Archaeogeophysics and Statistical Analysis at the Buffalo Lake Métis Wintering Site (FdPe-1)

by

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ABSTRACT

This thesis examines differences amongst cabin features at the Buffalo Lake Métis Wintering Site (FdPe-1), a late Fur Trade-era archaeological site located in central Alberta. I discuss Métis ethnogenesis as it relates to the roving groups of Plains Métis that occupied this site, as well as how it compares to the cultural practices of those groups of Métis located in eastern Canada or in permanent settlements such as Red River. Previous archaeological research regarding the Buffalo Lake site is summarized for each of the cabins excavated, as are the artifact assemblages. I perform Exploratory Data Analyses (EDA) on these assemblages to discover patterns within the data that might provide details about the activities occurring within the cabins, and use confirmatory statistics to test the significance and probability of these patterns. I also use archaeological geophysics techniques, specifically Ground-Penetrating Radar (GPR), magnetometry, and magnetic susceptibility, to determine the locations of geophysical anomalies that will assist in locating cabin features that have not yet been excavated at the site. These data then inform my conclusions on how the artifact assemblages at Buffalo Lake reflect differences in Métis conceptions of identity at the site.

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LIST OF ABBREVIATIONS

EMITA	Exploring Métis Identity Through Archaeology
GIS	Geographic Information Systems
GPR	Ground-Penetrating Radar
HBC	Hudson’s Bay Company
HRV	Historic Resource Value
NWC	North West Company
XY	New North West Company

CHAPTER 1

INTRODUCTION AND RESEARCH METHODS

At its broadest scale, the goal of this thesis is to gain a clearer understanding of the use of material culture at the Buffalo Lake Métis Wintering Site, a late Fur Trade-era Métis overwintering settlement occupied most intensively from 1872 to 1878, and how that material culture use may relate to Métis identity across the Canadian West. While questions addressing the organization and structure of Buffalo Lake's inhabitants have been asked before, the use of archaeological geophysics technologies and statistical analysis can provide a new perspective on the lives of the people who inhabited the region and how the material left behind can inform researchers about Métis identity. Specifically, I use these methods to examine the material culture that has been recovered from the cabins at Buffalo Lake, comparing similarities and differences amongst the assemblages. Based upon these analyses, I look at what the composition of the assemblages says about Métis identity and material culture at the Buffalo Lake site, especially with regards to how this material culture informs comparisons between Métis groups inhabiting the Plains and those in more permanent settlements such as Red River and Lac La Biche.

The Buffalo Lake Métis Wintering Site (Figure 1.1) was chosen as one of the initial study areas for the EMITA (Exploring Métis Identity Through Archaeology) research project for a number of reasons. First, the site had been previously studied during the 1970s and 1980s (Doll et al. 1988), with the original researchers conducting systematic surveys of the area, uncovering evidence of over eighty cabin features (Doll et al. 1988:iii). Five of these eighty cabin features were excavated over the course of a number of field seasons and surface collection of artifacts occurred at an additional seven cabins, providing me with archaeological assemblages from a

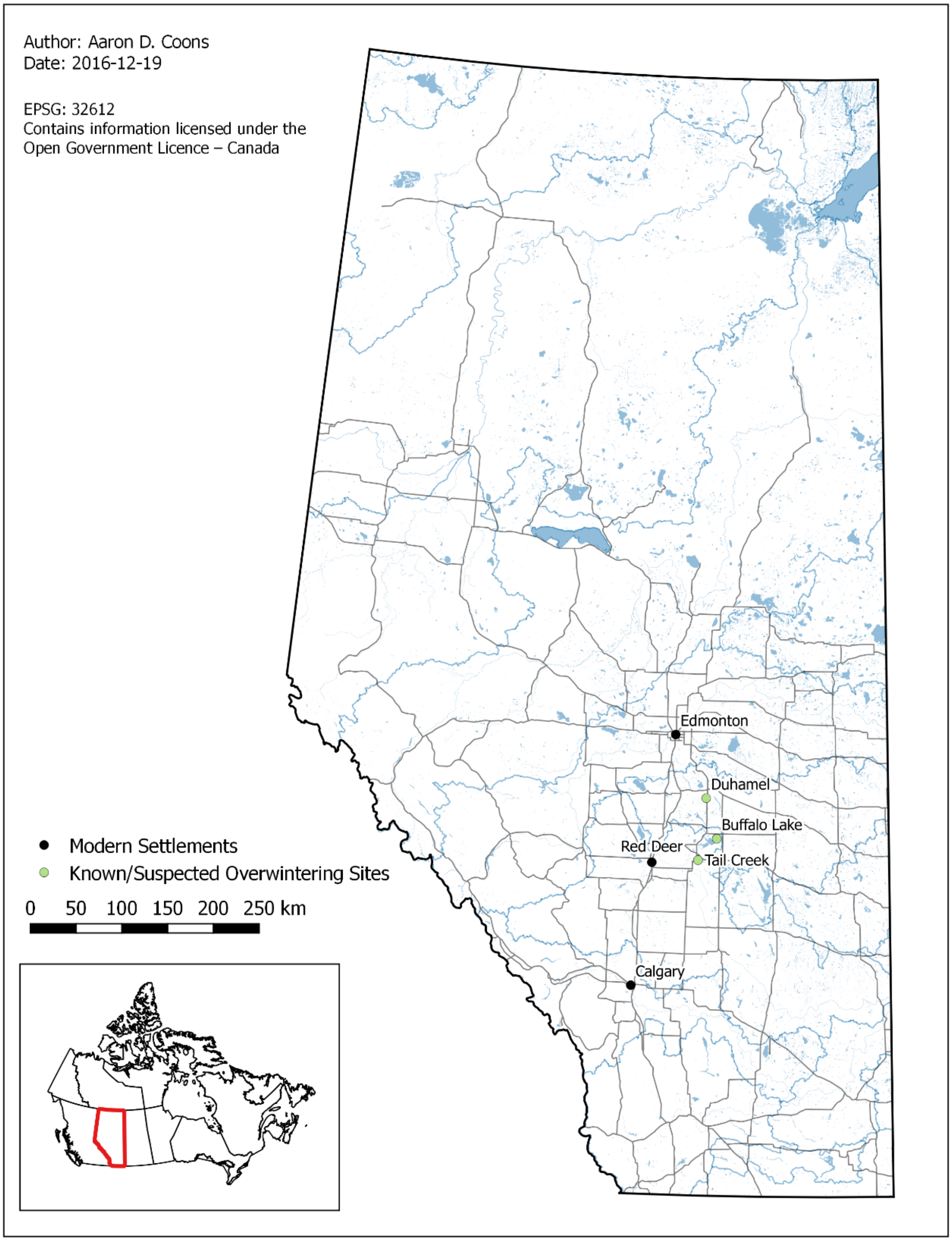

Figure 1.1

Overview Map of Métis Overwintering Sites in Alberta total of twelve cabins. This dataset was expanded during the summer of 2014 when a field school was conducted at the Buffalo Lake site, directed by Dr. Kisha Supernant of the University of Alberta with the support of the Institute for Prairie Archaeology. The goal of this field school was to open additional units directly adjacent to and outside of the original Cabin 3 excavation, the most intensively researched cabin feature from the previous studies. This provided additional information about daily life at the Buffalo Lake site, as well as a comparative dataset detailing a previously unexamined component of the site.

In addition, documentary accounts of the site had been collected by the original researchers, including first-hand descriptions of the site during the peak of its occupation by Sir Samuel Benfield Steele, a prominent North West Mounted Police officer and Fur Trade explorer. These accounts caught my attention, as Steele mentions searching "amongst the four hundred cabins" that comprised the settlement (Steele 1918:86). While the original archaeologists that researched the Buffalo Lake site note that this estimate of four hundred cabins is often questioned (Doll et al. 1988:46), if the actual number of cabins present was even half of this then the historic Buffalo Lake settlement would have been one of the largest habitation sites west of Red River at the time of its occupation.

The intention of this thesis is to examine life at the Buffalo Lake site through the application of a number of techniques, including integrating Geographic Information Systems (GIS) with archaeological geophysics techniques to locate new cabin structures that could be studied in future field sessions, as well as using statistical analyses to explore and test patterns in the artifacts excavated from the site. Through the use of non-intrusive remote sensing field methods, specifically magnetometry and ground-penetrating radar, as well as laboratory tests of magnetic susceptibility, geophysical signatures can be determined that will assist in locating the potentially hundreds of cabin structures that remain unrecovered at the site. Since one of the goals of the EMITA project is to work closely with and on behalf of extant Métis populations, an added benefit of locating these undiscovered cabins is the ability to more accurately determine the extent of the Buffalo Lake site, assisting with better conservation of the archaeological materials.

These methods were eventually expanded to include the use of statistical tests to examine the relationships between a number of functional artifact categories, as well as the cabin assemblages as a whole. Through using exploratory and confirmatory data analyses, I wanted to determine whether correlations existed between certain functional artifact categories at the Buffalo Lake site. For example, does an increase in a category of artifacts, such as lithics, also usually result in an increase in another category, such as faunal remains? Conversely, does an increase in one category often accompany a decrease in another category, and what, if anything, can these correlations say about life at the Buffalo Lake site?

Similarly, while artifact assemblages have previously been compared between different Métis overwintering sites (for example, see Burley 1989a, 1989b), and while individual cabin features have received detailed analysis (see Doll et al. 1988; Weinbender 2003), I was interested in seeing whether there was significant variation in the artifact assemblages recovered from separate cabin features within the same site. This variation can be interpreted as providing evidence for individualistic, or at least archetypal, use of material culture amongst the Métis inhabitants of Buffalo Lake, as opposed to presenting a monolithic interpretation of what it means to be Métis and the suggestion of a standard distribution of Métis material culture.

The origins of Métis culture are outlined in Chapter 2 of this thesis. This chapter also provides a definition for the term Métis as it is used throughout this document, as there are many conceptions and boundaries to the term, as well as an overview of Métis cultural adaptations as they moved out into the Prairies. It concludes with a brief description and history of the Buffalo Lake region, and some of the characteristics that would have drawn populations to the area.

Chapter 3 is primarily a summary of the existing archaeological studies that have occurred at the Buffalo Lake Métis Wintering Site, as well as a general overview of research that has been conducted at other Métis archaeological sites.

Chapter 4 details the archaeogeophysics research I conducted. This includes an overview of the two non-intrusive remote sensing technologies I used during my cabin surveys, as well as the initial results of the ground-truthing excavations. Methodology and results of the follow-up laboratory analysis I conducted after returning from the field are also detailed.

Chapter 5 focuses upon summarizing the cabin features and artifact assemblages recovered during the original 1970s and 1980s excavations and surveys. This background information is provided as the original research forms the foundation upon which my own statistical analyses build.

Chapter 6 outlines the statistical analyses I used to examine the Buffalo Lake assemblages. Descriptions of the tests and the datasets they were conducted upon are included, as is an explanation of the conclusions that I drew from their results.

Finally, Chapter 7 contains a summary of the information presented in this thesis, as well as conclusions drawn from the research as a whole.

CHAPTER 2

A PRELUDE TO BUFFALO LAKE: SUMMARIZING MÉTIS HISTORY

In order to better interpret the lifeways of those Métis[1] who occupied the settlement at Buffalo Lake, it is necessary to understand the sociopolitical and historical contexts surrounding their lives. This chapter will therefore trace a path from the origins of Métis culture to the point when Métis first inhabited the Buffalo Lake region around 1861 (Doll et al. 1988:19), and by so doing will provide insight into the social practices of a group now being studied archaeologically.

2.1 Defining "Métis"

The Atlantic fur trade of the early seventeenth century is where the seeds of Métis culture were sown (Turgeon 1998:586). Since this point of initial contact, the interaction between the colonizing forces of France, England, Scotland, and many other European nations with the aboriginal populations of North America has resulted in the Métis community as it exists today. Over 450,000 individuals self-identified as Métis in Canada in 2011[2], yet it is not the goal of this thesis to address the complex political issues that surround modern Métis identity and society; instead, I will focus upon what defined historic Métis populations within the Canadian west as this definition more closely reflects those Métis individuals inhabiting Buffalo Lake.

There are several sources that provide definitions for the historic Métis, each with varying degrees of inclusivity regarding the cultural groups that contributed to their origins.

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[1] Throughout this thesis I adopt the spelling "Métis". While many authors choose to focus upon the term "Metis", without an accent, due to it being more "inclusive of all mixed ancestry people" (Macdougall 2008:11, Footnote 6), the term Métis is more often encountered within historical contexts, and would have been the label most closely associated with the inhabitants of the Buffalo Lake site.

[2] Statistics Canada. *Aboriginal Peoples in Canada: First Nations People, Métis and Inuit, National Household Survey, 2011*, Catalogue No. 99-011-X2011001, accessed November 9, 2016.

Some discuss the Métis only as descendants of unions between French and aboriginal individuals, pointing to the root of *métis*/*métisse* as being "the French language terms for persons of mixed descent" (Peterson 2012:26). Other definitions are more inclusive, noting the confluence of French Métis with English "half-breeds", or even the sociopolitical pressure placed upon certain European populations to not identify as Métis at all (Dickason 1982:13). Others focus upon the distinction between these definitions of Métis—sometimes considered Red River Métis—and the Plains Métis groups that were composed of French, Cree/Ojibwa, and Michif-speaking individuals (Peterson 2012: 24). Finally, some definitions look at the wider cultural influences on those who have called themselves Métis, stating that the term encompasses the entire diaspora of the population, stretching from "the western and northern Prairie provinces… into North Dakota and Montana", and including "mixed individuals and groups ranging geographically from the Pacific Northwest, to the Athabasca, the shores of Hudson Bay, the northeastern plains and Red River, and to the Great Lakes, as well as individuals of French Canadian, English, Scots, Iroquois, Cree, Ojibwa, Assiniboine, Slavey, and Dene descent" (Peterson 2012:24-25).

Whichever definition one ascribes to, these numerous distinctions make it clear that Métis should not be conceptualized as a monoculture. Each of the preceding definitions has a basis, yet in different locations and under different circumstances there would not have been Métis individuals who would have encompassed all of the variations to the category. In fact, archaeologists and historians have uncovered many different combinations of material culture, subsistence, and architecture at Métis habitation sites across the country (for examples, compare any of Burley 1989a, 1989b, 2000; Burley and Horsfall 1989; Dickason 1982; Doll et al. 1988; Elliott 1971; Iseke-Barnes 2009; Macdougall 2006; McLeod 1985; Ray 1982; Weinbender

2003). The result of the different manifestations of Métis material culture and ideologies is that they allow me to look specifically at the different artifact assemblages associated with each cabin feature at the Buffalo Lake site, and from these data examine their implications on the daily lives, and by extension the identities, of the structure's inhabitants.

This is not to say that commonalities would not have existed amongst discrete Métis populations inhabiting different regions of North America. In fact, a key argument posited by Macdougall et al. (2012) was that three elements—mobility, geography, and family—transcended these boundaries, defining "Métis culture across North America… [and] pivotal to a Métis worldview and way of life" (Macdougall et al. 2012:6). In brief, the authors saw the interplay between these three elements as a complex and shifting relationship, but one that superseded other potentially defining characteristics and circumstances.

To the authors, *mobility* is discussed not in the sense of "nomadism," nor in the strict terms of its opposite, "rootedness", but instead in terms of the exceptional ability of many Métis groups to strike a balance between the two (Macdougall et al. 2012:8-9). It was the inherent mobility within Métis communities that saw family members visiting numerous regions during the course of their seasonal cycles, and many Métis found themselves "spread throughout northwestern North America, the Great Lakes region, the Great Plains, along rivers used as major fur trade routes, in the subarctic scrublands, and in the boreal woodlands and parklands" (Macdougall et al. 2012:9). The scope of this mobility introduced these groups to numerous distinct *geographies*, each of which in turn "informed the specific types of social and cultural communities that existed there" (Macdougall et al. 2012:9). Through modifying their cultural practices to the landscape at hand, Métis groups found new ways to thrive in their environments, going so far as to "produce homes in new landscapes by adapting place names, economies and political structures that reflected both nostalgia for their old homes and excitement by the invention of new ways of living and being" (Macdougall et al. 2012:10). This knowledge of new landscapes would be passed along through various Métis *kinship networks*, contributing to what Macdougall et al. saw as "an emphasis on family surnames as a means of inspiring and maintaining social and cultural unity" (2012:13).

To the authors, it is the intersection of these three foundational elements that gives unity to the Métis as a cultural entity, not the relative proportion of an individual's blood or background (see also Dickason 1982:4). Their spirit of discovery resulted in a drive to experience the continent's numerous locales, and to create new solutions to the ever-shifting demands placed upon them. When combined with the strong and extensive kinship networks that many Métis cultivated (Macdougall 2008), groups of Métis were able to experience significant portions of the North American frontier, and it is this perspective that seems to best represent the cultural practices that have been subsequently studied at the Buffalo Lake Métis Wintering Site (Doll et al. 1988).

2.2 Métis Ethnogenesis

Where did these mobile, geographically wide-ranging, kin-connected people come from? As early as the seventeenth century, aboriginal and mixed-blood populations in what is now eastern Canada were participating in the Atlantic fur trade, exchanging beaver pelts for copper and brass goods (Turgeon 1998). During these early days of interaction, European traders and explorers were unfamiliar with the new landscape they found themselves within and would often turn towards the assistance of aboriginal populations for support.

With the assistance of these newly forged relationships, entities such as the Hudson's Bay Company (HBC) and the North West Company (NWC) were able to expand their influence over much of northern North America. Founded in 1670, the HBC was granted royal charters and letters patent with the purpose to gain "both *imperium* (legitimacy of rule) and *dominium* (security over property)" over those lands whose rivers drained into the Hudson Bay (Cavanagh 2011:28-29). These documents provided the HBC with the right to "erect and build such Castles, Fortifications, Forts, Garrisons, Colonies or Plantations, Towns or Villages, in any Parts or Places… as they in their Discretion think fit and requisite"[3], and to impose martial law as necessary to succeed in their task (Cavanagh 2011:29).

The ensuing colonization of the bay watershed, and eventual expansion into the continental interior, resulted in more intensive interactions with the region's indigenous populations. While attitudes towards the indigenous populations varied throughout the Company's history (for example, see Cavanagh 2011:44 and Macdougall 2008:30), one of the early decrees was that Governors were encouraged to forge "compacts and Agreements wth. the Capts. and chiefs of the Rivers & Territories"[4]. The impacts of this policy were two-fold: first, the Company was assisted in securing "a right & property" in the land, helping legitimize a key point in the HBC Charter, and; second, these arrangements would assist in establishing the Company's security and the stability of the bay (Cavanagh 2011:32). Continued amicable interactions with the nearby indigenous populations eventually led to the emergence of a group known as the "home guard Indians", "several local families who lived alongside the company—

[3] HBC Heritage. *Royal Charter of the Hudson's Bay Company*, http://www.hbcheritage.ca/hbcheritage/collections/archival/charter/charter.asp, accessed January 17, 2017.
[4] HBC Heritage. *Royal Charter of the Hudson's Bay Company*, http://www.hbcheritage.ca/hbcheritage/collections/archival/charter/charter.asp, accessed January 17, 2017.

whose numbers ranged anywhere from two families up to '150 to 200 men, women and children' at each settlement during the mid-eighteenth century" (Cavanagh 2011:32). Among their many tasks, these groups became responsible for outfitting traders, hunting to stock the settlements' larders, and providing security against both French and indigenous incursions.

The daily interactions of Company employees with the home guard had a significant, and likely unexpected, impact on the formation of the modern multinational state of Canada. Although indigenous women were often viewed with suspicion by Company employees (Macdougall 2008:10), especially those of the London Committee that oversaw all Company policies, "celibacy was, in practice, impossible to enforce consistently", especially on "the official class, many of whom saw native women as a privilege afforded of their rank" (Cavanagh 2011:36). The offspring of these unions became the first individuals of mixed European and North American ancestry in the Hudson Bay region, as well as one of the origins of those groups that would eventually come to identify as Métis.

As these unions became more common and official Company stance became more accepting of indigenous women around the settlements, these women began to play a "vital role, both because of their family connections and because of their particular skills" (Dickason 1982:7). Indian, and within a generation Métis, women became "invaluable travelling companions, provided important labour, and through marriage linked European traders into Indian kinship systems thereby offering economic advantages to both cultural groups" (Ray 1982:94; see also Macdougall 2008). As early as the late 1700s, women worked in "the snaring and trapping of animals like marten, weasel, rabbit, and muskrat at Elk Point", "softening leather, sewing moccasins, stringing snowshoes", and "provisioning the post not only with furs but also with fish and partridge" (Iseke-Barnes 2009:43). Additionally, during the mid- to late-

1800s in and around Fort Edmonton, women worked "repairing canoes and fishing nets", "educating the children, and maintaining the family home while their husbands were out trapping and trading" (Iseke-Barnes 2009:43).

As the roles of the home guard began to become more formalized, Indian and Métis individuals started to form a symbiotic relationship with the HBC (Macdougall 2008:24-25). For those individuals that were young and healthy, the posts "were bases from which they could embark on seasonal hunting expeditions for the HBC economy and to which they could return and settle for the winter" (Cavanagh 2011:43). In exchange, the HBC would endeavour to care for those members of the home guard that were too "young, weak, sick or elderly" to engage in the seasonal hunts, providing rations and shelter while the younger members were away and incapable of looking after their relatives (Cavanagh 2011:43-44).

This symbiotic relationship continued for several decades, and new forts and posts were constructed well into the continental interior, provisioned by a combination of Indian, Métis, and European traders and freemen. Although this roving lifestyle was quite common at the time, agricultural practices were also beginning to emerge, and a land grant to Lord Selkirk was approved by the HBC in the early months of 1811 (Stephen 2013:45). Selkirk attributed this decision to an initiative by the HBC to "provide for retired and redundant personnel and their families" (Stephen 2013:45), one of the consequences of difficult economic times and a restructuring of the Company's fur-trade operations (Stephen 2013). In contrast to the more mobile lifestyle many fur-trade practitioners had become accustomed to, life was relatively settled for the inhabitants of what was to become the Red River colony. As time passed, "agriculture provided an increasing share of the settlement's basic food requirements and income", and education became more readily available (Ray 1982:100). Similarly, Marcel

Giraud saw these new colonists as "preferring to associate with the more 'refined' representatives of British civilization found at HBC posts" (Macdougall 2006:435), rather than the populations that tended to travel the Prairies.

