archeological artillery artifact distribution is the clear correlation of the road network and the location of artillery batteries. Guns could not be easily moved through wooded or brushy areas without a trace or a road. They could maneuver on open ground, if it was not muddy, but roads were the key to moving these heavy pieces of ordnance, and they were key to where the guns went into battery as well. Placing the cannon on the landscape based on the archeological evidence puts them on or immediately adjacent to roads or traces shown on the various maps. The archeological data of likely artillery placement points to areas where road traces should exist. Future park inventories can use the archeological data to aid in locating road traces which, in turn, will refine our knowledge of the routes of march by both armies and identify with greater precision the location of artillery batteries, especially in the more wooded areas.

As we have noted in the interpretation section the dense vegetation of some areas of the battlefield prevented the team from conducting effective metal detecting sweeps in some locales, and precluded investigations in others. Time constraints on the project also limited investigations in certain areas. It is recommended that additional metal detecting surveys be done in Foster's field east of Highway 72 and on the south and western sides of Cox's field where time constraints precluded completion of the investigations. Once the vegetation is thinned by mechanical methods or reduced by prescribed burning other areas could also be investigated using metal detectors. The ravine and slopes west of Narrow Ridge north of Elkhorn Tavern should be metal detected to located evidence of the first day's fighting in that area as well as possibly locate remains of the Union limber chests that were destroyed there. Archeological investigations on Broad Ridge and south to Clemon's field, as well as west, south, and east of Clemon's field will certainly yield additional information on battlelines, troop movement, and artillery placement in that area.

Ruddick's field, the wooded areas to the north, east, and south of the open area should be metal detected to ascertain the distribution of artifacts associated with the last of the first day's fight and the role the area played in the second day's battle. Ruddick's field

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should be considered a high priority for investigation to fill in the archeological record of that area to complement the work in the adjacent Cox's field.

The wooded areas between Oberson's and Foster's field, and the wooded area south of Oberson's field should be investigated when the area is opened up by prescribed burning or mechanical means. Along with additional work in Morgan's woods the analysis of archeological artifact distributions in these areas will aid in refining the battle sequence in those areas. Undoubtedly the archeological evidence from further investigations in these wooded zones will result in refined or new interpretations of troop movement and battle line placement for the fight in Morgan's woods and on the eastern side of Oberson's field. Given the archeological evidence contradicts the traditional view of the battle in that area, additional work in Morgan's woods and investigation of the other wooded areas should be given a high priority.

Geophysical investigations at Elkhorn Tavern and Leetown suggest that there is real potential for locating buried features in these areas. It is recommended that additional multi-instrument geophysical investigations be undertaken north of Elkhorn Tavern in an attempt to locate a purported cemetery in that area. Additional geophysical work at Leetown could aid in identifying more building foundations, roads and paths, as well as potentially identify grave shafts in the cemetery. It is also recommended that the findings resulting from the geophysical investigations be tested by limited archeological excavations to confirm their origin, extent, and dates of occupation.

Finally, geophysical investigations appear to be a good tool to employ at Pea Ridge to locate battle-related burial trenches and sites. However, it will be necessary to conduct additional historical research to refine and narrow the potential burial site locations to areas that can be effectively investigated using geophysical techniques.

In conclusion we can readily state that the battlefield archeology component of the park-wide inventory was very successful. The current investigation used the latest metal detector technology and electronic mapping capability. It is abundantly clear that relic collectors have not taken everything. There is a true plethora of buried evidence of the Battle of Pea Ridge remaining on the field today and in patterns of deposition that can be interpreted in light of the historic records. Relic collecting has taken some toll on the archeological resource, but not destroyed the over all patterned distribution of the artifacts. Pea Ridge National Military Park retains a rich and significant amount of physical evidence of the battle that raged across those rolling hills for those two cold days of March 1862.

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APPENDIX A

Transcription of disinterment records of the Union dead.

The transcription was made from records of interment for the Little Rock National Cemetery.

