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“SPARKS FLY”: CONNECTING MIDWESTERN HISTORIC FORTS THROUGH A COMPARATIVE STUDY OF GUNFLINTS

Jeffrey A. Spanbauer

114 Pages

This thesis will outline the temporal changes and choices of colonial powers and individuals as expressed at historic frontier posts in the Midwest between 1683 and 1779 as expressed through their supply and usage of gunflints. Gunflints exist as persistent artifacts at historic sites, and especially so at fortifications like Fort de Chartres, Fort St. Joseph, Fort Michilimackinac and Fort Ouiatenon. These sites exist within the same chronological timeframe, from 1683-1779, and saw occupation by both the French and British, with nearby indigenous groups, and should serve as instructive means to investigate the factors involved in the supply, selection, and use of gunflints. The project examines gunflint distribution based upon factors such as country of manufacture, style, and approximate chronological dating in order to investigate the influence of political, economic, and military events of this time period upon the availability and use of these artifacts. This study did not rely upon a trait based analysis, but rather drilled deeper into the reasons for the choices these communities made when selecting gunflints with different styles and places of manufacture. In this way, a more profound understanding of a nation's choices, as they pertained to gunflint modes and styles over time was concerned. Similarly, the study took into account the various social, economic, and political factors which affected logistical issues related to these interior forts to bring context and

understanding in the choices made by military, civilians, and indigenous populations in the Midwest during this time period.

The pervasiveness of gunflints at historic archaeological sites in the Midwest makes them a potentially central line of evidence about chronology, political and economic control, and trade patterns during this period. While a chronological window narrowing the styles and types of gunflints available to the different nations did not prove possible, differences in the metrics of the gunflints at Fort de Chartres when compared to those at the other fortifications led to questions of supply and choice by the British at this fort in particular. Previously unstudied gunflints offered the opportunity for a thorough morphological, physical, and functional analysis. Additionally, these assemblages offered insight into gunflints use, supply, trade patterns, and choices by the military, civilian, and indigenous populations within these fortifications during this period, and opened up the discussion of preferences in regards to styles and types of gunflints. As the first real European presence in the interior, the French influenced political and economic patterns with the indigenous groups. With later British penetration, and eventual control, these patterns continued to shift, despite local French influences, with Fort de Chartres representing an anomaly when compared to the other French-turned-British forts.

KEYWORDS: Colonial America, Gunflints, French and Indian War, Archaeology, Historic Artifacts, Gunspalls

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COMPARATIVE STUDY OF GUNFLINTS

JEFFREY A. SPANBAUER

A Thesis Submitted in Partial
Fulfillment of the Requirements
for the Degree of

MASTER OF SCIENCE

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“SPARKS FLY”: CONNECTING MIDWESTERN HISTORIC FORTS THROUGH A
COMPARATIVE STUDY OF GUNFLINTS

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I wanted to begin a career in archaeology as a middle school student in the early 1980s. At the time, I received poor advice from a guidance counselor, and believed it. This individual, who clearly had no idea about archaeology, informed me that I would have to go to college in the American southwest, and that I'd be spending my life in the desert studying pottery. While this is certainly a bonus for many, for a teenager whose primary interest lay in the Middle Ages, this crushing blow pushed me into a History major, M.A. degree, and a teaching career. I attempted to go back to graduate school ten years later, to get the degree in Historical Archaeology, but life got in the way after a few courses and field schools. Over a dozen years after that, Dr. Kathryn Sampeck graciously allowed me to persuade her to allow me back into the graduate program, and gave me partial credit for previous work completed, for which I am extremely grateful. Two years later had brought me to the end of this academic pursuit, and I have to first thank Mark Walczynski for a conversation which led to the basics of this thesis topic. The library staff of Illinois State University and Illinois Valley Community College deserve an abundance of gratitude for their incredible assistance in tracking down somewhat obscure source materials. I must thank DeeAnn Watt at the Illinois State Museum who very graciously coordinated the loan of the Fort de Chartres gunflint assemblage which allowed me to perform the basis of my study. Similarly, I must acknowledge the administration of Illinois Valley Community College for allowing me a semester of sabbatical to focus upon classwork and thesis writing. Dr. Michael Nassaney of Western Michigan University gave important initial advice as well as connecting me to the gunflint assemblage information from Fort St. Joseph. Drs. David Keene, Jeffrey Durst, and Dr. Torben Ballin all graciously provided email comments to initial questions. Professor David Williams of Loughborough University gave fantastic insight and comments

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CHAPTER I: INTRODUCTION

With the technological innovations in military weaponry in the mid-fifteenth century, the widespread use of firearms became the standard choice for European infantry and navies. Matchlock muskets first provided this change, as the ignition of the gunpowder came through the use of a “match,” a wick-lick cord attached to the lock of the musket. In an effort to create a more reliable sparking mechanism, the snaphance found creation in the very early seventeenth century, with the introduction of a spark produced when a small shaped stone of flint would hit a case-hardened steel frizzen. Further innovations brought along the flintlock musket by the first half of the seventeenth century, with improvements brought to British and French militaries from the Dutch and Lowland manufactures and exporters over ensuing decades.

From these early muskets, the quest to improve the array of sparks as well as sparking reliability of gunflints inspired experimentation in shapes and sources of gunflint, especially as continental conflict shifted suppliers and manufacturing centers. Even after developing their own style and form of flintlock, Britain maintained their trade networks in order to obtain French style flints, and would only later into the late seventeenth and early eighteenth century begin to fashion their own styles of gunflints. Colonial demands and conflicts necessitated this.

Military and civilian sites across the American colonies yield gunflints. Archaeologists have wrestled with the issue of dating and sourcing these gunflints, particularly since the late 1960s, in an attempt to differentiate between the nation of manufacturing, the source of origin for the lithic material itself, and in discussing the logistical network of trade and supply of colonial military fortifications. Most studies have focused upon the morphological characteristics of the gunflints, most specifically the color of the stone, in linking the gunflints to a particular nation or chronological period.

The pervasiveness of gunflints at historic archaeological sites in the Midwest in places like Illinois, Indiana, and Michigan make them a potentially central line of evidence about chronology, political and economic control, and trade patterns during this period. This project examined the temporal changes in the material aspects of colonial power and individual choice at historic frontier posts in the American Midwest between 1683 and 1779. This narrow time window was used in order to investigate gunflint artifacts from archaeological sites of both French and British occupation. The forts of Michilimackinac, St. Joseph, Ouiatenon, and de Chartres, spanning an area from the northern tip of Michigan to southern Illinois, provided a variety of military experiences, illustrate the difficulties associated with organization and supplying widespread interior fortifications, and dealt with the problems of defeated civilians within the context of a military establishment. All of these issues are reflected within the gunflint assemblages.

As the Fort de Chartres assemblage has had little analysis, its examination, and comparison, to these other collections clarified significant differences of supply and distribution between this site and the others. These sites serve as an instructive means to investigate the factors involved in the selection and use of gunflints. Gunflint distribution based on likely country of origin, style, and approximate chronological dating was observed in order to investigate the influence of political, economic, and military events of this time period upon the availability and use of these artifacts.

If the first step “in investigating a technology...is the object itself” (Skibo and Schiffer, 2009:7) then we must look at the designs and adaptation patterns of gunspalls and blades between the French and British, and their colonial components in North America, in an attempt to understand any advantages or disadvantages of particular styles, lithic sources, or nations of

manufacture of these gunflints. This project carefully considered the background of the artifacts, from production to deposition, and examined the question of “preference,” as detailed in primary and secondary source documentation as related to gunflint usage. In this way, the thesis examined the reliability of previous tests on sparking capability, as well as statements made that showed a reliance on the usage of French flints by the British, to illustrate the rationale behind these choices. Prior literature was examined to ascertain the extent to which technical traits: the size, color, type of stone, etc., influenced the choice of gunflints used, as well as how the technology changed to accommodate the different styles of gunflints.

A comparison of the metric components of the different styles of gunflints, the gunspall and blade/platform, and those of British and French manufacture, would offer insight into the patterns of supply and trade, between both the inhabitants of these French fortifications and the subsequent British who overtook them, and the British logistical issues afterwards. Measurement comparisons between assemblages had the potential of showing patterns between the larger, northern fortifications, and the outlier of Fort de Chartres, which was supplied across different routes. Similarly, a comparison between British gunflints at Fort de Chartres and those at the other three interior forts would show minor, but potentially significant differences in both size and pervasiveness.

By quantifying the mere physical components of gunspalls and blades of British and French manufacture found at Fort de Chartres, Ouiatenon, St. Joseph, and Michilimackinac, differences in style, lithic composition, and assemblage compositions were noted. Site reports and data exist for Ouiatenon, St. Joseph, and Michilimackinac, and the data amassed by my efforts with the Fort de Chartres collection will help to illustrate these similarities and differences. As a result, extrapolations relating to supply routes and issues relating to political

and economic, as well as military events involving these forts reveal factors which impeded British supply of their newly acquired fortifications. While past scholars have implied a British preference for French gunflints over those of their own manufacture, at Fort de Chartres, British gunflints make up a significantly greater percentage of the gunflint assemblage than at the other three sites. Expediency and supply issues most likely impacted gunflint “choice” as much as any perceived technological advantages. British technological adaptation, through the use of the cock jaw basin, may have also affected the makeup of gunflint assemblages.

This study will begin with Chapter II’s examination of gunflints as an element of technological change in the weapons of the 17th and 18th centuries. A review of the academic literature on gunflint studies will provide the framework for understanding the terminology and previous classification methods for this artifact, whether by mode of manufacturing, lithic material, or color. Chapter III begins an examination of the four sites involved in this study, outlining the history of the French and subsequent British occupations of these fortifications and a history of the excavations of these areas. Chapter IV offers the data analysis portion of the thesis through a thorough discussion of the gunflint assemblages, their metric quantities, and a statistical breakdown of their percentages within these sites. It ends with a comparative data set between the sites. Chapter V presents a discussion upon the topic of preference, as presented by the literature review, but also from perspective of the primary source materials and archaeological data. Careful scrutiny of the variables associated with gunflint performance are also taken into account in analyzing this subject. The chapter concludes by looking at the issues of logistics within the context of these interior forts, and how this may have impacted gunflint availability.

CHAPTER II: RESEARCH QUESTIONS AND LITERATURE REVIEW

Gunflints as Technology

With the early development of firearms, as matchlock muskets, European militaries now had the means of igniting the gunpowder in their weapons through the use of a “match,” essentially a long wick, as early as the mid-15th century. The desire for a more reliable method to spark the gunpowder would lead to the progression from matchlock to snaplock in the very early 17th century, with the introduction of a new method to fire powder, a spark created by the striking of stone to steel. With firearms a recent innovation, the British and French relied heavily on the Dutch, and to a lesser extent, the Germans within the Low Countries, for the manufacturing and importation of flintlocks for much of the first half of the seventeenth century. Dutch naval superiority only increased their domination of this trade (Blanchette, 1975:48). When France and England did begin to produce their own flintlocks, only a Franco-Dutch war in the 1690s provided the impetus. This sparked the innovation known as the “French lock.”

The development of the French lock solidified this form of ignition system, although the size, shape, and materials of the flints used within these locks would themselves change over time. While the French initially invented this type of lock, future locks would continue to be called “French locks” regardless of where they were manufactured, yet they all retained key characteristics: “a vertically acting sear, and the flint strikes the curved frizzen, or battery, at a gouging angle as it plows its way downward towards the pan” (Hamilton and Emery, 1988:5). The flintlock musket became the standard firearm of most European armies, and gunflints would continue to provide the spark for ignition for another two hundred years (Lenk, 2007: 26-27; Kenmotsu, 1990:93; Whithoff, 1966:13). By the time of the construction of the forts within this study, Michilimackinac, Ouiatenon, St. Joseph, and de Chartres, the French lock had become the

customary ignition system of the French as well as the British. As such, the styles of gunflints manufactured first in places like France and, later, Britain, would fit within these locks, provide the means of igniting the gunpowder, and see themselves factor prominently within military supplies transported and stored within these interior colonial fortifications.

The Weapons of the 18th Century

The British military did not formally adopt the flintlock musket until the midpoint of the 17th century, and its use would still be sporadic for the next sixty to seventy years. In 1715, the British government attempted to standardize its military, and better organize its supply service, through the creation of the Board of Ordnance system centered at the Tower of London. This allowed for the purchase of complete weapons, and contracts for large numbers of gunflints from private contractors rather than materials that lacked uniform measurements and sizes, and sometimes suffered from quality control issues (Stevenson, et. al., 2007:51; Bailey, 1972:9-10; Bannerman, 2008:17). The responsibility for providing weaponry and related accoutrement, as well as coordination of delivery of this to troops abroad, now lay with the Board of Ordnance. Standardization of the British military musket occurred at this same time, with the British Brown Bess manufactured in its “pre-land pattern” from 1715-1735, and the more typical “Land” pattern from 1730-1797 (see figure 1, below; Bailey, 1972:13).

Figure 1. Long Land Pattern of the British Brown Bess, circa 1730s-1790s.
https://commons.wikimedia.org/wiki/File:Long_Land_Pattern.jpg

The regularization of this musket, and uniform system for creating civilian and trade guns, allowed for a more uniform system in the production and measurement of gunflints as well. While the British would continue to import gunspalls and blades from the French and through Dutch intermediaries, a craft industry took route outside of London that would later expand and allow for the domestic production of gunspalls.

French firearms, collectively known as “Charlevilles,” (see Figure 2 below) stemmed from an arsenal created in 1675 where gun parts and locks were made and stockpiled. By 1717, the military infantry musket that bears the name came into production and the standardization of manufacturing of these instruments came into being. The musket would evolve through several models in the 18th century, but would still collectively be referred to as the “Charleville” (Gélinas, 2015:25, 27).

Figure 2. Close up of a French Charleville Musket.

<https://s-media-cache-ak0.pinimg.com/736x/f8/98/a5/f898a5766eac5ecd44ebb4a142335612.jpg>

Despite frequent reference to this style as the most pervasive French longarm in the North American colonies, it appears to exist solely as a military musket, and the manufactures did not make smaller, or lesser quality styles, for use in the civilian or trade markets. According to Gélinas (2015:34), “primary source records reveal that very few Charleville shoulder weapons may have seen use in New France contrary to popular belief. In addition, no evidence of ‘Charleville-made gun parts (i.e., locks or barrels showing Charleville arsenal markings) have been found up to the present time in any pre-1760 French associated North American archeological sites”.

Early French dominance in musket technology and gunflint manufacturing, undoubtedly resulted in the presence of French-manufactured firearms and gunflints in military engagements across Europe and European colonies in North America during the seventeenth and early eighteenth centuries. With the prominence of the French presence in New France (Canada and the interior of North America), significant trade relationship and alignments with the indigenous populations, not to mention strong military presences throughout, the existence of French-made firearms and gunflints is hardly in dispute. Citizen Salivet, writing in 1797, commented that the merchants of Saint Aignan shipped “considerable quantities” of gunflints annually to Holland, Spain, and England and Citizen Coquebert record in 1793 some thirty million gunflints in storage, stating that the “the English and Colonial traders were passing them along to their Indian customers” (Hamilton, 1982:191). For approximately 150 years, French gunflints, both gunspall and blade forms, found their way into the American interior and into the hands of military, civilian, and indigenous users.

Both the Brown Bess and Charleville utilized similar technology and had fairly similar measurements and components. Both of these smoothbore muskets utilized gunflints to ignite

priming powder, which ignited the powder within the barrel, propelling the lead ball forward. The Charleville's .69 caliber musket was only slightly smaller than the .75 caliber Brown Bess. Both, initially, used French gunspalls within their locks. Both, could, utilize British, French, of Chip/Self-made gunflints, as well as blade styles. One question, neither addressed by contemporary sources nor by recent scholarship or experimental archaeology, might ask whether either variant of musket is better suited to one style of gunflint over another. In other words, does a British Brown Bess fire more effectively with a British gunspall? Does a French gunspall produce more sparks on a French Charleville? Modern recreations and tests have employed reproductions of weapons, which often are made from modern materials (steel vs. case-hardened wrought iron), or utilizing gunflints crafted from other types of lithic materials like Brazilian agate, which may skew the results of spark showers, wear patterns, or the likelihood of powder ignition, all of which would clearly have mattered to users of 18th century gunflints. If preferences existed by those that used them, as some recent scholarship has asserted, beyond mere logistical supply or availability concerns, the primary documents should reflect these issues. If French or British gunspalls, or French blades held a clear technological superiority in their muskets, then a clear preference, reflected in the archaeological assemblages, should demonstrate this. These topics will be addressed in a later chapter, utilizing the archaeological data and primary source materials.

The State of the Field of Gunflint Research

With the prevalence of gunflints found on 17th and 18th century Euro-American and native archaeological sites, archaeologists began to search for a means to discern the country of origin, as well as chronological windows, for this omnipresent artifact. While earlier studies

have seen significant challenges and revisions, they did establish the framework for contemporary gunflint studies. As we develop better technology that allows us to investigate the geophysical structures and compositions of these source materials, we might better be able to link original quarry sources to the gunflints produced from them. This might also help to differentiate further the patterns of supply, trade, and use of gunflints in colonial America.

Other than direct physical examination, for example, only limited technological analysis has occurred of gunflints. Microscopic analysis and geological properties of the gunflints materials were first examined on gunflints found at Fort Michilimackinac. By analyzing microscopic differences, they believed they could differentiate between “English” and “French” styled gunflints (Hamilton and Emory, 1988). Durst (2009) utilized inductively coupled plasma-mass spectrometry, acid digestion, and laser ablation to detect measurable differences in the physical properties of gunflints found on a French shipwreck in Texas and those at a nearby French fort of St. Louis. With this information, Durst demonstrated a statistical likelihood of association of the base artifact materials, linking the chert to home quarries in France (Durst, 2009:23-24). In terms of the blade style gunflints found on *La Belle* and at Fort St. Louis, Durst’s testing revealed “three locations as origins of manufacture...The samples submitted for testing resulted in an almost identical match with the core samples from Meusnes, France...several gray to grayish brown blade-type gunflints...also showed a nearly identical match with the French source material from Meusnes” (Durst, 2009:25). While the British gunspall samples showed trace-element concentrations that indicated British manufacturing, and a common source origin, that origin point has yet to be located, making the identical matching impossible (Durst, 2009:28). Little analysis of these sorts has occurred beyond the gunflints of Michilimackinac and this small sample from Texas. Nor has any comparative study linked these

two studies together or to other colonial samples. With this process in mind, further testing, over a wider variety of core and worked samples, could help to refine further the data available and perhaps better link colonial samples to their sources of origin.

Utilizing only the physical characteristics of the gunflints, John Witthoft (1966) first established a basic chronology of European gunflints, outlining distinct phases of the evolution of the artifact as well as revisiting the process of making the gunflints themselves. Later studies (White, 1975; Blanchette, 1975; Kent, 1983) further refined the typology and dating, particularly of 17th century gunflints, demonstrating the differences between those believed to have been manufactured in Britain and those made in France. White, for example, offers manufacturing methods for French and British gunspalls, as well as blades, and discusses the tools used in this industrial process. Blanchette's analysis of the Chicoutimi site offered a closed context, due to a landslide, that offered new context on the dates of manufacturing of French blade style gunflints. These same studies would refute some of Witthoft's earlier categories. Kent (1983) would show that Witthoft's assertion of a "Nordic" gunflint was in error, perhaps due to translation, and further outlines the differences between indigenous made bifacial gunflints and the earliest European products. These categories primarily focused upon physical characteristics: color, size, shape, and style.

Current scholarship brings into question the designation of these categories of gunflints as "French" and British." Noting prior studies, based on raw materials, colors, and technology/style of manufacture, Ballin states that the "competing definition of 'French' and 'English' gunflints have made it more difficult to establish a reliable temporal sequence (2012:166). This confusion stems from the fact that gunspall production continued well into the

period where blade gunflints were introduced and used, with both nations manufacturing both styles simultaneously.

Gunflint Terminology

Figure 3. Diagram of the Different Types of Gunflints

The four basic types of gunflints are shown here. 1-A D-shaped gunspall, typically attributed to the French. 2-Square gunspall, with characteristics typically attributed to the British. 3-Square Blade/Platform gunflint, with a style normally associated with the British. 4-Square Blade/Platform gunflint associated with both nations, although the French generally continued to shape the heel in the “D” form.

Early classification methods--Styles of Manufacturing

Do it Yourself—The “Chip” Style

With debate existing surrounding the chronology of the gunflint industry in Europe, a definitive timeline remains problematic. Attempts to link nations who manufactured gunflints to distribution in North American colonies, especially those within the far western interior, remains even more difficult. With the invention of the snaphance (1570s), and later, flintlock musket (1630), the accompanying gunflints serve as useful dating tools for interpreting historic sites. Imported in large quantities, once the process of mass production began, gunflints appear throughout colonial sites. Initially in the colonies, however, Europeans and natives had to fashion their own replacement gunflints with the materials at hand (Kent, 1983:38). Gunflint

manufacturing began as an offshoot of fire starters, with individuals fashioning their own gunflints as needs arose. Some indigenous “chip,” or “do it yourself” style gunflints were produced in the early decades of gunflint manufacturing, but the demand for a more effective flint would drive innovation and produce the gun spall, or wedge-shaped type in the 1640s and 1650s (Kent, 1983:38).