However, troubled economies in the homeland of the HBC, exacerbated by the actions of Napoleon and the resulting collapse of British export activities throughout Europe, forced the main proponents of the North American fur-trade to rethink their strategies (Stephen 2013:39-45). British and French traders had been interacting in the bay area for the better part of a century, participating in "an almost constant state of Anglo-French conflict" that involved "a violent cycle of capturing and recapturing each other's forts" prior to the French eviction from the area as laid out in the Treaty of Utrecht in 1713 (Cavanagh 2011:30). While the French re-established much of their foothold in the continental interior, interactions post-Treaty were not nearly as hostile, as "conflict in Rupert's Land was utterly detrimental to the fur trade and was never worth its expense or risk for the HBC" (Cavanagh 2011:31). Instead, the HBC attempted a more diplomatic approach: "the French were to be traded out of the company's jurisdiction, not prosecuted within it" (Cavanagh 2011:40).

This approach, however, did not work nearly as effectively as the HBC had anticipated, largely due to the Company's conservative business practices (Wagner 2014). As a result, "the HBC's Montreal-based competition was claiming three-quarters of the fur trade at the beginning of the 19th century, and promised to double their efforts after the merger (or, rather, re-merger) of the North West Company (NWC) and the New North West (XY) Company in 1804" (Stephen 2013:39). Nearly two decades of negotiations occurred between the HBC and the NWC, including an offer in 1804 by the NWC of £103,000 in Navy 5% annuities, as well as £2000 in annual rent, for access to the route through the Hudson Bay (Stephen 2013:40). However, the companies did not agree to terms until 1821, at which time the North West Company merged into the Hudson's Bay Company; in the process, dozens of Posts were closed and many employees of the organizations were dismissed, a business decision which had far-reaching impacts upon the region's many communities. In the years following the 1821 merger, the dissolution of many of the employees' contracts allowed those affected to hunt, fish, trade, and undertake entrepreneurial pursuits, and many individuals worked as freighters during the decades from 1840 to the mid-1860s, transporting goods for the Company (Doll et al. 1988:13-14). It is largely as an outgrowth of these Métis roles as freemen (*l'homme libre*) and winterers that helped to bring about the genesis of Métis culture on the Plains (Foster 1994).

2.3 Material Culture and Practices of the Plains Métis

These emerging cultural practices and beliefs, coupled with sentiments that started to take root as early as the mid-1810s, resulted in many Métis starting to see themselves as a cultural group distinct from both aboriginal and European cultures. These ideas coalesced in 1816 at the Battle of Seven Oaks; it was at this point that "the consciousness of identity as a separate and unique nation was confirmed" (Chartrand 1999:280), with these ideas acting as a legal point of contact between the Métis Nation and Europeans settlers:

> it was at this point in time that the Métis were consciously aware of their collective existence and common interests as a people and as a new nation and engaged the Europeans from that national understanding. [Chartrand 1999:280]

From these initial interactions as a unique and separate entity, through to the proclamation of their provisional government in December of 1869 (Sawchuk 2001:79) and beyond, the Métis Nation continued to build upon this identity and independence through their daily cultural practices.

While much of the literature on Métis cultural practices focuses upon the relatively emplaced lifestyles of those populations living in settlements such as Red River, there was another distinct set of practices occurring coincidentally, namely those undertaken by travelling groups which have subsequently become known as Plains Métis (Macdougall 2006:435; Ray 1982:100). These Plains Métis were predominately seen as roving buffalo hunters, working within large parties to overwhelm their prey (Doll et al. 1988:13-14) and processing the kills for subsistence and profit. Living a more mobile lifestyle, Plains Métis were often considered to have abandoned the relative comforts of more "civilized" society in favour of personal liberty (for example, see Ray 1982:92-93), yet this viewpoint only presents a limited understanding of the full range of cultural practices employed by these brigades. Although they are often stereotyped as highly nomadic, certain groups of Plains Métis were also recorded as turning to agriculture, at least on a limited basis. It was noted that many communities "were growing gardens and root crops when they were not hunting, and indeed, the hunts were timed to accommodate the care of crops" (Doll et al. 1988:14).

Though cyclical journeys out into the Plains proved a significant departure from the cultural practices witnessed at Red River and other more permanent settlements like Lac Île à la Crosse, these practices more closely mirrored the provisioning efforts of the early home guards such as at York Factory and Fort Albany. While many of these travelling groups still utilized tents during the summer months of their seasonal cycles, one of the most iconic images of the Plains Métis remains that of the Métis, or Red River, cart (Macdougall et al. 2012:7). Although resembling a European cart or wagon, the Red River cart is unique in that it is "made with no metal or steel parts so that it could be easily repaired out on the plains", an adaptation that could mean the difference between life and death in the long stretches between trading posts

(Macdougall et al. 2012:7). Further, unlike the composition of the early home guard provisioning expeditions, entire extended kinship structures became included in the Plains Métis seasonal cycles, with women, children and the elderly each contributing to its success in their own ways (Macdougall and St-Onge 2013). Macdougall and St-Onge noted that one specific group of Plains Métis—the brigade headed by Charles Trottier—comprised over thirty families and three hundred people, and was largely the result of the political and familial maneuverings of a core group of related women (Macdougall and St-Onge 2013:24; see also Macdougall 2008).

The adaptations undertaken by these Plains Métis continued to be refined as the years passed, and these groups became highly efficient at provisioning the numerous trading posts throughout the Canadian west. Much of this efficiency is a result of these brigades' skill at hunting buffalo, eventually processing substantial, and ultimately unsustainable, amounts of fats and dried meat for use in pemmican production (Colpitts 2012). In time this resource became the backbone of the fur-trade; "compact and easily transported, it constituted a highly concentrated foodstuff offering 3,200 to 3,500 calories per pound that could be stored safely for years" (Colpitts 2012:184).

As populations grew in the Canadian west, increasingly large amounts of pemmican were required to provide the necessary rations to those living in HBC posts and their related settlements. The Red River colony alone grew in population "from 'about 600' in 1823 to 2,300 in 1831, to 4,073 in 1840, to 6,523 in 1856. By 1871 the census counted about 11,000 residents" (Colpitts 2012:193). Estimates for the quantity of "bison meat purchased exclusively by the HBC rose from 482,000 pounds in the 1840s to 579,870 pounds in the 1850s, to 615,625 pounds in the 1860s, to 864,053 in the 1870s, on the eve of the collapse of the bison herds" (Colpitts 2012:193).

To produce such staggering quantities of dried meat, especially in the face of dwindling buffalo populations throughout the Prairies, many Plains Métis adopted the practice of overwintering. This cultural practice occurred when “a person whose involvement in the fur trade require[d] absence from his or her normal place of residence”, with the individual taking up residence instead at a “wintering place” (Doll et al. 1988:22). While overwintering could take many forms, Doll et al. (1988:22) noted that “normally, the cycle was one calendar year, and the word *hivernant*, by the 1870s, increasingly applied to hunting families who entered and left the Plains from reasonably permanent places in the Parkland and woods”.

Giraud noted that overwintering Métis were often drawn to the “undulating lands which dominate the horizons of the prairies (like Touchwood Hills and Boss Hill) because of the resources that they offered” (Doll et al. 1988:2). These sites would be chosen because “wood, pasturage, and buffalo were all nearby”, and typically within two weeks of arriving at the site semi-permanent cabins were erected. The architectural styles of these structures were relatively simple, a result of the expedient nature in which they were being constructed, and houses were often “made of hewn spruce logs with windows covered with stretched hide, and bark used as roofing shingles”, while “buffalo robes were used as mattresses, with Hudson Bay Company blankets and flour or sugar sack pillows filled with duck and goose feathers” (Iseke-Barnes 2009:47). Victoria Callihoo noted that structures would occasionally take advantage of the local terrain, referencing “a milk house… dug down to the hard pan of the soil, like clay soil” (Iseke-Barnes 2009:47-48). This emergence of overwintering practices allowed those encamped throughout the Plains to extend the duration of their seasonal cycles, return to their home settlements with less frequency, and follow the buffalo progressively further west as their numbers rapidly declined (Ray 1982).

These numerous forms of adaptation—economic, material culture, and more—are some of the most prominent examples of how Métis groups hybridized their lifestyles during the course of the fur trade, and it was this capacity for adaptation that allowed these groups of Métis to play the prominent roles that they did in shaping Canada into the country that it has become.

CHAPTER 3

EXISTING ARCHAEOLOGICAL RESEARCH AT THE BUFFALO LAKE MÉTIS WINTERING SITE (FdPe-1)

Archaeological data provides an additional line of insight into material cultural adaptations at the Buffalo Lake Métis Wintering Site, and this thesis owes much to research conducted by Maurice F. V. Doll, Robert S. Kidd, and John P. Day, the three principal investigators on the archaeological project that studied the Buffalo Lake site during the 1970s and 1980s. Much of this chapter summarizes the results of their archaeological research to provide a framework of understanding for my own research. A significant portion of the work completed by the researchers involved a systematic survey of the site that resulted in the identification of over 80 cabin localities (Figure 3.1), a number of which were then excavated (Doll et al. 1988:iii).

However, to understand the importance of the Buffalo Lake Métis Wintering Site as an *hivernant* ("overwintering") site, I want to situate it within the broader scope of contemporary Métis archaeological sites from this region. While reports and analyses of these sites have already been referenced throughout the body of this document, a brief summary of the sites will provide a foundation upon which my own interpretations are built.

3.1 Summary of Previous Métis Archaeological Studies

Métis archaeology has been studied by many researchers over the recent decades (for example, see Figure 3.2). Research goals have included examining whether lithic technologies were readily adopted by Métis populations (Doll et al. 1988; Elliott 1971), as well as refutations of the same argument (Burley 1989a). Elliott, Doll et al., and several other researchers believed

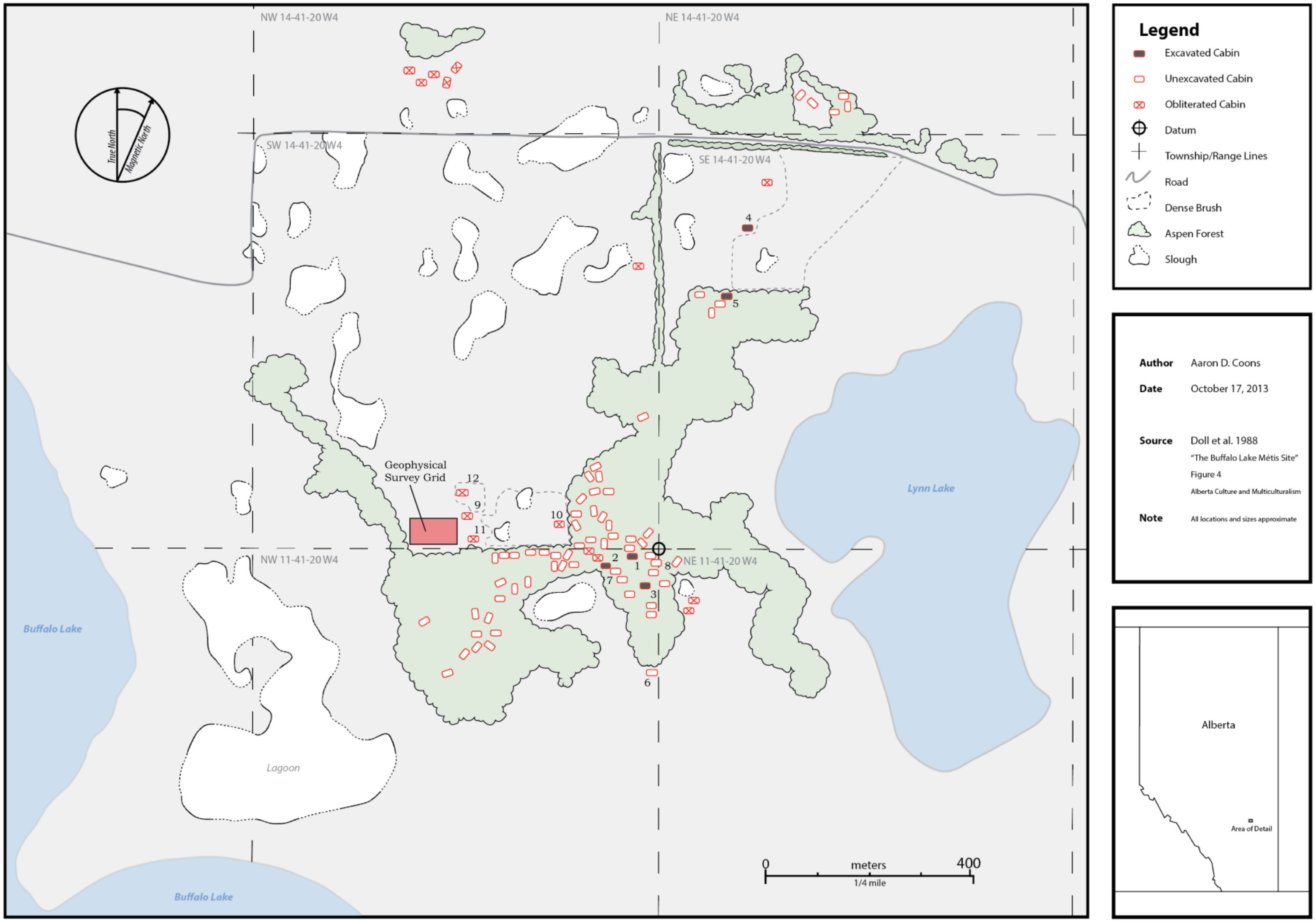

Figure 3.1

Layout of the Buffalo Lake Métis Wintering Site

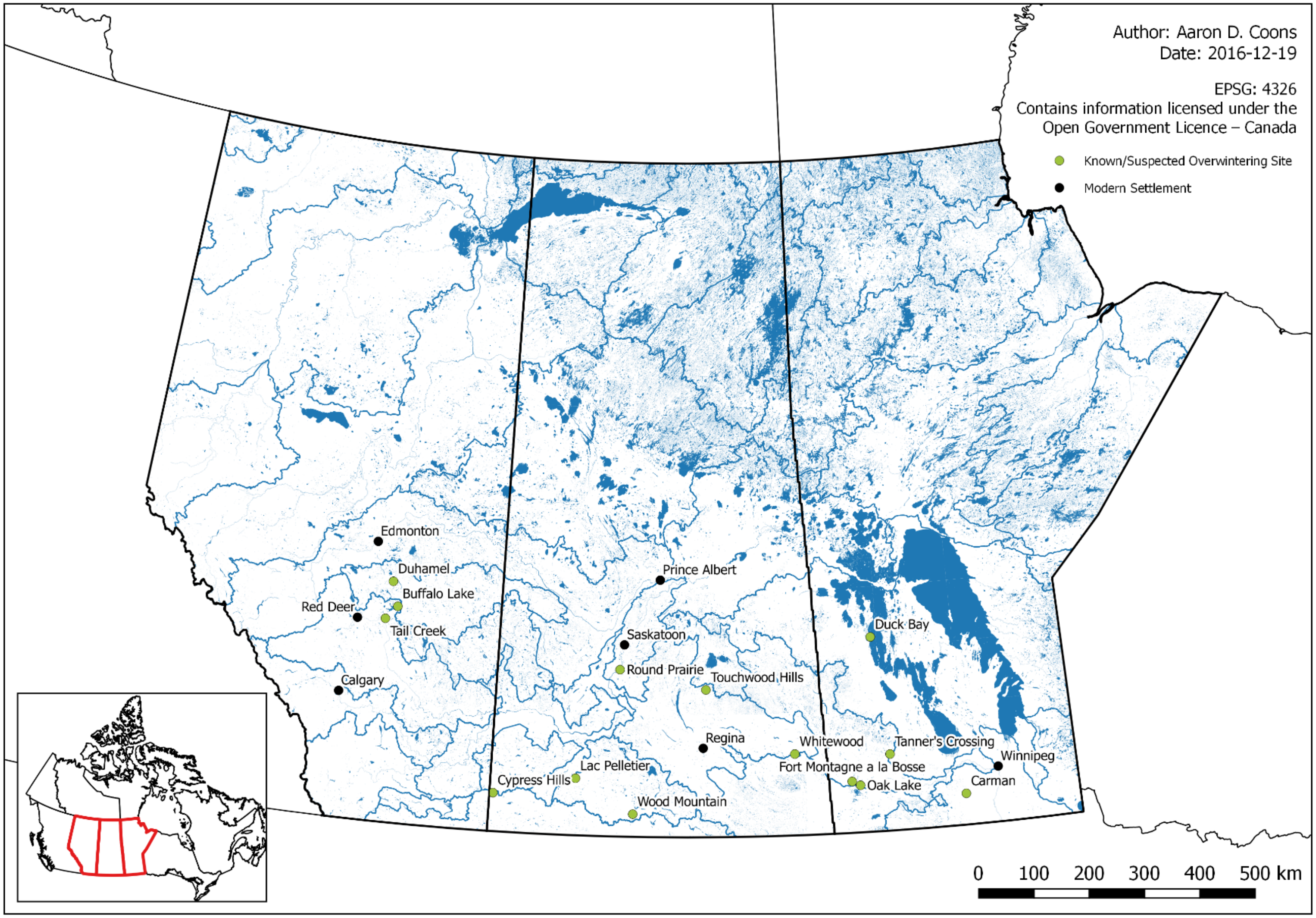

Figure 3.2

Known/Suspected Métis Overwintering Sites in the Prairies that a co-existence of lithic and “post-contact” artifacts would be commonplace amongst Métis populations, and that while “it is quite possible that many of the lithic artifacts and the ceramics … were left by a preceding late prehistoric occupation” it seems “most unusual that such concentrations would be found [at Buffalo Lake] in the two depressions… without a proportional distribution in the rest of the cabin interior” (Doll et al. 1988:118). Further, Thistle (1986:35) notes that often “traditional materials were still preferred for important tools”, particularly bone hide scrapers. In contrast, David Burley (1989a) believes that the evidence for Métis use of lithic artifacts is “less than substantial”; while he admits that “all documented hivernant sites have a co-presence of flaked stone and historic artifacts”, “the absence of well-defined and/or stratified floor deposits and the presence of nearby prehistoric components, all raise serious doubts” regarding the hivernant use of flaked stone technologies (Burley 1989a:160-161). While a significant number of lithic artifacts have been recovered from hivernant Métis sites across the region (see Doll et al. 1988:211-230; Weinbender 2003:76, 145-153), the debate between these two perspectives remains unresolved.

Comparative analysis across Métis sites became another topic of interest to many researchers, as it opened up discourse on the relative similarity and difference amongst artifact assemblages in the region. This is seen in studies on ceramic patterning and prevalence (for example, Burley 1989b; Panas 1999), focusing on the seemingly disproportionately high number of fragile earthenware ceramics recovered at many Métis sites. Burley notes that the prevalence of ornate designs on the earthenware ceramics, specifically of Spode/Copeland patterns with “images of strange places, odd customs, and unrecognizable scenery” would not have resonated with Métis as nostalgic signifiers (Burley 1989b:99). Instead, to the author it was clear that these ceramics had become embedded within hivernant material culture:

> ceramics have become more than something to eat or drink from or show one's position in the fur trade hierarchy. They are a commodity with imbued social meaning that is shared by all Metis. In this shared meaning, ceramics provide an intelligible social environment. [Burley 1989b:103]

Similarly, Panas saw these ceramics as being cornerstone to Métis society, noting that "regardless of financial or employment conditions, the requirement was always present for warm receptions to be provided to any who crossed the threshold" (Panas 1999:13); comparing the presence of these ceramic patterns across Métis sites allowed the researchers to examine the shared commonality of these Métis material cultural artifacts.

This type of comparative analysis was also performed on a seemingly less conspicuous, albeit no less informative, type of artifact than these intricately patterned ceramics. Faunal remains recovered from Batoche, the Cypress Hills, and Buffalo Lake were compared by Brian Kooyman (1981). He considered a number of factors when examining the assemblages, including the "spatial distribution of the remains, the actual fragmentation patterns in the material, and the clustering of various cut mark types on bone fragments" (Kooyman 1981:2). These assemblages were systematically broken down by faunal element, and the author compares whether the butchering patterns more closely represent what he conceived of as either European tendencies or Métis tendencies, based upon cultural preferences for certain cuts of meat or the placement of butchering marks (Kooyman 1981:109-190). The existence of this comprehensive dataset provides a foundation against which future examinations of faunal remains can be compared.

What all of these topics have in common is that each of the researchers are, in some capacity, using these archaeological questions and data to gain insight into the historic Métis inhabiting each site. While examinations of Métis lithic use provide an explanation for the presence of a specific component within the archaeological record, they also provide a look at the influences that other cultural groups have had on Métis material culture. The construction and design of the Métis log house is relevant to studies of the patterning of these structures, and assists with future excavations by providing a degree of knowledge of what to expect; however, the design, location and orientation of these log cabins can also be interpreted as providing evidence for Métis worldview and ideologies.

It is in these broader contexts that Sherry Farrell Racette places the comparative analysis of clothing and decorative arts as a means of expressing Métis identity (2004). While not strictly an archaeological thesis, the comparative analysis draws upon both archaeological data and historical documentation to provide insight into how patterns of dress could signify positions within Métis society, be that as interpreters, voyageurs, dog drivers, and more (Farrell Racette 2004:161-182). A similar conception is seen in the way that forms of dress act as a "cultural language", and in which clothing "marked a tangible material object exhibiting a certain agency in the way meaning is negotiated around it" (Parsons 2016:16). The reflection and advertisement of individual and group identity through the material culture one adopts helps confirm the pluralistic concept of identity amongst Métis groups, with the Buffalo Lake site forming a distinct component of a "sprawling spider web of hybrid communities located within an interconnected and interrelated network spread across the continent" (Farrell Racette 2004:305).

Clothing in fact plays a significant role when considering Métis identity, and the retention of traditional leather clothing—especially moccasins (see Figure 3.3)—would be visible in the archaeological record in the form of tools connected with hide processing, such as lithic scrapers. The volume of work these hide-processing tasks created for women at other archaeological

Figure 3.3

Group photograph of Métis and Native prisoners from the North West Rebellion

Image Source: Library and Archives Canada, MIKAN no. 3228114, Oliver Buell sites, including the Ross Glenn Site (DlOp-2), Rat Indian Creek Site (MjVg-1), the Promontory Caves (42BOS-1), and the Stelzer Site (39DW242) has been studied extensively (see Reilly 2015), and the retention of these traditional leather goods would likely have created a similar amount of work for women at the Buffalo Lake site. If estimates for the number of moccasins present at the Promontory Caves site are considered, then somewhere between 800 and over 2500 pairs of moccasins would have been necessary during the period of that site's occupation (Hallson 2017:103). This would require a significant investment in time, labour, and raw materials to sustain this type of material culture, and a similar expenditure of resources can likely have been expected at Buffalo Lake.