Running #	Known	Unknown	Description of Locality or comments
1		6	NE of Elk Horn Tavern on hillside near ravine
2		1	NE of Elk Horn Tavern 120 yards
3		1	NE Elk Horn Tavern on hillside
4		1	NE Elk Horn Tavern on hillside
5		1	NE Elk Horn Tavern on hillside near ravine, infantry buttons
6		1	NE Elk Horn Tavern on hillside near ravine, infantry buttons
7	4	11	NE of Elk Horn Tavern 100 yards from above, south side of wire road at edge of woods, Pvt. John Leemaster Co. B 1st Ark. Cav., died 6 Dec 1862
8			NE Elk Horn Tavern 120 yards, 1st Ark. Cav. Co. E, buried in cav. Uniform
9			NE of Elk Horn Tavern 120 yards, 1st Ark. Cav. Co. E, buried in cav. Uniform
10			NE of Elk Horn Tavern 120 yards, N.P.B. 1st Lt. Missouri State Militia, buried in infantry uniform
11			NE Elk Horn Tavern 120 yards, 1st Ark. Cav. Co. E, buried in cav. Uniform
12			Buried in cav. uniform
13			Buried in cav. uniform
14			NE of Elk Horn Tavern 120 yards, W. Cooper
15			NE Elk Horn Tavern 120 yards, W. M. Brooks, Pvt. Co. A 1st Ark. Cav., died 26 Nov 1862
16			NE Elk Horn Tavern 120 yards, N. J. B. 1st Lt MO. State Militia 25 Dec 1862 22 years, uniform (Note: may be same as 10)
17		1	NE Elk Horn Tavern 120 yards, 1st AR Cav., in cavalry uniform
18		1	NE Elk Horn Tavern 120 yards
19		1	NE Elk Horn Tavern 120 yards, supposed to AR
20	1		NE of Elk Horn Tavern 120 yards, W. Cooper, Pvt. MO. Age 22, Cav. Uniform, 25 Dec 1862
21			NE of Elk Horn Tavern 120 yards
22	2		120 yards NE of Elk Horn Tavern, L. W. Lee Pvt. Co. E, 1st Ark Cav., died 24 Nov 1862
23			NE of Elk Horn Tavern 120 yards, Moore, a citizen
24		3	120 yards NE of Elk Horn Tavern, Ark. Cav
25		1	SE Elk Horn Tavern 120 yards, Ark. Cav
26			NE of Elk Horn Tavern 120 yards, Ark. Cav
27	4		1/4 mile NE of Elk Horn Tavern, north of road, JMK Sgt. Co. G 3rd IL Cav.
28			1/4 mile north of Elk Horn Tavern, north of road, JL Co. G 3rd IL Cav
29			1/4 mile NE of Elk Horn Tavern, J. (or I.) W. Worster

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Running #	Known	Unknown	Description of Locality or comments
30			P. O. Stirman Pvt. Co. F 4th IA
31	2		North end of Elk Horn Tavern, FP Dubque Battery March 1862, same grave as 32
32			Dudley Gilbert, Dubque Battery, March 1862
33		1	NE Elk Horn Tavern
34	1		Capt. T. A. Bevins 9th IA Inf. March 1862, cut headstone
35	5		NE Elk Horn Tavern, 5 bodies in same grave, O. D. Bancroft, Pvt. Co. A 9th IA Inf.
36			P. W. Alexander, Pvt. Co. A, 9th IA Inf.
37			Samuel McCombs, Pvt Co A, 9th IA Inf.
38			D. B. Patterson, Pvt. Co. A, 9th IA Inf.
39			NE Elk Horn Tavern 1/4 Mile, P. Wildergraft Co. A, 9th IA Inf.
40			NE Elk Horn Tavern 1/4 Mile, F. Jackson, Dubque Batty, 8 March 1862
41			E. A. Smith Co. D, 9th IA Vol. Inf.
42			P. Goodenough Co. I, 9th IA Vol. Inf. Same grave as 43
43			G. Riggs, Co. I, 9th IA Vol. Inf.
44			NE Elk Horn Tavern 1/4 Mile, H. A. Ross, same grave as 45
45			J. Undergrass (?)
46		1	
47		1	NE Elk Horn Tavern
48		1	
49		1	NE Elk Horn Tavern
50		1	NE Elk Horn Tavern
51		1	
52	1		J. H. V. (or possibly W)
53	1		NE Elk Horn Tavern, J. M. M.
54	1		W. L.
55	1		NE Elk Horn Tavern, J. Parker, same grave with 8 others, probably 47-55
56			NE part of Cox's lot, SE Elk Horn Tavern, J. N. Kitchen(?) Co. D, 4th IA with headstone
56 1/2			NE Elk Horn Tavern 1/4 mile, A. Waters Pvt. Co. C 9th IA
57		1	
57 1/2		1	
58			J. P.
58 1/2		1	
59			C. W. H., buried in cavalry overcoat
59 1/2		1	
60		1	NE part of Cox's lot, SE of Elk Horn Tavern
61		1	
62		1	NE part of Cox's lot, SE of Elk Horn Tavern