The earliest style of gunflints, the chip, or do-it-yourself flint, appeared quite early chronologically, upon the American continent, as early as the production of the first flintlocks in the mid-1620s (Kent, 1983:34). In the absence of mass produced European trade flints, both indigenous and colonial populations manufactured what they could with the materials on hand. This style of gunflint appears in most early colonial assemblages along the eastern coast (Luedtke, 1998:37). Production of this bifacial gunflint would continue through the midpoint of the 1600s, decreasing in the Northeastern colonies by 1675 until their displacement with imported gunspalls. Still, due to supply issues, these locally-made bifacial gunflints would find themselves produced by flintknappers further west into the areas of Missouri, Nebraska, and Texas (Kent, 1983:34). Kenmotsu describes these indigenous and colonial bifacial flints as more square than European examples, with “all four edges carefully worked to an edge by secondary chipping” (Kenmotsu, 1990:97). These chip flints represent what Witthoft described as Nordic, “bifacially flaked by coarse percussion chipping. They are square to rectangular and pillow-shaped, with their edges bilaterally symmetrical rather than beveled toward one face. Most of them are tiny” (Witthoft, 1966:22). As individually-made tools, the functionality of these types of flints rested upon the skill of the knapper, whether colonial, indigenous, or European. The increased use of flintlocks, combined with an increase in European/colonial conflict would make

for a transition into gunflint technology. Simply put, they needed a more dependable sparking mechanism for their firearms.

Spall

This push for a mass-produced flint related to colonial demands, and perhaps more importantly, to European demands due to increased use in the many wars of the 17th century. A more efficient, and mass-produced flint led to the development of an actual knapping industry in France. Witthoft believed, however, that the French gunflint industry had its introduction in about 1675 (1966:28), stating further that it did not exist as a regular trade item until 1740. Evidence from a pristine Chicoutimi Indian site in Quebec has refined this date, demonstrating that blade-style gunflints, composed of a blonde, and most likely, French, stone, had been imported into the colony and traded as early as 1663 (Kent, 1983:32). White places gunflint production in France (with an unspecified type, but most likely gunspalls) in 1643, with the blade technique introduced there in approximately 1710 (White, 1975:70). He does, however, make an important note that gunflint makers could have manufactured both blade flints and gunspalls contemporaneously in different locations, which seems likely. The uncertainty, then, surrounding the dating of blade and spall gunflints on colonial sites at this chronological point is compounded. The manufacture of both of these types would have also impacted the trade of gunflints in the interior of the American colonies, and could have the potential of throwing off the dating of sites if using only gunflints as the chronological feature.

Replacing these locally-made gunflints, European traders introduced the “wedge” shaped gunflint, or gunspall, made from European-sourced stone, onto the American continent in the mid-1600s. Witthoft (1966) attributes this first to the Dutch, with evidence later contradicting

his designation to this nation as manufacturers. White (1975), Kent (1983), and Hamilton (1987) demonstrate that Witthoft made errors in translation and attribution of these to the Dutch, as well as showing that the French originated the process (White, 1975:68). Instead of making these items, the Dutch, instead, served as the middlemen in the colonial trade, transporting and selling them to overseas colonies, as well as Britain. At least for the first half of the 1600s, the Dutch merchant ships dominated those of France and England, but did not produce firearms or ammunition to any real degree (Blanchette, 1975:47-48). Britain in particular, as well as France relied on the Dutch imports of gunflints and ammunition from Germany to assist them in their martial needs. Then, French exports through the Netherlands dominated the gunflint market.

Gunspalls represent a shift in stone ignition technology, a desire to find a more reliable spark from the flint. As lock technology improved, the flints needed to improve. Witthoft states that these new locks “had evolved in the direction of a more acute striking angle between flint and battery; the new flints were better adapted to a grazing stroke than were earlier bifacial flints” (Witthoft, 1966:28). These spalls became much more uniform in terms of shape, size, and mode of production fairly quickly, as well as throughout Europe. As this technique spread, and as flintlocks became in more widespread use, this Clactonian style of production could be found not only in Britain and France, but also the Netherlands and Denmark during the second half of the seventeenth century (Ballin, 2012:119; Luedtke, 1999a:33; Kent, 1983:32).

Gunspalls differ from the chip style mostly in their manner of knapping. The gunspall gunflint came into production, and its technique spread fairly quickly, with only the source of stone and minor manufacturing techniques differentiating the gunflints between European nations. Hamilton and Emery (1988:10) believe that the introduction and spread of the gunspall style happened quickly, an easy transition from the Chip gunflints or fire steels. Through their

research, they also note that firsthand accounts of gunspall manufacture do not exist. The primary sources are not there. Still, they conclude, “the methods have been reconstructed from a study of the waste, and perfect replicas have been made” (Hamilton and Emery, 1988:12). The lack of primary source accounts of this have also led to some dispute, with French archaeologists denying a formal spall gunflint production within France (Hamilton and Emery, 1988:31; Luedtke, 199a:33). Still, gunspalls can be found in great numbers at French colonial sites.

Figure 4. Tools to Make Gunflints. (Photo from De Lotbiniere, 1977:37) From left to right: English flaking hammer; French flaking hammer; English knapping hammer; French knapping hammer.

The gunspall can be recreated by striking prepared cores or flint nodules directly, using specialized hammers (see figure 4 above), which removes individual flakes which a knapper would then retouch. “They typically have positive bulbs of percussion on the ventral surface, opposed by a relatively flat dorsal surface. The working edge of a gunspall is the roughly straight margin formed on its distal edge. This straight edge is sometimes formed naturally during the reduction processes, and sometimes formed by removal of small thinning flakes” (Hamilton 1979:210). The retouching of these flakes would differ, primarily, between the British and

French styles, with French spall heels “reduced through pressure flaking into a semi-circular” or “D” form (Kenmotsu, 1990:98) and the British remaining untouched. Knappers could work quickly, utilizing a wide variety of source materials, and create a fairly uniform product.

Despite some uniformity in shape and size, gunspalls still largely represented a cottage industry style of production. Dimensions were not standard. Knappers utilized whatever flints were available. In France, these stones were quarried, but the British tended to pick up whatever was laying on the surface. This is demonstrated through the wide scope of colors of gunspalls, as opposed to later blade, or platform, style flints. Core/nodule sizes varied, as would the number of flints that could be made from them. A great deal of waste was produced in the making of gunspalls. The size of the flint nodules could be smaller, which also helped to encourage small-scale, localized production (Luedtke, 1999a:33). Even then, differences exist within a particular nationality’s style of spalls. Over time, some changes occur.

Blanchette proposes more thorough methods of study of these abundant artifacts, suggesting that the chronology of gunspalls could be narrowed. Blanchette, through a study of gunflints at Burr’s Hill, a 17th century Wampanoag burial ground in Rhode Island, concluded that spalls came in two varieties, those that exhibited retouching on the ventral surface and those retouched on the dorsal surface (1980:69). Blanchette concluded that retouched ventral spalls were most likely produced 1640-1770, with the dorsal retouched gunspalls manufactured only in the seventeenth century (Luedtke, 1999a:35, Blanchette 1980:69). Luedtke suggests that an increased focus on illustrations and photographs of both ventral and dorsal sides, looking for these various flake scars, could help to refine this chronology in the way that Blanchette suggests. None of the artifacts used in this study have been examined for these particular

retouched marks. As a result, only a loose chronological period for the use of gunspalls can be illustrated.

French Gunspalls

The earliest date for the transition from chip to spall/wedge manufacture of blade-produced gunflints remains unclear. The earliest reference to gunflint production in France, unspecified as to type, occurred in 1643 (Emy and de Tinguay 1964:24). As stated previously, despite this reference and due to a lack of archaeological evidence, some French archaeologists dispute the production of gunspalls within France. Still, gunspalls are evident at French colonial sites. Fort Pentagoet, for example, in Penobscot Bay, Maine, existed between 1635 and 1654. Archaeologists excavated gunspalls from that site (Stevenson, et. al., 2007:53). French style gunspalls were also discovered at the Chicoutimi site, Quebec, which demonstrates a pre-1663 context (Blanchette, 1975: 49). While one could suggest that these were locally produced at the Fort, Hamilton and Emery comment that “No evidence so far has been found to indicate even small-scale production of gunflints of any type at any French colonial site.” (Hamilton and Emery, 1988: 31). Utilizing the color and type of stone, however, does help to narrow down the possible nation of origin of these gunspalls, assuming that the composition of the stones are inherently unique to France or Britain. French spalls, by far, tend towards a uniformity of flint, which suggests deliberate acquisition of specific nodules in specific places (colors to be discussed more later). Traces of cortex left on some flints similarly demonstrate that these particular stones were mined (Hamilton and Emery, 1988: 30). A cottage industry, which remained family-based, allowed for the manufacturing of these tools in specific localities within France.

British Gunspalls

Some further controversy surrounds the establishment of a British gunflint industry. The narrative originally stated that French prisoners of war had introduced their craft to contemporaries at Brandon in 1709 (White, 1975:68; Witthoft, 1966:36). Given the similarities between English-produced flints at Brandon and French produced flints of the same period, Witthoft suggests that the source of the British technique “must” have been this, and dates it specifically to 1686 (Witthoft, 1966:36). Primary sources disagree. British Board minutes, under Oliver Cromwell, inquired about a London gunsmith’s offer of pistols and 11,000 “flints” as early as 1654, and in 1660, “5000 flint-stones by him cut” were requested from a different London gun maker (De Lotbiniere, 1977:42). Clearly, some localized, craft industry of gunflints had developed, and this was found primarily around London and to its southeast. A few decades later demonstrates the continuation of this limited manufacture. A 1704 Board warrant illustrates a discussion for 240,000 “English Flints for musquett [sic.],” which seems to demonstrate that some sort of industry exists by that point (De Lotbiniere, 1987:155, 156). De Lotbiniere further suggests that the designation of “English” flints differentiates not just a mode of production, but that these flintknappers had duplicated and altered the French technique rather than just purchasing and redistributing French goods.

While initially the government of Great Britain may have been content with importing French gunflints for use in British firearms, with increased warfare in Europe, the British sought to provide their own gunflints to their colonial and continental forces. The British government had relied primarily upon matchlocks until well into the seventeenth century, but by the midpoint of this century, a desire for a more reliable mode of ignition had developed. By 1650, the British army formally adopted the flintlock musket for their infantry, but it would take another fifty

years for its usage to become standardized. Obviously, this would affect the demand for the meager British supply of gunflints. As the standardization of flintlock use continued, this demand would increase. The French, on the other hand, had adopted the flintlock about forty years prior to the British (Skertchly 1984: 3). Even then, gunflints would remain an unregulated entity, and size limits, while perhaps “recommended,” did not seem to factor into the decisions of the Board of Ordnance, who controlled the gunflint supply of the British Army and Navy from roughly the early 18th century through the mid-nineteenth (De Lotbiniere, 1984:207).

Quite simply, no need existed for the British to develop a systematic method of gunflint manufacture. The British government could fulfill their early needs through trade with the French and Dutch (who traded in French flints). During the sixteenth and through some of the seventeenth century, British military weaponry, ammunition, and gunflints largely came from trade controlled largely by the “‘Dutch’, the Low Countries, then the London Gunmakers Company (from 1637), through the peak of demand of the Civil War” and only then did those in Birmingham begin to contribute to a trade that came under the control of Britain’s new Ordnance System (Williams and Wilcock, 2015:32). While the Dutch and Low Country merchants may have simply acted as middlemen, providing French supplies and gunflints to the British, it still took Great Britain some time to truly begin their own gunflint, and gun, industry.

As De Lotbiniere had pointed out, by 1704, Board of Ordnance reports requested 240,000 “English Flints for musquett,” which clearly demonstrates some sort of English manufacturing through craft production (1987:156). While they may have continued to purchase French flints, France obviously, would have proven unenthusiastic to sell gunflints to her enemy in these many wars. The British had to look elsewhere. Only when warfare increased in the colonies and upon

the continent in the second half of the seventeenth century, and as flintlock use became much more standardized, would the British find the need to develop their own supply of gunflints.

British spalls, as a result, vary from the French both in the stone used and the method of manufacture. Rather than mining specific beds of flint, British producers utilized stone that existed as an offshoot of the chalk industry (Stevenson, et. al., 2007:56). Early British writers of gunflints record sites in the southeastern portion of England, most particularly near Downs and the Salisbury Plain. Here, at the beginning of the 20th century, Chandler recorded the discovery of a likely site of manufacture, with “several unshapely pieces of flint showing signs of having been flaked ... Judging from the appearance of the cortex, the flint has come from the clay-with-flints which caps the chalk in this neighbourhood.” (Chandler, 1917:360). Similar beds of flint could be found much closer to the Ordnance Board’s office within the Tower of London, as there existed “a small chalk outcrop at Lewisham, just across the Thames, and, only a few miles down the river, chalk formations began in earnest both in Kent and to a much lesser extent in Essex” (De Lotbiniere, 1987:154). Only later into the 18th century, sometime shortly after the American Revolution, would the famous quarries at Kent and Brandon produce the more stereotypical British platform, or blade, gunflint.

With this wide diversity of sites, where deliberate quarrying rarely occurred and knappers were far more likely to pick up stones on outcroppings, British spalls exhibited a wide variety of colors, unlike the homogenous nature of French gunspalls. British gunspalls at colonial sites might be “beige, black, gray, and tan” (Stevenson, et. al., 2007:50). Chandler described his surface fragments in 1909 as “of a pale honey colour [usually attributed solely to the French stones], some pieces quite unpatinated, but others very slightly,” while at a different site, “black, with bluish patination on the worked faces” (Chandler, 1917:360). Clay, in 1925, described

samples as “dull and lusterless. They are made from a tractable, blue-black flint spotted with cherty inclusions” (Clay, 1925:425). De Lotbiniere suggests that most of the wedge/gunspall style of gunflints produced in Britain, and transported to the North American colonies, would “to a large extent have been black with a brown translucency and occasional white spots,” and those shipped after 1740 “a distinct increase in the number of grey-brown flints which would have been rather duller and more opaque but again with whitish patches” (De Lotbiniere, 1987:157). Perhaps due to the sheer amount of waste created by this style of manufacturing, the British as well as the French were less choosy in the types and colors of flints selected for knapping. These wide variations in color/stone, as well as the occasional similarities between British and French colors/stone, force archaeologists to give colonial gunflints much more scrutiny and examine other characteristics to determine a possible nation of origin.

The spall/wedge style of gunflint involves a trimming down through retouching of the lateral edges and the proximal end (McNabb and Ashton, 1990:46). This is the process that can help differentiate gunspalls between British and French manufacturers. While the initial processes differ little, the amount of secondary retouching of those edges and ends can help to show these differences. The British, typically, did not significantly modify their gunflints once they had a flint of the approximate size. While secondary flaking of the sides may be in evidence, they did not trim all of the edges in the manner of the French (Hamilton and Emery, 1988:13). This retouching, for British gunflints, would also generally leave a percussion scar “on each side, at the ‘bed’ level” (Blanchette, 1975:46). Visual analysis should reveal these scars, which would indicate a British manufactured gunflint. Similarly, only the French gunspalls had a rounded heel, or “D” form. A more “square” gunspall would demonstrate British manufacturing. Lastly, the measurements of British gunspalls demonstrate a length that

exceeds their width (Hamilton and Emery, 1988:13). While the differences between gunspalls are few, and not always found in every sample, given the appropriate context of an archaeological assemblage, these clues could certainly help to assign a nation of origin (not necessarily “use”) of gunspalls.

Blade/Flake Gunflints

Advancements in firearm technology, which standardized the equipment itself, and perhaps a desire to find a more economical mode of manufacturing the gunflints themselves, prompted a shift in the style/techniques of gunflint manufacturing. The gunspall, or wedge, created a shape that caused it to fit insecurely within the jaws of the cock due to the prominent bulb of percussion near the heel. Similarly, only the front edge would serve as a firing edge, due to the shape (De Lotbiniere, 1988:41). As a result, the French sought a new technique, the blade, or flake, gunflint.

Dating for this transition also remains a bit less specific, with Witthoft placing it after 1740 (1966:28). Durst, however, contends that the finding of blade-type gunflints on La Salle’s *La Belle* demonstrates that this style existed well before, as this ship sank in 1686 (Durst, 2009:21). Similarly, Blanchette records blade type gunflints in a sealed context at the French colonial site of Chicoutimi, with a terminal date of 1663. This implies that the French had begun the production of blade-style gunflints not that long after gunspalls (Blanchette 1975:43). Clearly, Witthoft’s later date needs revising.

The blade, sometimes called the “flake” or “platform” style of gunflint, varies from the gunspall most noticeably in the shape, caused by the style of manufacturing. In the French and British blades, the color and type of stone used also varies. Both nations would focus more upon quarried stones, from particular areas, in an effort to seek better quality materials. The blade

style of gunflint involved more technology and a further refining of the process, with direct percussion by a steel hammer striking the core of a flint nodule, and then a snapping off of appropriately sized pieces. The knapper then trimmed these with a chisel and roulette (Austin, 2011:85; Witthoft, 1966, 28). As weapons became increasingly standardized, a corresponding need for a more standardized form of gunflint arose. The French did not perfect this technique most likely until after 1740, and these flakes, or blades, quickly dominated their industry. This style of production proved less wasteful of raw material and allowed for more production, in less time, of what was perceived as a more effective product (Ballin, 2012:133).

It would not be until another three quarters of a century had passed that new methods of gunflint manufacturing evolved in Britain. Hamilton and Emory (1988:193) avow that the “technique for making the English flake gunflint was not introduced into that country until 1775, and we have no archaeological evidence that it appeared on the American scene until well after the end of the American Revolutionary War.” De Lotbiniere noted that the British Parliament’s Board of Ordnance minutes of July, 1775, discussed a letter from an individual offering the “best musquet [sic.] flints of a New Construction,” as well as enclosing samples of them. The Board ordered 200,000 (De Lotbiniere, 1987:156). This style, the English blade gunflint, would become more popular after this, especially given the trade constraints of the wars with America and, later, Napoleon, and would continue well into the 20th century (Kent, 1983:39). Scholars largely agree with this general chronology (White, 1975:70; Austin, 2011:86; Kenmotsu, 1990:95).

Organization Techniques—By Color of Stone

Archaeologists continue to use the color of the stone as a simple means of organization and classification of gunflints. Obviously, color represents the most visible trait of the stone.

Luedtke (1992:65) shows that the bulk of these cherts or flints “fall somewhere in the range from white through gray to black,” noting that colors such as gold, red, and brown are also fairly pedestrian. For those utilizing gunflints, classification by color remains the simplest mode, although problems with this method clearly exist.

From the first major study on gunflints (Witthoft, 1966: 30-31), separating gunflints into basic categories of color, thought to be linked to particular European nations as a result, would help to identify artifacts found in strata on a site. Gunflints typically deemed “French” would have a yellow color, a “waxy lustre” and would demonstrate “translucence” (Witthoft, 1966:31). Kenmotsu describes this as a “honey-yellow or blond” color, which “often contains white inclusions and occasionally a whitish chalk cortex” (Kenmotsu, 1990, 96). Carvalhaes, in a study of Fort St. Joseph’s gunflints, utilized the Munsell color chart to refine further this description, designating French flints in the range “from 2.5Y5/3 (light olive brown) to 2.5Y3/2 (very dark grayish brown)” (Carvalhaes, 2011:22). In 1796, Citizen Dolomieu wrote a *Memoir on the Art of Making Gunflints*, noting some of these color differences, “the ones sold in Paris come from the banks of the Seine and are ordinarily brown” (Dolomieu, 1960:60). Another French source, François Pierre Nicholas Gillet de Laumon, wrote in 1797, noting that the cities of Meusnes and Lye, in the Cher River valley, provided flints of the stereotypical blond colors, while the mines at Cerilly and Coufy produced the brown flint corroborated by Dolomieu. While blond, and to a lesser extent, brown remain the staple colors of the French flint industry, Carlyle Smith, the translator of these early French sources, also noted that one mine, Vitray, provided black flint (Smith, 1961:420).

One explanation for the differences in colors of French gunflints rests in the style of gunflint produced by the various flints. French spalls at Fort Michilimackinac, for example,

displayed remarkable uniformity. “The one unvarying characteristic is the material—a non-glossy translucent flint that ranges from a light brownish gray to a deep brown” (Hamilton and Emery, 1988:30, 159). In this same study, the authors note that the flake, or blade, style of gunflint utilized a different source of flint, a source which contained a different color of stone. “It is unlikely that the spall gunflints were made in the Cher Valley (between Tours and Bourges), the center of flake production, because, as was pointed out, the flint from which the spalls were made is entirely different from that of flakes” (Hamilton and Emery, 1988:33). Blade-style French flints largely represented the honey/blonde colored flints, with brown colored flints producing the spalls, which came from an entirely different area.