It is with these considerations in mind that I began my own research on the cabin features and artifact assemblages at Buffalo Lake, building upon these previous studies of Métis material culture and the ways that its various components can be seen as constituting individual and group identities. Through determining geophysical signatures that relate to Métis archaeological features, I hoped to examine spatial patterning amongst as-yet-unexcavated components of the Buffalo Lake site. While this would provide the project with data on where to place future excavations, my primary interest was the distribution of cabin features, looking at the social organization of the site's inhabitants through the clustering, dispersion, and orientation of the cabin features. Were cabins located in small clusters, potentially implying extended familial groups living in close proximity, or were they relatively evenly distributed across the site? Were the structures at Buffalo Lake consistently orientated along the same axis, and how can this be interpreted with regards to Métis ideology or beliefs?

Further, I wanted to compare the data against previous research conducted further east along the South Saskatchewan River (Burley 2000; Burley and Horsfall 1989). The authors examined building construction techniques and the spatial organization within structure clusters, noting that the Métis "built environment reflects openness, informality, lack of rigidly refined structure, and continuity with the landscape" (Burley and Horsfall 1989:30). However, these conclusions are based upon the organization of structures within Métis homesteading communities, and so I set out to expand upon this study by examining whether similar spatial patterning could also be seen within an hivernant Métis settlement. In addition, different forms of settlement structure, such as the use of the seigneurial system visible at settlements such as Batoche and Victoria Settlement, would provide a good point of comparison against the more amorphous settlement structure that seems to be in place at Buffalo Lake, and I was interested in seeing how the cabin features at Buffalo Lake might be located around the depressions and sloughs given that river lots would not have been a viable form of organization in this landscape.

3.2 Detailed Background on the Buffalo Lake Métis Wintering Site (FdPe-1)

With these research questions in mind, I began to study the Buffalo Lake site in earnest. Yet given my interest in spatial distribution and organization I started to wonder, why was this location chosen for this overwintering settlement in the first place? As became clear, an understanding of the attractiveness of settlement at Buffalo Lake must begin with a description of the topography of the landscape. The Buffalo Lake region is "characterized by a glaciated landscape with numerous moraine and outwash features", while "scattered throughout are several bodies of water dominated by Buffalo, Boss, and Lynn Lakes, and including numerous smaller permanent and temporary sloughs" (Doll et al. 1988:5). Classified as Aspen Parkland, the area contains two major ecosystems—woodland and grassland—which tend to form "a patchwork of aspen stands and irregular open grassy areas" punctuated by lakes (Doll et al. 1988:5). The soil at the Buffalo Lake site is classified as an elluviated black chernozem on medium and coarse textured materials, and includes areas of poorly drained soils[5].

The lake itself is a natural source of fish—northern pike, burbot, white sucker, and brook stickleback—and Buffalo Lake is "second only to Beaverhill Lake in its importance for waterfowl brood production, moulting and fall staging, and for nesting of colonial birds" (Mitchell and Prepas 1990:512). In fact, "up to 17,000 ducks, 3,500 swans and 12,000 geese (mostly Canada Geese and Snow Geese) use Buffalo Lake for staging before migration" (Mitchell and Prepas 1990:512). Finally, muskrats are plentiful in the region, and "the area supports numerous white-tailed deer; mule deer are less common and moose are occasionally seen" (Mitchell and Prepas 1990:512), and inhabit the dominant vegetation of trembling aspen, wild rose and saskatoon (Mitchell and Prepas 1990:508).

While Alberta is home to an extensive, 11,000 year history of occupation (see Peck 2011:32), most relevant to this document is the pre-contact occupation at Boss Hill, a prominent feature in the landscape located directly south of the settlement at Buffalo Lake. Researched by Maurice F. V. Doll (1982), this archaeological site contained much lithic debitage and stone tools, including lanceolate and corner-notched projectile points, bifaces, scrapers, retouched and utilized flakes, four hammerstones and anvils, and two milling stones, in addition to botanical remains and bone and antler tools (Doll 1982:38-58). Radiocarbon dating of a hearth feature coincident with the occupation layer provided a date of "7750 ±105 years B.P." (Doll 1982:65), and faunal remains from numerous species of mammal, waterfowl and fish were present throughout the occupation (Doll 1982:60-65). Although the Doll report (1982) focuses only upon

[5] Alberta Agriculture and Forestry, Alberta Soil Information Viewer, Polygons 15297 and 15302. Available online, https://soil.agric.gov.ab.ca/agrasidviewer/, accessed January 17, 2017

the occupation at Boss Hill, archaeological sites in the region appear to date back at least 9000 years (for example, see Peck 2011:67-94).

However, even a concise history of the territorial politics of the Prairies and Parkland lies outside of the scope of this thesis, and instead I will focus upon the history following the foundation of Fort Jonquiere near present-day Calgary in 1752; as the earliest point of contact this far to the west, it forms a temporal boundary on Métis occupation within the region (Bell 1885:np). Regarding for the Buffalo Lake settlement specifically, the origin of the eventual occupation of the site seems to occur between 1836 and 1837, when a smallpox epidemic caused extensive population loss amongst the Blackfoot and Assiniboine in the area (Doll et al. 1988:11). As a direct result of "hearing of this plague, it appears that the freemen at Red River decided to return to the Upper Saskatchewan… [and] various Upper Saskatchewan settlements came into existence about 1838 to 1840 and were occupied, essentially continuously, from that time onwards" (Doll et al. 1988:11).

By 1870 when the Buffalo Lake site started to develop in earnest, Métis familial connections had already been firmly established in the area for decades, comprised largely of the Dumont-Salois families, the Munro family, and the Bird family (Doll et al. 1988:19). By the time a significant blizzard hit the area in October 1872 the settlement seemed to have been firmly established (Doll et al. 1988:28-29). During the years following, Oblate mission records chronicle the occupation at Buffalo Lake; by 1873 "as many as 500 Carlton, Pitt, Victoria, and St. Albert Métis were staying in the hunting areas that year" (Doll et al. 1988:25-26), although a net emigration out of the region was observed following this period (Doll et al. 1988:50). As the bison numbers dwindled and the Alberta First Nations groups that relied upon them signed treaties, many Métis continued to occupy the area, although the settlement at Buffalo Lake was never the same. Specifically, the buffalo “were no longer sufficient for life in any event”, and “the three preceding winters had demonstrated that the Upper Saskatchewan society had become increasingly dependent on cultivated crops and domestic livestock” (Doll et al. 1988:71). This period of transition away from a roving lifestyle marks the other temporal boundary for the archaeological research at the Buffalo Lake site.

CHAPTER 4

NON-INTRUSIVE SURVEY VIA ARCHAEOLOGICAL GEOPHYSICS

One of the intentions of the EMITA research project was to leave as much of the site as undisturbed as possible, an imperative that was self-imposed for a number of reasons. The recent historical nature of the site allows the archaeological materials being examined to be linked to extant Métis populations, and as a result the project worked quite closely with advisors from the Métis Nation of Alberta to best conserve these materials. Additionally, much of the land where archaeological materials have been recovered has been assigned by Alberta Culture and Tourism a Historic Resource Value (HRV) of 3, which means the land "contains a significant historic resource that will likely require avoidance" (Alberta Culture and Tourism 2016:1).

Given these conditions, I endeavoured to strike a balance between an ability to study the spatial distributions of the archaeological features at the site and the imperative to leave these same features undisturbed. The solution to this problem came in the form of archaeological geophysics, often abbreviated archaeogeophysics (Dalan 2008; Lockhart and Green 2006). By using a number of technologies to passively and actively sense specific geophysical properties of subsurface features, archaeogeophysics allowed me to start searching for buried archaeological materials in a non-intrusive, and most importantly non-destructive, manner. To accomplish this, I focused on two of the most commonly applied technologies within this field, magnetometry and ground-penetrating radar, and eventually also tested samples for magnetic susceptibility.

Archaeogeophysics works because the environment is continuously changing, and human interaction with and occupation of these environments further compounds these changes, resulting in phenomena called natural and cultural formation processes (Schiffer 1987). Taken together, these site formation processes "produce a three-dimensional archaeological matrix or volume composed of topographic and physical properties such as soil texture, soil compaction, stratigraphy, biogenic and biochemical components, differential moisture retention, thermal alteration (burning), and artifact composition" (Lockhart and Green 2006:18). The technologies that archaeogeophysics uses provide researchers with the "capability to measure the variable strengths and locations of physical properties that make up the archaeological record... by measuring physical properties that have been created or altered by natural processes and/or past anthropogenic activities" (Lockhart and Green 2006:18-20).

Archaeogeophysics also relies upon knowledge first applied to the interpretation of aerial photography, specifically that "patterned geometries in the landscape like circles, ellipses, squares, rectangles, or lines are generally of human origin" (Kvamme 2003:438). By focusing upon distinct *contrasts* between archaeological deposits or features and their surrounding matrix, often referred to as anomalies, trained archaeologists are frequently able to detect "larger features like hearths, big post holes, storage pits, ditches, and architecture of any kind" (Kvamme 2003:440).

Through combining knowledge of these physical properties with the pattern-recognition skills derived from air photo interpretation, archaeogeophysics allows for "fast and accurate mapping of buried remains" (Gaffney 2008:314), a necessity on many research and CRM projects where time and budget considerations can dictate the overall workflow. Because of this, geophysical technologies "are important tools that can provide a non-destructive, cost-effective, accurate means of gathering objective information on site appearance, significance, integrity, and boundaries" (Lockhart and Green 2006:30).

4.1 Magnetometry

Magnetometry was a logical first choice for my research to focus upon, given the historical nature of the Buffalo Lake site and therefore the expectation, and even desire, to locate ferromagnetic features and artifacts that would interfere with magnetometry surveys at pre-contact archaeological sites. Magnetometry survey relies upon a number of basic principles that serve to distinguish anomalies from the surrounding matrix. Although these principles are detailed extensively in previous publications (see especially Black and Johnston 1962:201; Kvamme 2003, 2006), a brief summary of the major points is provided here to emphasize why magnetometry has become "the most productive prospecting method employed in archaeology" (Kvamme 2003:441):

> 1. Firing of the soil beyond the Curie point (about 600°C), whether purposeful (hearths, kilns) or accidental (a burned house), can intensify the local magnetic field owing to a property known as *thermoremanent magnetism*.
>
> 2. Accumulations of fired artifacts, such as ceramics or bricks, also intensify the local magnetic field.
>
> 3. Soils and sediments can vary in their magnetic susceptibilities, the ease with which they become magnetized when subjected to a magnetic field, such as the earth's main field.
>
> 4. Thanks to natural processes that can include burning, surface soil layers become magnetically enhanced compared to buried soils. Responsible processes include weathering and chemical reactions that change certain iron compounds to more magnetic forms[6] and magnetotactic and other bacteria that can concentrate magnetic compounds… Paleosols tend to retain this effect.
>
> 5. The removal of magnetically enriched topsoil during the construction of ditches, house pits, or other excavations causes a local lowering of the magnetic field over these features.

[6] Such as the conversion of weakly magnetic oxides and hydroxides to more strongly magnetic forms (see Dalan 2006:162).

6. Accumulations of topsoil, such as occurs in mound or sod building construction, berms adjacent to excavated ditches, or when storage or other pit features become filled, all create local increases in the magnetic field.
7. Rocks that might be employed in the construction of buildings or pavements might be more (e.g., igneous rocks) or less magnetic (e.g., certain limestones) than surrounding soils.
8. Iron or steel artifacts markedly alter the earth's magnetic field, producing readily sensed anomalies and large magnetic measurements commonly expressed as dipoles consisting of paired positive and negative extremes at mid-latitudes. [Kvamme 2003:441, emphasis in original, footnote added]

Many different types of magnetometry devices have fallen into and out of fashion in the half-century since their first applications to archaeology, ranging from the earliest proton precession magnetometers to newer cesium vapor devices (cf. Alldred 1964; Ralph 1964). Although all of these technologies still adhere to the basic principles of magnetometry outlined above, each of these devices came with their own considerations: Did the device measure the vertical or the total field? Was this a single sensor or a gradiometer? Is it carried by a person or a vehicle? The relative merits of each of these devices and configurations have been the subject of much debate since their earliest uses, and have already been considered by a number of authors (for example, see Bevan 1998; Gaffney 2008; Kvamme 2006). As this topic has been covered quite extensively, this thesis will instead focus upon the specific technology used during my own fieldwork, a Geoscan FM256 fluxgate gradiometer.

The Geoscan FM256 operates by positioning two passive sensors called fluxgates a half-metre apart vertically, one orientated along the North-South axis and the other orientated along the East-West axis (Oswin 2009:51). Fluxgate sensors are constructed from a "core of magnetic material surrounded by a pick-up coil" (Primdahl 1979:241) and the earth's field along the sensor's core axis produces a magnetic flux (Primdahl 1979:241-242). These sensors allow fluxgate gradiometers to accurately measure the strength of buried magnetic fields that persist as a result of cultural and natural formation processes. Fluxgate sensors are also able to record measurements much more rapidly than other types of magnetometers, and the FM256 allows the user the choice of recording 1, 2, 4, 8, or 16 samples per metre (Geoscan Research 2004:4-14) on grids ranging in size from 10 to 100 metres per side (Geoscan Research 2004:5-3). This adjustable pacing and the frequency with which the device takes measurements allows for large areas to be surveyed in relatively short amounts of time, and during my fieldwork we were able to record nine 30 metre by 30 metre grids over the course of two days.

4.2 Ground-Penetrating Radar

The second method employed during my fieldwork was ground-penetrating radar (GPR), a technology that is particularly well-suited for acquiring information in the vertical plane of the archaeological record (Bevan 1998:43-57; Kvamme 2003:442). Although archaeologists were early adopters of the technology, very quickly seeing its potential "to both locate and map buried archaeological features and associated sediment and soil layers", its roots actually lie in a 1972 effort by NASA to study the electrical and geological properties of the moon's crust (Conyers 2006:133). From its first archaeological applications in Chaco Canyon (see Vickers and Dolphin 1975), ground-penetrating radar has become a staple technology in both research and CRM archaeology.

Ground-penetrating radar is considered an "active" surveying technology, in that it actively sends and receives a signal as opposed to passively sensing an existing signal. These active signals occur in the form of radar waves that propagate through the ground in distinct pulses emitted from an antenna on the ground's surface (Conyers 2006:136). Because "reflections and diffractions of electromagnetic waves occur at boundaries between rock strata and objects that have differences in their electrical properties", "part of this [electromagnetic] energy is reflected or scattered at layer boundaries or buried objects" (Blindow et al. 2007:283). This reflection effect causes a portion of the electromagnetic wave to be returned upwards, where a second antenna is switched on to "listen" for these returning signals. These return signals are recorded and interpreted "as a function of traveltime", such that "when the travel times of energy pulses are measured and their velocity through the ground is known, distance (or depth in the ground) can be accurately measured" (Conyers 2006:136).

Because of the nature of ground-penetrating radar devices, "frequencies between 10 and 1000 MHz are used for geological and engineering investigations", although the functional depth and resolution varies greatly depending on where along this frequency spectrum the specific instrument lies (Blindow et al. 2007:284). Longer wavelengths, such as those between 10 and 100 MHz, have been shown to be effective at examining geological structures in quaternary environments at depths exceeding 30 metres (Smith and Jol 1995:97), and devices outfitted with 25 MHz antennas have proven capable of recording geological facies as deep as 57 metres (Smith and Jol 1995:96). However, archaeological research is uncommon at such depths, and so most projects employ devices in the 250 to 1000 MHz ranges. A benefit of reducing the functional depth of the ground-penetrating radar device is a corresponding increase in its spatial resolution, allowing significantly smaller features to be recorded; although the maximum functional depth of a 900 MHz antenna is approximately 1 metre or less in typical soils, "its generated reflections can resolve features down to a few centimeters" (Conyers 2006:138).

Soil composition also significantly affects the quality and strength of the reflected signals, and for this reason "GPR is particularly suitable for materials with higher resistivities, such as dry sand with low clay content or consolidated rocks" (Blindow et al. 2007:284). This is based upon the relative permittivity, or the relative ease with which the electromagnetic signals propagate through the parent material, with a baseline value of 1 for the air, and many geological materials, including sand, granite, limestone, asphalt, oil, and shale, cluster around relative permittivity values of 3 – 8 (Blindow et al. 2007:288). However, especially at frequencies greater than 100 MHz, "absorption heavily increases due to Debye relaxation of the water molecules" (Blindow et al. 2007:288; see also Huisman et al. 2003:477-478). As a result, both liquid water as well as sediments with high liquid water content exhibit significantly higher values of relative permittivity, reaching an effective maximum of 80 for pure forms of liquid water (Table 4.1), and therefore the relative saturation of the sediments being examined with a ground-penetrating radar can have a significant effect upon the results of these surveys. Lastly, air gaps and void spaces "such as caskets in cemeteries, tunnels, and buried pipes or conduits made of either metal or plastic will also generate strong radar reflections as a result of a significant change in radar-wave velocity" (Conyers 2006:136).

Given the functionality of ground-penetrating radar devices, devising a survey methodology becomes a relatively straight-forward task. Although every device model varies in terms of the technical specifications, in general the devices allow for large areas to be covered in quick succession; one author noted that in areas that "are not cluttered or topographically complex, GPR data for grids of 50 x 50 m or more, with a 50-cm profile separation, can be collected in a day" (Conyers 2006:132).

My fieldwork focused upon the use of a Sensors and Software Noggin 250 MHz radar system and DVL data logger, mounted upon a Sensors and Software SmartCart. This system allowed for data to be recorded at equispatial distances instead of at defined time intervals,

Material	ε_r^*
Air	1
Distilled Water	80
Fresh Water	80
Sea Water	80
Dry Sand	3 – 5
Saturated Sand	20 – 30
Limestone	4 – 8
Shales	5 – 15
Silts	5 – 30
Clays	5 – 40
Granite	4 – 6
Dry Salt	5 – 6
Ice	3 – 4

Table 4.1

Relative permittivity (ε_r^*) of various materials at 100MHz

(Adapted from Davis and Annan 1989:537, Table 1) making the system more flexible and easier to operate, and provided data of suitable quality to a depth of 1.10 metres. A low learning curve and an intuitive data logging system allowed for the collection of eight 30 metre by 30 metre grids of data over the course of two days in the field, although an experienced crew capable of swapping in both spare batteries and fresh personnel could conceivably complete the same in a single day.

4.3 Magnetic Susceptibility

Magnetic susceptibility formed the final component of my archaeogeophysics research. More technically known as “low field magnetic susceptibility”, this property “provides a measure of a material’s ability to be magnetized” by quantifying “the response of a material to a weak magnetic field (i.e., one on the order of the earth’s field)” (Dalan 2006:161-162). In contrast to the remanent magnetism that is passively sensed by devices such as magnetometers, “magnetic susceptibility is measured in the presence of the magnetizing field” by actively inducing magnetization within a sample (Dalan 2006:162). Tests of the magnetic susceptibility of a sample provide the observer with a “ratio of the magnetization induced in a sample to the inducing (magnetizing) field”, and can be recorded as either a susceptibility per unit volume or as a mass-normalized susceptibility (Dalan 2006:162). This results in either a dimensionless quantity for tests of volume susceptibility, or a unit of cubic meters per kilogram when the volume susceptibility is divided by density (Dalan 2006:162).

Many of the causes of magnetic susceptibility mirror the standard causes of magnetic anomalies discussed in Section 4.1, including the impacts of natural and anthropogenic fires. In addition, “pedogenic enhancement through various… pathways” allow for magnetic enhancement of soils to occur inorganically as a result of “low-temperature chemical reactions”

(Dalan 2006:162-163), as well as organically through processes such as bacterial magnetism (Evans and Heller 2003:189-196) and the fermentation mechanism (Evans and Heller 2003:94-95). Of these organic processes, bacterial magnetism occurs as a result of the presence of "tiny crystals of pure magnetite (Fe_3O_4)" that certain species of bacteria "synthesize from iron in their environment" (Evans and Heller 2003:189). This has the result of turning the bacterium into, "in effect, biological dipoles that will be rotated—passively—into alignment with the local geomagnetic field" (Evans and Heller 2003:191-192).

These magnetic enhancement processes are considered to be "conservative", in that "the enhanced magnetic signal of these soils will persist unless they are gleyed[7] or the iron minerals otherwise reduced" (Dalan 2006:164, footnote added), a property that has "critical implications in the search for buried archaeological sites and layers" (Dalan 2006:164). As a result, "types of features particularly appropriate for magnetic susceptibility surveys include magnetic features (e.g., burnt features), excavated features (e.g., ditches or pits filled with contrasting soils), and other earthen features" (Dalan 2006:178).

Given the nature of magnetic susceptibility tests, measurements were not recorded in the field but rather in the lab after fieldwork had already been completed. This allowed me to quickly and efficiently examine the large number of bulk samples (approximately 5 litres of soil and sediment per unit of provenience) that were collected during the excavation of four shovel test pits during the 2015 field season. Measurements were recorded with a Terraplus KT-10

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[7] Gleyic soils are a soil subgroup "associated with non-permanent water saturation, with faint to distinct mottles within 50 cm of the surface or prominent mottles between 50 and 100 cm" (Lavkulich and Arocena 2011:795). Gleysolic soils are defined on the basis of this colour and mottling, and are considered "to indicate the influence of periodic or sustained reducing conditions during their genesis" (Soil Classification Working Group 1998:Chapter 7)

Magnetic Susceptibility Meter, a handheld sensor which utilizes a circular coil to induce magnetism in a sample.