APPENDIX A

Running #	Known	Unknown	Description of Locality or comments
63		1	NE Cox's lot, SE of Elk Horn Tavern
64		1	NE Cox's lot, SE of Elk Horn Tavern, supposed to be IA
65		1	NE of Elk Horn Tavern 120 yards
66			NE Cox's lot, E. Richardson, Pvt. Co. K, 4th IA, rough headstone
67		1	NE part of Cox's lot, SE of Elk Horn Tavern
68		1	NE part of Cox's lot, SE Elk Horn Tavern, buried in 2nd Lt. uniform coat
69		1	NE part of Cox's lot, SE of Elk Horn Tavern
69 1/2		1	NE part of Cox's lot, SE of Elk Horn Tavern
70			NE Cox's lot SE Elk Horn Tavern, R. P. Pvt. Supposed to be from Iowa
70 1/2		1	NE Cox's lot south of Elk Horn Tavern
71		1	NE Cox's lot, SE of Elk Horn Tavern
71 1/2		1	NE Cox's lot south of Elk Horn Tavern
72		1	NE Cox's lot SE of Elk Horn Tavern
73			SE Elk Horn Tavern, E. S. Tripp, supposed to be from Iowa
74	1		SE of Elk Horn Tavern, W. C. Wingo, Pvt. MO Vol, headstone
76			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols
77		18	South of Elk Horn Tavern, South part Cox's open lot, 18 in one pit, supposed to be Indp. Co. AR Vols.
78			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols
79			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols
80			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols
81			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols
82			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols
83			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols
84			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols
85			SE Elk Horn Tavern, south part of Cox's open field, 18 men in one grave, believed to be part of Lt. Wellhite's Co. Indpen. AR Vols.
86			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols
87			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols
88			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols
89			SE Elk Horn Tavern, south part of Cox's open field, 18 men in one grave, believed to be part of Lt. Wellhite's Co. Indpen. AR Vols.
90			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave, believed to part of Lt. Wellhite's Co. Indepn AR. Vols