While the French had selected specific sources of stone for the various styles of flints, yielding fairly uniform artifacts, in terms of color, quite simply, the English did not. English gunflints represent a variety of colors, from a number of locations, and would only later be mined at specific a specific location, Brandon, yielding a specific glassy, black flint. Utilizing Carvalhoes’ St. Joseph sample, and the Munsell color chart again, gun spalls designated as English ranged from “2.5Y5/0 (gray) to 2.5Y2/0 (black), and many are quite mottled with white and brown.” (Carvalhoes, 2011:22). Found across southeastern England, the cherts used in the English gunflint industry varied widely in color. Chandler, in 1917, recorded a site twenty-miles outside of London with flint “of a pale honey colour” and another site less than two miles away where he described the flints as “black, with bluish patination on the worked faces” (Chandler, 1917:360). A few years later, Clay describes flints found at a site just northeast of London as “dull and lusterless...blue-black flint” (Clay, 1925:425). Rather than deliberately mine for specific materials, the British apparently used varieties of stone from, essentially, surface collections at outcroppings. Only later, in the late eighteenth century, would the British gunflint

take on its stereotypical glassy black description, as British knappers shifted their area of production to the Brandon area, and the quarries there which contained this type of flint. This coincides with the shift from the spall style of gunflint to the blade, or flake, type of gunflint. Kenmotsu describes these Brandon flints, as “very dark, nearly black, translucent fine-grained flint to a gray, opaque flint with inclusions” (1990:95).

Color, when matched with mode of crafting, has traditionally given the clues to a nation of origin for gunflints found in colonial archaeological sites, yet this evidence does not remain conclusive. Simply put, colors change. Chemical and environmental processes can alter the original look of the stone and could potentially alter the findings and interpretations of sites as a result. The difficulties of unilaterally classifying a gunflint by the color of stone can be shown simply by examining the various strata of stone in any one source quarry. Typically, “not only do different strata in the same quarry show divergent characteristics of colour and opacity, but both colour and opacity can vary in the same flint nodule” (De Lotbiniere, 1987:157). Durst agrees with De Lotbiniere’s conclusions. His studies of LaSalle’s shipwrecked *La Belle* also noted the effect of prolonged submersion on stone. He observed that the gunflints would darken after centuries underwater (Durst, 2009:22). This experiment demonstrates some of the inherent difficulties of attributing a nation of origin as a source solely on the hue of the lithic material. It also raises the possibility that French honey colored flints COULD be mistaken for English black flints if found in a damp environment, or given other chemical processes that impact color change.

Organizing Techniques—By Composition of Lithic Material

Closely linked to sorting by color, some archaeologists have attempted to use the chemical and material properties of the stone itself as a way to link the gunflints to a nation of

manufacture. Durst, for example, notes finding blond blade-type gunflints on *La Belle*, which he links as geologically-identical matches with ore samples obtained in France (Durst, 2009:25). This seems to justify the classification system, largely based on color, established decades previously. Durst's study builds on an early comparison of the geology of the gunflints from Fort Michilimackinac to other colonial sites done by K.O. Emery and T.H. Hamilton (1988). These projects have linked gun spall flints at these sites to the geological makeup and sources of the flints themselves. For example, French gunflints found at Fort Michilimackinac had the same geological attributes as flint samples from the Santonian layers in France, while gun spalls archaeologically linked to the British belonged to the Campanian age. While the Campanian geological layer does exist in both France and England, Emery suggests that accessibility and preference in each nation determined which rock was utilized (Emery, 1987:152). By this, Emery means that the French intentionally mined particular types of stone, while the English, at least in the early part of their gunflint industries, satisfied themselves with surface collection and only small scale quarrying, which allowed for a wide array of colors and types of stone.

Both Emery and Durst's studies also utilized fairly sophisticated technology to make these linkages, expanding upon prior hypotheses. Emery's samples came from flints sliced by a diamond saw, with very thin sections observed through a petrographic microscope with magnifications up to 300 times. This allowed the identification of specific mineral elements (Emery, 1987:152). Durst believed that trace elements within the rock should appear consistent, regardless of the color of the flint itself. He utilized inductively coupled plasma-mass spectrometry, acid digestion, and laser ablation to yield his results. These techniques allowed him to detect measurable differences between the samples, demonstrating the original source material could be differentiated. The trace elements revealed through these techniques allowed

the author to show a pattern of English, French, Danish, and indigenous/local sources for these gunflints (Durst, 2009:23-24). No analysis of this sort has occurred beyond the gunflints of Michilimackinac and the small sample from Texas. Further study into the Illinois country/interior sites could help to link these interior sites into the larger trade network as well as provide data to corroborate the dating of these sites.

Another issue in designating flints solely through color exists within the geomorphology of the gunflint cores, despite the longstanding tradition of ascribing national origin by color. Durst attempted to connect the *La Belle* and Fort St. Louis to the geological formations which produced the stones in England and mainland Europe, noting that both “produce a wide range of colors, including both gray and blond” (Durst, 2009:28). Durst also states “to my knowledge there is no way to distinguish a black spall-type gunflint made in France from one made in England” (email to author, April 13, 2016). With black flints found in French quarries, alongside blond and brown cobbles at a workshop site in Porcheioux, and orange-brown flints found in the gravels of southeastern England, the issue of relying only on the color of flints in assigning a national designation for manufacturing remains dubious (Smith, 1961:423; Luedtke, 1999:73). As a result, only mass spectrometry analysis will yield the necessary information to definitively link colonial artifacts to the production locations in Europe.

Another note of difficulty in linking a particular group’s use of a particular style of gunflint exists with the complex stratigraphy of successive occupations of these particular sites. Fort Michilimackinac, for example, had French inhabitants from 1715 until 1761, when the British assumed control. Three separate incarnations of Fort de Chartres existed between the establishment of it in 1720 and its surrender to the British in 1763. The French fort of Ouiatenon began construction in 1717, and was in use until British takeover in 1761. Simply because the

flints remain at the site does not necessitate a linkage to the British or French. The British, for example, could easily re-use French gunflints—and may have preferred them to existing English flints. Emery suggests this at Michilimackinac (Emery, 1987:148). Still, British primary sources which discuss gunflints mention both sides of this issue, which will be discussed further later. Existing trade networks may have proven more reliable than crafting new ones. Political and economic issues, never mind militaristic, may have impacted the availability of these items in the interior of America. These questions demonstrate why further analysis is necessary, especially in the Illinois Country. As will be shown in later chapters, classifying these gunflints by their manufacturing characteristics, by their form and shape, yield much more relevant data in linking them to a potential nation of manufacture, but only the primary sources, combined with secure archaeological contexts, will yield any information regarding usage patterns.

CHAPTER III: SITES INVOLVED: A BRIEF HISTORY

The French occupied forts and civilian sites in the Illinois Country/Midwest throughout much of the 17th century and well into the 18th century. Fort de Chartres, in southern Illinois, established by the French in 1720, saw a British takeover in 1763. Nearby Spanish St. Louis was begun in 1764, and obviously influenced this interior fort (Spanbauer, 2005). Fort Michilimackinac, in far northern Michigan, built in 1715, existed as a French possession until 1761, when the British occupied it (Hamilton and Emory, 1988). Fort Ouiatenon, in western Indiana, began under a French flag in 1717 until British takeover in 1761. The British would evacuate around 1778 while fighting the colonials. Fort St. Joseph, established by the French in southwestern Michigan in 1691, continued under the British from 1763 until Jay's Treaty in 1795. Gunflint data from these sites will yield a wide range of chronological and geographical information that will establish a significant contribution to our understanding of this type of artifact's usage and distribution in the Midwest. One of the difficulties in assigning a linkage between usage of particular styles of gunflints and the inhabitants of particular fortifications lay in the fact that at most of these garrisons, French civilians lived within the walls long after the British took over ownership and control. This makes definitive associations of British soldiers using French gunflints, for example, problematic in places like Michilimackinac, St. Joseph, and Ouiatenon. In Fort de Chartres, however, French civilians were excluded to outside of the fort's walls.

The discussions of these artifacts, to date, have done little to discuss the impact of the history upon the availability of particular types or styles of gunflints in the interior of the American colonies. A discussion of the specific assemblages found at these inland forts and civilian/indigenous sites should also consider the influence of political and economic events

upon the trade and supply patterns of the British, French, Spanish, and later, Americans. The British, for example, fought a succession of global conflicts during the late 17th and throughout the 18th centuries which would have impacted and influenced the availability of both gunspalls, and later, blades-type gunflints. King William's War (1688-1697), Queen Anne's War/War of Spanish Succession (1702-1713), the War of the Quadruple Alliance (1718-1720), the War of Jenkin's Ear (against Spain, 1739-1742), the War of Austrian Succession (1742-1748), the Seven Years War/French & Indian War (1754-1763), Pontiac's Rebellion (1763-1766), and the American Revolution (1775-1783) would have involved Britain and France, their colonial cohorts, indigenous allies, and clearly would have impacted trade patterns and the availability of gunflints within the interior of the continent. This project would examine these assemblages and attempt to make these linkages.

Similarly, economic issues also impacted the ability of the colonists and military officials to obtain needed gunflints. Disruptions of trade by war, embargoes, or simply logistics affected the supply of gunflints at these sites. Prior to the French and Indian War (1754-1763), the British ruled their colonies through a form of salutary neglect, an unofficial policy that allowed lax enforcement of laws and tax collection. After this war, however, British officials curtailed the availability of French trade goods and enforced strict importation of British goods. The Stamp Act (1765), Revenue Act (1767), and resultant boycotts and nonimportation agreements by American colonists also impacted trade and trade goods availability. On some of these interior sites, the British occupation lasted only a very short time until the sites were abandoned or the Americans took over during, or after, the Revolutionary War. As a result, these assemblages should reflect the accessibility of British and/or French gunspalls and blade gunflints through offering a very specific reflection of this time period. This project would also attempt to

examine these trade patterns. Given the relatively short period of time in which the British occupied places like Fort de Chartres (1763-1772), Fort Ouiatenon (1763-1778), and Fort Michilimackinac (1761-1779), an examination of these assemblages, through site reports and direct observation, should show answer these many questions.

Figure 5: A Map of the Forts Used in This Study.

A Brief History of the Fortifications

Fort St. Joseph, in southwestern Michigan, was created as a French mission and trading post in 1691 along the St. Joseph River in modern day Niles, Michigan. With a garrison of

twenty men, the French fort saw prominence as a trading post with local indigenous groups of Miami and Potawatomi but control changed over to the British in 1761 (Carvalhaes, 2011). The British forces of Fort St. Joseph, like many interior forts, would surrender briefly to Pontiac's confederacy in 1763, but the fort would remain a British possession until 1781. In that year, Spanish, French, and indigenous forces from St. Louis attacked the fort, which would never see occupation again.

Fort Ouiatenon

Fort Ouiatenon, in the Wabash River Valley of western Indiana, was established by the French in 1717 as a means to prevent British expansion into the region. The French hoped to ally with local tribes, establish trading partners, and set a French presence firmly in this region (Noble, 1991). Over the next decades, increased trade would bring more French colonists to the region as well as indigenous groups. With the defeat of the French in the Seven Years War, the British marched from Detroit in 1761 to occupy Fort Ouiatenon. Fort Ouiatenon would see a brief surrender to Pontiac's forces in 1763, and British fiscal and military policies would eventually see this fort eventually diminished in size and importance until it fell to the Americans during the American Revolutionary War (Noble, 1991:67).

Fort de Chartres

The French established their control of the Illinois country with the building Fort de Chartres in 1718. They would build three different versions of this fort, with the last, a stone fortification, completed between 1753 and 1756. From here, the French would maintain crucial alliances with local indigenous tribes, carry on a lively trade, and solidify their control over the Midwest, supplying it not from Canada, but by going upriver from New Orleans. Following the

French and Indian War, this post, too, would transfer to the British, although they would not be able to claim their new post until 1765. British traders would then begin to make the journey down the Ohio to carry on the trade and supply with the post and to conduct Indian Affairs with the surrounding tribes. The immense costs of this interior fort would eventually cause the British to abandon it, with the commanding officer opening it up to the ravages of the Mississippi in 1772.

Fort Michilimackinac

Fort Michilimackinac was built along the Mackinac straits by French soldiers in 1715. From there, a very vibrant fur trade with local indigenous tribes developed and further colonization occurred over the ensuing decades. This fort became the center for the French trade of the Great Lakes, with voyageurs and *couer de bois* controlling and coordinating the interior trade and the French military maintaining their presence through this location. With the Treaty of Paris, Michilimackinac transferred to British control, but other than a formal shift in control, little changed for the residents and trade. The British would dismantle this fort in 1779, moving across the strait to Mackinac Island.

A History of Site Excavations

Fort St. Joseph

Excavations at Fort St. Joseph began in 1998 and archaeological investigations have continued there since. The Fort St. Joseph Archaeological Project, through Western Michigan University, first sought to locate the site of the fort as well as to begin to form the context of the artifactual remains upon the site (Nassaney, 2007:3). Over the years, investigations have focused upon five houses likely representing fur traders, and excavations have occurred over roughly twenty-five percent of the site's area, although Dr. Michael Nassaney, who has led this project,

comments that the site's boundaries are unknown, and may rest beneath a twentieth century dump (Nassaney, personal communication, 11/28/2016). Contemporary documents suggest that at peak population, perhaps another 15-20 buildings existed within this area.

Over the course of these excavations, only one study utilized the 120 gunflints found on site, dating through the 2009 season. Carvalhaes's (2011) analysis of this assemblage represents the sole systematic work done on these artifacts. No further analysis has been done on this type of artifacts recovered since 2009 (Carvalhaes, 2011), nor have any other reports appeared detailing gunflints at the fort, although excavations have continued each summer since 2009. Carvalhaes's study, while thorough and academic, is an honors thesis, and some conclusions ascribing flint sizes, nation of origin, and end use are tenuously based, as will be discussed.

Figure 6: Excavation Map of Fort St. Joseph
(Nassaney, 2007:8)

Fort St. Joseph, because of its location, was linked intimately to Fort Michilimackinac. These contemporaneous forts served different purposes, but were similarly supplied, so much so

that Fort Michilimackinac would serve as the distribution center for the trade and military goods sent into the interior of the French colony. Fort St. Joseph, as stated previously, existed in the capacity of a local commercial center. It existed to link the local indigenous population through trade and alliance to the French in Michilimackinac, and ultimately, New France. Carvalhaes (2011:38) concludes that, as a result, their gunflints would come from the same source. In this same analysis, and given the relatively small garrison of twenty soldiers at the fort, linking the gunflints by their size to the style of firearms they were intended to spark also proved possible.

Serving the French goals of commerce and alliance, trade guns (and their corresponding gunflints) would dominate this assemblage, and the French also provided a blacksmith to help repair native guns (Nassaney et al. 2007). With only a limited British presence there, from 1761-1763, when Pontiac wiped out its garrison of ten soldiers and imprisoned three other English who resided there, the fort would see only limited British trade or military goods. Given the logistic difficulties of transporting good to the fort from Fort Pitt, at the confluence of the Allegheny and Monongahela Rivers in modern-day Pittsburgh, or up the Ohio River from Fort de Chartres, the most likely place of resupply for the British would have been Fort Michilimackinac, which saw stockpiles of French-manufactured goods. In fact, the Commander of British forces in North America commented as late as 1770 that the “Pouteatamies [sic.] at S^t Joseph, a Licentious People who have done Mischief; but they always receive their Supplys from Canada” (Carter, 1931:279). Even when the British overtook this fortification, they continued to supply it, however briefly, from Michilimackinac. The indigenous and French populations surrounding the fort, however, sought cheaper, and better quality, by their perception, goods from French traders coming down from this same area. The French dominance of this fort, then, should find reflection in the gunflint assemblage.

Fort Ouiatenon

Archaeological excavation at Fort Ouiatenon began in 1968 and would continue for eleven years. The original goal was to locate the stockade and original blockhouse of the fort. Subsequent investigations have focused upon the indigenous villages located outside of the fort's walls. Excavations occurring between 1974 and 1979 yielded 612 gunflints. Dr. Vergil Noble examined these, classifying them by mode of manufacture and color. A dissertation by Judith Tordoff (1983) examined a smaller number of these as well, using Lyle Stone's classification system of the artifacts from Michilimackinac. No recent analysis has occurred on these gunflints, nor any published material on more recent excavations performed in the indigenous villages which surrounded the fort. No master map of excavation currently exists of Fort Ouiatenon.

Fort Ouiatenon, like Fort St. Joseph, rested within the Michilimackinac trade and supply network. Ouiatenon sat at an interesting geographical position between New France (Canada) and the Louisiana colony, with goods flowing both ways along the rivers and trade paths. The assemblages, then, remain fairly similar, although serving different purposes. Founded in 1717 by the French as a way to stymie British incursions into the areas south of the Great Lakes, this fort would see seventy-five years of occupation, but settlements similar to Fort St. Joseph. While a civilian trading and farming population would grow up at the fort, and indigenous populations would come to engage in trade, the French and British military presences would remain small. In 1748, the French planned for an estimated garrison of ten soldiers during times of peace, with twenty during war (Tordoff, 1983:49). With the British takeover of Ouiatenon in 1761, a garrison of fifteen would command the area, at least until Pontiac's war two years later, when the

fort would surrender. While the British would retake the fort, they would never regarrison it (Noble, 1991:67).

Fort Michilimackinac

Fort Michilimackinac existed as an extension of French control into the interior of New France from 1715 until 1760. The French located the fort, at least nominally, in a strategic location to control the Indian trade and in an attempt to stymie British advances and influences into their territories (Tordoff, 1983; 28). As only one in a chain of fortifications from Montreal to Quebec to the western reaches of New France, Michilimackinac served as a supply depot to smaller posts like Ouiatenon and St. Joseph, but perhaps more importantly as a fortified trading post. In the first decades of its existence, the fort may have held thirty-five soldiers and officers, but also their families, traders, craftsmen, missionaries, and those who traded with the natives, the coureurs-de-bois and voyageurs. By the mid-eighteenth century, as imperial wars grew larger, British colonial influence threatened, and colonial corners grew, the garrison at Michilimackinac numbered twenty soldiers in times of peace, 150 during times of war, but with ten families living within the fort year round and 200 voyageurs and traders intermittently inhabiting the fort (Tordoff, 1983:49; Nassaney, et.al., 2007:6).

The British took control of this fortification in 1760, after the French and Indian War, and would continue in their attempts at asserting their control over the former French colonists, their indigenous allies, and trade networks, until 1780, when they razed the fort and relocated on Mackinac Island (Stone, 1972:45). With similar number of traders at the fort, the British troops would increase over the duration of the British tenure. In 1763, General Gage would reorganize the troops in North America, sending two companies, approximately ten officers and forty-seven soldiers per company, to man Fort Michilimackinac (Alvord and Carter, 1916:551).

Michilimackinac's civilian population would only continue to increase. Of note, and impacting archaeological interpretations at this site, in the Articles of Capitulation which surrendered this fort to the British in 1763, the French civilians within still “owned most of the houses and land within the palisade” (Evans, 2013:227). British military and civilians cohabitated with French Canadian civilians daily during the British tenure of this fortification.

Figure 7: Master Excavation Map of Fort Michilimackinac (Courtesy of Mackinac State Historic Parks)

Continuous excavation of Fort Michilimackinac has occurred since 1959. In the most comprehensive of these studies, Lyle Stone (1974) recorded 2,536 gunflints recorded between 1959 and 1966. Of these, he classified 2,183 as wedge/spall gunflints, 248 as blades, and 5 as “blade-spalls” through an examination of color and technique of manufacture (Stone, 1974:247).

Later analysis by Hamilton and Emery sought to reclassify these artifacts through an analysis of the composition of the stone comprising the artifact itself. They noted, as well, that gunspalls, when weighed, totaled 25.8 pounds with French flakes at 3.7 pounds, further reinforcing the differential between these weights of gunspalls by seven (1988:27). Additional excavations have occurred at the Powder Magazine and along the Rue de la Babillarde a few years later, which have yielded additional gunflints, but Stone, obviously, did not include these numbers within his work and no cumulative work has been issued (Heldman and Minnerly, 1977; Heldman and Grange, 1981).

In the powder magazine excavation, for example, researchers discovered a small, broken keg which contained gunflints, providing a preserved context of the British-abandoned and subsequently burned structure. These gunflints remain as discovered, unanalyzed but available for observation at the fort. While heat altered the colors of the stones to a dull gray, reducing analysts ability to assign a color to the gunflints, Hamilton and Emery classify their basic form as English due to their lack of a rounded heel, yet rounded edges, and the presence of little to no retouching, or nibbling, along the edges. All appear to represent gunspalls, with no French flakes present. Lastly, they qualify these particular gunflints as most likely military fowler in size, although no measurements have been recorded directly (1988:173).

Within the context of the Rue de Babillarde, Heldman and Grange recorded evidence of both spall and blade gunflints. British and French gunspalls totaled ninety one, with French blades amounting to thirty-six. They further note a decrease in frequency of gunspalls in associated contexts over time, as the French blade appeared at Michilimackinac (Heldman and Grange, 1981:165). Within this excavation area, Heldman and Grange had access to early British occupation deposits, as well as with specific 1760s refuse pits in other areas of the

fortification that they could link to the British, helping to secure the context of some of these gunflints to a likely association with their use. Both spall and blades were discovered, in particular, behind “House F,” and likely linked to British occupation (1981:107, 299). With the adoption of military standards for size, the adoption of the French lock as standard equipment, and overall increased standardization of parts and equipment within the French military, this decrease would fit the overall trend.