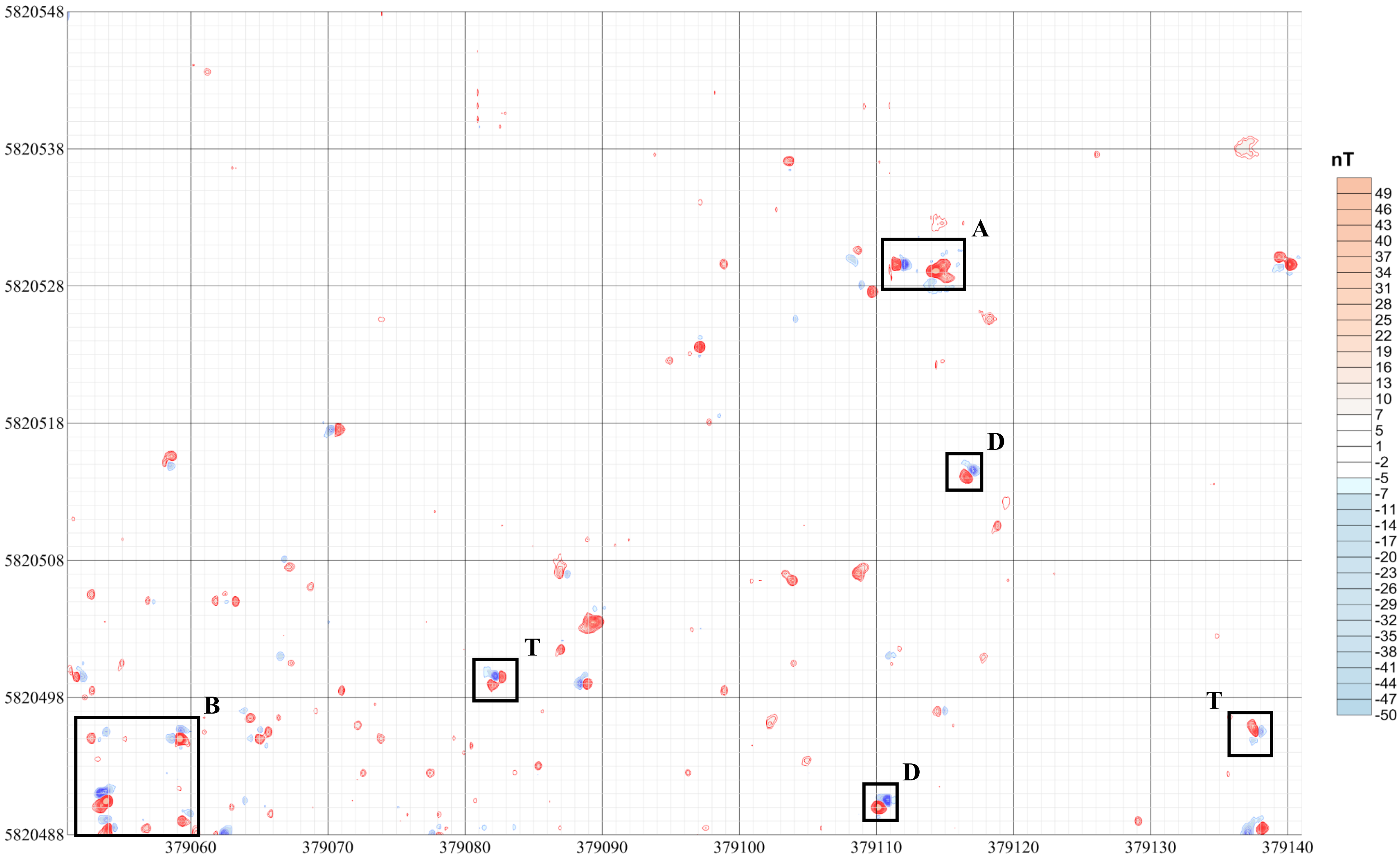
Testing methodology was such that each 5 litre bulk sample was simplified to three sub-samples, each collected from different areas within the bulk sampling bag. In order to ensure consistency amongst the sub-samples, each was transferred into a small petri dish measuring approximately 40 mm diameter by 15 mm, adjusted to as close to 20.000 grams as was possible, and then levelled out (though not explicitly compacted). This ensured that the magnetic coil was consistently sampling the same weight of material every time, and was placed a consistent distance from the sample so as not to introduce additional variables to the measurements. During testing, sub-samples were placed on a raised, non-ferromagnetic platform so as to reduce unwanted magnetic induction into adjacent materials, and each sub-sample was measured between four and six times in order to ensure a consistent, non-anomalous value was being recorded. If anomalous values were encountered during these tests but could not be replicated on subsequent measurements, the anomalous values were recorded but otherwise excluded from any averaging of the final recorded values for each sub-sample.

4.4 Results and Analysis

Magnetometry surveys were conducted over two sessions during the 2014 and 2015 field seasons, and although nine 30 metre by 30 metre grids were eventually recorded, only eight came to impact the final results of the surveys (the other was not contiguous to the other survey grids and lacked any significant magnetic anomalies). These surveys were conducted under the guidance of Terry Gibson of Western Heritage, who provided the necessary equipment, as well as technical expertise on the use of the gradiometer and assisted with follow-up analysis of the data.

Figure 4.1 shows the results of the initial six 30 metre by 30 metre grids, and became the starting point for the geophysical analysis of the Buffalo Lake site. Although small magnetic anomalies appeared quite persistently throughout the surveyed area, a few areas of note stood out:

- **Cluster A**: Centred at approximately 379,113 mE, 5,820,529 mN is a pronounced cluster of anomalies. Immediately to the west is a dipole anomaly with one strong positive and one strong negative lobe. Immediately to the east is a trilobate anomaly showing three strong positive lobes. Weaker nodes appear throughout the cluster as well, mostly negative.
- **Cluster B**: Another prominent cluster appears in the very southwest corner of the figure, filling much of the 9 metre by 10 metre grid. Of these anomalies, it appears that there is a trilobate feature with a strong positive lobe and two weaker negative lobes centred at 379,054 mE, 5,820,489 mN. Immediately north of this is a dipole feature similar to that in Cluster A, with a strong positive and strong negative lobe, as well as another dipole feature centred at 379,059.5 mE, 5,820,489.5 mN. Finally, another trilobate anomaly is visible centred on 379,059 mE, 5,820,495 mN.
- **Trilobate Anomalies**: Additional trilobate features not strongly associated with any anomaly clusters can be seen at both 379,082 mE, 5,820,499 mN and 379,138 mE, 5,820,495 mN.



A Cluster A
B Cluster B
T Trilobate Anomaly
D Dipole Anomaly

Figure 4.1
Magnetometry results, Fall 2014

- **Dipole Anomalies**: Although dipole anomalies are visible throughout the magnetometry survey, a number of strong anomalies that are not clearly associated with anomaly clusters are visible at 379,110 mE, 5,820,491 mN and 379,117 mE, 5,820,514 mN.

These geophysical anomalies indicated that something buried beneath the ground's surface was displaying enough remanent magnetism to be recorded by the gradiometer, although whether this was a result of natural remanence or anthropogenic remanence was as yet indeterminable.

The results of the magnetometry survey indicated a number of anomalies that I was interested in ground-truthing. To strengthen the interpretation of these anomalies, I also decided to perform a ground-penetrating radar survey of the same six 30 metre by 30 metre grids. This fieldwork occurred during the spring of 2015, again with the support of Terry Gibson of Western Heritage, who provided the ground-penetrating radar unit as well as the expertise to complete the surveys and analyze the data. However, these six ground-penetrating radar grids were finished quite quickly, and so the decision was made to add an additional two 30 metre by 30 metre grids to the west boundary of the previously surveyed area, collecting both GPR and gradiometer data that weekend for the additional grids. The end result was eight contiguous grids with complete radar and magnetometry data, totalling over 7200 square meters of area (Figure 4.2).

The nature of the ground-penetrating radar data was such that it provided a consistent baseline of information regarding the stratigraphic layers at various depth intervals. However, these geophysical anomalies still only represented unknown entities, as although the sensors provided evidence of anomalies of various sorts, I was as yet unsure what those anomalies actually corresponded to. By superimposing the discrete magnetometry data over the continuous

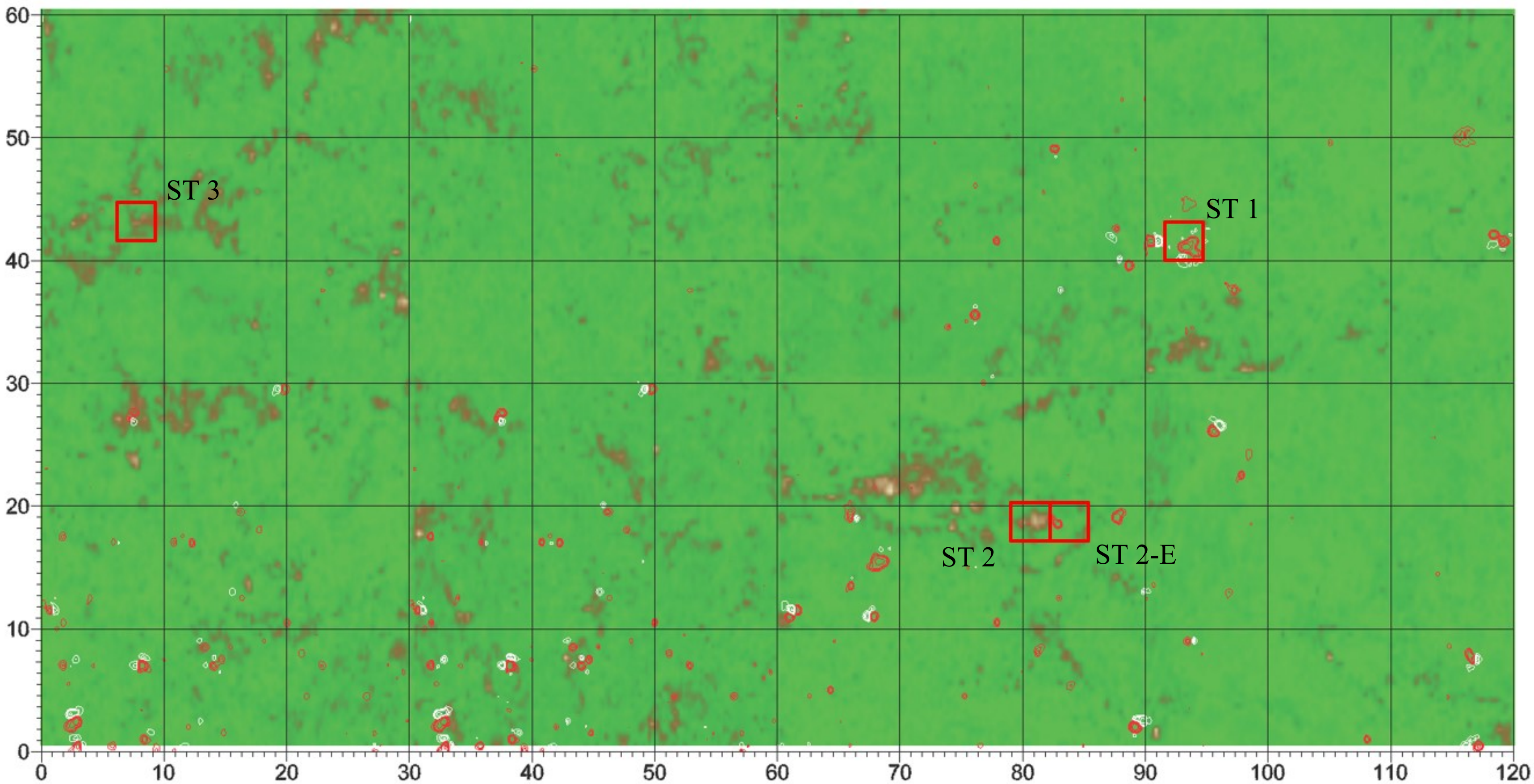


Figure 4.2
Magnetometry and GPR Results, Spring 2015

Includes the location of Shovel Tests (Not to Scale)

GPR datasets I was able to correlate between anomalies that were a result of remanent magnetism and anomalies that were a result of changes in density and the relative permittivity of the features. This provided the information required to determine which locations I wanted to ground-truth, and given the relatively short amount of both time and volunteers I had available to me I focused on examining a select number of different anomaly archetypes:

- **ST 1**: Shovel Test 1 was placed in the middle of Cluster A (Figure 4.1), as I wanted to focus upon gaining a clear idea of what was causing the magnetometry anomalies without being overly concerned with broad stratigraphic anomalies. This unit became the magnetometry constant.
- **ST 2**: Shovel Test 2 was placed over a location showing both a strong magnetometry and a strong radar anomaly. This location was determined because it seemed to show the strongest correlation between the two geophysical datasets.
- **ST 2-E**: Shovel Test 2-East was added near the end of the field session, due to concerns over the lack of recovered artifacts or features, as well as the small size of the shovel tests (50 cm by 50 cm). It expanded ST 2 to a 1 metre by 50 centimetre contiguous unit.
- **ST 3**: Shovel Test 3 was placed over a location showing consistent stratigraphic anomalies throughout the ten centimetre radar depth slices. This unit became the ground-penetrating radar constant.

With the location of the shovel test units determined, fieldwork occurred in the Fall of 2015 over the course of nine days and with the assistance of several volunteers. During this time we were able to excavate each of the four shovel tests to depths between 30 and 60 centimetres, at which point a clay layer which had previously been determined to be sterile was encountered.

However, despite placing shovel tests directly overtop of the locations of numerous geophysical anomalies, all four of the shovel tests came back negative for any artifacts or ecofacts of any kind, save a single small faunal long-bone fragment that did not appear to be modified. While this was initially disheartening, as it implied that the area surveyed was likely not part of the archaeological site at Buffalo Lake, these results did not adequately explain what phenomena were causing the geophysical anomalies to show up in the first place, especially the magnetic anomalies.

Additional research and discussion resulted in the decision to complement the research with magnetic susceptibility tests in order to try and determine the cause of the seemingly invisible geophysical anomalies. This technology had been briefly demonstrated by Krista Gilliland of Western Heritage during a public outreach event run in conjunction with the 2014 field school that occurred at the Buffalo Lake site, and so I again contacted Western Heritage regarding the availability of the sensor and training on its use. It was decided that the best course of action would be to test the bulk samples that had been collected from the field—a process undertaken by myself and the volunteers due to the expectation of encountering millimetre-diameter decorative trade goods called seed beads—to determine whether certain units, layers, or levels might have caused the anomalous magnetometry readings.

By using the handheld magnetic susceptibility sensor on each of these bulk samples, a noticeable pattern emerged in the relative magnetic susceptibility of each of the excavated units. In ST 1 (Table 4.2), there are average level values ranging from as low as 0.029 to as high as 0.157, a differential of 0.128. However, this is largely the result of a single extreme value, as seen in ST 1 Layer C Level 3, Test 2. This value, 0.408, is a result of a number of small rocks being included in the 20.000 gram susceptibility sample. These small rocks were extremely magnetically susceptible, enough so that they significantly skewed the entire table's results, pushing the level average from closer to 0.033 to 0.157, and the entire layer's average from 0.038 to 0.069, despite such a small sample being present.

A similar phenomenon occurs in ST 2 and ST 2-E (Table 4.3). Individual level averages range from as low as 0.032 to as high as 0.143, a spread of 0.111 over the whole range. However, if the anomalous average is ignored, the maximum spread drops to only 0.024. Here, ST 2-E Layer B Level 1, Test 2, with a recorded magnetic susceptibility of 0.369, is also significantly skewing an entire table's results.

Finally, when the results from ST 3 are examined (Table 4.4), one last major point of comparison becomes clear. Here, individual level averages range from as low as 0.011 to only as high as 0.039, and the lowest individual test value was a mere 0.008. While the maximum spread is comparable at 0.028, the left and right tails of this spread and noticeably lower than the left and right tails of the other two tables. In fact, the left tail is lower by 0.013 and 0.021, and even ignoring anomalously high values the right tail is still lower by 0.021 and 0.014.

However, I believe these results are actually to be expected, given the logic behind how the shovel test locations were determined. Both ST 1 and ST 2/2-E display a single anomalously high magnetic susceptibility reading due to the inclusion of magnetically enhanced rocks in the sub-samples. Additionally, ignoring these individual values, the levels and layers on average trend towards 0.010 to 0.020 higher than the values recorded in ST 3. In this case this reflects the initial unit placement logic, as ST 3 was designed to be a radar test unit that did not exhibit any particular signs of magnetic anomalies within a close proximity. In contrast, both ST 1 and ST

Site	Unit	Layer	Level	Weight 1	Test 1	Weight 2	Test 2	Weight 3	Test 3	Level Average	Layer Average	No Rocks
FdPe-1	ST 1	A	2	19.839	0.058	19.949	0.035	20.324	0.059	0.051		
FdPe-1	ST 1	A	3	20.166	0.042	19.850	0.038	20.119	0.033	0.038	0.045	
FdPe-1	ST 1	B	1	20.045	0.038	20.003	0.039	20.014	0.040	0.039		
FdPe-1	ST 1	B	2	19.895	0.055	20.069	0.059	19.913	0.065	0.060	0.050	
FdPe-1	ST 1	C	1	20.178	0.067	19.997	0.045	19.993	0.055	0.056		
FdPe-1	ST 1	C	2	19.981	0.041	19.995	0.039	19.988	0.041	0.040		
FdPe-1	ST 1	C	3	20.009	0.037	20.054	0.408	20.149	0.028	0.157		
FdPe-1	ST 1	C	4	20.197	0.026	20.007	0.020	19.895	0.027	0.024	0.069	0.038
FdPe-1	ST 1	D	1	19.847	0.030	20.048	0.029	20.030	0.024	0.028		
FdPe-1	ST 1	D	2	20.067	0.025	19.992	0.026	20.079	0.035	0.029	0.029	

Table 4.2
Magnetic Susceptibility, ST 1

Site	Unit	Layer	Level	Weight 1	Test 1	Weight 2	Test 2	Weight 3	Test 3	Level Average	Layer Average	No Rocks
FdPe-1	ST 2	A	2	20.097	0.033	19.978	0.035	19.904	0.038	0.035	0.035	
FdPe-1	ST 2	B	1	20.002	0.039	19.942	0.037	20.109	0.040	0.039		
FdPe-1	ST 2	B	3	20.145	0.041	20.024	0.047	20.044	0.041	0.043	0.041	
FdPe-1	ST 2	C	1	20.110	0.043	19.947	0.046	19.961	0.048	0.046		
FdPe-1	ST 2	C	2	20.054	0.066	20.089	0.037	19.934	0.055	0.053		
FdPe-1	ST 2	C	3	19.872	0.039	19.945	0.061	19.958	0.042	0.047		
FdPe-1	ST 2	C	4	20.053	0.039	20.055	0.065	19.939	0.040	0.048		
FdPe-1	ST 2	C	5	20.128	0.049	19.895	0.055	20.107	0.065	0.056	0.050	
FdPe-1	ST 2-E	A	2	19.893	0.022	19.995	0.038	20.086	0.035	0.032		
FdPe-1	ST 2-E	A	3	20.195	0.042	19.864	0.048	19.930	0.029	0.040	0.036	
FdPe-1	ST 2-E	B	1	19.940	0.032	20.009	0.369	20.118	0.028	0.143		
FdPe-1	ST 2-E	B	2	19.883	0.047	20.016	0.045	20.006	0.044	0.045	0.094	0.038
FdPe-1	ST 2-E	C	1	20.011	0.035	20.250	0.040	19.927	0.050	0.042	0.042	

Table 4.3
Magnetic Susceptibility, ST 2 / ST 2-E

Site	Unit	Layer	Level	Weight 1	Test 1	Weight 2	Test 2	Weight 3	Test 3	Level Average	Layer Average
FdPe-1	ST 3	A	2	19.932	0.042	19.990	0.038	20.025	0.037	0.039	
FdPe-1	ST 3	A	3	19.861	0.032	20.044	0.036	19.887	0.034	0.034	
FdPe-1	ST 3	A	4	20.052	0.034	19.983	0.043	20.008	0.029	0.035	
FdPe-1	ST 3	A	5	20.080	0.029	20.080	0.037	19.989	0.029	0.032	0.035
FdPe-1	ST 3	B	1	20.088	0.039	20.044	0.022	20.022	0.023	0.028	
FdPe-1	ST 3	B	2	19.964	0.012	20.032	0.018	20.039	0.011	0.014	
FdPe-1	ST 3	B	3	20.086	0.015	20.041	0.021	19.867	0.014	0.017	
FdPe-1	ST 3	B	4	19.906	0.022	20.076	0.015	20.079	0.020	0.019	0.020
FdPe-1	ST 3	C	1	19.965	0.022	20.155	0.019	19.963	0.012	0.018	
FdPe-1	ST 3	C	2	19.998	0.023	19.994	0.025	19.946	0.018	0.022	
FdPe-1	ST 3	C	3	19.976	0.020	20.184	0.009	19.895	0.010	0.013	0.018
FdPe-1	ST 3	D	1	19.894	0.008	19.867	0.012	20.050	0.014	0.011	0.011

Table 4.4
Magnetic Susceptibility, ST 3

2/2-E were placed where they were because I was hoping to determine the cause of the geophysical magnetic anomalies, and both of these units display anomalously high readings in at least one sub-sample.

As for why the remote-sensing technologies detected the anomalies in the first place, I believe this to be a result of the gleyic soil effect mentioned in section 4.3[8]. Further research on the topic revealed that "long periods of anaerobicity and more severe reducing conditions in imperfectly drained soils, such as gleys, presumably lead to the reduction of ferrihydrite outstripping production, and a decline in the equilibrium concentration" (Dearing et al. 1996:731), and where there "occurs a gleyed soil… loss of ferrimagnets has been incurred in every size fraction, with no countering neoformation" (Maher 2007:33). As a result of this gleying effect, I believe that the baseline ferromagnetism within the soil was stripped away as a result of groundwater saturation, as follow-up conversations with the current landowners revealed that the southwest corner of the quarter-section where the survey grid was located was inundated for much of the period directly following the site's occupation. And while this gleying effect would have reduced the ferromagnetism in the soil matrix, it would have had less effect on the solid cobbles and boulders that were still scattered throughout, causing them to appear as anomalies on the magnetometer. This conclusion is also supported by the elevated magnetic susceptibility values measured in the follow-up lab work, as it was the solid pebbles and cobbles that I measured that were giving anomalous results.

Therefore, despite not uncovering any evidence of human occupation within the geophysical survey grids, a better understanding of the root causes of a number of the

[8] Photographs of the Shovel Tests have been included in Appendix D of this thesis

geophysical anomalies that were visible throughout the surveyed area has been gained, and future expansions of the geophysical surveys to other areas of the known archaeological site will have a comparative dataset that can be checked against.

CHAPTER 5

THE BUFFALO LAKE ARCHAEOLOGICAL ASSEMBLAGE

Given the nature of the artifact assemblage at the Buffalo Lake site, containing a mix of what could be considered both "aboriginal" and "settler" technologies that make up Métis material culture, the EMITA research project adopted the historical archaeological convention of organizing the site's artifacts by functional category[9]. These functional categories primarily derive from the method laid out by Stanley South (1977:92-102), in which artifacts are classified into progressively more restrictive categories, with these categories forming the basic framework for comparative analyses.

While the original site manuscript organizes the artifacts hierarchically by Cabin, then Feature, then Functional Category, this made comparing artifacts across the site that are from the same functional category particularly difficult. Instead, this analysis organizes the site's artifact assemblage first by Functional Category, then mentioning Cabin and Feature provenience as necessary within this division. For this reason, I provide a summary of each of the cabin structures and their associated archaeological features to provide a brief background and so as not to interrupt the organization of the functional categories. Readers who prefer the original system of hierarchical organization can refer to the original site manuscript (Doll et al. 1988) for the same data, summarized differently.