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Running #	Known	Unknown	Description of Locality or comments
91			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave believed to be part of Lt. Wellhite's Co. Indpen. AR Vols.
92			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave believed to be part of Lt. Wellhite's Co. Indpen. AR Vols.
93			SE Elk Horn Tavern, South part of Cox's open field, 18 men in one grave believed to be part of Lt. Wellhite's Co. Indpen. AR Vols.
94		1	SE Elk Horn Tavern, south side of Cox's open field, supposed to be IN men.
95		1	SE Elk Horn Tavern, south side of Cox's open field, supposed to be IN men.
96		1	SE Elk Horn Tavern, south side of Cox's open field, supposed to be IN men.
97	1		SE Elk Horn Tavern, Potter, Capt. 8th IN Inf., in Capt. Stripes
98			NE Elk Horn Tavern, A. C. Hines and Unknown, Sgt. Co. D, 9th IA
98 1/2		1	NE Elk Horn Tavern, skull and some bones at base of fallen tree
99		1	SE Elk Horn Tavern 1/4 mile, in grave with Hines, note 98 and 99 descriptions different
100		1	100 feet SW of Cox's house in private road
101		1	100 feet SW of Cox's house in private road
102		1	100 feet south of Cox's house in private road
103			West of Cox's young orchard, HG, long stone at grave
104		1	100 feet south of Cox's house in young orchard along side of fence in front of house, buried with 4 others
105		1	100 feet south of Cox's house in young orchard along side of fence in front of house, buried with 4 others
106		1	100 feet south of Cox's house in young orchard along side of fence in front of house, buried with 4 others
107		1	100 feet south of Cox's house in young orchard along side of fence in front of house, buried with 4 others
112		1	Elk Horn Tavern, cavalry uniform
113			D. S. Pvt. Co. F, 9th IA
114			Elk Horn Tavern, L. Aswine(?), Pvt. Co. C, 9th IA, 4 March 1862
115		1	
116		1	Elk Horn Tavern, supposed to be IA
117			supposed to be 9th IA
118			Curtis' place, 1 mile S Elk Horn Tavern, J. Yantz, Pvt. Co. I, 3rd IA
119			Curtis' place, I. J. Bridges, Pvt. Co. I, 9th IA
120		1	Federal uniform
121		1	Pea Ridge, cavalry
122		1	
123		1	
124			Elk Horn Tavern, A. supposed to be 9th IA
125		1	
126	1		1 mile south of Elk Horn Tavern east side of road, J. A. Jacquemin (?), Lt. Co. D, 2nd MO Inf.

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Running #	Known	Unknown	Description of Locality or comments
127			1 mile south of Elk Horn Tavern on Curtis'
128		1	1 mile SE of Elk Horn Tavern on Cox's place
129		1	1 mile S
130		1	1 mile SE of Elk Horn Tavern on Cox's place
131		1	Elk Horn Tavern, Curtis' place, in cavalry uniform
132			Slaughter, Pvt. Co. C, 4th IA
133			NE Elk Horn Tavern, C. F. Wiseman, Pvt.
134		1	Elk Horn Tavern
135		1	Elk Horn Tavern
136		1	Elk Horn Tavern
137		1	Pea Ridge, had on officer's clothing
138		1	Elk Horn Tavern
149		1	Elk Horn Tavern
140		1	Elk Horn Tavern
141		1	Pea Ridge 100 yards from house
142		1	Elk Horn Tavern
143			1 mile south of Elk Horn Tavern, west of road, JRS-SH, Lt. H, 8th IN
144	1		Elk Horn Tavern on Curtis' place west of road, WS Pvt. Co. G, 8th IN Inf.
145	3		Elk Horn Tavern on Curtis' place west of road, JC, JS, HH, Pvts. Co. F, 8th IN Inf.
146	1		Pea Ridge, HH, Pvt. Co. H, 8th IN Inf.
148	1		Pea Ridge, W. Reed, Pvt 1st MO Battery
149	1		Pea Ridge, C Barnes, Pvt 1st MO Flying Artillery or WAG, Pvt Co. A 8th IN Inf
150	1		Pea Ridge, R. Gerk(?), 1st MO Flying Artillery
152	1		Pea Ridge, J. Stawdinger, Pvt 1st MO Flying Artillery
153	1		Pea Ridge, Michael Lehaub, Pvt 1st MO Flying Artillery
154		1	Pea Ridge, in cavalry uniform
155		1	Pea Ridge on land of Lewis Pratt
156		1	Pea Ridge on land of Lewis Pratt
157			Pea Ridge on land of Lewis Pratt
158	1		Pea Ridge, J. Wayle(?), 1st MO Flying Artillery
160		1	Lee Town, west corner of Pratt's field
161		1	Lee Town near orchard
163	1		Pea Ridge, Winter's place at spring, M. Neighbor Co. F, 25th IL
164	1		Winter's field near spring, Pea Ridge, I. (or J.) S. Wheeler, Co. H 25th IL
165	1		Pea Ridge, SW corner of Winter's field, W. Walter, Co. E, 25th IL
166	1		Winter's field near spring, Pea Ridge, Pygr (?) Co. H 3rd IL Cav.
167		1	Lee Town, 3rd IL Cav.(?)
168		1	Pea Ridge, SW corner of Winter's field, under large tree, 3rd IL Cav. (?)