Fort de Chartres

The French completed enough construction of the third incarnation of Fort de Chartres by 1756 to allow inhabitation by French troops. Taking advantage of the local resources, this stone fortification, built in the Vauban style, continued the French plans for trade, alliance, and empire in the way that Michilimackinac and the other forts had done, but Keene (1991:29) asserts that “French intentions in the midcontinent were more sophisticated and economic activity more diversified than previously thought”. Unlike French activities at Michilimackinac, which served essentially as a trading depot, Keene suggests that in the Illinois Country, French activities focused, instead, upon agricultural pursuits, as well as trade, for shipment down the Mississippi to New Orleans. As a result, the fort itself, and its inhabitants were composed differently than at other forts. While the 1752 census of the Illinois Country showed 151 soldiers, and three hundred soldiers later came to construct the fort (Keene, 1991:38, 20), only a few officers and forty soldiers inhabited the fort in 1765, when it was surrendered to the British (Alvord and Carter, 1916:106).

The British, on the other hand, needed large numbers of soldiers at this distant place in order to maintain the peace of the former French colony, but also to show strength in the presence of large number of indigenous peoples who lived near the fort. This is especially true

with the conclusion of Pontiac's War just the year prior. With one hundred men, Captain Stirling took control of the fort in October of 1765 (Alvord and Carter, 1916:105), and this number would fairly quickly swell to 171 proposed troops in 1767 and 227 in mid-1768 (Alvord and Carter, 1916:551; 1921:287). Under the British, only a few licensed traders were allowed to reside within or near the fort's walls, and other than families of the soldiers, no one else lived within the structure, contrary to what occurred regularly at Michilimackinac. French civilians, unlike at the other forts examined in this study, lived outside the fort's walls (Keene, 2013:233).

Figure 8: Excavation Map of Fort de Chartres (courtesy of Dr. David Keene) (Keene, 2002:82)

The current site of Fort de Chartres is approximately 6 acres in size (Keene, 1991: 95). Excavations began in the early 1970s, and subsequent investigations have focused, essentially,

on gaining information for historical reconstruction efforts. To date, no systematic analysis of the gunflints from the Fort de Chartres assemblage has been performed. Site reports for some of the excavation seasons yield scant evidence and have apparently only classified gunflints by color and ‘model’ (spall/blade). Keene’s research (2002) noted fifty-three gunflints from the various seasons of excavation at Fort de Chartres, and commented that only five of the fifty-three gunflints belonged to the blade category, with the rest fitting into the gunspall category. He also noted that he only considered materials found in French contexts, as that was the focus of his work. As part of this thesis, this author has obtained the gunflints from previous assemblages, and the heretofore unstudied Thurman (1980) excavation, in an attempt to provide such a systematic analysis.

Further complicating the collection from Fort de Chartres is the context and later documentation of the artifacts. In the 1974 excavation, for example, Brown noted the difficulty of assigning materials to context to the post-occupation disturbances within the fort. Most of the artifacts found during this first formal excavation came from general fill, and assigning cultural significance to particular strata proved tenuous as a result (Brown, 1976:31). The parade ground, a little less than two acres, when tested demonstrated no undamaged archaeological deposits. Keene noted that “It is unclear if this is due to the fact that the area may have been scraped in the nineteenth or early twentieth century or whether very little activity” took place within that area (Keene, 2002:146). In the subsequent year, Orser noted that particular features clearly demonstrated post-1772 [the date of the fort’s formal destruction by the British] intrusions in the subsoil and that most artifacts were relocated as secondary deposits. Still, Orser believed that two particular features, numbers 39 and 40, could be related to the British occupation of the fort due to associated artifacts and a possible documented blacksmith shop attributed to the British.

In these features, grey gunspall style gunflints were excavated (Orser, 1977:107-108, 128).

Orser further notes that, given the history of the fort, eight separate cultural horizons should exist, demonstrating the separate natural and cultural stages of its occupation (1977:139).

One difference between Fort de Chartres and a few of its contemporary companion sites lay in the fact that historical documents exist which gave detailed information about the interior structures of the fort, allowing archaeologists to attempt to provide some context for the artifacts found within those areas. Nine structures existed within the fort, some with deep cellars, but these “appear to have been cleaned out decades prior to systematic excavations. Testing in these cellars failed to reveal any intact archaeological deposits” (Keene, 2002:144). This allowed the excavations of the 1970s, which focused on recreation of the buildings, to examine areas such as the barracks buildings, powder magazine, and bake house.

Further complicating the archaeological history of Fort de Chartres is its geography. It sits astride the Mississippi River threatened with flooding since its inception, as it still does today. In fact, General Thomas Gage ordered the razing of Fort de Chartres in 1772, destroying it “in such a Manner...that he removed the stones which protected the Banks of the River and opened Drains to admit the Water, so that the Floods in the Fall will entirely wash away the Front of the Fort” (Gage to Hillsborough, 2 Sept., 1771 in Carter, 1931:332). Subsequent flooding, the stripping away of stones from the fort by locals, tree growth throughout, and farming of the land meant that by 1900, only the powder magazine, in a dilapidated state, remained of the fort.

Lastly, investigations concluded with two other attempts at excavating parts of Fort de Chartres, in 1979-1981 and 1985-1987. The first of these, under Melburn Thurman, sought to establish a more formal and systematic mapping and plan of the earlier excavations seasons, but

the vast majority of information and data collected from these seasons, including field notes, were destroyed in a house fire. All that exists of these seasons is a *very* preliminary report filed with the Illinois Department of Conservation which contains no analysis or description of materials and the seven boxes of artifacts housed in the Illinois State Museum collections, and which, prior to this thesis, had not received any further analysis. The 1985-1987 season, conducted by David Keene, sought to examine a number of areas, particularly the walls, prior to their reconstruction in 1989. In Keene's dissertation, a very brief examination of the gunflint assemblage of all of the excavation seasons was undertaken by simply classifying the fifty-three gunflints into blades or gunspalls. Keene does not mention any examination of the Thurman assemblage. Keene considered five as qualifying as blades, with one of those of British manufacture (Keene, 2002:156). No descriptions of shape, morphological characteristics, or any other diagnostic markers were discussed.

In this analysis of the gunflints of Fort de Chartres, all of the gunflints previously listed in site reports from the Brown, Orser, Thurman, and Keene excavations have been examined, measured, and recorded. Gunflints have also been scanned and uploaded online on kobotoolbox, with the address listed in this paper's conclusions. The Illinois State Museum has loaned twelve gunflints to the Fort de Chartres Museum. These gunflints have not been made available for examination in any way over the course of this thesis research and cannot be included in this study, regrettably. As a result, a total of thirty gunflints, of the original forty-three artifacts designated as gunflints, remained accessible for analysis for this study. Of those, five lithic artifacts were studied and deemed not to be gunflints, or appeared so damaged that a reasonable designation of artifact class [spall, blade/English or French] could not be assigned. One of the first items to note about this assemblage from Fort de Chartres lay in the relative lack of

gunflints recovered from excavations. While Michilimackinac's gunflint count numbered over 2,000, and Ouatennon's collection numbered over 640, even St. Joseph's tally reached 120. At Fort de Chartres, this tally only reached thirty-five [plus twelve unavailable for study]. These tallies might suggest a difference in availability of supply, or more likely, the smaller scales of excavation performed at this site as opposed to the other three.

CHAPTER IV: DATA AND ANALYSIS

These four fortifications have not had comparative archaeological investigative experiences. Only Fort Michilimackinac has seen extensive, continuous excavation at the one extreme, with Fort de Chartres undergoing only a few, sporadic seasons decades ago that examined only a comparatively small area of the site. As a result, sample sizes between these four assemblages vary dramatically and may have an impact upon the interpretation of gunflint data. On the other hand, British and French habitation of these locations have also varied, again with Michilimackinac at the longest and most thorough extreme, but this time with Fort Ouiatenon on the short end. This, too, needs to be factored into, or at least discussed, in any interpretation. What follows is a systematic exploration of the various seasons of archaeological investigation and degrees of that excavation on the four target sites. An inquiry into the morphological characteristics of the gunflints assemblages as well as the probable lithic characteristics is also presented in an attempt to ascertain likely supply and usage patterns. Finally, this section will examine other factors which may have impacted the supply or choice of particular gunflints at these interior fortifications such as sparking qualities, durability, political-economic influences, and symbolic choices.

Sites and Their Assemblages

Fort de Chartres

As previously stated, no systematic analysis of the gunflints from the Fort de Chartres assemblage has been performed to date. Keene's research (2002) only classified gunflints by color and 'model' (spall/blade). This study noted fifty-three gunflints from the various seasons of excavation at Fort de Chartres, and commented that only five of the fifty-three gunflints belonged to the blade classification, with the rest fitting into the gunspall classification. Keene

also noted that he only considered materials found in French contexts, as that was the focus of his work. Granted, Keene's focus was to examine all of the artifacts found in previous efforts, and to classify them, but this brief examination of the gunflint assemblage does not mention any descriptions of shape, morphological characteristics, or any other diagnostic markers. As part of this thesis, I have obtained the gunflints from previous assemblages, and the heretofore unstudied Thurman (1980) excavation, in an attempt to provide such a systematic analysis. By providing the metrics for the gunflints, a more apt investigation, and comparative study, can be accomplished.

In the present analysis, again, all of the gunflints previously listed in site reports excavations have been examined, measured, and recorded. A total of thirty gunflints, of the original forty-three artifacts designated as gunflints were utilized in this analysis. Five lithic artifacts were studied and deemed not to be gunflints, or were so damaged that this designation could not be assigned. The damage appeared to result from reuse, and significant chipping and gouges had resulted in the removal of any diagnostic characteristics. One of the first items to note about this gunflint assemblage of Fort de Chartres is the relative lack of gunflints recovered from excavations. While Michilimackinac's numbered over 2,000, Ouiatenon's collection numbered over 640, and even St. Joseph's tally reached 120, this fort tallied only thirty-five [plus twelve unavailable for study]. This relatively low number *may* result, in part, from there only having been four seasons of excavation on site, and those excavations' focus upon areas meant for historical reconstruction. Only a small percentage of Fort de Chartres has been excavated. It may also result from the scarcity of gunflints at the site in general, due to original supply issues or that the British military stripped the fort of everything useful before razing it.

Taxon	# Measured/# Listed	Length (mm)	Calculated Mean/Median	Width (mm)	Calculated Mean/Median
SAT1 (Blade-Beveled Edge and Back, Flat Face, Rounded Back Heel)	4/4	20.94-23.42 (only 2/4 measured)	22.18/22.18 mm	19.97-22.28 mm (4/4)	20.91/20.6 mm
SCT1 (Spall—From Noble)-French	20/24	18.8-36.93 mm	29.82/29.51 m	15.09-29.11 mm	22.64/22.36 mm
SCT1 (Spall)-British	7/7	25.08-36.2 mm	29.25/27.9 mm	20.6-33.76 mm	25.67/24.05 mm

Table 1: Fort de Chartres Gunflint Metrics

Taxon	# Measured/# Listed	Thickness (mm)	Calculated Mean	Weight (g)/Average
SAT1 (Blade-Beveled Edge and Back, Flat Face, Rounded Back Heel)	4/4	5.47-8.29 mm	6.51 mm	2.1-5.9g/3.93g
SCT1 (Spall—From Noble)-French	20/24	4.15-10.31 mm	7.65 mm	1.5-12.1g/5.87g
SCT1 (Spall—From Noble)-British	7/7	6.14-10.62 mm	8.77 mm	3.1-11g/6.94g

Table 2: Fort de Chartres Gunflint Metrics (*All measurements and calculations mine*)

Figure 9: Fort de Chartres British Gunspalls (1 cm scale)

Figure 10: Fort de Chartres French Gunspalls (1 cm scale)

With five blades recovered, and given the chronology of Fort de Chartres, only four were examined and recorded as of French manufacture. Keene also classified one of these blades resulting from British manufacture (2002:156), but given that the British did not begin crafting blades until late into the American Revolution, it was either deposited there long after the British had abandoned the fort, or is a later intrusion, possibly from one of the many shooting reenactments which occur at the fort regularly. Of the four remaining French blades, two were

fragments, with lengths (edge to heel) recorded for two. Still, as representatives, they match similar styles found at the other forts. With the fort's completion not happening until almost 15 years after the standardized measurements for military gunflints found in Emy's 1740 contract (Hamilton and Emery, 1988:14) showing a heel to edge length of 31.6-33.8 mm, a side to side width of 33.8-36.0 mm, and a thickness ranging from 9.0-11.8 mm, these blades clearly do not fit within those specifications. If we use Hamilton and Emery's ranges for other types of firearms, all four fall within the trade gun range. Hamilton and Emery consider trade guns as muskets meant for exchange or sale with the local indigenous population, smaller than military muskets or civilian fowlers in terms of calibers. Trade guns typically had blade flints from 20-28mm in side to side width (Hamilton and Emery, 1988:21). The four blades in this collection fit within 19.97-22.28 mm. Even with Emy's 1740 contract, which specified a standardized size, modern researchers have suggested that these standards simply were not met. David Williams and David Harding, for example, are adamant that the British East India Company and British flint manufactures found it almost impossible to standardize flint sizes to any significant degree (personal communication, 2/1/2017; D.F. Harding, 1997). Given the role of Fort de Chartres not only as a military site, but as a major trading station which also attempted to solidify alliance with a substantial number of surrounding indigenous nations, the role of trade goods, like firearms and accoutrements, should not be undervalued.

Figure 11: Fort de Chartres French Blades (1 cm scale)

Using the style of manufacture, with characteristics such as the “D-form” of the heel, large flake scars on the heel, or significant nibbling along the edges, the author separated the thirty-one gunspalls into a likely nation of affiliation based on these characteristics (Hamilton and Emery, 1988:13, 159; Kenmotsu 1990:98; Smith, 1961:422). Twenty-four of the gunspalls most likely represent artifacts of French manufacture and seven of British. The French gunspalls ranged from 18.8 to 36.93 mm in length, with a mean of 29.81 and a median length of 29.51 mm. Their width ranged from 15.09-29.11 mm, with a mean of 22.64 and a median width of 22.46 mm. The British gunspalls measured larger in both length and width, with the heel to edge distance ranging from 25.08 to 36.2 mm, and a 29.25 mean, 27.9 mm median. Widths, similarly measured more than the French gunspalls. The width of British gunspalls ranged from 20.6 to 33.76 mm, with a mean of 25.67, and a median side to side measurement of 24.05 mm. Essentially, then, British gunspalls at this site demonstrated a likelihood to be both larger and wider, statistically, than the French gunspalls. Granted, the Fort de Chartres sample, at this time, remains fairly small, with less than forty-five total gunflints and only seven British gunflints, but even so, these size differences, when compared to those of the other three fortifications, is of

note. Granted, with a larger sample/more excavation, it would be interesting to see if this trend continued, and supported the possibility of a different potential source maker or supplier for these particular gunspalls at Fort de Chartres, most likely due to the differences in traders responsible for supplying this interior fort.

Fort St. Joseph

The scientific excavation of Fort St. Joseph began in 1998 and archaeological collections have continued there essentially every year since. Over the course of these excavations, only one study utilized the 120 gunflints found on site, dating through the 2009 season. Carvalhoes' 2011 analysis of this assemblage represents the sole systematic work done on these artifacts. No further analysis has been done on this type of artifacts recovered since 2009 (Carvalhoes, 2011), nor have any other reports appeared delineating gunflints at the fort since, although excavations have continued each summer since 2009.

With the 120 gunflints excavated and analyzed, Carvalhoes classifies them as mostly gunspalls, totaling 109, while eleven represented blade technology and one locally made, representing an unreported, different style. These spalls matched the variety and colors of spalls thought to reflect the French supplies found at Fort Michilimackinac, and Carvalhoes designates ninety-two as French, noting that their "colors range from a light olive brown (2.5Y5/3) to dark grayish brown (2.5Y4/2)." Carvalhoes notes the homogeneity of these artifacts in terms of color and composite stone, as well as intrusions and shapes, with "carefully worked heels into a rounded "D" shape" (Carvalhoes, 2011:26). The D-shape and uniformity of stone, due to the mining of specific quarries, rather than the haphazard surface collection more typical of British spalls, indeed is representative of the stereotypical French spall. The French craft industry, while

still a craft industry, demonstrated a much more standardized, systematic, and organized approach to the fashioning of gunflints than did the British.

Figure 12: Fort St. Joseph French Gunspalls
(Carvalhaes, 2011:27)

Deviating from the concept of manufacturing techniques/shape, where the English style of gunspall has less work, and a more squarish heel, Carvalhaes instead designates the gunflints thought to represent English styles, based essentially on the color, which ranged “from gray to black with many mottled ones and look as though they come from various sources of flint.” While the English did, in fact, utilize much more variety in flint sources, the difficulty with this type of separation, arises from the fact that both nations utilized similar stones, and neither had colors unique to one particular nation. Both France and Britain have outcroppings of black, grey, and other colored stones. As Durst stated, merely visually-definitive assignation of black style spalls to manufacturing in Britain or France remains impossible at this time. “The spall-type gunflints manufactured in England did not utilize the Brandon source for flint and are thus not easily distinguishable from their French counterparts. Any assignment to a geological source of spall-type gunflints remains purely speculative at this point” (email to author, April 13, 2016). Careful observation of the heels of gunspalls in particular must be made to differentiate

between those *likely* to originate in France or England. Based on the technique of manufacture, and the shape of the heel, only ten gunflints (all spalls) most likely represent gunflints of English origin. Given the English style of nodule collection, and similar representatives in the Fort Michilimackinac collection, the heterogeneous nature of this stone is not atypical (Carvalhaes, 2011:27). Additionally, in terms of later supply, the British would continue to send supplies, like gunflints, to this fort from Michilimackinac, and not down the Ohio from Fort Pitt. Thus, the collection would continue to retain gunflints more representative of this French style of gunspall, as the British utilized stores remaining and bought from French traders residing within Fort Michilimackinac. Potentially, the few British soldiers garrisoned within this fort could have fashioned their own gunflints from local supplies or French stores, but little evidence exists to suggest these “chip” or “do it yourself” style of gunflints existed within these assemblages.

With the bulk of supply coming from upper Michigan, and only a very limited British presence, this type of assemblage seems illustrative and deviates little from larger examples like Michilimackinac. On a related note, the assemblage from St. Joseph denotes differences in the raw materials used in the designated French spalls and blades. “The source of raw material for these French spalls has yet to be found. It is not the same as what French blade gunflints were made” (Carvalhaes, 2011:43). Carvalhaes bases this conclusion upon the comparison to the Michilimackinac collection as well as other sites such as the Trudeau site in Louisiana, and an Osage site in Missouri. Assuming that the initial designation of Michilimackinac spalls as “French” remains accurate; Carvalhaes concludes that similar spalls at St. Joseph also represent French manufacture.

Figure 13: Fort St. Joseph British Gunspalls
(Carvalhaes, 2011:28)

Only eleven of the 120 gunflints fit the category of blade gunflints. Based, again, on comparison to the Michilimackinac collection, Carvalhaes reasserts that French blades find their composition from “a yellowish glossy translucent flint,” and when measured, have widths greater to their lengths. The British did not begin blade manufacturing until around the time of the American Revolution, and most likely did not export them into the American colonies until very late in that conflict, if not until after. As a result, no British-made blades should exist within this assemblage, as it was evacuated a decade before this time. Similarly, none of the eleven blades represent the stereotypical black “glossless” flint associated with Brandon-made British blades (Carvalhaes, 2011:26). Simply, the lack of British blade, or flake, style gunflints does not come as a surprise. They should not be there unless deposited at a later time. Additionally, with no other connections of British blade manufacturing sources beyond Brandon, and its fairly uniform flint, conclusive links to other types of flint simply cannot be made at this time.

When examining the physical dimensions of the artifacts, the St. Joseph assemblage continues to represent both British and French patterns for gunflints. Utilizing manufacturing style and color for separation, the gunflints represent similar samples found at Michilimackinac,

but when looking at other characteristics, some differences arise. Very few (six) of the blade gunflints met the minimum size for French military muskets (34 mm) as delineated by Emy's study of a contract of 1740 military muskets (1975), with the remaining representing those muskets intended for the indigenous market or civilian guns. This is assuming that the contract referred to blade-style gunflints, which is not discussed within the original contract. Subsequent writers (Hamilton and Emery, 1988) and Carvalhaes appear to apply the contract to *all* manner of gunflints, whether blade or spall. This, however, seems unlikely, especially as the French had already begun the switch over to blade style gunflints by the late 17th century, and had standardized their use with the invention of the French lock at least twenty years before Emy's classification system, particularly within their military.