[9] Functional categories were adapted from the Sonoma Historic Artifact Research Database (SHARD) cataloguing system (Anthropological Studies Center 2008)

5.1 Cabin Summaries

Cabin 1

Cabin 1 was excavated during 1970 and 1971, and is located "approximately 190 feet (57.91 m) west and 60 feet (18.29 m) south of the northeast corner of LSD 14, Section 11, Township 41, Range 20 west of the Fourth Meridian" (Doll et al. 1988:121). Surrounded by a thick growth of aspen, Cabin 1 was located on a slight slope just south of a series of "two deep ruts suggestive of a wagon road" (Doll et al. 1988:121), although the authors questioned the road's contemporaneity with the Métis occupation. Measuring 2.44 m north-south by 1.52 m east-west, the primary depression "appeared to be entirely the result of recent disturbance", and an intact and scattered rock pile comprised the rest of the locality (Doll et al. 1988:121).

Excavations revealed that the Cabin 1 structure measured 9.14 m along the long axis and 3.96 m along the short axis, with the overall structure offset by 35 degrees west of true north along the short axis (Doll et al. 1988:122). Wall lines were determined by a thin layer of rotten timber between two ridges of light brown clay, likely a result of mud-plaster chinking or whitewash dissolving from the rains, and the walls appear to have been built entirely on wall sills (Doll et al. 1988:123). The authors were also under the impression that the elongate nature of the cabin structure implied that "two contiguous cabins were represented, one possibly a later extension of the other, or that a partition had occurred to form two rooms in a single cabin" (Doll et al. 1988:123).

The most conspicuous feature of the structure was a large rock pile that appeared to resemble the collapsed remnants of a fireplace (Cabin 1 Feature 1). Although scattered due to colluvial forces, the researchers could approximately locate the west and south edges, and the fireplace's dimensions were estimated at 1.83 m east-west by 1.22 m north-south (Doll et al. 1988:124). The presence of hard-packed earth and the general orientation of the stone structure suggested an apron was located in front of the firebox, and the relatively small quantity of stones remaining here and at other locations throughout the site implied that the upper portions of the chimney were likely created from either poles and mud, or even sheet-metal pipe (Doll et al. 1988:125). This matches "similar conclusions regarding wood and mud plaster superstructures" at many other fur trade sites (Doll et al. 1988:125).

A second anomaly within Cabin 1 was a large ash concentration, rich with artifacts (Cabin 1 Feature 2). Located just outside the south wall line of the cabin, the concentration measured 1.22 m east-west by 1.07 m north-south by 15.24 cm at maximum depth (Doll et al. 1988:125). Whether this ash concentration was a result of dumping the fireplace contents out of a nearby window, or was just a spot along the back of the cabin where the contents were discarded, was never determined conclusively by the researchers (Doll et al. 1988:125-126).

The dimensions and artifacts (discussed in detail below, see *5.2 Artifacts by Functional Category*) resulted in the researchers defining Cabin 1 as a general seasonal residence (Doll et al. 1988:141), and the possible evidence for a central partition meant that one room (likely Cabin 1 East) "might have served as a storeroom or other sort of annex" (Doll et al. 1988:142). No evidence was discovered that suggested repeated occupations, such as rejuvenation of fireplaces or storage pits, and no specific date can be confidently applied to the structure.

Cabin 2

Cabin 2 was also excavated during the 1970 and 1971 field seasons. Located "approximately 360 feet (109.73 m) west and 140 feet (42.67 m) south from the northeast corner of LSD 14, Section 11… it was about 150 feet (45.72 [m]) west-southwest of Cabin 1 and approximately seven feet (2.13 m) higher in elevation" (Doll et al. 1988:121). This locality consisted of two rock piles and three depressions, the largest of which was 3.05 m in diameter and the smallest 1.52 m in diameter, and although all three were excavated to some degree only the southwest depression was fully cleared (Doll et al. 1988:143). As in Cabin 1, although wood was poorly preserved, faint evidence of parallel wall lines along the north and south was recovered during the excavation process, spaced approximately 3.96 m apart ("almost exactly the same as the indicated width of Cabin 1") (Doll et al. 1988:144). Although no wall lines were recovered on the east and west boundaries the location of sill depressions indicated a minimum wall length of 4.42 m, and the cabin's short axis was orientated at approximately 66 degrees west of true north (Doll et al. 1988:144).

Some evidence exists for interior joists or flooring, namely cross-timbers in four locations within the cabin, and each seemed to intersect a wall or pass within close proximity of a rock pile or depression (Doll et al. 1988:144). Although it does appear as though the log walls of Cabin 2 were "mudded", relatively little else can be discerned about the structure as no strong evidence exists to confidently determine the locations of the corners, doorways, or posts contributing to the structure (Doll et al. 1988:145).

A small rock pile (Cabin 2 Feature 1) was left unexcavated, although it appeared similar to the fireplace feature recorded in Cabin 1, with the rock concentration measuring 2.13 m north-south by 1.22 m east-west and abutting the north wall of the structure (Doll et al. 1988:145). In addition, the southwest depression (Cabin 2 Feature 2) was determined to likely be a refuse pit, measuring 2.13 m east-west by 1.52 m north-south by 60.96 cm at maximum depth (Doll et al. 1988:146). Both the location within the cabin and the relatively large size of the depression, as well as the inclusion of nails within the feature, imply that a lid may have been present to cover the depression during daily use, and based upon "the apparent occurrence of such a 'lid' in Cabin 5" this conclusion does not seem improbable (Doll et al. 1988:146).

The distribution and quantities of artifacts again led the researchers to conclude that here too there was no indication of functional specialization. Instead a residence is again presumed by the researchers, and they note the only major distinction between Cabins 1 and 2 was the presence of pit depressions within the latter. However, they argue that "the somewhat higher ground at Cabin 2 would have encouraged the digging of cellars, which might have been more readily flooded in the Cabin 1 locality" (Doll et al. 1988:168). Lack of excavation of the fireplace feature resulted in no discernable evidence for the season(s) of residence, and no date can be confidently attributed to the cabin (Doll et al. 1988:168-169).

Cabin 3

Cabin 3 quickly became the most extensively researched structure at the Buffalo Lake site, owing in large part to its prominent mound and depression features, and over one hundred and two person-days were expended to complete the work (Doll et al. 1988:80). Located approximately 117.96 m south and 4.57 m west of the northeast corner of LSD 14, Section 11, Township 41, Range 20 west of the Fourth Meridian, "the primary intent in excavating Cabin 3 was to indentify [sic] the associated features as remains of a single building, to determine its dimensions and details of construction, and to establish the essential contemporaneity of this building with Cabins 1 and 2" (Doll et al. 1988:79). Additionally, further research was desired on the site's fireplace features and pit depressions, as both types of features had been prominent at other Métis settlements. It was hoped that the depression in Cabin 3 would be as comparably rich as the refuse pit in Cabin 2 to "enlarge the sample size from the site quantitatively and qualitatively" (Doll et al. 1988:79).

Wall lines uncovered during excavation showed that Cabin 3 measured 7.32 m north-south by 4.57 m east-west, and no evidence was recovered implying the presence of interior partitions or a wood floor (Doll et al. 1988:81). As in Cabins 1 and 2, "preservation of wood (probably poplar or aspen) was extremely poor", although a layer of clay that appears to have washed or collapsed off the wall or roof allowed for relatively good preservation of wood fragments in the west wall of the cabin (Doll et al. 1988:81).

The mound became Cabin 3 Feature 1, and excavations proved it to be a granitic and quartzite cobble fireplace measuring 2.13 m wide north-south and 1.22 m deep east-west, abutting on the interior of the west wall in approximately the middle of the cabin (Doll et al. 1988:82). Despite a modern disturbance by unknown individuals "the major part of the feature remained intact, and the firebox, bits of burned bone, charcoal, and a concentration of wood were encountered" (Doll et al. 1988:82). As excavations continued, an ash concentration, three "distinct and vertically separated firebox floors", and two "superimposed aprons" were encountered in the feature (Doll et al. 1988:82). These aprons of burnt clay separating the firebox floors may have been the result of the "weathering of mud plaster off the fireplace or chimney during the spring or summer rains" or of "purposeful re-plastering and re-lining of the fireplace in the autumn, along with a re-chinking of the walls, to weatherproof the cabin for the winter" (Doll et al. 1988:82).

The larger of the two depressions in the locality became Cabin 3 Feature 2, eventually labelled a large refuse pit. Located entirely within the walls and to the southeast of the fireplace, it measured 1.92 m north-south by 2.53 m east-west by 1.37 m at its maximum depth (Doll et al. 1988:83). The researchers believed that this feature may have served as both a borrow pit for the creation of the fireplace, and later as an interior storage pit or cellar, although "ultimately, it seems to have been used for the disposal of trash" (Doll et al. 1988:83). This feature proved to be extremely rich in artifacts, constituting "90.04% of the assemblage from Cabin 3" (Doll et al. 1988:83), and nearly 57% of the entire site's assemblage.

The final feature in Cabin 3 was the smaller of the two depressions, Cabin 3 Feature 3. Measuring 1.22 m north-south by 1.52 m east-west by 60.96 to 76.20 cm deep, this depression too was located within the interior of Cabin 3 (Doll et al. 1988:83). Neither Feature 2 nor Feature 3 displayed evidence of cribbing or lining of the depression, the two shared similar interpretations about their use and eventual abandonment, and both features were interpreted as having the same functions and use-lives.

The authors make no explicit determination of whether Cabin 3 showed functional specialization or if it was simply a general residence like Cabins 1 and 2. With regards to duration of occupation, evidence excavated from the fireplace implied that "the feature was renewed at least three times, twice on a temporary basis and the third time permanently", suggesting that "Cabin 3 may have been occupied for three winters and then abandoned" (Doll et al. 1988:82-83).

Cabin 4

Cabin 4 was excavated as a result of salvage operations due to imminent brush-clearing and breaking operations that were to occur during the 1982 field season, and had previously been disturbed through cultivation half a century prior (Doll et al. 1988:171). Located 128.02 m east and 490.42 metres north of the original site datum in the northeast corner of LSD 14, Section 11, Township 41, Range 20 west of the Fourth Meridian, excavation of the wall lines indicate that the cabin measured 8.0 m along the north-south and 6.1 m along the east-west side.

A large exterior depression became Cabin 4 Feature 1, and although the diameter of the feature is unspecified, a depth of 124.5 cm was recorded. Similar to the depressions associated with the preceding cabins, Feature 1 "appears to have been a borrow-pit to obtain clay to plaster the adjacent north wall and fireplace of the cabin", and the presence of a few artifacts implies that it may have later been used as a storage pit (Doll et al. 1988:172). Cabin 4 Feature 3 was named for an exterior pit located alongside the south wall of the cabin. Unlike the previous pits, Feature 3 was "cribbed and lined with bark" and appears to have been utilized as a form of "clean" storage, such as an ice-house for keeping food (Doll et al. 1988:172). Cabin 4 Feature 5 was an interior depression within the cabin, and resembles many of the other depressions in its characteristic use as a borrow-pit, storage pit and refuse pit, as was Cabin 4 Feature 6, an exterior depression located to the west of Feature 1 (Doll et al. 1988:173).

The remains of an excavated fireplace became labelled Cabin 4 Feature 2. While there are no recorded measurements for the feature, the researchers noted that "although the cobbles had been removed in the 1920's, portions of the firebox and apron remained" (Doll et al. 1988:172). Of significant note are the four layers of ash and clay discovered during excavations, which the researchers believed provided "a strong suggestion of four winters of occupation at this cabin" (Doll et al. 1988:172). Excavations searching for the wall lines of the cabin uncovered Cabin 4 Feature 4, a "clay ridge covering bits of burned and rotted log", and seem to represent the remnants of the north wall of the structure. This feature lies in close proximity to Feature 2, and the washing away of the clay walls and fireplace is likely the source of Feature 4's preservation (Doll et al. 1988:172). Finally, Cabin 4 Feature 7 was a small ash dump located approximately 9.14 m south of the fireplace and 4.57 m south of "the proposed back door on the south wall of the structure", measuring approximately 40.64 cm in diameter (Doll et al. 1988:173).

Cabin 5

The structure of Cabin 5 is far-removed from the cluster of cabins making up Cabins 1, 2, and 3, being located over 500 metres north and slightly east of the site datum. The researchers outlined a number of specific research questions that they had in mind when they began excavations of Cabin 5, as its distance and perceived discontinuity with the previously excavated cabins left it open to reinterpretation (Doll et al. 1988:185). Although the authors listed 10 key points, they can be summarized as follows: 1) whether Cabin 5 exhibits similar structural elements and patterning as did Cabins 1, 2, and 3; 2) whether there was additional evidence of renewal and rejuvenation of site features such as fireplaces and borrow-storage-refuse pits; and 3) to provide additional datasets in terms of units, sub-units, and artifacts for comparative analysis among the cabin's features and subsections (Doll et al. 1988:185-186).

Cabin 5 also became important because it appeared to be relatively undisturbed, largely as a result of its position away from the main concentration of buildings, but also due to the efforts of the landowner, Ron Rider (Doll et al. 1988:186). This allowed the team of researchers to discern 15 different features associated with the structure, in addition to identifying its basic structural elements. The wall lines for Cabin 5 were quite pronounced, "probably owing in part to the large amount of clay used to plaster the walls. Eventually, this clay was deposited as a series of ridges forming a square encompassing approximately the area occupied by the original structure" (Doll et al. 1988:187).

Cabin 5 Feature 1 was composed of a large mound, approximately 3.05 m in diameter and 55.00 cm high, and although it was unexcavated, based upon "its size and form, the granitic cobbles seen eroding from it, and its location adjacent to and within apparent wall lines, it was assumed to have been a fireplace" (Doll et al. 1988:187).

Cabin 5 Features 3 and 3A were a paired depression and mound cluster; while the depression measured 3.73 m by 2.49 m and 1.02 m deep, the mound of clay directly adjacent to it measured 4.73 m from northwest to southeast and 3.75 m from northeast to southwest. These features were separated because the researchers believed that they may have "represented a separate cabin or perhaps a large cellar associated with Cabin 5" (Doll et al. 1988:187).

Features 2, 4, 5, 6, and 11 were all depression features of various sizes and shapes. Of these, Cabin 5 Feature 2 was located adjacent to the Feature 1 mound, measuring approximately 3.37 m by 2.66 m by 79.3 cm deep, and Cabin 5 Feature 4 was a small pit measuring 1.39 m by 1.38 m by 37.8 cm deep which the researchers believed to be a borrow-refuse pit (Doll et al. 1988:187). Cabin 5 Feature 5 was a depression located somewhat further away from the other features, and at 1.11 m by 1.09 m by 35.66 cm deep was "thought to be the remains of a privy" (Doll et al. 1988:188). Cabin 5 Feature 6 was located within the confines of the main structure, and was of the same type as the borrow-storage-refuse pits mentioned previously. Measuring 2.09 m by 1.79 m by 45.72 cm deep, artifacts were recovered from the pit during excavation, as well as the remains of what appeared to be wooden and metal elements from a trap door (Doll et al. 1988:188). Cabin 5 Feature 11 was the final depression, and based upon its size and position the researchers believed it may have been a small stairwell placed to provide access to Feature 2 (Doll et al. 1988:189).

Features 7, 8, 9, and 10 accounted for the four clay ridges mentioned above, and "appeared to represent the four corners of the main Cabin 5 structure, forming a square approximately 25 feet (7.62 m) to a side" (Doll et al. 1988:188).

Finally, while Features 12 to 15 were noted during the initial mapping of the site, it was believed that they corresponded to a structure separate from the rest of the Cabin 5 features (Doll et al. 1988:189), including potentially an associated out-structure such as a stable, drying racks, a saw pit, or stages for storing meat, dog harness, carrioles or other equipment (Doll et al. 1988:190).

Cabins 6 to 12

Cabins 6 to 12 were never excavated, and instead served as mapped locations where surface collections of artifacts were gathered. These cabin structures will therefore be discussed within the context of their artifact assemblages. The following is a summary of all artifacts from the Buffalo Lake site, organized by category rather than provenience.

5.2 Artifacts by Functional Category

Personal

Clothing: Buttons

Buttons formed a significant component of the artifacts from Buffalo Lake, with many different types being recovered. Doll et al. (1988) recorded 101 complete or broken buttons amongst the 12 cabins they examined, including glass, shell, bone, and metal varieties, and buttons were found in association with all excavated cabin features (Cabins 1 to 5). Cabin 3 produced the most artifacts in this category, generating 53 of the 101 specimens, and most of these were recovered within a large refuse pit (Cabin 3 Feature 2) (Doll et al. 1988:106-112).

These artifacts were predominately located on general garments such as women's blouses and men's shirts; however, some examples do point towards specific sources, such as military dress (Doll et al. 1988:110)

Clothing: Textiles

During excavations, several small pieces of fabric were recovered, and further analysis of these fragments was undertaken by Barbara Schweger (Doll et al. 1988:331-340). Of these fragments, two small pieces of "tightly woven silk cloth" were found within the Cabin 2 excavations, described as "plain, unbalanced weaves" (Doll et al. 1988:161). Additional scraps of cloth were found attached to buttons or "associated with the cache of cartridges" for transport and storage, and were recovered in all excavated cabins (Doll et al. 1988:198).

Clothing: Fasteners

Two hook-and-eye fasteners were excavated from the remains of Cabin 5, "one brass, the other from ferrous metal" (Doll et al. 1988:199), and the remains of Cabin 2 contained a tin-plated object that may have been a metal clasp or retainer, described as a band of sheet metal bent around a rod with wings extending to both sides (Doll et al. 1988:158). In addition, fragments of what appears to have been a horse-head shaped clasp were recovered from a storage pit in Cabin 4 (Doll et al. 1988:175), and the proximal end of a ferrous metal hat pin from Cabin 5 (Doll et al. 1988:199). All other fastening implements used for personal articles appear to have been buttons instead of simple hook fasteners.

Hygiene

The most common artifacts related to hygiene recovered at Buffalo Lake were fragments of combs, specifically hard rubber teeth for "louse" combs. These combs appear to have been made from a material known as vulcanite, "a hard rubber and sulphur compound used during the late nineteenth century", and fragments were recovered in Cabins 2 and 3, while a complete comb was found in Feature 5 of Cabin 4, a storage pit (Doll et al. 1988:173).

In addition to the combs, the bristle end of a shaving brush was found in the refuse pit associated with Cabin 2 (Doll et al. 1988:160). Both Cabins 3 and 5 displayed the presence of "mirror glass"; six sherds were recovered during the excavation of Cabin 3, some of which retained the "silvering" of one surface, as well as a "thin, iridescent patina on the surface of both sides" (Doll et al. 1988:98), while a single sherd from a round mirror in which the silvered surface had eroded away was recovered from Cabin 5 (Doll et al. 1988:195).

Footwear

Artifacts relating to footwear were recovered in relatively small number from the Cabin features at Buffalo Lake. Although some leather fragments were recovered from various sources around the site, most appear to have been associated instead with transportation activities (discussed below). However, fragments of commercially tanned leather that resemble the heels of boots or shoes were recovered from Cabins 4 and 5, and the specimen from Cabin 5 still displays "evidence of stitching around the edges" as well as the nail holes and a fragment of a cobbler's nail (Doll et al. 1988:199). Additionally, a "shoelace eye" made of black-enamelled non-ferrous metal was found within the Cabin 5 assemblage (Doll et al. 1988:199).

Medicines

Although many samples of bottle glass were recovered from the Buffalo Lake excavations, a small number of these can be confidently assessed as containing "medicines" of some sort. The most distinct of these artifacts were identified as fragments of "Perry Davis Vegetable Pain Killer" bottles, a proprietary medicine containing various quantities of Myrrh, capsicum, opium, benzoine, guiac, camphor, and alcohol (Doll et al. 1988:97). According to consultations requested by the original team of researchers, this medicine's primary use was "as a topical irritant for the external treatment of muscular strains, as a liniment" (Doll et al. 1988:97). In total, 17 sherds from Perry Davis bottles were recovered from the cabins at Buffalo Lake: 11 from Cabin 3, five from Cabin 6, and one from Cabin 9. Fragments from two generic medicine bottles were also recovered from Cabin 3, including 12 sherds from a "medicine or druggist's bottle" and 13 sherds from what was believed to be a "multiple dose medicine bottle" (Doll et al. 1988:98). A single side panel sherd of transparent glass from Cabin 5 was also suggested as being from a medicine bottle (Doll et al. 1988:174), as were two sherds which joined to form "the bottom of a small green rectanguloid glass bottle" (Doll et al. 1988:134). Finally, nine melted sherds of "partially fused, very pale green transparent glass" were recovered during the Cabin 3 excavations, which the original authors suggested may also have been from a medicine bottle (Doll et al. 1988:98).

Ornamentation: Beads

Beads were by far the most numerous artifacts recovered from the Buffalo Lake site, with 13,225 total beads found amongst the twelve cabins studied. Almost 90% were recovered from Feature 2 of Cabin 3, a large refuse pit that contained a number of other associated artifacts (Doll et al. 1988:83). Amongst the bead assemblage, one category of bead was dominant, namely a type of small, drawn tubular bead known as a "seed bead". These beads were made from glass tubing that was "heated and tumbled to round the edges"; typically monochrome, some were bichrome with a separate core and exterior colour palette such as the popular "Cornaline d'Aleppo" variety (Doll et al. 1988:113).

Other bead styles recovered from the site include wound beads, pressed beads, metal beads, facetted beads, spherical beads, hexagonal beads, and two other sizes of drawn tubular beads known as "intermediate" and "pony" beads. However, none of these other styles were nearly as heavily represented within the Buffalo Lake assemblages as drawn tubular "seed" beads.

Ornamentation: Jewelry

A small amount of personal jewelry was also found at the site, including a pendant, an earring, and the stone from a ring. The earring, described as a "two-piece drop-earring with a shepherd's hook wire attachment", was recovered from a depression (Feature 6) within Cabin 5, and contains an imitation ruby or garnet mounted into silver-plated non-ferrous metal (Doll et al. 1988:199). The pendant, which may also have been a portion of an earring, was recovered from the large refuse pit (Feature 2) of Cabin 3. This artifact "consists of a flat stamped circle with a pin projecting from the edge into the open centre", where "a scarlet-colored clay ball or bead was suspended" before eventually disintegrating, and the edge includes a small hasp for suspension (Doll et al. 1988:114). The ring stone is a "large round cabochon or unfacetted stone… made of clear glass with no other distinguishing marks", and the original researchers believed that it was "presumably a stone for a fairly massive ring, perhaps a cuff-link, or possibly a button" (Doll et al. 1988:165). Finally, a "globular black glass object wrapped around an iron wire core" was recovered from Cabin 3, and may have been "part of an ornament or costume jewelry" (Doll et al. 1988:114).