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Running #	Known	Unknown	Description of Locality or comments
169		1	Lee Town, 3rd IL Cav.(?)
170		1	Lee Town
171		1	Lee Town
172		1	Lee Town
173		1	Lee Town
174	1		Lee Town, N. Wyre (?), Co. D, 37th IL
175		1	Lee Town
176		1	Lee Town
177		1	100 feet south of Cox's house on pvt. Road
178		1	Lee Town
179		1	Lee Town
180		1	Lee Town
181		1	Lee Town
182		1	Lee Town
183		1	Lee Town
184		1	Lee Town
185		1	Lee Town
186		1	Lee Town
187		1	Lee Town
188		1	Lee Town
189		1	Lee Town
190		1	Lee Town
191		1	Lee Town
192		1	Lee Town
193		1	
194		1	Lee Town, in same grave with 195 and 197
195		1	Lee Town, in same grave with 194 and 197
196		1	Lee Town
197		1	Lee Town, in same grave with 194 and 195
198		1	Lee Town
199		1	Lee Town
200	1		Lee Town, Paul Stevenson, 36th IL
201		1	
202		1	
203		1	Lee Town
204		1	
205		1	Lee Town
206		1	Lee Town
207		1	Lee Town

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Running #	Known	Unknown	Description of Locality or comments
208		1	Lee Town
209		1	Lee Town
210		1	Lee Town
211	1		Lee Town, Murray, Pvt.
212		1	Lee Town
213		1	
214		1	Lee Town
215		1	Lee Town
216		1	Lee Town
217		1	
218		1	Lee Town
219		1	Lee Town
220		1	Lee Town
221		1	Lee Town
222		1	Lee Town
223		1	Lee Town
225		1	Lee Town
226		1	Lee Town
227	1		100 yards SW of Lee Town, O. R. Powers, 1st Lt. 37th IL
228		1	Lee Town
229		1	
230		1	
231		1	Elk Horn Tavern, Curtis' place, cavlary uniform
232		1	
233		1	
234		1	NW of Lee Town on Willey Foster's place
235			Lee Town, G. N. Anderson, Pvt. 3rd IA Cav
236			G. E. Pvt. 3rd IA Cav.
237			Lee Town, A. T. Mansfield, 3rd IA Cav.
238		1	1 mile north of Lee Town on Willey Foster's place
239		1	1 mile NW of Lee Town
240		1	Lee Town
241	1		Lee Town, W. Cowles
242		1	1 mile NW of Lee Town
243			Carroll, Pvt. 3rd IA Cav.
244			1 mile north of Lee Town on Willey Foster's place, E. Ham, Pvt. 3rd IA Cav.
245			1 mile north of Lee Town on Willey Foster's place, James Dodd, Pvt. 3rd IA Cav., age 24