Carvalhaes lists the mean width for blade gunflints at 26.4 mm, with a median of 28 mm. Mean length falls at 20.6 mm with a median of 21.1 mm. Thickness, or height, of the blades has a median of 7.5 mm with a mean of 7.9 mm (Carvalhaes, 2011:30). Gunspalls measured greater in all categories, with a median width of 27.3 mm and a mean width of 27.2 mm. Gunspall length had a median length of 23.1 mm and a mean length of 23.0. Carvalhaes does not list a mean and median for the thickness of gunspalls, but instead lists a range from 5.0 mm to 8.9 mm with "few outliers" (2011:29). No distinction for the measurements of those gunspalls designated "French" or "English" forms, based on the methods of manufacturing, is listed in the contained tables, making it difficult to ascertain any difference in widths, thicknesses, or lengths of French or British-designated gunspalls.

With these measurements taken, Carvalhaes then utilizes Emy's study of a contract of 1740 military muskets (1975) to organize all of the gunflints into categories based on their average size. With this, Carvalhaes then classifies 56% of the gunflints as trade guns, based on

the average size, and 38% as fowlers and carbines. None of the flints designated as English flints would fit a military musket based on their size (Carvalhaes, 2011:41). Granted, almost any ‘size’ flint would fit a military musket, but over-large flints, or too small flints have the potential to affect the firing and sparking efficiency of the lock. Further mimicking established norms of gunspall differences, especially when compared to those at Fort Michilimackinac, the gunspalls classified as French measured larger and of a more standardized proportion than did the English gunspalls. The problem with this classification, however, again rests upon the fact that Emy’s 1740 study does not offer any distinction as to whether this standard measurement referred to gunspalls or blades. As such, the 1740 contract most likely gives the best-case measurements for blade style gunflints in France, and Carvalhaes’ attempt to apply it to gunspalls may be dubious at best. While size, in terms of width and length, may matter in particular styles of firearms, yielding more or fewer sparks, the evidence isn’t in the literature to suggest that blades and spalls could be uniformly exchanged in this manner, or that the British and French soldiers, civilians, and traders were all that aware of the likely impact of size differences. In fact, gunspalls, on the whole, tend to have dimensions both longer and wider than blades.

Figure 14: Fort St. Joseph French Gunspalls Showing Reuse Wear. (Gunspall on left shows reuse with fire steel. Carvalhaes, 2011:35)

With many used gunflints finding a new life with fire-steels throughout the colonial world, the St. Joseph gunflints proved no exception to this. The Fort St. Joseph gunflints were also subjected to examination for signs of wear and reuse. The majority of the artifacts demonstrated use wear, with many showing the heavy wear resulting from striking fire-steels. Use wear also exists on multiple edges of the gunflint, denoting the tendency to retouch and turn gunflints in the flintlock cock in order to provide continued sparking capability. Carvalhaes describes thirty-eight gunflints possessing retouched edges, with twelve having two worked edges. Twenty-two of these evidenced three retouched edges, and three had all four reworked. Based on an observation of “diagnostic bi-facial step-flaking and concave fracturing,” and a much heavier degree of minute flake removal, these gunflints show that they most likely had been used with fire-steels (Carvalhaes, 2011:34, 19). Sixty percent of the English gunspalls demonstrated three or four working edges, evidenced by this bifacial step-flaking. Carvalhaes bases the discussion and criteria on reworked gunflints vs. those reused as fire steels largely upon criteria set up by Kenmotsu (1990). Given the logistics of supplying the fort during the brief

British tenure, and life upon the frontier, individuals would constantly see the need to rework their gunflints to prolong their usefulness. In terms of the location of these gunflints, “with the exception of two refuse pits, gunflints are relatively evenly scattered across the site” (Carvalhaes, 2011:37). It is difficult, then, to assign particular gunflints, whether designated English or French, to specific activity areas, or discard areas, at Fort St. Joseph.

Fort Ouiatenon

The various excavations that occurred during the 1970s yielded 612 gunflints. Dr. Vergil Noble examined these, classifying them by mode of manufacture and color. A dissertation by Judith Tordoff (1983) examined the same collection, but reported a smaller number of artifacts. Tordoff used Lyle Stone’s classification system of the gunflints from Michilimackinac. No recent analysis has occurred on these gunflints, nor any published material on more recent excavations performed in the indigenous villages which surrounded the fort. Discrepancies exist between Noble’s calculations and classifications and Tordoff’s, with no explanation given. These can be observed in the following two tables, which outline the numbers of gunflints reported vs. measured, and the size differences. Fort Ouiatenon, like Fort St. Joseph, rested within the Michilimackinac trade and supply network. The artifactual record, then, remains fairly representative of New France, demonstrating this site’s role as a fur trade station and its role in maintaining alliances with the indigenous populations.

The gunflints distribution at Ouiatenon centered around three principle locations, the forging area, a basement (possibly to a row house), and a subterranean storehouse. The storehouse, in particular, yielded forty-three unused gunflints from a cache pit. In the vast majority of these locations, Tordoff associates the gunflints with other artifacts designated

French, or to a French designed/utilized activity period (Tordoff, 1983:167). British assignments of gunflints remain dubious for Tordoff, and only are suggested as possibilities when connections to particular area are in doubt, or can't conclusively be determined. A paucity in the availability of written documents, as they relate to the supply of Fort Ouiatenon, hampers further clear discussion of just which goods were brought into this trading post/fortification.

Of the slightly over six hundred gunflints excavated from Ouiatenon, Noble and Tordoff classified 498 of them as spall type gunflints and 114 blade type gunflints using Stone's classification system from Fort Michilimackinac. According to Noble, "only blade gunflints (those struck from a prepared core) and spall gunflints (those exhibiting a bulb of percussion on the superior surface) are recognized . . . [and] Measurements, again following Tordoff's precedent, are recorded only for complete specimens" (Noble, 1983:196). Using Stone's system, Tordoff and Noble modify the classifications to incorporate a Series/Type description and a color designation. These categories include descriptions of the extent of beveling of the edges and back, and the extent of the face or back flake, but only for the blade type of gunflint. Spall gunflints receive little to no description beyond "wedge shaped," and color designations. See the following chart for a breakdown of the measurements (no mean or median given by Noble or Tordoff).

Noble's Tabulations

Taxon	# Measured/ # Listed	Length (mm)	Width (mm)	Thickness (mm)
SAT1 (Blade- Beveled Edge and Back, Flat Face, Rounded Back Heel)	11/114 (but only lists 21)	15.8-25.2	20.7-32.5	4.8-8.7
SAT2 (Blade- Beveled Edge, Flat Face, Rounded Back Heel, No Back Flake)	20/41	14.2-32.1	18.3-35.8	4.2-11.2
SAT3 (Blade- Beveled Edge and Back, No Face Flake, Triangular in Cross Section)	10/17	15.7-26.7	24.0-31.5	4.6-8.9
SAT4 (Blade- Long Flat Face, Rounded Back)	7/7	19.0-32.7	23.2-40.8	4.3-7.7
SCT1 (Spall)	123/498	17.0-32.7	19.9-38.7	4.0-12.7

Table 3: Fort Ouiatenon Gunflint Metrics
(Nobel, 1983:206)

Tordoff's Measurements

Taxon	# Measured /# Listed	Length (mm)	Mean/ Median	Width (mm)	Mean/ Median	Thickness (mm)	Mean/ Median
SAT1 (Blade-Beveled Edge and Back, Flat Face, Rounded Back Heel)	5/6	20.5-27	23.5/23.7	24.0-32.4	27.75/28.2	5.25-8.7	7.01/6.98
SAT2 (Blade-Beveled Edge, Flat Face, Rounded Back Heel, No Back Flake)	9/18	16.9-29.0	23.63/23.1	22.4-33.9	26.89/26.4	4.4-11.8	6.13/5.2
SAT3 (Blade-Beveled Edge and Back, No Face Flake, Triangular in Cross Section)	5/86	17.3-22.3	20.46/21.1	19.3-27.7	25.16/25.6	4.3-8.1	6.62/6.7
SAT4 (Blade-Long Flat Face, Rounded Back)	0/2	-	-	-	-	-	-
SCT1 (Spall)	111/293	16.7-33.8	23.70/23.3	18.9-39.4	27.73/27.6	3.4-10.7	6.86/6.8

Table 4: Fort Ouiatenon Gunflint Metrics
(Tordoff, 1983:311-319) [Means and Medians, my calculations]

Tordoff's conclusions of national manufacture for these gunflints rest on the idea that "many of the flints sent to Ouiatenon came through Michilimackinac as part of major supply

shipments,” thus demonstrating that the assemblages should reflect one another (Tordoff, 1983:319). This certainly seems likely for the French time at the site, and nothing in the British documents suggest otherwise. This is especially true for the difficulty of the British to supply the inhabitants from Fort Pitt, once again, and the reliance on either local French traders or those sent down from Michigan as more likely suppliers. Spall gunflints at Fort Ouiatenon, as at Fort Michilimackinac, were found in much greater frequency than blade gunflints. The ratio of blade to spall flints at Ouiatenon is 1:6.98; at Michilimackinac it is 1:6.25 (Stone 1974b:263). As stated previously in the discussion of Fort St. Joseph, given that spall gunflints saw use for a number of decades before blade gunflints became the standard for France, the ratio is consistent, as spall use was prevalent much longer than blade. Blades of British manufacture, like at Fort St. Joseph, post-date the British occupation of this fortification.

Neither Noble nor Tordoff attempted to assign a national affiliation for the manufacturing style of these gunflints. While categories are created, based on characteristics of manufacture, all gunspalls appear equal to them, with no allocation of national creation based upon these characteristics, like rounded backs, D-forms, or an absence of large flake scars to demonstrate potential British or French manufacture. Color categories have been assigned to both blades and spalls, classifying them with these broad-sweeping categories. Blades, for example come in four basic colors: honey, tan, gray, and black. Upon tabulation of these assigned designations, gunspalls essentially fall into one of two categories, with roughly half “gray-black” and the other half “honey-tan.” A small number are listed as “rosey” or “tan-grey” (Noble, 1983:196-206). No mention of translucence, finish, inclusions, or the like add to the descriptions of these gunflints. Given the supply chain for both Britain and France, these colors seems likely, and fairly typical, as those of “French” designation, based on the general colors typically assigned

them at places like Michilimackinac and in other contemporary assemblages. If national affinity is to be analyzed and ascribed, these flints need reexamination, colors need refining through utilization with the Munsell chart, and the particular shapes and degrees of retouching of the gunspalls need analysis. Only then, perhaps, could one separate British from French gunspalls.

In an attempt to ascertain the particular use of these gunflints, Tordoff uses Emy's study of the 1740 French military contract and Hamilton and Emery's 1988 discussion of Fort Michilimackinac gunflints to compare the average lengths and widths of the French blade gunflints. Tordoff, unlike Carvalhaes at St. Joseph, applies this examination solely to blades. Muskets blades generally measured over 34 mm from side to side (length). Fowlers ranged from 28-34 mm. Trade guns averaged 20-28 mm from side to side (Hamilton and Emery, 1988:21). At Ouatatonon, blades came in the following average sizes:

Classification Type	Length	Width	Thickness	Color
Series A: Blade Type 1: Beveled Edge and Back, Flat Face, Rounded Back Heel	23.5 mm	27.8 mm	7.0 mm	Honey, Tan, Gray
Series A: Blade Type 2: Beveled Edge, Flat Face, Rounded Back Heel, No Back Flake	23.6 mm	26.9 mm	6.13 mm	Honey, Tan, Gray, Black
Series A: Blade Type 3: Beveled Edge and Back, No Face Flake, Triangular in Cross Section	20.5 mm	25.2 mm	6.6 mm	Honey, Tan, Gray
Series A: Blade Type 4: Long Flat Face, Rounded Back	23.8 mm	27.9 mm	6.3 mm	Honey

Table 5: Fort Ouatatonon Gunflint Averages (Tordoff, 1983:320).

Based on these averages of the blades, essentially all of these gunflints fell into the trade gun category of firearms. Given Ouiatenon's primary role in maintaining native alliances and trade, this is hardly surprising. Tordoff also examines the amount of musket balls and gun parts found at Ouiatenon, classifying ninety-seven percent of the balls as fitting into the trade gun category, with less than two percent of the size necessary for French military muskets. Less than one percent would fit the British Brown Bess musket. As a result, given the location and function of Ouiatenon, it would appear that its proximity to French Michilimackinac, the difficulty of British resupply via the Ohio river, and its purpose as a trading post with local indigenous populations, dramatically affected the quantity and types of blade gunflints found there (Tordoff, 1983:321).

Some Ouiatenon gunflints also saw reuse, primarily with fire steels or as scrapers. Tordoff's examination of these artifacts showed evidence "jagged side edges" on fifty-seven of the gunspalls, with many of these evincing significant uses. (Tordoff, 1983:319) No further description exists in this catalog of the extent and type of use wear, whether retouched, step-flake, or fractured, or if the conclusions are based solely on visual observation rather than through microscopic analysis. Again, given the location and function of Ouiatenon, reuse of gunflints fits into the general frontier trade and residence patterns.

Fort Michilimackinac

Given the long history of excavation at Fort Michilimackinac, and the fact that the vast majority of the site has seen investigation, a substantial amount of gunflints have been examined, albeit not within the past twenty-plus years. The results of Stone (1972) and Hamilton and Emery (1988) have set the standard for most North American gunflint comparisons and discussion. Recent excavations at Fort Michilimackinac have yet to fully document their gunflints and discuss these results in comparison to prior research at the fort. Perhaps the best

study of Michilimackinac's gunflints comes from Stone's 1972 breakdown of the Michilimackinac artifact assemblage. Stone classified the 2,536 gunflints based on the forms, or techniques of manufacturing, identifying them as French and Dutch, rather than Blade/Flake, Gunspall/Wedge, or Chip, as is the case now. Blades were further divided based on shape, and spalls on flint color (Stone, 1972:46). Measurements were taken on unused gunflints, with averages given.

Classification Series, Type	Number	Length	Width	Thickness	Color Designation
Series A: Blade Type 1: Beveled edge and back; flat face; rounded back heel	50	18.3-26.1; 22.85 average	<i>None given</i>	3.9-8.8	Blond to light grey; “Beeswax”
Series A: Blade Type 2: Beveled edge; flat face; rounded back heel; no back flake	94	16.4-31.8; 23.54 average	<i>None given</i>	3.9-11.8	<i>None given</i>
Series A: Blade Type 3: Beveled edge and back; no face flake; triangular in cross section	66	18.0-27.1; 21.95 average	<i>None given</i>	5.0-11.1	<i>None given</i>
Series A: Blade Type 4: Long, flat face; rounded back	3	23.75 average	<i>None given</i>	6.2-6.4	<i>None given</i>
Series B: Blade-Spall Gunflints	4	23.45 average	<i>None given</i>	6.8-9.1	<i>None given</i>
Series C: Spall Gunflints Type 1: Wedge Shaped Variety A	2032	15.9-38.3 25.11 average	<i>None given</i>	4.0-10.4	Grey to Brown (94.8%)
Series C: Spall Gunflints Type 1: Wedge Shaped Variety B	139	21.2-32.5; 27.68 average	<i>None given</i>	5.0-11.9	Dark Grey to Black (5.2%)
Series C: Spall Gunflints Type 1: Wedge Shaped Variety C	4	22.6 average	<i>None given</i>	5.5-8.3	Brownish Red

Table 6: Fort Michilimackinac Gunflint Metrics
(Stone, 1974:247-259)

Based upon Michilimackinac’s founding and initial settlement in 1715 until its razing in 1780, the presence and absence of particular styles of gunflints fits with the archaeological

record. With its establishment by the French, gunspall technology had already supplanted chip gunflints. Furthermore, with the presence of civilian traders within Michilimackinac, and the relative inexpensive nature of gunflints, little need for making one's own gunflints existed. As French blades began to replace gunspalls in the 1730s and 1740s, the assemblage would reflect this technological shift. Similarly, although the British had placed orders for its new blade-style gunflints, mimicking the French ones, by the late American Revolution, none appeared at this site by the time of its abandonment and subsequent move across the strait (Hamilton and Emery, 1988:10; Stone, 1972:49).

Upon analysis, the majority of Fort Michilimackinac gunflints represent gunspalls, despite the French blades existing essentially throughout its existence. Blades only represented 13.7% of the total assemblage, and did not appear in features associated with dates prior to 1730-1740. Furthermore, Stone notes that the frequency of spalls actually increased in contexts associated with 1730-1735, as well as British features, which regularly contained spall gunflints (Stone, 1972: 46, 261, 263). Potentially, France's involvement in the 1733-1738 continental War of Polish Succession and ensuing War of Austrian Succession may have impacted their ability to manufacture and transport supplies of gunflints to this North American interior fort.

In terms of physical characteristics, Stone's analysis breaks spalls and flints down by their metrics even further. Black colored spalls consistently measured approximately 2.5 mm longer and 1.43 mm wider and generally lacked the rounded heel founded in the light grey to brown gunspalls. Black gunspalls appeared to have less reworking along their sides as well as a more square appearance (Stone, 1972:47). This style of manufacture, generally attributed to the British, would fit the "variety" B of wedge/spall gunflints, and make the British style of gunflint attribute slightly less than 5.5% of the total gunflint assemblage.

In further regard to the sizes of these various gunflints, Hamilton and Emery compared the sizes to known measurements to look for the intended weapon-use for these gunflints. Upon assessing one particular box of French gunspalls, they concluded that “Flints larger than 34 mm are definitely military, but the probabilities are that many flints in the upper ranges of the 34 to 28mm size could have served equally well in the French military locks of the period, and some of those slightly smaller than 28mm could have been used in fowlers” (Hamilton and Emery, 1988:20). As a trading post and military outpost, Fort Michilimackinac’s stores needed to serve a variety of weapons, from muskets (smoothbore military long arms) to fowlers (civilian smoothbores, with smaller locks), carbines, and tradeguns. Thus, tradeguns flints ranged from 20-28 mm in width (side to side), and fowlers/carbines from 28 to 34 mm (Hamilton and Emery, 1988:21). While Hamilton and Emery cite Emy’s 1740 French military contract, for specifications of gunflints, again, it is not known if this referred to blades or gunspalls. Still, they utilize these measurements for all, even though spalls typically measured larger in length and blades wider. Similarly, user preference, whether on the individual level or even based upon French vs. British, needs further analysis. Soldiers in the field and individual gunflint craftsmen often neglected these standards, especially during times of conflict, for the expediency of a usable, saleable, gunflint. A larger discussion of performance, or perceived performance, within the context of the 17th and 18th centuries, especially using the primary sources of that period, would shed light further light upon these topics.

The question of blade vs. spall preference will be addressed in more detail later, yet the presence of both styles at Michilimackinac, even with such a disproportionate ratio, deserves an initial discussion. With both gunspalls and blades present at Fort Michilimackinac, Stone examined whether this had as much to do with availability over time or, instead, preference.

With spalls larger, but less consistent in shape and size, and despite lacking standardization, they still saw use well into the 1750s. The introduction of blades at Michilimackinac does not appear to have come until about 1735, and blades were both wider in size and much more standard in size and craftsmanship. Stone questioned whether those at the fort continued to use gunspalls from preference. A related inquiry focused upon whether blade use denoted the likelihood of a particular style of firearm as a potential source of explanation for this particular archaeological record (1974:255, 47). Conclusive answers are not given for either question.

Hamilton and Emery propose the preference argument, stating [without historical sources] that “It already had been established that the British army used French flake gunflints when they could get them, and, possibly, French spall as well,” thus contributing to the confusion of designating end use of these French gunflints (1988:2). Comparing Michilimackinac to several other sites of the Revolutionary era (not pre-French and Indian War/French and Indian War, as might be more appropriate given Michilimackinac’s history), the authors contend that British troops both used and sought out French blade/flake gunflints when possible. “It is reasonable to assume that the British did so because they thought that the French flakes were superior to their own spalls in field performance” (Hamilton and Emery, 1988:17). With the adoption of the Land Pattern of the Brown Bess in 1730, perhaps the British Board of Ordnance believed that a flat upper and lower face would allow a tighter grip for the vise, producing a greater spark (Bailey, 1972:13). With the rounded upper face of gunspalls, the “hump” which gunflint production creates, causes the stability of the gunflint in the vise to be less certain. By that same token, then, one would expect a massive shift in the artifactual assemblage of the French to reflect a similar preference in blades over spalls, and a substantial reduction of spalls post-1740, but this is not the case. No systematic documentation of gunflint

reuse at Michilimackinac was noted by Stone or Hamilton and Emery. Perhaps the British used French flakes over British gunspalls simply out of expediency, because they were accessible.

Comparative Metrics

The Fort de Chartres assemblage represents only a small sample when compared to the collections of the other forts, yet somewhat uniquely, British gunspalls make up 29% percent of the total gunspall artifacts there, and 20% of the total gunflint category. At St. Joseph, of 109 gunspalls, British gunspalls represent 15.6% of these artifacts, or 14.17% of all gunflints. Fort Michilimackinac, on the other hand, with its 2,032 gunspalls only demonstrates a 6.84% British gunflint presence, or 5.45% of all gunflints excavated from the site (see Tables below). This representation may reflect the issues of supply at these various sites, as well as duration of residence of inhabitants, as the British at Fort de Chartres, for example, only manned this fort officially for seven years, and had to supply it by a long, arduous journey down the Ohio River. French goods travelling up the Mississippi to the same fort could take a month as well. Fort Michilimackinac, as the supplier of Ouiatenon and St. Joseph, on the other hand, may have purchased French stores or acquired French stockpiles of gunflints upon the surrender of that fort and continued to buy from the French traders.