Indulgences

Relatively little evidence of indulgences was exhibited within the Buffalo Lake assemblages. Two cabins displayed evidence of tobacco use, as fragments of clay smoking pipes were recovered. This included the base of a burned and partially melted pipe, "consisting of the stem and part of the bowl", recovered from Cabin 4 (Doll et al. 1988:180), as well as two rim fragments from a "white clay trade pipe" that were found in Cabin 1 (Doll et al. 1988:136-137). In addition, two base sherds and 15 body sherds of a yellow-green glass bottle were recovered from Cabin 3, which the researchers believed were similar to a "Scotch Style Whiskey" bottle (Doll et al. 1988:98).

Crafts

Little evidence for crafting was recovered from the Buffalo Lake site. I have chosen to ascribe two types of artifacts to this category, specifically sewing needles and straight pins, the former of which were recovered from Cabin 5 and the latter of which were recovered from Cabins 3 and 5. Although heavily oxidized, one "complete large ferrous metal sewing needle" and "the mid-section of a fine sewing needle" were found within Cabin 5, as were four straight pins (Doll et al. 1988:196). In addition, five "plated steel straight pins" were found within Cabin 3, four from Feature 2, a large refuse pit, and one from Feature 1, the fireplace (Doll et al. 1988:101). Whether these needles and pins were used for crafting, such as decorating garments with the numerous styles of beads that were recovered from the site, for mending tattered clothing, or for some other use entirely cannot be explicitly determined, however.

Religion

Religious paraphernalia were recovered from the excavations of Cabin 3 at Buffalo Lake. These artifacts included two main pieces of an incomplete rosary "decorated with encircling ribs, oriented at right angles to the length of the bead" (Doll et al. 1988:116). The second piece of this rosary includes "an additional string of blue beads marked by two single separate beads ('Our Father Beads') and a group of three beads ('Hail Mary Beads')" (Doll et al. 1988:116). A religious medal was also excavated, which may have been a scapular medal, although it was too rusted to identify confidently (Doll et al. 1988:116).

Household

Kitchen: Cooking

A few artifacts provisionally fit within this category, including a perforated sheet metal artifact recovered from Cabin 1. While, to the original researchers, "the actual function of this object is unclear", they also believed that it shared a "resemblance to part of a colander or strainer" owing to the 25 perforations "set in the pattern of an elongated diamond" (Doll et al. 1988:135). In addition, three fragments of an iron hook were found within the features of Cabin 3. These fragments "may represent a portion of fireplace hardware used to suspend cooking pots" (Doll et al. 1988:101). Also recovered from Cabin 3 was a "flattened piece of steel, broken at both ends” that appeared to the researchers to be a section of fire steel or “strike-a-light” (Doll et al. 1988:101-102).

Kitchen: Preparation

A single object has been placed within this category, comprised of nine artifacts which were described as “perforated zinc alloy sheet fragments” that were recovered from Cabin 3 (Doll et al. 1988:100). This object included a number of perforations which “appear to have been punched with a square nail”, all of which “were perforated from the same side, resulting in a series of sharp raised ridges” (Doll et al. 1988:100). The design of this object led the researchers to believe that these fragments may have made up either “a tobacco shredder, a grater, or a pierced petal-work lantern” (Doll et al. 1988:101).

Kitchen: Storage

The majority of the artifacts that I have chosen to classify as kitchen storage are 116 fragments of metal foil recovered from a number of the cabins at Buffalo Lake. In total, 15 scraps of foil were recovered from Cabin 2, 28 from Cabin 3, and 68 from Cabin 5, and Doll et al. (1988:151) believed that although the foil could also be used in containers for gunpowder, it was more likely to “have been used in the packaging of tea or a similar product” as documentary evidence for the Buffalo Lake site suggested that powder was more likely sold from kegs (Doll et al. 1988:100). However, two thicker fragments of foil from Cabin 5 were also recovered, and “such thicker foil was often used to package black powder” (Doll et al. 1988:195). Finally, two foil fragments formed “the major portion of a seal from an imported container of preserves or condiments”, and a third fragment appears to represent “Superior Chutney, a common nineteenth century condiment” (Doll et al. 1988:195-196).

In addition to the metal foil, two tin can lids were recovered from Cabin 2, likely removed with openers (Doll et al. 1988:159), and the traces of solder located on a "fragment of thin ferrous metal" located within Cabin 4 suggested that the fragments were from an iron can (Doll et al. 1988:179). The side fragment of a tinned iron can was also found in Cabin 6, which "retains a lip of solder, irregularly applied to attach one of the can ends", and seven fragments of a "tin-plated ferrous metal dried food or biscuit tin" with folded, rather than soldered, edges were all recovered from the surface artifact scatters at Cabin 6 (Doll et al. 1988:207).

Kitchen: Eating and Drinking

Implements for ingesting food formed a sizeable portion of the Buffalo Lake artifact assemblage, dominated by numerous styles of ceramic fragments. Across the site a total of 516 sherds were recovered, from which the original researchers were able to successfully reconstruct portions of approximately 50 vessels. Based upon ceramic analysis of the patterns printed onto the surface of the sherds the majority of these vessels represented earthenware ceramics that were produced by Copeland or one of its various entities, and therefore would have been sold here by the Hudson's Bay Company. These patterns, such as "Turco", "Grapevine", "Beverly", "Flowed", and many more, were typically applied through a monochrome or polychrome transfer-printing technique, and due to the extensive records and research associated with the Company could often be dated to relatively narrow timeframes of production, shipment, and sale. For example, Sussman (1979) provides detailed prints of each pattern, production dates, as well as the fort or post at which each pattern was sold and its active years. Vessel form also varied extensively, and included bowls, plates, cups, saucers, and a possible teapot.

In addition to the earthenware artifacts recovered, 61 sherds of glass were pieced together to form a number of generic glass bottles. Although their contents or specific usages cannot be definitively known, they seem most likely to have fallen within this functional category. A small number of utensils were also present across the site, including the oxidized handle from a utensil or a knife bolster and a complete "three-tined ferrous metal dinner fork" recovered from Cabin 4 (Doll et al. 1988:179). Likewise, at Cabin 3 a "machine-stamped tin-plated ferrous metal spoon" was found within the large refuse pit (Feature 2), as was a tin-plated cup (Doll et al. 1988:101).

Lighting

Two artifacts ostensibly fall into the category of household lighting. The first, a "transparent, facetted, tear-drop-shaped glass pendant" was found within a storage pit (Feature 5) of Cabin 4, and "may have served as a decoration suspended from the border of an oil-lamp shade" (Doll et al. 1988:174). The second was a "very thin, curved transparent glass sherd from a lamp chimney" that was recovered from the refuse pit adjacent to Cabin 4 (Doll et al. 1988:179). Whether the two artifacts were once associated with each other is as yet indeterminate.

Miscellaneous

A number of fragments of generic household hardware were also recovered from the Buffalo Lake site, many of which cannot be confidently ascribed to any specific tasks within the house unit. Consistent amongst all the cabins is the presence of broken and rusted pieces of tin, often shaped into sheets that likely formed the sides of various shapes of metal boxes. These sheets have been found flattened, corrugated, perforated, and cut into strapping to reinforce wooden crates or kegs. The assemblage also includes fragments of hoops, rings, lids, cans, handles, as well as samples of the various types of fasteners necessary to affix this hardware, including staples, tacks, rivets, nails (discussed in detail below), and screws.

A key was also found within the excavation of Cabin 2; however, “no other evidence of locks was found in Cabin 2 or elsewhere in the Métis site” (Doll et al. 1988: 149). Finally, a “forged iron hinge fragment” was recovered from the surface collections at Cabin 6, and would have been “about the size used on shutters or perhaps a trap door” (Doll et al. 1988:205), the latter of which seems more likely given the number of refuse and storage pits located within the walls of the cabins at Buffalo Lake.

Architectural

Construction

Nails formed another significant portion of the archaeological assemblage at Buffalo Lake. Across the five excavated cabins, 364 complete or fragmentary artifacts were determined to be nails. The majority (~87%) were classified as “machine-cut iron nails”, including the various head and finishing types that this category includes such as rose-head, gable-head, and flat-head nails, as opposed to the chronologically earlier style of hand-forged nails.

In addition to the nails, a number of generalized construction tools were recovered from the site. This includes file tangs from Cabins 2, 3, 4, and 5, as well as fragments from a “forged iron axe head” that has been split such that the cutting edge was missing (Doll et al. 1988:192). Also recovered was a fragment of the blade of a spade from the surface collections at Cabin 6 (Doll et al. 1988:205).

Windows

The window category at Buffalo Lake is thus far limited only to suspected window glass fragments. Twelve such fragments were recovered from Cabin 2, and were defined as window glass due to the lack of "silvering" that would be present on one side of mirror glass (Doll et al. 1988:150, 159). In addition, a single thin, flat sherd of transparent glass was recovered from the large refuse pit (Feature 2) at Cabin 3 (Doll et al. 1988:99). At the time window glass would have been an expensive luxury, and a greased hide or parchment would have been a more likely form of window covering (Doll et al. 1988:65, 99).

Commerce and Industry

Hunting: Gun Parts

Although evidence of hunting activities was fairly common at the Buffalo Lake site, actual gun parts were relatively rare. From the large refuse pit (Feature 2) of Cabin 3, a "brass ferrule from the proximal end of a shotgun ramrod" was recovered (Doll et al. 1988:84), and excavations of Cabin 5 uncovered a "complete trigger from a black powder muzzle-loading firearm", which the researchers believed was likely kept around as a spare part for gun repairs (Doll et al. 1988:190-191). In addition, a "percussion muzzle-loading gun barrel and breech" was surface-collected from Cabin 12, and appears to represent a single-barrel shotgun (Doll et al. 1988:205).

Hunting: Ammunition

Ammunition was much more commonly recovered from the refuse and storage pits located around Buffalo Lake. Recovered artifacts included rimfire and centrefire cartridge cases, centrefire shot shells, percussion caps, round balls, lead shot, gunflints, and lead bullets. This also provides a general understanding of the types of guns that would have been used at the site, even though none of those are directly evidenced within the archaeological assemblage. This includes repeating Henry rifles or the Winchester model 1866, percussion shotguns or plains rifles, the 1873 Winchester rifle, and the Colt Single-Action revolver.

Hunting: Miscellaneous

In addition to the above hunting implements, a “badly oxidized iron projectile point” was also recovered from the large refuse pit (Feature 2) of Cabin 3, with the researchers noting that this point was “of a style typical of those that were manufactured from scrap metal for trade at the various fur trade posts on the Upper Saskatchewan” (Doll et al. 1988:87). The “shell cover or inlay from a clasp knife or jackknife” was found at Cabin 2, and is described as having an “elongated rectangle of mother-of-pearl shell” (Doll et al. 1988:160). Also found was the tip of a thin skinning knife blade, as well as the “modified section of a skinning knife blade” that may have been hafted for use as “a scraping tool for hide preparation or wood working” (Doll et al. 1988:87-88).

Currency

A single coin was recovered from the excavations at Buffalo Lake, a “silver United States half dime dated 1857” that was recovered from the small refuse pit (Feature 3) of Cabin 3 (Doll et al. 1988:102).

Lithics

Tools

During excavations three end-scrapers were recovered from Cabin 3. Of these, two were described as a “bipolar split pebble”, while the last was “steeply unifacially retouched” (Doll et al. 1988:117). Also recovered was a “medium-sized unifacially worked scraper-plane” from Cabin 5 (Doll et al. 1988:201). Of note, a small number of tools and flakes were collected from Cabin 4 following disturbance by a bulldozer; however, those artifacts are believed to have come from a pre-contact context and so are not included in this summary (Doll et al. 1988:181).

Projectile Points

A “small side-notched point made of a reddish chalcedony resembling ‘Knife River Flint’” was recovered from Cabin 2, measuring 16.5 mm by 12.3 mm by 3.7 mm, as was the “tip of a small triangular point” that was composed of a reddish microcrystalline stone (Doll et al. 1988:165). Fragments of three projectile points were also found within Cabin 3, including a side-notched point, a triangular point, and a point tip, all of which were made from a grey siltstone or porcellanite (Doll et al. 1988:116). Finally, a “broken tip of a biface of grey-green quartzite” was found at Cabin 5 (Doll et al. 1988:201).

Flakes

In addition to the above well-formed lithic artifacts, 92 flakes of various types were recovered from the excavations at Buffalo Lake. These included decortification flakes, biface-thinning flakes, utilized and retouched flakes, and bipolar flakes, all made from a range of materials that included chert, mudstone, quartz, quartzite, jasper, chalcedony, and porcellanite.

Transportation

Tack

Transportation was an important aspect of Métis life at the Buffalo Lake site, and proper tack would have been a key component of successful trips and hunts. One of the most heavily represented aspects of this from the excavations included fragments of leather that likely made up horse harnesses. Five leather straps were recovered from Cabin 2 and six fragments from Cabin 3, some of which were "elongated and with various indications of perforations" (Doll et al. 1988:160). In addition to the leather fragments, remnants of a harness stud or bell, two types of harness buckles, and two harness rings were excavated from Cabin 3 (Doll et al. 1988:105-106).

Miscellaneous

To wrap up the transportation category, 12 horseshoe nails were found at the Buffalo Lake site, and were recovered from each of the five cabins that were excavated.

Flora

Miscellaneous

Only a small number of ecofacts were recovered from the Buffalo Lake site. Specifically, one pit of a choke cherry was recovered within Cabin 2, as were six unidentified black seeds from and one wood fragment from Cabin 3 Feature 3. Charcoal samples were collected from the Cabin 3 Exterior excavations, and laboratory sorting of bulk samples have uncovered the presence of thousands of small black seeds. However, these samples have not been analyzed and their archaeological significance is still unknown, so they have been left out of the statistical analyses.

Faunal Remains

Faunal remains were recovered from each of the excavated cabins at the Buffalo Lake site. While quantities are left out of this summary, exact numbers are available in Appendix II of the original site manuscript (Doll et al. 1988). Of note, however, are the breadth of species that were encountered during the course of the excavations: bison (*Bison bison*), moose (*Alces alces*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), snowshoe hare (*Lepus americanus*), white-tailed jack rabbit (*Lepus townsendii*), Nuttall's cottontail (*Sylvilagus nuttallii*), pocket gopher (*Thomomys talpoides*), ground squirrel (*Citellus* sp.), deer mouse (*Peromyscus maniculatus*), meadow vole (*Microtus pennsylvanicus*), shrew (*Sorex* sp.), Canada goose (*Branta canadensis*), snow goose (*Chen caerulescens*), white-fronted goose (*Anser albifrons*), mallard (*Anas platyrhynchos*), pintail (*Anas acuta*), gadwall (*Anas strepera*), red head duck (*Aythya americana*), ruddy duck (*Oxyura jamaicensis*), sharp-tailed grouse (*Pedioceter phasianellus*), trumpeter swan (*Olor buccinator*), crow (order Passeriformes), toads (family Bufonidae), as well as fish of indeterminate species were all found within the Buffalo Lake site.

These artifacts comprised the archaeological assemblages for the twelve cabins that were excavated and surface-collected. Notably, many dozens more cabins at Buffalo Lake have not been studied in any systematic way. In addition, there are potentially hundreds of cabin structures still unaccounted for based upon documentary descriptions of the historic settlement, and as such it is unclear how representative this collection is for the entire site because much of it remains unexcavated. However, the artifact assemblage that has been excavated is worthy of more careful comparative analysis, and for this I apply the techniques of exploratory data analysis.

CHAPTER 6

EXPLORATORY DATA ANALYSIS: METHODOLOGY AND RESULTS

In order to examine any patterning amongst the artifact assemblages associated with individual cabin features, I instead turned towards a statistical analysis of the known cabin assemblages. Specifically, I chose to focus upon the assemblages from Cabins 1, 2, 3, and 5, as well as the recent excavations directly adjacent to Cabin 3 (the Cabin 3 Exterior assemblage). Cabin 4 was left out of these analyses due to prior disturbance, as were Cabins 6 to 12, which were only surface-collected. Prior analyses of these assemblages have focused on the identification, classification, and cataloguing of the artifacts and ecofacts, with special emphasis placed upon the identification of historic artifacts, faunal remains, and the numerous beads that the original team of researchers recovered (Doll et al. 1988).

The assemblages from the early excavations at Buffalo Lake have been compared to a number of Métis sites throughout the Prairies, including other wintering sites, Free Traders' Posts, Hudson's Bay Company Posts, and Métis habitation sites such as Lac La Biche, Batoche, and Petite Ville (Doll et al. 1988:211-230). However, less emphasis has been placed upon comparing the assemblages at an intra-site level. Summary statistics were calculated to allow for a comparison of the relative proportion of the artifacts and ecofacts within each cabin assemblage, with data for the initial excavations being adapted from catalogues housed at the Royal Alberta Museum and the Buffalo Lake site report appendices (Doll et al. 1988:359-411). My goal is to examine the similarities and differences in artifact assemblages found within separate areas of this single, relatively chronologically constrained site. The Buffalo Lake site provides fertile ground for these analyses due to the amount of excavations that have occurred there over the decades, providing four artifact assemblages from the interiors of cabin features as well as one from the exterior. While I would not expect the dataset from the exterior to perfectly correlate with the interior assemblages, it does provide a different point of comparison and analysis. If these data are considered within the scope of a single community composed of individual inhabitants interacting on a daily basis, each potentially with their own task specializations and knowledge, then the similarities and differences within these artifact assemblages provide a better understanding of the lifeways of the actual inhabitants occupying the Buffalo Lake area.

6.1 The Fundamentals of Exploratory Data Analysis

I used exploratory data analysis (EDA) to examine patterns within the artifact assemblages of Buffalo Lake. In contrast to many of the statistical analyses archaeologists undertake, often called confirmatory analyses, exploratory data analysis allows initially hidden patterns in the data to emerge or be identified. This is accomplished by "gradually identifying trends and patterns that look interesting" (Fletcher and Lock 1991:9) through successive operations and manipulations of the underlying dataset, in order to "see what other patterns might exist" (Hartwig and Dearing 1979:10).

These successive operations and manipulations allow for two main features of any dataset to be extracted, the *smooth* and the *rough* (Hartwig and Dearing 1979:10-11; Tukey 1977:208). The smooth is the "underlying, simplified structure of a set of observations… represented by a straight line describing the relationship between two variables or by a curve describing the distribution of a single variable" (Hartwig and Dearing 1979:10). When the smooth is extracted from the data, the remaining data points, or residuals, are known as the rough. This forms the iterative aspect of exploratory data analysis, because ideally the rough that is left behind will be completely free of structure, or smoothing, of its own; if it is not, additional smoothing of the residual data must be completed (Hartwig and Dearing 1979:11).

To these authors, all forms of data analysis can be reduced to separating the smooth data from the rough data (Fletcher and Lock 1991:10; Hartwig and Dearing 1979:11; Tukey 1977:208). This willingness of EDA's proponents to explore the data is built upon two guiding principles, *skepticism* and *openness*:

> One should be skeptical of measures which summarize data since they can sometimes conceal or even misrepresent what may be the most informative aspects of the data, and one should be open to unanticipated patterns in the data since they can be the most revealing outcomes of the analysis. [Hartwig and Dearing 1979: 9]

This skepticism of numerical summaries of data derives from the effect that a small number of extreme cases can have upon certain summary statistics, particularly the *mean* and the *standard deviation* (Hartwig and Dearing 1979:19-21). Because of the effect that even a single significant outlier can have, these summary statistics are considered to be "nonresistant", and should not be uncritically accepted as describing the bulk of the dataset they claim to represent (Hartwig and Dearing 1979:12, 19-20).

Instead, the authors recommend focusing upon more resistant statistics to describe the *location* (the value around which the other values are distributed) and *spread* (the variability or dispersion of cases) of the dataset (Hartwig and Dearing 1979:13; Tukey 1977:97). These statistics include the lower hinge and upper hinge, the median, and the low-, mid-, and highspread, as these values remain "highly resistant to changes in the extreme values, i.e., in the shape of the tails of a distribution" (Hartwig and Dearing 1979:21). By relying upon a number of these more resistant summaries to describe each dataset the researcher gains a clearer understanding of the location, spread, and shape of the data's distribution.

By manipulating the data until one has an intimate knowledge of the underlying dataset, EDA allows for many different expressions of the data to develop. Some of the most important of these expressions take the form of visual, or graphic, representations of the data. Depending on the format of the data, as well as the specific modes of analysis the researcher is attempting at the time, these visual representations can take many forms, from box-and-whisker displays to scatter plots and many more. Indeed, deciding the correct style of visualization for each situation can go a long way towards making the data more approachable.

Through experimentation with these different forms of visual representation, it also becomes easier to determine the smooth from the rough in the underlying dataset, and to determine whether additional manipulation of the data is required. This raises one of the final fundamentals of exploratory data analysis, the notion of the *reexpression* of data. Hartwig and Dearing (1979:12) note that "the scale on which a variable was originally observed and recorded is not the only one on which it can be expressed", and that new insights into the data can appear if it is transformed through the application of some arithmetic function (Hartwig and Dearing 1979:54). While the manipulation of the data via "adding, subtracting, multiplying and dividing a variable by a constant" will transform the data to some degree, the relative distances between the data points will be preserved, and therefore the rank order and the shape of the distribution will not be affected (Hartwig and Dearing 1979:54-55). In contrast, "transforming a variable by logs, roots, powers, and exponentials will change relative distances between data points, thereby producing distributions with different shapes" (Hartwig and Dearing 1979:55), allowing for additional methods through which to smooth and better understand the data.

6.2 Select Methods of Exploratory Data Analysis

Given these fundamental principles of exploratory data analysis, it becomes necessary to analyze a small number of key applications of the methodology that will be applied to the Buffalo Lake assemblages, as these forms of summarization and visualization will have the largest effect upon understanding the data's distributions. In addition to simple bar graphs which break the data down into assemblages based upon artifact category or cabin feature, a number of exploratory data analysis techniques were adopted from Drennan (2009), Hartwig and Dearing (1979) and Tukey (1977).

The first of these techniques that I employed was a *stem-and-leaf* display[10] (Hartwig and Dearing 1979:16-17). The stem-and-leaf is a helpful aide in examining the data as "the result is a histogram that retains and rank orders all of the observed values, losing none of the data, while still providing a picture of the shape of the distribution" (Hartwig and Dearing 1979:17). This form of visualization was supplemented with the creation of *box-and-whisker* plots for each of the artifact categories[11]. Here, "half of all cases in the distribution lie within the box", values within one midspread of the two hinges are connected by dashed lines known as *whiskers*, and values more than 1.5 midspreads from the hinges marked individually with a hollow circle (Hartwig and Dearing 1979:23-24). As a result, box-and-whisker plots that display individual values can be quickly identified as departing from normality (Hartwig and Dearing 1979:24).