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Running #	Known	Unknown	Description of Locality or comments
246			1 mile north of Lee Town on Willey Foster's place, Milton Townsend, Pvt. 3rd IA Cav., age 20
247			1 mile north of Lee Town on Willey Foster's place, M. Townson, Pvt. 3rd IA Cav., age 20
248			J. Clark, Pvt. 3rd IA Cav.
249			T. P. Gray, Pvt 3rd IA Cav.
250			1 mile north of Lee Town on Willey Foster's place, R. H. Willard, Pvt, 3rd IA Cav.
251			1 mile north of Lee Town on Willey Foster's place, P. J. Stephenson(?), Pvt. 3rd IA Cav.
252			1 mile north of Lee Town on Willey Foster's place, S. Miner, Pvt. 3rd IA Cav.
253			I Sellars, Pvt. 3rd IA Cav.
254			1 mile north of Lee Town on Willey Foster's place, I. E. Mercer, Pvt. 3rd IA Cav.
255	1	38	1 mile north of Lee Town on Young Foster's place where Genl. Sigel lost his battery and McCulough and McIntosh were killed. J (possibly G) Campbell, Pvt. 3rd IA Cav.
256			1 mile north of Lee Town on Willey Foster's place, E. Voorheis, Pvt. 3rd IA Cav.
257		1	Elk Horn Tavern
259		1	1 mile north of Lee Town on Willey Foster's place
260		1	1 mile north of Lee Town on Willey Foster's, with 261 and 262 in same grave.
261		1	1 mile north of Lee Town on Willey Foster's, with 260 and 262 in same grave.
262		1	1 mile north of Lee Town on Willey Foster's, with 260 and 261 in same grave.
263		1	1 mile north of Lee Town on Willey Foster's
264		1	1 mile north of Lee Town on Willey Foster's
265		1	Lee Town
266	1		1 mile east of Lee Town, H. Brown, 37th IL
267	1		1 mile east of Lee Town, W. S. Wade
268		1	Lee Town
284		1	1/2 mile NE of Elk Horn Tavern, west of road 20 feet
285		1	1/2 mile NE of Elk Horn Tavern, west of road 20 feet
286		1	1/2 mile NE of Elk Horn Tavern, west of road 20 feet
287		1	1 mile SW Elk Horn Tavern
288		1	1 mile SW Elk Horn Tavern
289		1	1 mile SW Elk Horn Tavern
290		1	1 mile SW Elk Horn Tavern
296		1	3/4 mile west of Elk Horn Tavern
297		1	3/4 mile east of Elk Horn Tavern
298		1	3/4 mile west of Elk Horn Tavern
299		1	1/4 mile west of Elk Horn Tavern
312		1	NE of Elk Horn Tavern 120 yards
359	1		Pea Ridge, P. Friend(?) 23 March 1862, 25th IL

APPENDIX A

Running #	Known	Unknown	Description of Locality or comments
486			Lindsey's Prairie, Smith, Lt 19th IA Inf., died 7 Dec 1862
487			Lindsey's Prairie, Charles Buckingham, Sgt. Maj. 19th IA Inf., died 7 Dec 1862
488			Lindsey's Prairie, Johnson, Lt 19th IA Inf, died 7 Dec 1862

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APPENDIX B

The Bullet That Killed Ben McCulloch?: Firearms Identification Analysis of a .58-Caliber Bullet

**By
Douglas D. Scott**

Introduction

A large impact-deformed lead bullet that is purportedly the bullet that killed him is currently on loan to Pea Ridge National Military Park. The bullet and some buttons purportedly associated with his clothing were donated by the descendents of General McCulloch to the Center for American History, University of Texas at Austin with the story that this bullet was removed from the general's body after the battle.

There are a number of eyewitness accounts of McCulloch's death summarized in Shea and Hess (1992:110-111). McCulloch was reported to have been dressed in a velvet civilian-cut suit and carried a Maynard rifle or carbine and a Colt revolver at the time of his death. As he advanced through a belt of trees on the northwest side of Oberson's field near Leetown, members of Company B, 36th Illinois Infantry spotted him. They fired on McCulloch from a fence line on the north side of the field. One or more shots struck McCulloch, one in the breast killing him instantly. Peter Pelican of Company B was among the first to reach the body and liberated the general's watch, but his looting efforts were cut short by skirmishers of the 16th Arkansas Infantry as they began firing at the 36th Illinois soldiers, forcing them to withdraw.

Capt. Joseph Bailey of the 16th Arkansas Infantry (Massey 1995:24) commenting in his memoir on the discovery of McCulloch's body, stated "He was lying full length on his back with a bullet wound in his right breast. A bit of white cotton patching, such as was used at that time in making up cartridges for the Mississippi or old squirrel rifles was sticking in the hole made by the bullet in his coat, which showed conclusively that he had been killed by one of the Federal skirmishers from behind the fence as some of their dead and wounded near the fence were armed with Mississippi rifles."

The white cotton patching Bailey refers to is most likely the remains of a linen or paper cartridge wrapper that did not fully combust during firing. Cartridges of the era contained the black powder propulsion charge wrapped in paper or linen that was soaked in combustible solution to accelerate combustion of the propellant charge (Thomas 1997). It is also possible that the material may have been fabric from McCulloch's coat lining or shirt that was mistakenly identified by Bailey as patching.