Figure 15: Gunspall Representation within Entire Assemblages

Figure 16: British Gunspall Representation within Entire Assemblages

(Note: The reports on Fort Ouiatenon's assemblage did not distinguish between French and British gunspalls, so no differentiation between these could be used for this graph.)

Figure 17: Gunspalls and Total Gunspall Assemblages at all Four Sites

Gunspalls clearly represented the majority of gunflints found from the four fortifications represented within this study. Only Fort de Chartres's assemblage numbered less than eighty-seven percent gunspalls. Perhaps only due to its small sample size, it numbered less than seventy-five percent. This difference may, of course, also reflect the difference in time frames and lengths of British occupation or conceivably a manifestation of potential differences in logistical issues. Further examination of key ordnance documents might reveal this answer. Similarly, gunspalls that demonstrate characteristics likely to denote British manufacturing show a much higher percentage at Fort de Chartres than at other the other forts, potentially, again, related to temporal or logistical contexts. In the absence of any differentiation between British and French made in the Ouiatenon assemblage, a more thorough examination would allow more conclusive comparisons, and their inclusion in future discussions. Similarly, the accessibility of specific measurements of the different types of gunflints, spalls and blades, French and British,

through open access documents or even through documentary sources would allow specific comparisons to continue as well as to help answer other research questions. For example, the British gunflints at Fort de Chartres, although a small sample at this point, measured both larger in length and wider across, statistically, than the French gunspalls. Detailed relative data from other sites could allow the potential of tracing supplies across logistical routes, the noting of variables across sites, or other possible research questions. At this point, however, the information does not exist.

CHAPTER V: GUNFLINT PREFERENCE

Apparent “Preference” for Gunflints

Little investigation has been completed regarding any potential preference patterns of European, or even indigenous, gunflints by the various nations involved in the Illinois Country over the 17th and 18th century. As the variety of options expanded, the possibility of differences in sparking capability of one style of gunflint, or one type of stone itself, might find itself reflected in the archaeological or historical record. Historical sources could, potentially, denote these preferences or sparking results. Archaeologically, if a pattern of use wear from firing can be determined, linked to a model of firearm, for example, Charleville or Brown Bess, and specific styles of gunflints, like gunspalls or blades, a further link could be made to the nation of manufacture for the gunflint itself. Other than Hamilton and Emory (1988), only Kenmotsu (1990) and Quinn (2010) have performed experimental research to investigate the possibility of uniform use wear patterns which might help to eventually aid in gunflint identification.

Both Kenmotsu and Quinn provided a general outline of wear usage in their results. Neither of these studies, however sufficiently addressed the issues of raw materials and production techniques in the examination (Quinn, 2004:66). Quinn, for example, did illustrate evidence of crushing, polishing, and blunting upon gunflints fired, but the gunflints used in the test were modern recreations, and the firearms used a modern, but homemade, replica (2010:251). Granted, period gunflints and flintlocks are potentially too valuable and fragile for a study such as this, but comparatively, both studies leave open the possibility that gunflints manufactured by hand, utilizing tools made of modern materials, employing flintlocks from that period, rather than modern reproductions, with modern metal compositions, might have different sparking results and different wear patterns.

Still, the potential is there for use-wear analysis to demonstrate different nation's habits and traditions of utilizing particular styles of gunflints or resultant effects upon particular types of lithic material. As will be discussed later in this chapter, especially in the later eighteenth century, little uniformity seemed to exist among the published manuals regarding a preferred method of fixing flints, and at times, contradictory information was presented. Microscopic analysis, while currently "unreliable," could help to show different uses in "varying regional and cultural contexts" (Quinn, 2010:250).

Austin (2011) notes other factors that might, as well, have an impact upon use wear evidence of gunflints. Soldiers and civilians upon the frontier would routinely utilize several methods to extend the lives of their gunflints, especially if in a place, like the frontier, where supply might be haphazard, and sparks might mean the difference between life and death. Retouching gunflints occurred regularly, but so also did the rotating of flints in the cock to get a different angle, and simply flipping the flint over as a means to lengthen the life of a gunflint (Austin, 2011:93).

While use-wear analysis could, indeed, demonstrate reuse, the elongation of the life of the gunflint, retouching, and simply the life history of the ordinary gunflint, the number of variables involved in this type of research demonstrates it's difficult at the present state. The composition of the particular type of stone, the structure of the frizzen, the manner of manufacture of frizzens: variables involved with the forging, file finishing, and heat treating, in addition to the varieties of material impurities and re-facing with other materials (David Williams, personal communication), and even the method in which the gunflint was placed within the cock of the lock itself can all affect wear on the gunflint. The tightness of the cock and the angle which the gunflint strikes the frizzen itself, with other factors, "affect microscopic and macroscopic use-

wear patterns more than intensity of use” (Quinn, 2010:250). So, while valuable, the sheer number of variables to be considered which affect the use-wear of gunflints makes attributing a style or lithic to a particular nation of origin or use fairly insurmountable, given today’s technology and techniques. Many of these factors will be outlined later.

In the absence of documentary evidence clearly stating a preference of one nation for one particular type of flint, or trade records requesting purchase of particular types of gunflints, it remains an assumption that French flints, for example, are linked to French sites only. Heldman, for example, in his excavation at Fort Toulouse, Alabama, believes “it is reasonable to assume that the French preferred to use their own flints, flints that their British enemy conceded to be the better of the two types” (Heldman, 1973:166). He also claimed a later American preference for French gun flints, yet provides no documentary or archaeological reference for this. Perhaps this could be linked to a general boycott of all things British, but if the flints performed well and/or the British produced them at such a level that they “were able to eclipse France in the mass production of gunflints,” by the late 18th century (Austin, 2011:86) it would seem unreasonable, as well, that the American would not have used these flints. Clearly, further study remains in terms of both the documentary and archaeological records. A deeper inquiry into the records of the Board of Ordnance, into the letters between officers and the Board, and even between commanding officers might reveal key characteristics about the functionality of particular styles, lithic material, or deficiencies in certain gunflints.

In their exhaustive study of gunflints, and their sparking qualities, from the Fort Michilimackinac assemblage, Hamilton and Emery set out to “determine the source of gunflints used for 18th-century firearms in North America and to give reasons why gunflints from some sources apparently were preferred over ones from other sources.” To do this, they utilized

samples viewed under petrographic microscopes and x-ray diffraction, as well as photographs of spark showers, which they then measured (Hamilton and Emery, 1988:I, 246). As generally happens, better quality photographic technology exists today that might refine some of their conclusions and recent testing that utilizes inductively coupled plasma-mass spectrometry (ICP-MS) further reinforces the differences in the chemical composition of the lithic materials (Durst, 2009:22). Ascertaining and utilizing quarry sources in Britain and France will only help to connect samples with these gunflints found at colonial sites, thereby enabling better conclusions relating to use, supply, and other related issues.

Hamilton and Emery conclude that the British army clearly desired French flake gunflints whenever possible, and alluded to the idea that this stretched into spall-style gunflints as well (1988:2). They offer no primary documentation or historical data to justify these statements, and further note that the difficulties in separating the British and French contexts at Fort Michilimackinac demonstrate a difficulty in separating a dependable use pattern.

The conclusion of British usage of French flakes rests heavily upon the archaeological assemblage found at Fort Frederica, in Georgia, a site that was inhabited by the British from 1736 until 1749. As with many British frontier forts, the logistical issues of supplying items like gunflints would prove difficult throughout the eighteenth century. The British there utilized only French flakes, 113 of them excavated, (because the British did not make their own yet), and 278 gunspalls, of which 275 were deemed of English origin, based on the type of flint and method of manufacturing (Hamilton and Emery, 1988:184). One key difference in the gunspall manufacturing between Michilimackinac and Frederica lay in the type of stone used, for at Frederica, ballast flint often was fashioned into gunspalls (White, 1975:71; Luedtke, 1998:35, Burdette, et.al., 2014:106). Proximity to shipping provides the key to this difference. These

interior forts did not have the access to ballast flint, and had to rely on the imported shipments of gunflints from places like upriver from New Orleans, down the Ohio from Fort Pitt, or from Michilimackinac.

Another suggestion for the British reliance on gunspalls lay in an adaptation of technology. While primary documentary evidence for the conclusions of the study remain problematic, and due to a lack of intact gunlocks, with gunflints intact, in the archaeological record, Donald Baird (1981) demonstrates that the British may have altered the structure of their lock itself in order to accommodate the uneven nature of the gunspall. The main characteristic of gunspalls, again, lay in the bulb of percussion which creates a dome, or hump, upon one surface. This hump forced users to wrap the rear of the flint in leather or lead in order to gain a more secure, and tighter, grip by the vise of the cock (Baird, 1981:82-83; Simes, 1777:2). This uneven surface prompted the French to eventually switch to the blade gunflint, which had to even surfaces, allowing the cock to grip the blade tightly, which allowed a more consistent spark.

Figure 18: Brown Bess 1755/6 Land Pattern Cock, Lower-Jaw Basin (courtesy of Dr. David Williams)

Baird noticed an inexplicable basin found in the lower jaws of British military muskets of the period and speculated that this would allow for the accommodation of the dome, when

mounted “face” up, which resulted from the percussion strike which manufactured the gunspall. Again, archaeological evidence is scant, and gunlocks with flints still in place are relatively rare, and spall positioning has varied between indigenous, French, and English specimens. Part of this difficulty, however, lay in the fact that not all can conclusively be classified as British military locks, or demonstrate sufficient corrosion that the basin itself is potentially obscured. Still, as late as 1796, the Frenchman Citizen Dolomieu deemed the long side of a blade gunflint as the underside, and the short side, the seat (Baird, 1981:83).

Few contemporary researchers outside of Baird’s 1981 article have made note of this basin. Written correspondence with firearm experts, Dr. David Williams, Mr. David Harding, and Dr. Erik Goldstein (2017), and examinations of dateable gunlocks within their purviews, have suggested that the existence of these basins confirms the premise of Baird’s argument. Post 1740s British musket locks appeared to have this innovation, and retained it through the 1820s, post-blade/platform gunflint adoption. While archaeological and documentary evidence needs much more investigation to confirm, it would appear that the basins were retained beyond the adoption of blade gunflints, potentially to exhaust gunspall supplies. While hardly conclusive, the existence of these basins in the lower jaw of the cock of British military muskets does suggest a potential solution to the ill fit of gunspalls within the cock, and why the British took longer to develop their own mode of the blade technology.

Preference for Flints?

If, indeed, the British preferred to use the French flints when possible, as numerous authors suggest, a demonstrable reason for this preference must exist. Hamilton and Emery’s study attempted to ascertain if sparking capability determined that preference, if French or

British gunflints produced the necessary sparks, or more consistent sparks, that would make the difference between life and death upon the frontier. This part of the study involved photographs of the showers of sparks produced by the striking of flint against a steel frizzen of an “antique” gun. The test involved pictures of the first twenty snaps of the lock, and alternating shots through the fiftieth snap. Of note, however is that they did not use an 18th century lock, for “it probably could not have withstood the punishment” (1988:100-101). While this certainly rings true, it must be noted that this speaks of some of the many variables which may have influenced the sparks involved in this test. For example, this “antique” gun and lock, a French made Liège musket assembled between 1811 and 1853, may have originated in a time period fairly close to that of the Land Pattern Brown Bess of the 18th Century, but key components may be different. For example, its frizzen may be steel rather than the case hardened iron frizzen of which a French Charleville or British Brown Bess would have had, or the springs of the lock mechanism may have had different tensions. There is also no guarantee that the gunflints typically used within those muskets would react similarly in this type of test. Regardless, the test involved French flakes and spalls, English spalls and flakes, and Indian “chip” gunflints.

The photos revealed some interesting results, with one of the most predictable results being the unpredictability of the spark arrays. From one shot to the next, for example, Hamilton and Emery comment that the prediction of the next spark array’s size, large or small, simply could not be foretold. Of a more advantageous note, the total length of spark arrays for spalls diminished over time-use for gunspalls, but “may increase” for flakes (Hamilton and Emery, 1988:121). For a soldier or civilian on the frontier, the dependability of a shower of sparks which would ignite the priming power was paramount. If, indeed, as Hamilton and Emery’s test conclude, that spark array lengths increased for flake gunflints (no distinction is made between

British and French flakes), clearly those depending upon such technology would have quickly adopted this more advantageous style, yet the authors had pointed out earlier that wherever the French were involved in colonial affairs, “French spalls outnumbered French flakes in ratios of 3 or more to 1” (Hamilton and Emery, 1988:32). Clearly, either other factors affect the preference for spalls over flakes, or other factors affected the results of sparking in the eighteenth century. At this same time, little standardization, or even testing, was conducted by the British military during this period the bulk of the eighteenth century. David Williams (personal communication) suggests that unless a quartermaster had come up through the ranks, and had intimate knowledge of the pros and cons of particular makes of gunflints, advantages in terms of sparking capabilities would only come through the choices of individual soldiers and their choices through purchase or trade at the local level.

With that in mind, the averages for sparking and spark arrays between the French and English spalls and flakes, and the indigenous gunflints revealed interesting results. Hamilton and Emery conclude that the gunflints which performed best, under these test conditions at least, were the French spalls and flakes, followed by the English versions, and lastly, the native-produced gunflints. Even with that, averages of the results demonstrated an equivalence of French and British spark production, which still calls into question the issue of the authors presumed assumption for a British preference for French flakes, although the supposition of a technological advantage to a better “seated” flake between the jaws of the cock resulting from the even surfaces of a flake seem reasonable, even while not demonstrable (Hamilton and Emery, 1988:152, 121).

Additionally, to better seat the flake style of gunflint, soldiers would often wrap the gunflint with a thin piece of lead or leather in order for the vice jaws to gain more purchase,

allowing a tighter grip. This would allow for a better spark. Thomas Simes, writing in 1777, note that “they should be screwed in firm, between a thin piece of lead, it having them surer hold than leather, &c” (Simes, 1777:2). Examples of these lead “flint sheaths” have been found archaeologically, most notably at Michilimackinac, behind the British occupied “House F,” whose garden also revealed spall and blade gunflints (Heldman and Grange, 1981:229)

From this, then, reinforces the concept that other variables and factors exist beyond mere sparking ability, or that the composition of the materials of eighteenth century muskets may produce different results. Lastly, the concept of dry firing was not explored. As David Williams pointed out in a personal communication, merely measuring sparks does not take into account the “effect of the ignition in the pan” on the flint. If, indeed, eighteenth century muskets, using wrought iron frizzens and pans, somehow produced different spark arrays that actually affected the ignition of the priming powder within the pan, *then* a clear argument for preference of particular styles of flints of a particular national manufacture might be made.

Variables Affecting Performance

An abundance of variables could affect performance of gunflints, and thus, influence individuals and governments’ choices and preferences. The manner in which the gunflint fits within the cock, as previously mentioned, affects how it strikes the frizzen as well as the resulting spark array, but so also do a number of other factors. The shape of the clamp and size of the gunflint in relation to the frizzen, the tightness of the vice on the cock, how the flint itself “sits” within the vice, its speed in striking the frizzen, and especially the hardness/composition of the frizzen can all affect the sparking capability, and thus performance, of the humble gunflint.

Lithic Composition

Hamilton and Emery's study, which utilized petrographic analysis, first attempted to identify the nation of origin of gunflint through an examination of those at Michilimackinac. Comparisons made with other samples from Fort Frederica helped to corroborate results, and they believed that they could ascertain the microscopic differences between gunflints deemed French and British, based largely upon the coarseness of the grain matrices and the presence of bryozoans or other organic materials (Hamilton and Emery 1988:246; Durst, 2009:20). Santonian samples, essentially, were designated as French and Campanian to be English. As Durst's studies later reveal, however, both series of stone exist in outcroppings in both mainland Europe and within Great Britain, making this early study's conclusions somewhat dubious (Durst, 2009:20). Still, Durst utilized newer technological techniques, inductively coupled plasma-mass spectrometry, on samples that did enable the distinction of subtle "variations in the chemical composition" which demonstrated characteristics particular from one region to another (Durst, 2009:22). While this could certainly help studies in the future, did it impact individual choices in lithic material for gunflints in the eighteenth century?

As related to color, which will be discussed later, the translucence and fine-grained flints from France had a perception, at least, of producing superior sparks (Austin, 2011:87). The greater homogeneity of French stone, due in part to their specific mining focus, helped to reinforce, at least, a *perceived* reliability because of this standardized color and form. The more coarse-grained, variable-colored stones which often contained inclusions seemed to cause doubt in the reliability of sparking in purchasers.

Lock Speed

The speed at which the flint strikes the frizzen impacts both wear upon the flint and the shower of sparks it produces. When the trigger is pulled, the spring-loaded cock flies forward, and shoves the flint against the frizzen, which is also spring-loaded. That scrape along the frizzen produces the dual-action of forcing the frizzen back, which exposes the priming powder, and the friction scrape generates the shower of sparks, which are actually molten particles of iron scraped off of the frizzen, necessary to ignite the priming powder. Key to all of this sequence happening successfully is the timing and speed of the lock. Pletcher's study of locks (1991) also incorporated the seating of the gunflint, whether bevel side facing up or down.

In this experiment, Pletcher utilized "chipped" English flints and "sawed" agate flints (1991:66). No discussion is made as to the style of flint, whether blade or gunspall. The study focuses solely upon lock speed. Also of note, the four locks used in this study all post-date the French and Indian War, and discussion of these timings, then, as they relate to the Brown Bess or Charleville may need much further study and elaboration to conclude if these findings have relevance to this particular discussion. Still, Pletcher concludes that the longer the frizzen scrape, the "more consistent the lock," which produced a greater quality of spark (1991:67). In "early" locks, Pletcher believes that fast lock speeds produced a higher velocity of the flint edge, which resulted from the strength of the springs within said locks. High flint speeds and fast locks, then, would provide the uniformity and dependability that gun makers wanted and users needed (1991:80). Again, a specific comparison between French and English muskets, between trade guns and fowlers, could shed additional light upon the issue, and may help us to understand a potential difference between sparking reliability between spalls and blades.

The Frizzen and Cock Composition

As noted previously, the composition of the frizzen also factors into the reliability of the sparking mechanism. As the gunflint strikes and scrapes along the frizzen, several factors related to its structure and alignment comes into play. The case hardened wrought iron of which the frizzen is made needs to be both hard and soft, for “a frizzen too hard or too soft will give poor results” (Luedtke, 1999:72). If the frizzen is too hard, it will cause too much damage and wear to the gunflint. Too soft, and its sparking capability is reduced. Just as the composition of the frizzen is important, so also is the arrangement of its parts. The frizzen must easily snap back as the gunflint scrapes across it to reveal the priming powder. The shape of the hammer/cock, and even the curvature of the frizzen, as well as the distance of its throw as the gunflint descends all factor into the sparking capability. “If the spring is wound too tight it can drive the flint too forcefully and shatter it” (Kenmotsu, 1990:104). The metal parts of the lock must work in harmony with the gunflint itself in order to yield the requisite sparking. The raw material of that gunflint, too, must cause minimal damage to the iron parts while yielding maximum sparks (Luedtke, 1999:73, Smith, 1982b:162). In other words, use wear happens. The ability to create these sparking involved a wide variety of factors, all of which had the potential to impact the diverse types of muskets and firearms utilized within the North American frontier. This has the potential to affect choices and preferences in the selection of gunflints by those involved.

Did Color Matter?

As discussed previously, the assignment, archaeologically, of a gunflint to a particular nation of manufacture based on its color remains problematic. While color does not distinctively represent mechanical properties, questions abound whether flint colors could indicate advantages or disadvantages in lithic properties. Historically, yellow, or honey, blade gunflints have been

attributed to France with black or gray gunflints to Britain, but a much more diverse range of ‘colors’ of gunflints exist in the American colonies, and similar veins of stone exist in both France and Britain which could yield similar colors of gunflints (Durst, 2009:20; Stevenson, et. al., 2007:57). Luedtke (1999:73) points out as well that black and gray stones exist in Denmark, Sweden, and Germany, as well as France, while the honey-color usually deemed to be French has also been found in Italy. Like Durst, Luedtke recommends the examination of microfossils and grain size, as well as mode of manufacture in any attempt to assign national origin to gunflints.

Still, eighteenth century manufacturers and consumers would have made note of some of the characteristics of different colored stones, if indeed, they yielded different firing results. The French scientist Déodat Gratet de Dolomieu, writing in 1796, noted that the good fire flints varied from honey yellow to blackish brown, but that the “different shades in the masses of flint have no effect on their ability to serve as gunflints. It is the uniformity of their color when reduced to thin pieces” that demonstrated the standardized colors typical of French flints (1960:53). Thus, once flaked, the consistency of color in French stone, as well as its semi-transparent qualities, seemed to suggest a more viable product. At the same time, a French military contract from 1740, 56 years before, required grayish flint for its gunflints (Luedtke, 1999:73). Dolomieu suggests that blond stones are more fragile than brownish ones, and that the brownish ones both spark more strongly but the battery [frizzen] of the lock to deteriorate a little more quickly” (1960:54). Perhaps this last quality caused some of the preference in desirability of the honey-yellow stones.