Also created as a way to analyze the assemblage data visually were a number of scatter plots[12], one of the "most effective tools for data analysis because they provide such a complete

[10] Raw data and outputs for exploratory and confirmatory statistics are available in Appendix B. Stem-and-Leaf displays can be found in Appendix B Figures 1 to 11.
[11] Box-and-Whisker plots can be found in Appendix C Figures 1 to 14
[12] Scatter plots can be found in Appendix C Figures 15 to 25

picture of the relationship between variables" (Hartwig and Dearing 1979:33). The addition of least-squares linear regression and *Tukey* lines provide another way of visualizing the data and differentiating the smooth from the rough. However, these models are based upon an assumption of linearity within the data, and "the statistical summaries [they] provide can be misleading and fail to convey information about the characteristic shape of the relationship" if the underlying data is actually nonlinear in nature (Hartwig and Dearing 1979:49).

Finally, resistant statistics were calculated for the assemblages[13]. As mentioned above, these resistant statistics include *order* statistics such as median value ("the value above which and below which fall one-half of the values in a rank-ordered list"), the lower hinge ("that point above which three-fourths and below which one-fourth of the values lie"), and the upper hinge ("that point above which lie one-fourth of the values") (Hartwig and Dearing 1979:21). Low-, mid- and highspread values were also calculated for the distributions; these values, also known as "half-ranges", reflect the numeric distance between the lowest value and the median, the distance between the lower and upper hinge, and the distance between the median and the highest value, respectively (Hartwig and Dearing 1979:22). Taken together, these numbers are helpful in analyzing all three characteristics of a distribution, as "the median indicates the location of the distribution; the midspread is a measure of the spread; and a comparison of the distances can provide information about the shape" (Hartwig and Dearing 1979:22-23). Interesting patterns within these analyses are explored in the section below, while a complete listing of the results from the EDA analysis can be found in Appendices B and C.

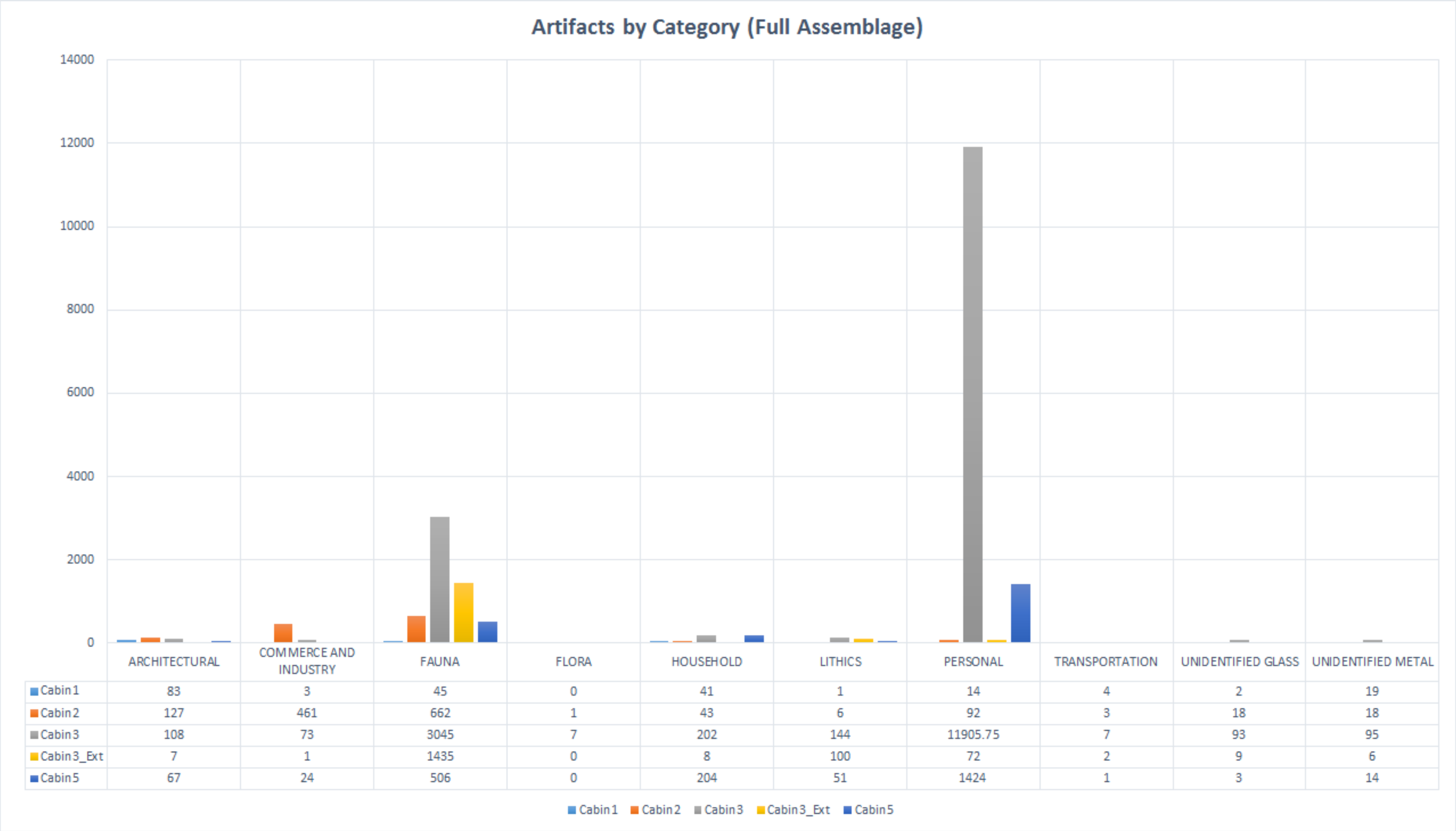
[13] Resistant statistics can be found in Appendix B Figures 12 to 22

6.3 Exploratory Data Analysis Results

Looking to the artifact data from each of the cabin assemblages, the cabin features at the Buffalo Lake site exhibit a number of similarities in terms of their general structures, but also show distinct differences in regard to a few functional categories. These few discrepancies are significantly large enough that they completely skew efforts to visualize the artifact assemblages and compare them between cabins (Figure 6.1). Removing these significant outliers (Figure 6.2) allows for an easier comparison of the assemblages between the cabins in a more equitable manner, bringing minor discrepancies to light.

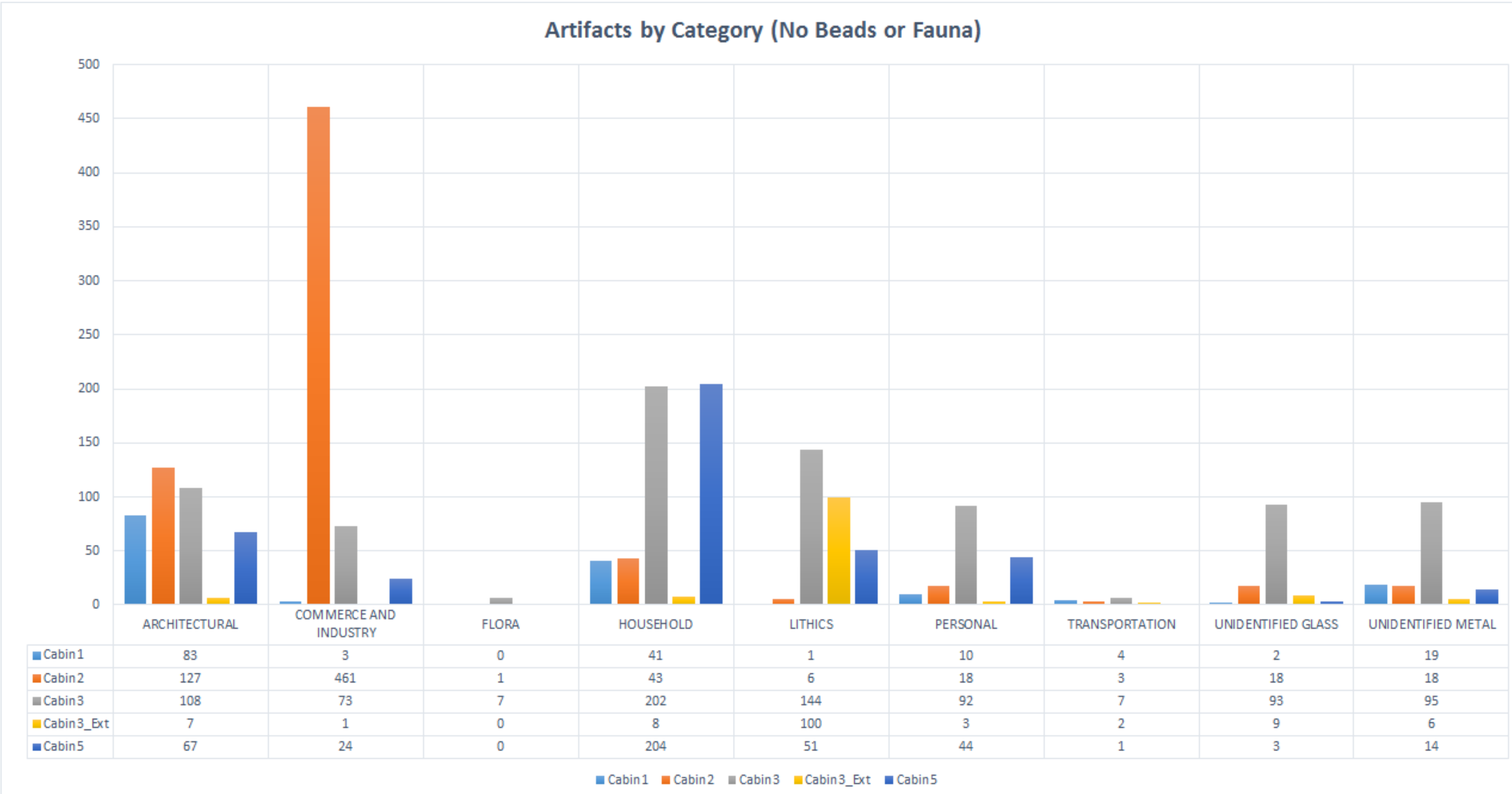
Functional Category Analysis

Looking more closely at individual functional categories, only the Architectural artifact category (Figure 6.3), which is largely dominated by nails, seems to show relative parity across all five assemblages examined here. Of these, the four assemblages displaying elevated numbers were excavated from the interiors of cabin structures (Cabins 1, 2, 3, and 5), whereas the assemblage lacking in artifacts was excavated from the area directly outside one cabin (Cabin 3 Exterior). This distribution is therefore expected. I also attempted to correct for the differing size of each cabin assemblage by adjusting for the volume of material excavated from each cabin (for example, Figure 6.4). When this volume-corrected data is considered, however, it initially appears that the amount of architectural materials recovered from Cabin 3 may still be an outlier. Although the excavations of Cabin 3 were extensive in terms of the amount of volume excavated, the amount of physical material excavated appears to have been less than the shallower but more extensive excavations completed on Cabins 1 and 2, thereby increasing the numbers for the volume-corrected Cabin 3 artifact assemblage. Additionally, when the



	ARCHITECTURAL	COMMERCE AND INDUSTRY	FAUNA	FLORA	HOUSEHOLD	LITHICS	PERSONAL	TRANSPORTATION	UNIDENTIFIED GLASS	UNIDENTIFIED METAL
Cabin1	83	3	45	0	41	1	14	4	2	19
Cabin2	127	461	662	1	43	6	92	3	18	18
Cabin3	108	73	3045	7	202	144	11905.75	7	93	95
Cabin3_Ext	7	1	1435	0	8	100	72	2	9	6
Cabin5	67	24	506	0	204	51	1424	1	3	14

Figure 6.1
Artifact counts by Functional Category (Full Assemblage)



	ARCHITECTURAL	COMMERCE AND INDUSTRY	FLORA	HOUSEHOLD	LITHICS	PERSONAL	TRANSPORTATION	UNIDENTIFIED GLASS	UNIDENTIFIED METAL
Cabin1	83	3	0	41	1	10	4	2	19
Cabin2	127	461	1	43	6	18	3	18	18
Cabin3	108	73	7	202	144	92	7	93	95
Cabin3_Ext	7	1	0	8	100	3	2	9	6
Cabin5	67	24	0	204	51	44	1	3	14

Figure 6.2
Artifact counts by Functional Category (No Beads or Fauna)

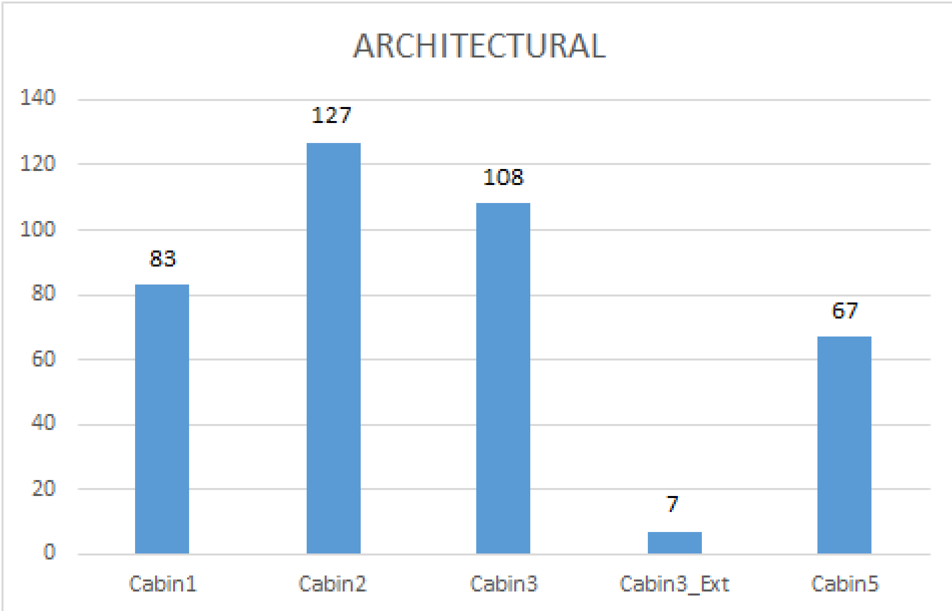


Figure 6.3
Architectural artifacts by Cabin Feature

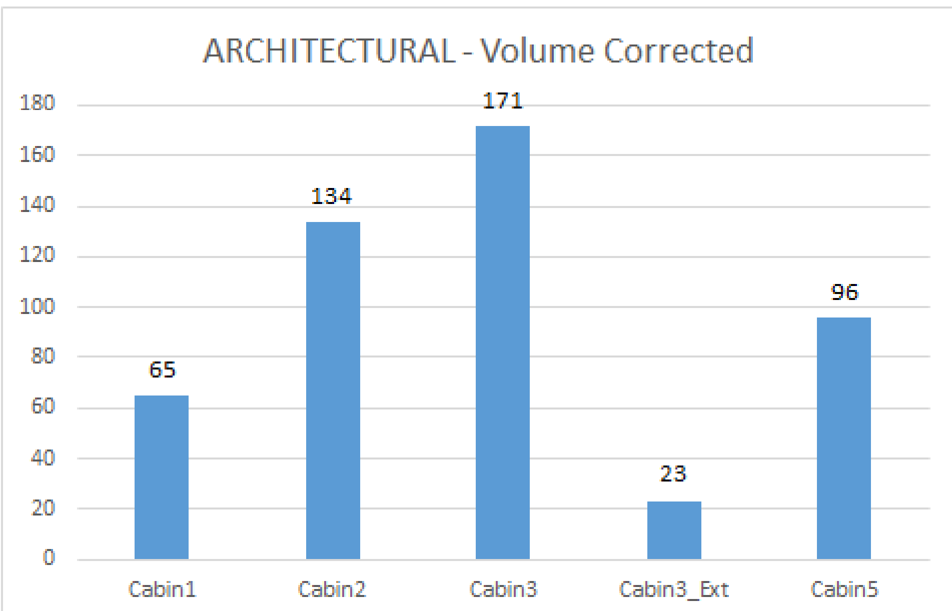


Figure 6.4
Architectural artifacts by Cabin Feature
(Volume Corrected)

Architectural artifacts recovered are plotted by the amount of material excavated from each cabin feature (Figure 6.5), it is the only category that approaches an approximately linear relationship between the amount of excavated material and the quantity of artifacts recovered[14].

I decided to therefore look closer at the effect that volume of excavated materials was having upon the total number of artifacts being recovered from the cabin assemblages. I plotted the total number of artifacts for each cabin feature's full assemblage versus the excavation volume (Figure 6.6), as well as the same data with the significant outliers (beads and fauna) removed (Figure 6.7). The results were such that the Cabin 3 assemblage still stands as a clear outlier, especially when the entire artifact assemblage is considered. When the beads and faunal outliers are removed, Cabin 3 still retains the highest number of artifacts, but settles much closer to the Cabin 2 assemblage, both of which are still significantly higher than the other three assemblages being considered.

A number of the cabins show a much clearer disparity when it comes to the relative proportion of an artifact category within the assemblage. The first of these is the Commerce and Industry category of artifacts (Figure 6.8), which includes blacksmithing and manufacturing artifacts, but also importantly artifacts related to hunting, including gun parts and ammunition. Cabin 2 is distinct in that it has 461 artifacts from this category, while the next closest artifact count is from Cabin 3, with only 73 such artifacts. Correcting for volume does not seem to have any significant impact on this disparity[15]. The artifacts from Cabin 2 are dominated by 451 pieces of lead shot, almost all of which were recovered from a refuse pit within the cabin, "at least some of [which] were introduced with bird or small mammal remains disposed of here"

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[14] For comparison, see scatter plots for all Functional Categories in Appendix C Figures 15 to 25
[15] See Appendix A Tables 1 and 4