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Bennett and Haigh (1876:59) record that Companies A and B of the 36th Illinois Infantry were armed with Miniés [Models 1842, 1855, or 1861 rifled muskets] and Enfields [Pattern 53] not Mississippi Rifles [Model 1841 Rifle] with the remainder of the companies armed with remodeled Springfield muskets. In all likelihood Companies A and B were armed with either the Model 1855 or Model 1861 .58-caliber rifled musket that fired the conical hollow base bullet also known as the Minié ball or elongated ball (Coates and Thomas 1990:14-17). The British P53 Enfield rifled musket was .577-caliber and could fire the standard .58-caliber Minié ball (Figure 1) issued for the U.S. model muskets (Coates and Thomas 1990:19). The reference to the other companies in the regiment being armed with remodeled Springfield muskets probably refers to various models of .69-caliber smoothbore Springfield muskets that had been converted from the flintlock ignition system to the percussion cap ignition system (Coates and Thomas 1990).

The presence of the “white cotton patching” or cartridge wrapper is not indicative of the specific weapon type at that time. Bailey could have been correct, but if so, the original Model 1841 Mississippi rifle actually fired a .54-caliber round ball, although some of these weapons were re-bored and re-rifled to fire the .58-caliber Minié ball beginning in 1855 (Coates and Thomas 1990:24). The rifling in these re-bored “Mississippi” rifles is indistinguishable from the Springfield .58-caliber wide and shallow three land and groove rifling that became standard for all U.S. rifled muskets after 1842. The P53 Enfield rifled musket had either a five land and groove rifling or a three land and groove rifling. The Enfield rifling is distinguishable from the broad shallow three land and groove rifling found in U.S. manufactured rifled muskets.

Thus the historian is left with a conundrum, was the bullet that killed McCulloch fired from a .54-caliber “Mississippi” Rifle or a .58-caliber rifled musket like those issued to Company B of the 36th Illinois Infantry Regiment? Whose testimony and memory is accurate?

Technical Analysis and Observations

The bullet purported to have been recovered from McCulloch’s body is a .58-caliber hollow base Minié ball or bullet with three rings or cannelures around the lower skirt (Figure 2). The .58-caliber Minié ball was developed by army ordnance officers in the mid-1850s based on an original design by Frenchman Claude Minié and other European military adaptations of the thin walled hollow base concept that allowed the fired bullet’s base to flare, gripping the rifling to insure greater spin stability and accuracy as well as acting to alleviate powder fouling in the gun’s barrel (Thomas 1997:1-10).

The purported McCulloch bullet is impressed with three broad shallow land and groove marks. The land and groove marks are consistent with the bullet having been fired from a Model 1855 or Model 1861 rifled musket or other firearms rifled according to U.S. Government specifications such as the altered M1841 “Mississippi” rifle. The hollow base

exhibits a rough surface or stippling effect that is consistent with the bullet being fired from a blackpowder weapon (Figure 4).

The bullet is a deep gray in color. There is no evidence of white lead oxide build-up on the bullet's surface that would be consistent with it having been buried in the ground or subject to extreme environmental change over time. A subjective observation is that the bullet has probably been handled many times, but kept in an environment free from major changes in temperature or humidity.

The bullet is impact deformed at the head (Figure 3). The bullet essentially mushroomed on impact, although the mushroom effect is asymmetrical. The mushroomed head has several indentations or impact deformities that provide clues to what it may or may not have struck. The bullet was viewed under 30 X magnification using a digital electronic microscope (Figure 5) to determine if any foreign materials were imbedded in the bullet body or head. No foreign materials were noted imbedded in or adhering to the bullet. The impact deformation is inconsistent with having struck rock, sandy soil, or coarse dirt. All would have left different types of marks on the bullet indicating it struck the ground. There is no evidence of tissue or bone imbedded in the bullet, although tissue would be unlikely to survive repeated handling through time. The impact deformation on the bullet head is consistent with it having struck and penetrated an object with no intervening hard elements. The deformation is consistent with a bullet that was spin stabilized, and at the time it struck the object was still traveling in trajectory at a velocity well above its terminal limits. The deformation is consistent with having penetrated tissue, but not striking any bony features.