If color, or, for that matter, translucency and luster are desirable qualities, did they link to technological benefits for the resulting gunflint? Luedtke (1999:74) believes in the possibility.

Inclusions of different colors or textures could represent flaws. Differences in grain size might have a role resulting in variances in luster or translucency which could have an effect in breakage or sparking capability (1999:74). These same characteristics could cause the flint to be too brittle, a trait undesirable in a gunflint as “the hardest flints are generally the best” according to a London writer in 1819 (Woodward, 1982:141). So, while color clearly seemed to matter, and impacted producers and consumers’ attitudes towards particular gunflints, in reality, it would appear that the color largely had little to do with the actual quality and function of the gunflint. If that is the case, other factors must have come into play when selecting particular styles and colors of gunflints.

One of the more exhaustive discussions of these factors comes from Luedtke, who suggests that gunflint choices/preferences need to be examined on issues beyond just their functional characteristics. “After all, a Porsche and a Nissan Sentra both perform the same technological function in our culture, but they differ enormously in cost and symbolism” (Luedtke, 1999:71). Incorporating a much broader view, which could help us to understand what was going on in the colonial interior, Luedtke suggests that some of the physical traits of the gunflints themselves had symbolic significance to those that made them and those that bought and used them. Thus, inclusion into the ideological realm, beyond just cost, may have impacted consumer choice, especially as these gunflints served as an important trade item at these interior forts for both the French and British.

Influences upon Gunflint Availability in the Interior

In addition to questioning the issue of preference, or the desirability of particular nations in obtaining particular styles, colors, or types of gunflints, we must also look at the practicality of

obtaining such goods while in the deep interior of the North American colonies. The discussions of the artifacts, to date, have done little to discuss the impact of the history upon the availability of particular types or styles of gunflints in the interior. A discussion of the specific assemblages found at these inland military, civilian, and indigenous sites should also consider the influence of political and economic events upon the trade and supply patterns of the British, French, Spanish, and later, Americans.

The British, for example, fought a succession of global conflicts during the late 17th and throughout the 18th centuries which would have impacted and influenced the availability of both gunspalls, and later, blades-type gunflints. King William's War (1688-1697), Queen Anne's War/War of Spanish Succession (1702-1713), the War of the Quadruple Alliance (1718-1720), the War of Jenkin's Ear (against Spain, 1739-1742), the War of Austrian Succession (1742-1748), the Seven Years War/French & Indian War (1754-1763), Pontiac's Rebellion (1763-1766), and the American Revolution (1775-1783) would have involved Britain and France, their colonial cohorts, and indigenous allies. These political and military events clearly would have impacted trade patterns and the availability of gunflints within the interior of the continent.

Similarly, economic issues would also have impacted the ability of the colonists and military officials to obtain needed gunflints. Disruptions of trade by war, embargoes, or simply logistics would have affected the supply of gunflints at these sites. Prior to the French and Indian War (1754-1763), for example, the British ruled their colonies through a form of salutary neglect, an unofficial policy that allowed lax enforcement of laws and tax collection. This policy also involved very little in the ways of a formal, professional, military presence within their Atlantic colonies, and instead they relied upon provincial militias. After this war, however, British officials would have curtailed the availability of French trade goods and enforced strict

importation of British goods. The Stamp Act (1765), Revenue Act (1767), and resultant boycotts and nonimportation agreements by American colonists would also have impacted trade and trade goods availability. General Gage, for example, complains to Lord Barrington, the Secretary of War about the colonial response to the Townshend Acts of 1767. “There is nothing new to inform your Lordship of about Importation; Committees of Merchants ... continue to exercise the Government they have set up, to prohibit the Importation of British Goods...and enforce their Prohibitions by coercive Measures” (Carter, 1969:530). Nonimportation agreements, these boycotts of British goods, may have impacted the supplies available for purchase within these colonies by the British military suppliers, and this politico-economic interference lasted throughout the time that these interior forts saw ownership by the British.

At Michilimackinac and other prominent French sites, Hamilton and Emery, again, have determined that French spalls outnumber French flakes in ratios of three or more to one (1988:32). They also conclude, based on uncited sources, that the British obviously utilized French flakes and spalls when possible. If blades held the clear advantages of being held tighter in the vise than the domed spalls, why would this ratio be so skewed into these later decades? Political and economic events, however, would have clearly impacted both of these issues. The French ceded their North American territories to the British with the Treaty of Paris, which ended the Seven Years War, in 1763. From that point, some were allowed to stay within their previous habitations, like at Fort Michilimackinac, but the majority either fled or were forced to leave for the, now, Spanish territories west of the Mississippi. While the French had utilized the flake style as early as 1663 (Blanchette, 1975:43), it did not become a standard for the French military for another sixty-eighty years. Whether expensive, spurned, or unattainable within the North American colonies, by the time of their routine use in places like Michilimackinac, spall

gunflints had had decades of use and would clearly outnumber them in the assemblages (Faulkner, 1986:84).

With the French traders still occupying houses within Michilimackinac, St. Joseph, and Ouiatenon, but ousted from Fort de Chartres, the artifactual assemblages might demonstrate small, but noticeable changes. The British certainly may have seen the advantage in buying from French traders, utilizing French blades for their advantages over spalls (especially as they had yet to develop this style), or bought French spalls simply due to their supply and cost. Indian agents at Fort de Chartres routinely purchased supplies, including gunflints, from local traders, and there is no reason to suspect that those at Michilimackinac did not. The difference, however, lay in the fact that *only* a British trading company existed within Fort de Chartres' walls, as opposed to the multitude of French civilian traders who were permitted to live and thrive there.

With three of the four sites examined in this study, the British occupation lasted only a very short time until the British abandoned their fortifications or the Americans took over during, or after, the Revolutionary War. American forces never occupied these fortifications, and American soldiers essentially utilized French and locally produced gunflints in their weapons. As a result, these assemblages *should* reflect the accessibility of British and/or French gunspalls and blade gunflints through offering a very specific reflection of this time period. Similarly, resultant effects upon shipping for the French and British, as they attempted to supply these interior forts through New Orleans or across land to Michilimackinac or from Fort Pitt (now, Pittsburgh), may have impacted the styles, forms, or types of raw material from which the gunflints originated, and the availability of particular gunflints at these remote posts.

Logistical issues for the British would hamper their efforts to equip and maintain the forts won from the French at the end of the Seven Years (French and Indian) War in 1763. General

Gage, who commanded the British forces in North America after 1763, repeatedly noted his difficulties in supplying the interior colonies. Michilimackinac, for example, proved the easiest of the four from this study to supply, but that, too, proved no small task. In a letter to Thomas Whately, then Secretary to the Treasury in the Grenville administration, Gage complained about the logistical issues, noting that supplies from England were “Loaded and Unloaded Twenty times, to be Transported in Vessels Boats and Waggon[sic.]” (Carter, 1969:279). Still, transportation from wagon to schooner, which travelled across the Great Lakes from Montreal to Michilimackinac, would prove much easier than to the other forts.

Transportation issues would compound at the more interior forts of Ouiatenon and St. Joseph, but even those saw resupply from Michilimackinac, along the waterways of Lake Michigan and the roughly 130 miles overland between Fort St. Joseph and Fort Ouiatenon. These distances and difficulties paled when compared to the complications of supplying Fort de Chartres, which featured prominently into complaints of rising costs and problematic conveyance routes. The French had supplied their fort by journeying seventy days up the Mississippi from New Orleans, crossing some 1,700 miles with their goods (Alvord and Carter, 1916:302). With good relations with the indigenous populations, this journey would prove much easier and French goods were always reported to be sold more cheaply, by some accounts, thirty-percent cheaper (Carter, 1931:215). This, in itself, might help to explain the presence of significant numbers of French goods within the Fort de Chartres artifact assemblage.

The British lacked that advantage for much of their tenure at Fort de Chartres, and lacking the port of New Orleans, which sat in Spanish hands post-French and Indian War, were forced to rely on shipping goods down the Ohio from Fort Pitt. The cost and trials of this passage proved tedious to General Gage, as well as the British traders involved in the Illinois Country. After

unloading goods at New York, supplies travelled ninety miles to Philadelphia, and then another 320 miles to Fort Pitt. From Fort Pitt, large batteaus (boats) needed construction to transport the goods the 1,100-1,200 mile trip to Fort de Chartres, assuming, of course, that the Ohio River proved navigable at that time of year. Transportation proved difficult due to the seasons, for flooding occurred in the spring, and levels dropped in the fall, allowing for “two Months in the Spring and about two Months, in the Fall of the Year” to send troops and supplies to the Illinois Country (Alvord and Carter, 1916:226, 473; Carter, 1969:381). Notwithstanding the hazards of river travel, the British also faced dangers from the inhabitants of the interior, for “the French, have at all Times, the fairest opportunity of inducing inimical Indians, to cut Off the Supplys of Provisions [sic.]” (Alvord and Carter, 1916:473). Numerous incidents of violent encounters between the British and indigenous populations occurred as the British attempted the transportation of supplies to Fort de Chartres during their brief tenure there.

As stated previously, the gunflint assemblage from Fort de Chartres demonstrated a unique pattern when compared to these other period fortifications. Fort Michilimackinac, with its vast number of gunflints, showed only a 6.84% compilation of British-designated gunflints (gunspalls), and these only represented 5.45% of the total gunflints excavated at that site. Perhaps the ease with which French traders, who inhabited the fort itself, could obtain supplies like gunflints, coupled with the added costs of transporting British goods to the fort contributed to this skewed artifact assemblage. At the other end of this spectrum, however lay Fort de Chartres, where stores perpetually ran low, the costs of transportation costs and risks were high, and the future of the fort itself always lay in limbo. Gage writes to Lord Hillsborough, the Secretary of State for the Colonies, in 1769, “A great many Stores with an Addition of Artillery and Ammunition are demanded for the Service of the Ilinois [sic.], but it appears best, to

postpone everything of this Nature, ‘till His Majesty’s final Determination respecting that Country shall be known” (Carter, 1931:235). British gunspalls represented 29% of the total gunspall assemblage, and 20% of the total gunflint category. With costs dear, and the risks and difficulty of transportation high, the British still appeared to rely less upon French goods at Fort de Chartres, particularly in the realm of military goods. The uncertain nature of their tenure there, as opposed to Michilimackinac, may have caused them to prolong usage of things like gunflints, to more stringently curtail their waste and use, and encourage reuse or retouching of their firing edges. Perhaps, then, the British did utilize French gunspalls and flakes due to their technological advantages, but an alternative might also simply be expediency. Choice may have factored into their use of French gunflints, but the practicality of obtaining this necessary material so far from their bases of operation along the east coast may have driven them to use French gunflints by the chronological period when they did have the technological option.

Supplying Gunflints—The British

The British clearly struggled during the mid to late 17th century with their early manufacturing of gunflints. Not until the early 1720s, with Ordnance system of supply and its Board, which dealt with these logistical issues, purchasing, and distribution, and the contracts for their gunflints would some of the issues be dealt with, especially until they developed the capability of producing some of their own internally. Early gunflint contractors obtained their supplies, largely, through Dutch middlemen. The Dutch merchant fleet, through much of this same time period, dominated that of France and Britain, and gave the Dutch great economic strength. Early production of firearms centered with the Low Countries, or Dutch and Germans producers, and both France and Britain imported what they needed. De Lotbiniere contends that the Dutch lacked good flint on any real scale, and Clarke suggests that the Dutch “are seen

purchasing vast stores of flints and drawing the customary large profits in their capacity of arms racketeers” (Blanchette, 1975:48; De Lotbiniere, 1987:156; Clarke, 1935:40). With the Dutch as middlemen, at first, supplying both France and Britain with gunflints and weaponry, this tenuous balance would change in the late 17th century, as the Netherlands and France go to war, compelling France to develop their own firearm and gunflint industries.

The French would then operate as the main supplier of British gunflints, at least until such time as the British could, or would, establish their own standardized gunflint industry. The Hudson’s Bay fur trading company routinely purchased items like gunflints from French, rather than British, suppliers. In 1691, a letter from their Committee stated, “& particularly to be spareing [sic.] in your Flints (tho' it seems a very small thing) and in your brandy, they both being French comodities [sic.] and hard to come by.” Other documents specifically list gunflints from France as key items shipped to these interior fur trade posts (Christianson, 1982:39). With France and Britain fighting throughout much of the late 17th and 18th centuries, through a succession of global conflicts, only France existed to supply the accoutrement necessary for war in the scale Britain needed. Yet, wouldn’t France have been reluctant to supply her enemy? Perhaps this was the case, or perhaps British military purchasers at the Board of Ordnance continued to utilize middlemen, for as late as the 1730s, over 2.5 million musket flints, in various sizes, were imported from France by a London gun maker working for the Board of Ordnance (De Lotbiniere, 1987:156; Bailey, 2009:253). In Birmingham, as a result, came the growth of the gun industry, with the birth of the eighteenth century, as Britain attempted to supply her own needs (Williams, 2010).

Britain began to manufacture gunflints shortly after France, by the middle of the 17th century, in addition to utilizing the “French lock,” and derivatives based upon it, within their

infant gun industry. In 1655, a London gun maker, Roger Carlisle, was tasked by Oliver Cromwell to provide 11,000 flints, and five years later, another, George Fisher, contracted to supply the Board of Ordnance with “5000 flint-stones by him cutt [sic.] and brought into store” (De Lotbiniere, 1977:42). De Lotbiniere asserts that these individuals operated as the middlemen between the knappers and the Board, rather than as knappers themselves. This industry continued to develop over the next fifty years. As early as 1704, a warrant from the Board of Ordnance was issued for “240,000 ‘English Flints for musquett’” (De Lotbiniere, 1987:156). This, at least, implies that an English mode of production, if not style of gunspall, had begun and began to offer competition to the French imports. With the spread of gunspall production in Britain, and the continued surface collection of flint itself, the issue of quality threatened to hamper domestic production. This, especially when combined with the increased demand caused by the French and Indian War/Seven Years War (1754-1763) caused difficulties for the Board of Ordnance in satisfying their gunflint needs.

The quality of the gunflints produced in Britain caused consternation amongst those who used them. By 1758, quality suffered, and “nearly half of the flints delivered ‘have been rejected on account of their shape or colour, though they believe them to be serviceable, but said that by the strictness of the present View there will not be a number sufficient for His Majesty’s Service.’” Soft stones, picked from the surface, easily crumbled and flaked, and did not meet the needs of the military (Bailey, 2009:252). Lord Colvill, a naval officer, wrote the Board in 1757 complaining of similar issues as they journeyed to attack Louisbourg, stating that “three or four Musquets out of six frequently misfire occasioned by the Badness of the Flints” (Durnford, 1757). In fact, General Gage would write on the eve of the American Revolution, complaining that ““The Ordnance Flints have at all times been reckoned so bad, that the regiments generally

supply themselves; and if the [regimental] Agents shou'd be ordered to send five or six thousand of the famous Kentish Flints to their respective Corps, it wou'd be of Use, and no great expence to them'" (Bailey, 2009:253). Commanders frequently requested French flints (whether spall or blade is not known), due to this unreliability, and many company officers dealt with this issue by purchasing gunflints from traders for their men privately. Only further research into the documents of the Ordinance Office, and those of the traders buying and selling gunflints, will yield the potential answer to the question of preference.

Regardless of the source of supply, soldiers needed gunflints. When the British first arrived at Fort de Chartres, in 1765, they found neither "Ammunition nor any other Stores, that are useually [sic.] Expected in Such a place" (Alvord and Carter, 1916:105). In the Inventory of the Goods at Fort de Chartres, categorized by the French commissary and verified by James Rumsey, the regimental commissary, no mention of gunflints exists (Alvord and Carter, 1916:102-105). The French took the stores of flints, ammunition, and powder for firearms while leaving behind the same for the fort's artillery. The only means of creating sparks, then, were those that the British had brought with them, in a place where they felt surrounded by hostile natives and "indolent" French bent on causing strife. This especially rang true for Stirling's regiment, as the takeover of Fort de Chartres meant that they must purchase stores from the nearby French if they hoped to maintain control over the area.

In times of peace, a British soldier was issued two gunflints per year, but by the outbreak of war in 1755, that number rose to five gunflints per man (Bailey, 2009:254). In the case of her interior possessions, the Crown designated somewhere between 3 and 9.5 companies to maintain its presence in the Illinois Country (Alvord and Carter, 1916:512-513; 551). In the post French and Indian War world, a company consisted of approximately fifty-five men. At its greatest

population, then, Fort de Chartres required a minimum of 2,500 gunflints per year, just for its foot soldiers. Its artillery also required gunflints, for practice and war. The Indian trade required gunflints. In just the months of August and September of 1766, for example, the British army contracted traders to supply over 1,040 gunflints to the Indians in the Illinois Country as gifts or in trade (Alvord and Carter, 1916:391-3). Clearly, this particular item, manufactured in quantity, was in high demand at this interior fort. Whether these flints represented those crafted within Britain or purchased directly/through intermediaries from France, however, remains undocumented.

A dearth of contemporary sources exists describing the efficacy of particular styles or modes of gunflints of the 18th century. Of those that do discuss gunflints, most arise from the American Revolution or Napoleonic Wars, and the latter refer mostly to blade gunflints, which were only produced in France prior to the end of the American Revolution. From these, the flint itself generally seems immaterial. Thomas Simes, a British Captain, notes in 1777 that the “flints best for service are those most clear, though the colour is immaterial, as there are good and bad of all kinds; neither too small or too thin are best, lest the first may not give good fire, or the latter break” (1777:2). Other commentaries on flints from this period revolve, instead upon the proper placement of the flint within the lock as a means to produce the most consistent spark shower. Simes recommends “they should be screwed in firm, between a thin piece of lead, it having them surer hold than leather” (1777:2). During the Napoleonic Wars, several pundits make similar suggestions, and ascribe misfires less to the “badness of the flint” or other material defects of the firearms, and more in a lack of “correctness in fixing the Flint”. Of note from this source as well, the recommendation that “Each particular Flint requires therefore its own particular mode of being fixed, so as to accommodate itself to the particular proportions and

conformation of each particular Lock” (Adjutant General’s Office, 1811:312-3). As the British solidified production of their black blade gunflints at the quarries in Brandon, the gunspall, and the basin/depression within the lower jaw of the cock, had disappeared. Still, the fixing of flints, whether bevel up/bevel-down, remains a matter of some debate to firearm aficionados even today, this was clearly not the main concern to those that actually used these firearms.

Another consideration in regards to gunflints lay beyond the military market. With Forts Michilimackinac, Ouiatenon, St. Joseph, and de Chartres serving as significant sites for trade and alliance with the indigenous populations, their concerns as consumers of this product must be taken into account. Did the raw material or style of manufacture of these gunflints matter to the native populations with which the British and French interacted? The only evidence for these preference lay in the consumption patterns or in specific treaty negotiations, and gunflints rarely find specific mention in those documents. In the interior of North America, at least, the presence of the French, who lived with and treated with these peoples, would influence the selection of trade goods, at least by British perceptions.

Rivals in trade and sway in the post 1763-world, the British would often comment on the Franco-indigenous relationship. From his journal to the Illinois Country in 1765, Indian agent George Croghan worries about news that, “a Frenchman from the Illinois passed by the Miamies Village, towards Detroit, & told all the Indians he saw, that the King of France their Father, had sent a large Quantity of Goods to New Orleans, for to supply his Children the Indians, in this Country & would send them more next Year” (Alvord and Carter, 1916:8). Critically, he claims that these peoples “have been bread up together like Children in that Country, & the French have always adopted the Indians Customs & manners, Treated them Civily [sic.] & supplied [sic.] their wants generously, by which means they gained the Hearts of the Indians & commanded

their Services, & injoyed [sic.] the Benefit of a very large Furr [sic.] Trade” (Alvord and Carter, 1916:54-55). This close relationship may have encouraged the British Indian agent within these interior forts to continue to purchase French goods, like gunflints, as a way to placate indigenous groups, to persist in supplying them with the goods that they were accustomed to using. With French and British gunflints differing in shape and colors, a switch in product would certainly be noticeable. The Hudson’s Bay Company and East Indian Company continued to buy French flints “which their Indian customers no doubt favoured on account of earlier contact with French traders” (De Lotbiniere, 1987:156). Similarly, this preference might not *just* signify allegiance to their former French fathers, or a continuation of a technology with which they were familiar. “Colors have ideological associations...and it is possible that some of the native peoples...may have preferred flints of colors that were especially meaningful in the context of their own culture (Luedtke, 1999:76). Black, yellow, and red, for example, all serve as symbolic colors within native clothing, jewelry, and even face paints. It would certainly be reasonable that such symbolism could be extended to items like gunflints. A more thorough examination of primary source documentation as it relates to the papers of the traders and trading companies may reveal these preferences.

CHAPTER VI: CONCLUSIONS AND RECOMMENDATIONS

Attempting to compare four archaeological contexts across comparative French/British fortifications through their gunflint assemblages has demonstrated a number of issues as related to the study of gunflints themselves. While gunflints, as a class of artifact, have been a focus of study for some time, confusion over terminology and chronology of the technological changes has caused difficulty in clearly assigning particular styles of manufacturing to a specific nation of origin. Similarly, gunflints have traditionally been assigned to a nation of manufacturing origin based largely upon their lithic color. Recent research has demonstrated that these color assignments, for example those traditionally assigned to the exclusive use by the British, and to a lesser extent, the French, have been found within samples and quarries throughout both France and Britain. Ballin (2012:119) suggests that even the terms “French and English” should be avoided when discussing gunflints. A reliance on the descriptive characteristics, which could allow more comparative criteria to be created, and utilized on an intra-site basis, may allow for less confusion, and more purposeful patterns to develop.

The real struggle in examining North American colonial gunflint assemblages and looking for patterns in usage, logistical supplies, and potential preferences in terms of styles, lithic material, or other characteristics, lay in the issue of mixed contexts within these frontier fortifications. With British occupations of French sites, and continued French presence within these sites afterwards, assigning usage and deposition patterns remains extremely tenuous, especially in the absence of secure contexts.

Comparing the Fort de Chartres gunflint collection to those at the other three fortifications illustrates some of the issues, but also the potential, involved with increased scrutiny of gunflints. British gunspalls at Fort de Chartres, again, made up 29% of the total

gunspall category, and 20% of all gunflints excavated. At the other forts, these percentages were either roughly halved or one-fifth of the assemblage, which is a substantial decrease. Similarly, the Fort de Chartres British gunspalls measured larger in terms of width and length than did the comparative averages. Granted, future excavations could increase the sample size, and this might reveal more statistics more consistent with the other three fortifications. Conversely, this representation may indeed reflect the various issues of logistical supply between these forts and Fort de Chartres. These same concepts would also help to address contemporary authors' reliance on a stated preference by the British for French flints, and illustrate that reality reflected less of demand than it did supply. Changes to the lock/cock jaw configuration of the Brown Bess over the second half of the eighteenth century might similarly reflect the necessity of gunspall supply rather than any stated preference.

The development and usage of gunflints, as well, did not exist within a vacuum. The parallel innovations of musketry, increased changes in tactics and warfare, and colonialism throughout the seventeenth and eighteenth centuries all intertwined around this tiny little piece of chipped flint. A thorough examination of performance problems of this technology, then, could help us to understand better the "spurts of invention" that occurred "as new problems are encountered and resolved" (Skibo and Schiffer, 2009:3). This could help to explain, for example, the accommodation of the gunspall bulb through the development of the cock's lower jaw-basin in the British Brown Bess over the course of the mid-eighteenth century. Looking at the issues of how the British utilized these gunspalls, why they seemed to retain this technology, or even proved reluctant to change over to the blade/platform style as quickly as did the French, might help us to understand more thoroughly the manufacturing, logistically, and depositional processes.

Similarly, a better grasp of the performance characteristics of both lock and gunflint, those key components that “possess specific formal and behavioral properties” (LaMotta and Schiffer, 2011:29), utilizing the technological standards and components of those centuries might better elucidate the choices made in using these technologies. Comprehending the true sparking qualities of French gunspalls over British, of blades over gunspall, particularly within the locks intended, could help us to gain insights into the concepts of the technology itself, as well as why and how it spread, became marketable, and gained meaning within the context of the colonial military and indigenous worlds. Looking, then, specifically at the actual properties of the raw materials, we could begin to understand how those properties affected issues such as spark reliability and spark production which would have been so very crucial to those who depended upon these tools for their very lives.

Future investigations into gunflints would hopefully involve much more detailed quantitative source testing that would allow the linkage between colonial gunflints to their origin quarries within Europe. Well dated features within archaeological sites, and their linkage to specific British and French contexts, will allow better descriptive characteristics to be made, detailing just which morphological features, and specific metrics, are linked to those nations’ gunflints. Similarly, specific measurements and sample digital scans of existing gunflint collections, placed on open source or accessible sites, would allow needed cross-site comparative data to be obtained and assessments more effectively formulated. The measurements and scans, for example, of all Fort de Chartres gunflints currently utilized in this thesis can be accessed at: <https://kc.kobotoolbox.org/jspan/forms/agsj7bihfFRP5dXwewpHt6> . Lastly, a much more in-depth examination of the documents in the collections of the Britain’s Ordnance office itself, as well as the papers of its logistical supply line, down through the traders and military commanders

within these forts, might help to shed additional light on the concept of preference and usage of these various types of gunflints.

While gunflints represent only a very tiny portion of the technology of the seventeenth and eighteenth centuries of colonial Britain and France, these small pieces of chipped stone clearly impacted life on a personal, daily level all the way through the imperial planning and implantation process. Life on the frontier, within these forts, depended upon the reliable firing of their muskets, for food and for defense. As a valuable item of trade with the indigenous and civilian populations and a necessary tool of trade for the military, the gunflint helped to shape the future of empires and nations.

REFERENCES

Adjutant General's Office.

1811 General Regulations and Orders for the Army. London: W. Clowes.

Alvord, Clarence W. and Clarence E. Carter, eds.

1921 Trade and Politics, 1767-1769, Illinois State Historical Library Collections, XVI, British Series vol. III. Springfield: Illinois State Historical Library.

1916 The New Regime, 1765-1767, Collections, XI, British Series vol. II. Springfield: Illinois State Historical Library.

1915 The Critical Period, 1763-1765, Collections, X, British Series, vol. I. Springfield: Illinois State Historical Library.

Austin, Robert J.

2011 Gunflints from Fort Brooke: A Study and Some Hypotheses Regarding Gunflint Procurement. *The Florida Anthropologist* 64(2): 85-106.

Babits, Lawrence E. and Stephanie Gandulla

2013 *The Archaeology of French and Indian War Frontier Forts*. Gainesville, FL: University Press of Florida.

Bailey, De Witt

2009 *Small Arms of the British Forces in America, 1664-1815*. Woonsocket, RI: Andre Mowbray, Inc.

1972 *British Military Longarms, 1715-1815*. Harrisburg, PA: Stackpole Books.

Baird, Donald.

1981 Gunspalls and the Cock-Jaw Basin in British Military Flintlocks. *The Canadian Journal of Arms Collecting* 19 (3): 80-86.

Ballin, Torben Bjarke

2012 'State of the art' of British Gunflint Research, with Special Focus on the Early Gunflint Workshop at Dun Eistean, Lewis. *Post-Medieval Archaeology* 46 (1): 116-142.

Bannerman, Gordon E.

2008 *Merchants and the Military in Eighteenth-Century Britain: British Army Contracts and Domestic Supply 1739-1763*. London: Pickering & Chatto.

Blanchette, Jean-François

1980 Firearms. In *Burr's Hill: A 17th Century Wampanoag Burial Ground in Warren, Rhode Island*. Pp: 67-71. Providence, RI: Brown University.

1975 Gunflints from Chicoutimi Indian Site (Québec). *Historical Archaeology* 9: 41-54.

Brown, Margaret Kimball

1976 The 1974 Fort de Chartres Excavation Project. Archaeological Service Report No. 49. Carbondale, IL: Southern Illinois University.

1975 Preliminary Investigations at Fort de Chartres. The Conference on Historic Site Archaeology Papers 1973 (8): 94-107)

Burdette, Kemp Magnus Wilkes and Michael S. Smith

2014 The Mineralogy, Petrology, and Provenance of Ballast Stones from the Cape Fear, North Carolina. *Southeastern Geology* 50 (2): 93-108.

Carvalhaes, Cezar

2011 An Examination of Gunflints from the Fort St. Joseph Site (20BE23) in Niles, Michigan. Honors Thesis. Department of Anthropology. Western Michigan University.

Carter, Clarence E., ed.

1969 The Correspondence of General Thomas Gage, vol. 2. Hamden, CT: Archon Books.

1931 The Correspondence of General Thomas Gage, vol. 1. New Haven: Yale University Press.

Chandler, R.H.

1917 Some Supposed Gunflint Sites. *Proceedings of the Prehistoric Society of East Anglia for 1916-17* II (3): 360-365.

Christianson, David

1982 Gunspalls from the Hudson's Bay Company New Severn Post (1685-1690). *Ontario Archaeology* 37: 35-40.

Clarke, Rainbird.

1935 The Flint-Knapping Industry at Brandon. *Antiquity* 10 (1): 38-56.

Clay, R.C.C.

1925 A Gun-flint factory site in South Wilts. *The Antiquaries Journal* (5)1: 423-426.

Durnford, Shilling

1757 Letter to Board of Ordnance, Plymouth. Great Britain. Board of Ordnance. Record Book of the Plymouth Office of Ordnance, 1756-1757. Manuscript Collection Number 393—Special Collections, University of Delaware Library, Newark, DE January 31, 1757

De Lotbiniere, Seymour.

1987 English Gunflint Making in the Seventeenth and Eighteenth Century. In *Colonial Frontier Guns*. Pp: 154-159. Union City, TN: Pioneer Press.

1977 The Story of the English Gunflint, Some Theories and Queries. *The Journal of the Arms & Armour Society* (9): 18-53.

Dolomieu, T.

1960 Report on the Art of Making Gunflints. (Reprint of 1796 article). Trans by Carlyle S. Smith. *Missouri Archaeologist* 22: 40-69.

Dolomieu, Citizen

1982 The Art of Making Gun Flint (Fire Flint) (Reprint of 1796 article). Trans by Carlyle S. Smith. In *Indian Trade Guns*. Pp 160-174. Union City, TN: Pioneer Press.

Durst, Jeffrey J.

2016 Personal Communication (April 13, 2016)

2009 Sourcing Gunflints to Their Country of Manufacture. *Historical Archaeology* 43 (2): 18-29.

Emy, Jean

1975 Dimensions of French Gunflints. *Canadian Historic Sites; Occasional Papers in Archaeology and History* 12 (1): 125-127.

Emery, K.O.

1987 The Geology of Gun Spalls. In *Colonial Frontier Guns*. Pp: 148-153. Union City, TN: Pioneer Press.

Evans, Lynn M.

2013 Michilimackinac, a Civilian Fort. In *The Archaeology of French and Indian War Frontier Forts*. Pp: 216-228. Gainesville, FL: University Press of Florida.

Faulkner, Alaric

1986 Maintenance and Fabrication at Fort Pentagoet 1635-1654 Products of an Acadian Armorer's Workshop. *Historical Archaeology* 20(1): 63-94.

Gélinas, Kevin

2015 Charleville Shoulder Weapons in New France. *American Tradition: The Journal of the Contemporary Longrifle Association*. Pp: 25-35.

Gibbard, P.L.

1983 Flint Gravels in the Quaternary of Southeast England. The scientific study of flint and chert: proceedings of the Fourth International Flint Symposium held at Brighton Polytechnic, 10-15 April 1983. Cambridge: Cambridge University Press.

Gibson, Susan G., editor

1980 Burr's Hill: A 17th Century Wampanoag Burial Ground in Warren, Rhode Island. Providence, RI: Brown University.

Gillet-Laumont, F.P.N.

1982 Extract from a Report by Citizen Salivet: The making of Fun Flints in the Departments of Indre and Loir-et-Cher (Reprint of 1797 article). Trans. By Carlyle S. Smith. In *Indian Trade Guns*. Pp: 175-188. Union City, TN: Pioneer Press

- Hamilton, T. M., ed.
 1987 Colonial Frontier Guns. Union City, TN: Pioneer Press.
 1982a Indian Trade Guns. Union City, TN: Pioneer Press.
 1982b Concluding Comments on Gunflints. *In Indian Trade Guns*. Pp: 189-196. Union City, TN: Pioneer Press.
- Hamilton, T.M. and K.O. Emery
 1988 Eighteenth-Century Gunflints from Fort Michilimackinac and other Colonial Sites. Archaeological Completion Report Series No. 13. Mackinac Island, MI: Mackinac Island State Park Commission.
- Hanson, Lee H., Jr., and Dick Ping Hsu
 1975 Casemates and Cannonballs: Archaeological Investigations at Fort Stanwix, Rome, New York. Publications in Archaeology, No. 14. National Park Service, Washington, DC.
- Harding, D.F.
 1997 Small Arms of The East Indian Company 1600-1856. London: Foresight Books.
- Heldman, Donald P.
 1973 Fort Toulouse of the Alabamas and the Eighteenth-Century Indian Trade. *World Archaeology* 5(2): 163-169.
- Heldman, Donald P. and Roger T. Grange, Jr.
 1981 Excavations at Fort Michilimackinac: 1978-1989, the Rue de la Babillarde. Mackinac Island, MI: Mackinac Island State Park Commission.
- Heldman, Donald P. and William L. Minnerly
 1977 The Powder Magazine at Fort Michilimackinac: Excavation report. Mackinac Island, MI: Mackinac Island State Park Commission.
- Hickson, Robert N.
 2010 Flint and Steel on the Frontier of West Central Illinois: A Common Necessity with an Ephemeral Archaeological Signature. *Illinois Archaeology* 22 (1): 84-99.
- Hirst, K. Kris
 1991 The Great Gunflint Debate. *Journal of the Iowa Archaeological Society* (81) 38:62-65.
- Hodder, Ian
 2001 Archaeological Theory Today. Cambridge, UK: Polity Press.
- Holmes, Richard
 2001 Redcoat: the British Soldier in the Age of Horse and Musket. New York: W.W. Norton.

Honerkamp, Nicholas and Norma Harris

- 2005 Unfired Brandon Gunflints from the Presidio Santa María de Galve, Pensacola, Florida. *Historical Archaeology* 39 (4): 95-111.

Keene, David J.

- 2013 War and the Colonial Frontier: Fort de Chartres in the Illinois Country. In *The Archaeology of French and Indian War Frontier Forts*. Pp: 229-239. Gainesville, FL: University Press of Florida.
- 2002 Beyond Fur Trade: The Eighteenth Century Colonial Economy of French North America as Seen from Fort de Chartres in the Illinois Country. Ph.D. dissertation, Department of Anthropology, University of Wisconsin-Madison.
- 1991 "Fort de Chartres: Archaeology in the Illinois Country" In *French Colonial Archaeology: The Illinois Country and the Western Great Lakes*. Pp: 29-41. Urbana, IL: The University of Illinois Press.

Kenmotsu, Nancy

- 1990 Gunflints: A study. *Historical Archaeology* 24 (2): 92-124.

Kent, Barry C.

- 1983 More on Gunflints. *Historical Archaeology* 17 (2): 27-40.

LaMotta, Vincent M. and Michael B. Schiffer

- 2001 Behavioral Archaeology: Towards a New Synthesis. In *Archaeological Theory Today*. Pp: 14-65. Cambridge: Polity Press.

Lenk, Torsten

- 2007 *The Flintlock: Its Origin, Development, and Use*. New York, NY: Skyhorse Publishing, Inc.

Luedtke, Barbara E.

- 1999a Gunflints in the Northeast. *Northeast Anthropology* 57 (1): 27-43.
- 1999b What Makes a Good Gunflint. *Archaeology of Eastern North America* (27): 71-79.
- 1998 Worked Ballast Flint At Aptucxet. *Northeast Historical Archaeology* 27 (1): 33-50.
- 1992 *An Archaeologist's Guide to Chert and Flint*. Los Angeles, CA: Institute of Archaeology, University of California.
- 1978 Chert Sources and Trace-Element Analysis. *American Antiquity* 43 (3): 413-423.

McNabb, John and Nick Ashton

- 1990 Clactonian Gunflints. *Lithics* 11: 44-7.

Nassaney, Michael S.

- 2016 Personal Communication (November 28, 2016)

- Nassaney, Michael S., José Antônio Brandão, William M. Cremin, and Brock A. Giordano
 2007 Archaeological evidence of economic activities at an eighteenth-century frontier outpost in the Western Great Lakes. *Historical Archaeology* 41 (4): 3-19.
- Nassaney, Michael S., William M. Cremin, and Daniel P. Lynch
 2002 The Identification of Colonial Fort St. Joseph, Michigan. *Journal of Field Archaeology* 29(3/4): 309-321.
- Noble Jr., Vergil E.
 1991 Ouatienon on the Ouabach: Archaeological Investigations at a Fur Trading Post on the Wabash River. In *French Colonial Archaeology: The Illinois Country and the Western Great Lakes*. Pp: 65-77. Urbana, IL: The University of Illinois Press.
 1983 Functional classification and intra-site analysis in historical archaeology: A case study from Fort Ouatienon. Ph.D. dissertation. Department of Anthropology. Michigan State University.
- Orser, Charles E.
 1977 The 1975 Season of Archaeological Investigations at Fort de Chartres, Randolph County, Illinois. *Southern Illinois Studies No. 16*. Carbondale, IL: Southern Illinois University.
- Pletcher, Larry
 1991 A Study of Lock Timing. *Journal of Historical Armsmaking Technology* VI: 61-101.
- Quinn, Colin
 2010 Use-Wear Under Fire: An Experimental Use-Wear Functional Analysis of Gunflints. *The Michigan Archaeologists Vol 50-52 (1-4)*: 249-260.
 2004 An Experimental Use-Wear Functional Analysis of Gunflints. *Lambda Alpha Journal: Student Journal of the National Anthropology Honor Society of Wichita State University* 34: 60-72.
- Schiffer, Brian.
 2011 *Studying Technological Change: A Behavioral Approach*. Salt Lake City: The University of Utah Press.
- Simes, Thomas.
 1777 *A Military Course for the Government and Conduct of a Battalion*, 2nd ed. London: Self published.
- Skertchly, Sydney B.
 1879 *Memoirs of the Geological Survey, England and Wales. On The Manufacture of Gunflints, The Methods of Excavating for Flint, The Age of Paleolithic Man, and the Connexion Between Neolithic Art and the Gunflint Trade*. Her Majesty's Stationary Office, London.

Skibo, James M. and Michael B. Schiffer

2009 *People and Things: A Behavioral Approach to Material Culture*. New York: Springer.

Smith, Carlyle S.

1982a 18th Century Manufacture of French Gun Flints. In *Indian Trade Guns*. Pp: 147-159. Union City, TN: Pioneer Press.

1982b Extract from a Report by Citizen Salivet: The Making of Gun Flints in the Departments of Indre and Loir-et-Cher by F.P.N. Gillet-Laumont. In *Indian Trade Guns*. Pp: 175-188. Union City, TN: Pioneer Press.

1982c The Art of Making Gun Flint by Citizen Dolomieu in the Year 5 [1796-1797]. In *Indian Trade Guns*. Pp: 160-174. Union City, TN: Pioneer Press.

1961 Identification of French Gunflints. *The American Philosophical Society* 1: 419-423.

Stevenson, Christopher M., et. al.

2007 Investigations into the European Provenance of Historic Gunflints from Fort Christanna, Virginia, Through Trace Element Chemistry. *Archaeology of Eastern North America* 35: 49-62.

Stone, Lyle.

1974 *Fort Michilimackinac, 1715-1781: an Archaeological Perspective on the Revolutionary Frontier*. East Lansing, MI: Michigan State University Museum Publications.

1972 Gunflints: Fort Michilimackinac. *Northeast Historical Archaeology* 2 (1): 45-50.

Surtees, William

1833 *Twenty-five years in the Rifle Brigade*. London: Muller.

Thurman, Melburn

1980 *Archaeology at Fort de Chartres, 1979 season: preliminary report for Illinois Department of Conservation*. Springfield, IL: The Department of Conservation.

Tordoff, Judith

1983 *An Archaeological Perspective on the Organization of the Fur Trade in Eighteenth Century New France*. Ph.D. dissertation. Department of Anthropology. Michigan State University.

Walthall, John A., ed.

1991 *French Colonial Archaeology: The Illinois Country and the Western Great Lakes*. Urbana, IL: The University of Illinois Press.

West, Jenny

1991 *Gunpowder, Government and War in the Mid-Eighteenth Century*. Woodbridge, Suffolk: The Boydell Press.

Whittaker, John C.

- 2001 'The Oldest British Industry': Continuity and Obsolescence in a Flintknapper's Sample Set. *Antiquity* 75: 382-90.

White, Stephen W.

- 1975 On the Origins of Gunspalls. *Historical Archaeology* 9: 65-73.

Witthoft, John

- 1966 A History of Gunflints. *Pennsylvania Archaeologist* XXXVI (1-2):12-49.

Williams, David

- 2016 Personal Communication (June 15, 2016; February 3, 2017).
2012 The Flintlock Ordnance Muskets of William III and their Supply. *Arms & Armour* 9 (1): 7-19.
2010 James Farmer and Samuel Galton, the Reality of Gun Making for the Board of Ordnance in the Mid-18th Century. *Arms & Armour* 7 (2): 119-141.

Williams, David and Paul Wilcock

- 2015 Early 18th-Century Military or Militia Pistols in the Armoury of the Duke of Buccleuch and Queensberry at Boughton House: An Important Example of the Products of the London—Low Countries Supply Chain. *Arms & Armour* 12 (1): 30–44.

Williams, Scott E.

- 2010 Monhantic Fort Gunflints: Continuity or Change in Mashantucket Pequot Lithic Manufacturing. M.A. Thesis, Department of Anthropology, University of Connecticut.

Woodward, Arthur

- 1982 Some Notes on Gunflints. In *Indian Trade Guns*. Pp: 135-146. Union City, TN: Pioneer Press.