On one side of the bullet's impact deformed area a toolmark is evident (Figure 6). This is a small area of one to two millimeters wide and two to three millimeters long. The area is slightly flattened and impressed with very fine crisscross striations. These crisscross toolmarks are consistent in type with the gripping or inside surface of the jaws of a medical forceps tip of the type in common use in the mid-nineteenth century.

Conclusions

In summary the observations made during the examination of the bullet are: (1) the impact deformed bullet was fired in a rifled musket of .58-caliber that is consistent with the type of weapon known to have been issued to the men of Company B, 36th Illinois Infantry Regiment who are credited with killing General McCulloch on March 7, 1862; (2) The impact deformations evident on the bullet are consistent with it having struck McCulloch in the breast, but passing between the ribs, encountering only soft tissue in its path; and (3) The toolmarks present on one side of the bullet are consistent with the gripping surface of medical forceps of the type known to be part of Civil War era surgical kits. None of the observations are inconsistent with the oral history ascribed to the bullet's origin or that it

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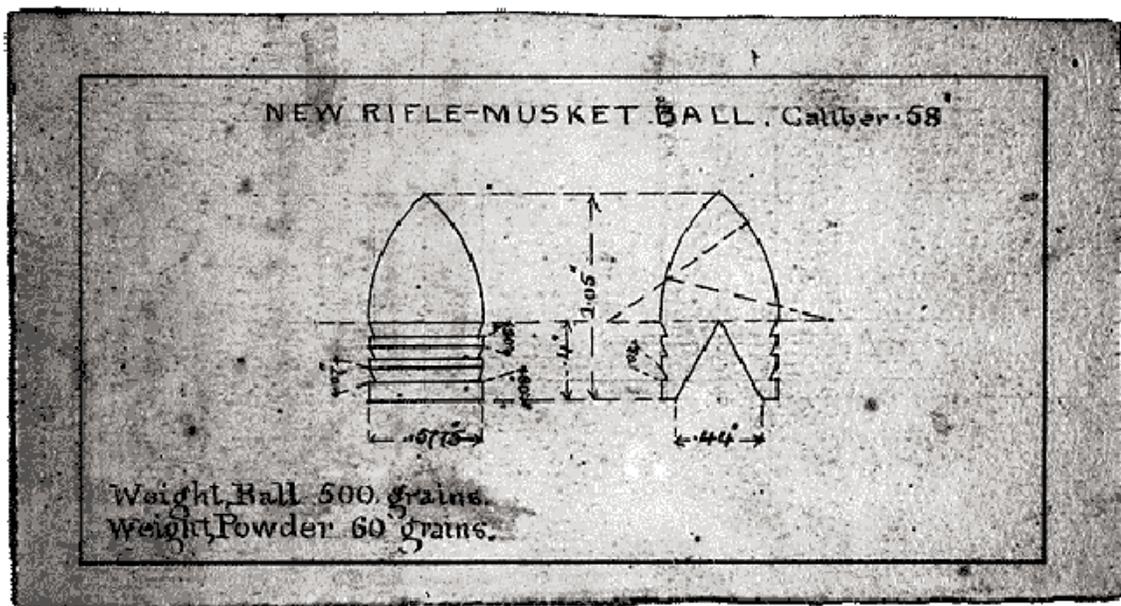


Figure B1. A copy of the ordnance pattern drawing for the .58-caliber Minié ball for the U.S. rifled musket.



Figure B2. The impact deformed .58-caliber Minié ball attributed to being the bullet that killed General Benjamin McCulloch on March 7, 1862 at the Pea Ridge Battle. Scale is in centimeters.

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Figure B3. The head of the .58-caliber bullet showing the impact deformations and scars.



Figure B4. The hollow base of the .58-caliber bullet that is typical of Civil War era Minié balls. The rough texture or stippling present in the hollow base is typical of the effect of the bullet being fired in a blackpowder weapon.

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Figure B5. The portable digital microscope in use at Pea Ridge National Military Park with the McCulloch bullet displayed on the screen. The magnified image is captured and stored on a Compact Flash media card in standard jpeg image format.



Figure B6. The very fine toolmarks on the side of the impact deformed head. The marks are consistent with the gripping surface of Civil War era medical forceps.