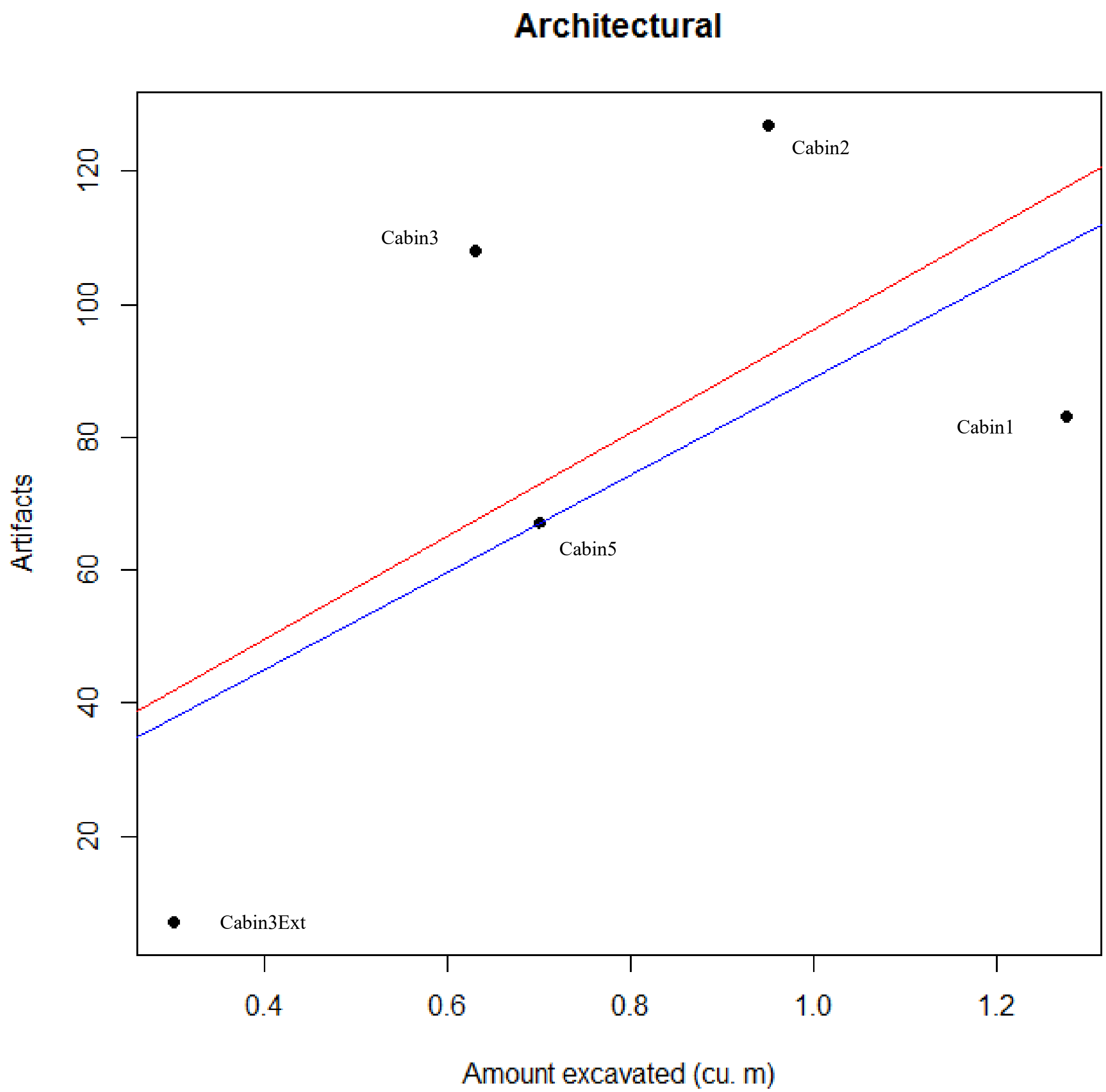

Figure 6.5
Scatterplot of Architectural artifacts by Volume of Excavation

Linear Regression Line

Tukey Line

Rho=0.5

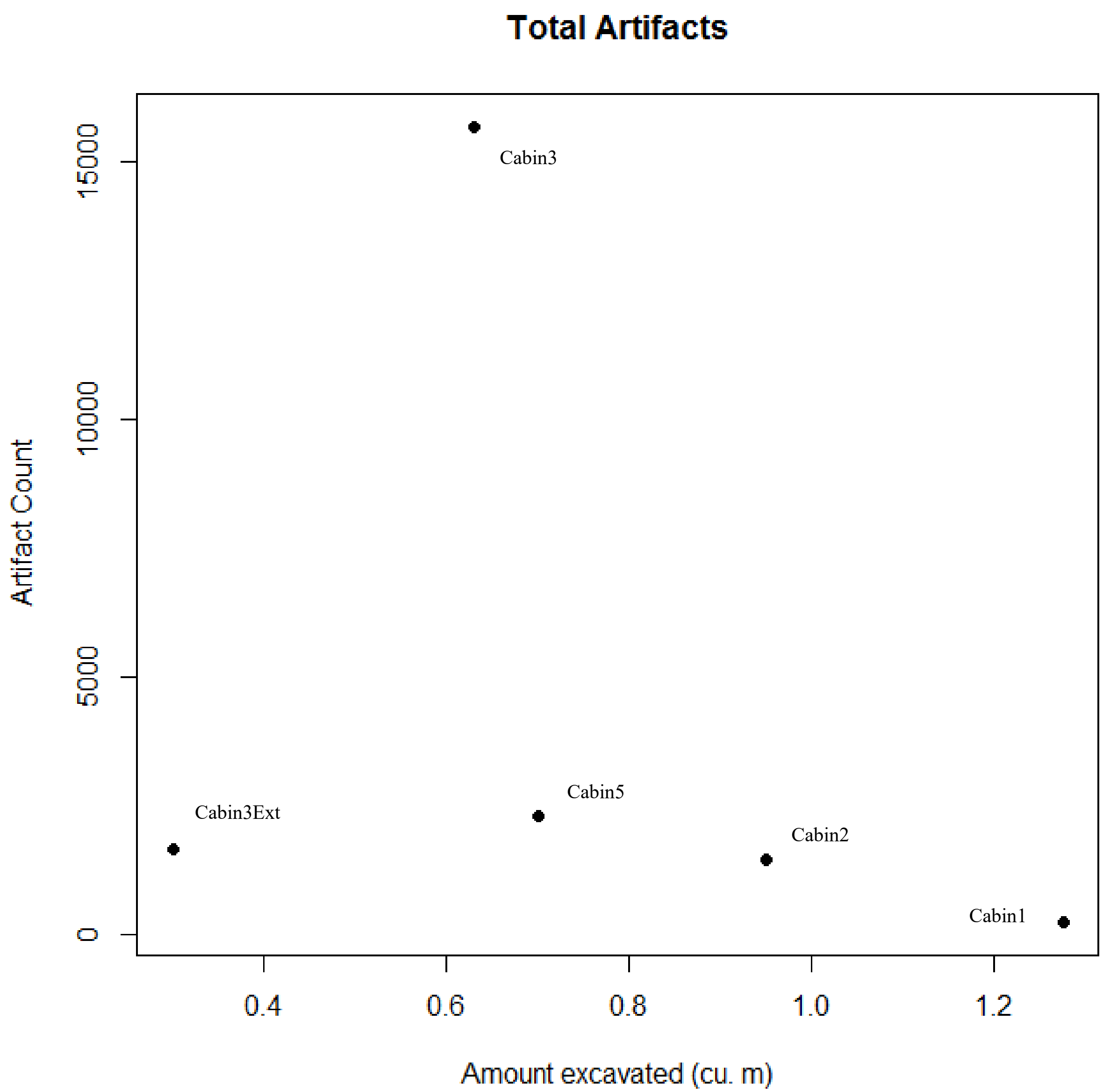

Figure 6.6
Scatterplot of Total Artifacts by Volume of Excavation

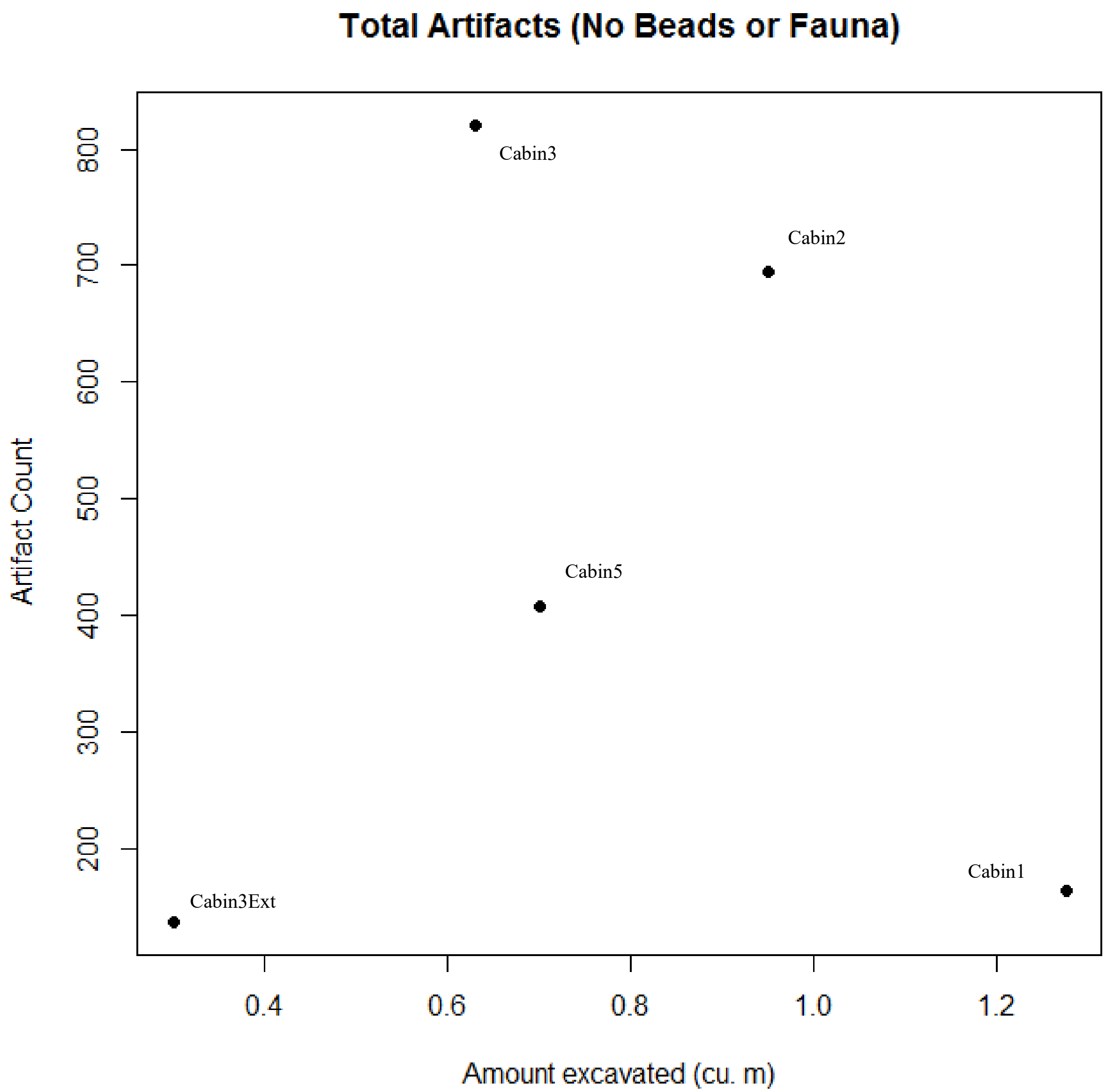

Figure 6.7
Scatterplot of Total Artifacts (No Beads or Fauna)
by Volume of Excavation

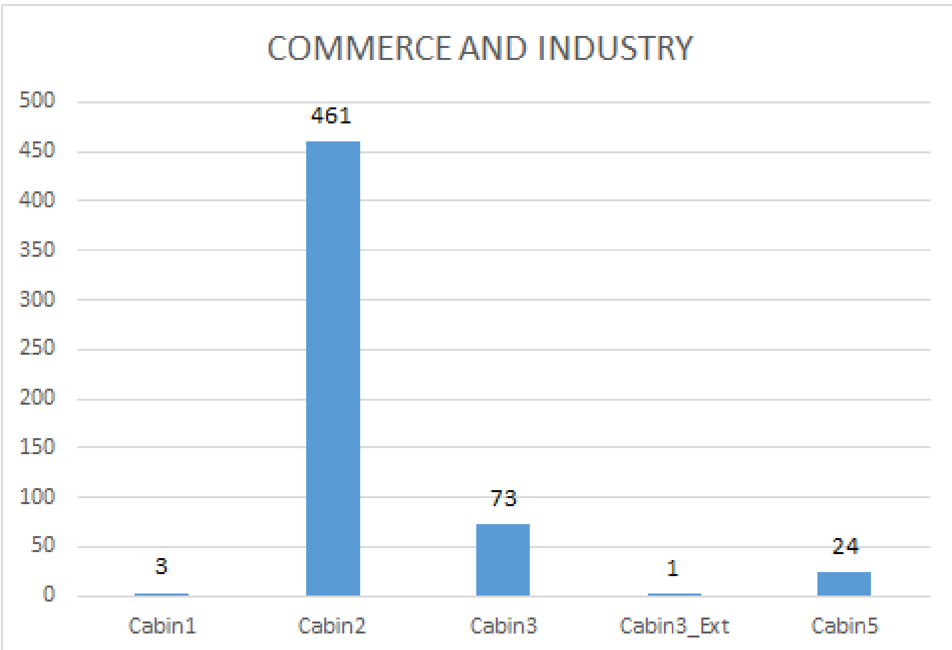

Figure 6.8
Commerce and Industry artifacts by Cabin Feature

(Doll et al. 1988:154). The majority of this shot was of size 5 to 4, although the total range was from 6 to BBB (Doll et al. 1988:154).

Overall, Cabin 3 and the Cabin 3 Exterior appear to have more faunal remains than did the other three cabin assemblages (Figure 6.9). While only Cabin 3 appears to have these elevated values, volume correction of the Cabin 3 Exterior data (Figure 6.10) showed that the relatively small amount of materials excavated (approximately 3 cubic metres) likely had an impact on the amount of faunal materials recovered, and further excavations may bring these values almost on par to those actually excavated from the Cabin 3 interior. This is supported by the distribution of the faunal remains within the Cabin 3 Exterior excavations (Figure 6.11), as the largest concentrations of faunal remains were located furthest away from the cabin structure. Even so, the amount of fauna recovered from the interior of Cabin 3 appears to be a significant outlier from the other assemblages, measuring almost six times the amount of that recovered from each of Cabins 2 and 5.

Similarly, Cabin 3 and the Cabin 3 Exterior excavations show a much higher proportion of lithic artifacts than seen in Cabins 1 and 2, and to a lesser degree in Cabin 5 (Figure 6.12). This pattern appears more distinct when the volume corrected numbers are considered, with the intermediate values from Cabin 5 being diminished and the Cabin 3 Exterior being enhanced (Figure 6.13). Doll et al. wrote extensively about the lithic artifacts recovered during the course of their excavations, and while the authors admitted the possibility that the artifacts could have been left by a pre-contact population residing in the area, they found it “most unusual that such concentrations would be found in the two depressions, Features 2 and 3, without a proportional distribution in the rest of the cabin interior” (Doll et al. 1988:118). Additionally, if the lithic artifacts were an intrusive assemblage from the approximately 10,000 years of prior occupation

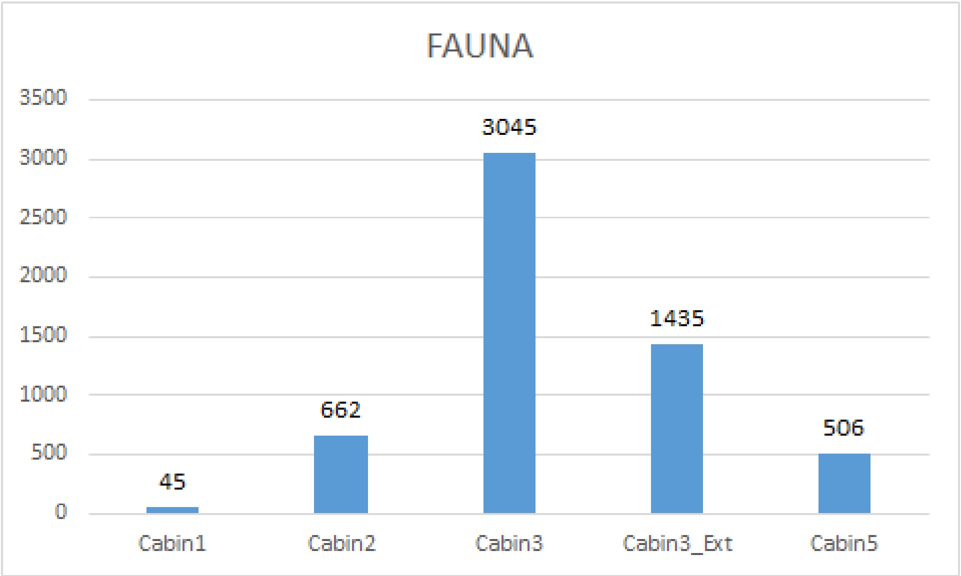

Figure 6.9
Faunal Remains by Cabin Feature

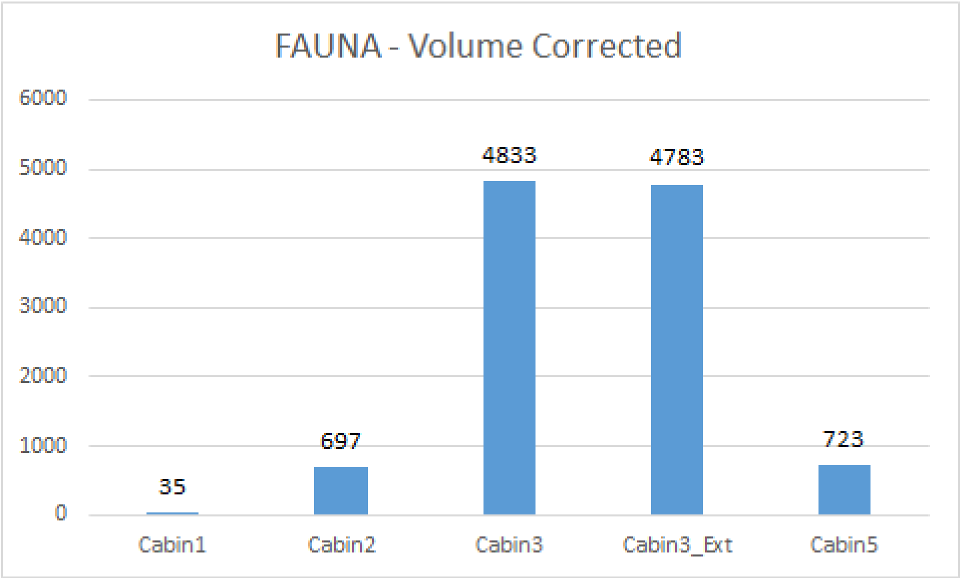

Figure 6.10
Faunal Remains by Cabin Feature
(Volume Corrected)

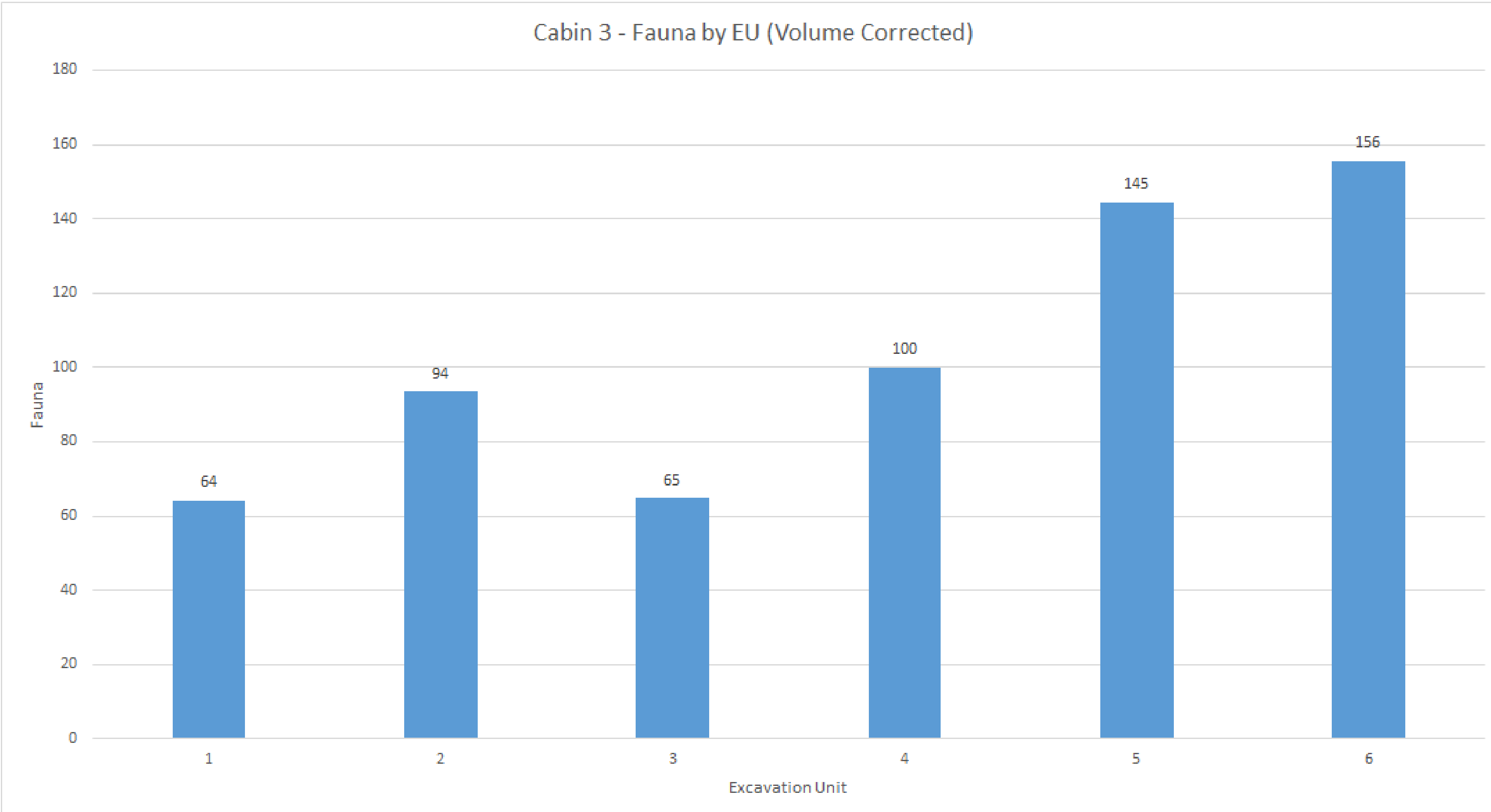

Figure 6.11
Cabin 3 Exterior Faunal Remains by Excavation Unit

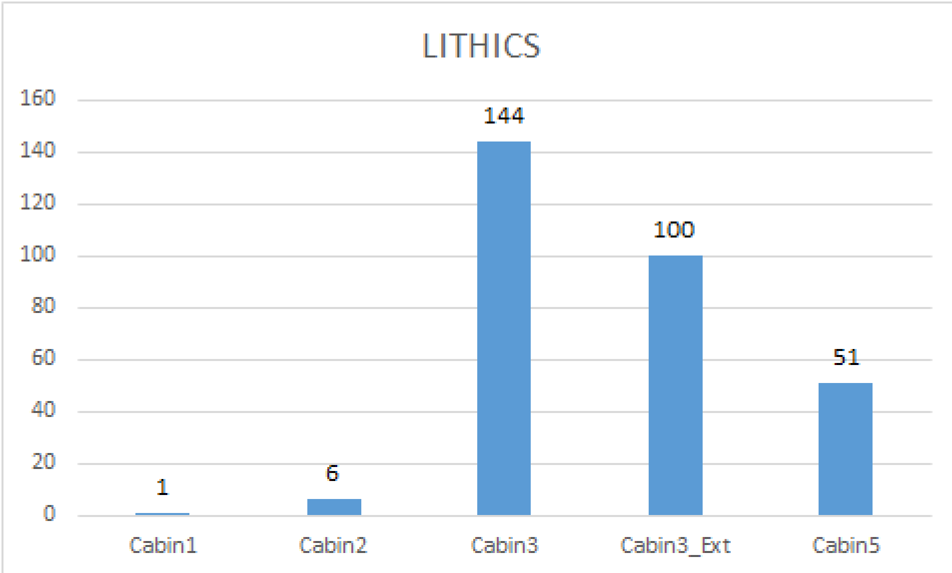

Figure 6.12
Lithic artifacts by Cabin Feature

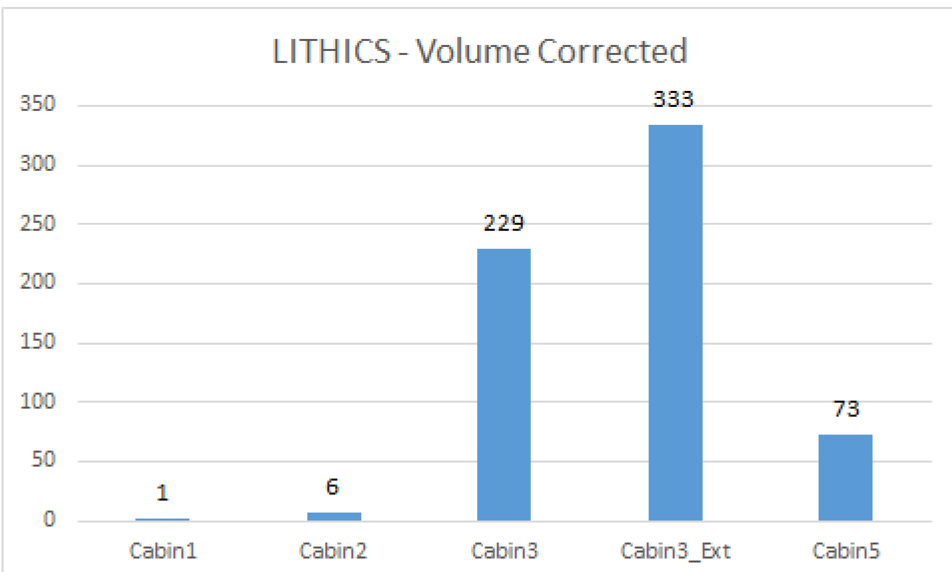

Figure 6.13
Lithic artifacts by Cabin Feature
(Volume Corrected)

of the Buffalo Lake region, then perhaps a more even distribution across the entirety of the Buffalo Lake site would be expected. However, examination of the lithic artifact distribution by excavation unit (Figure 6.12) shows significant variability in their distribution, and does not seem to provide any evidence for a pre-contact lithic layer intruding on the historical excavations.

The disproportionate results within the Personal artifacts category at first appear to skew the results to the point that other comparisons are difficult to make (for example, see Figure 6.1). However, this is almost completely the result of the presence of artifacts known as "seed beads", a type of small glass bead that "may represent the decoration of a small number of objects such as moccasins, gauntlets, or men's garters" (Doll et al. 1988:115). These beads dominate the Personal category (Figure 6.14[16]). The Cabin 3 assemblage contains 11905 artifacts that fall within the Personal category, but if beads are excluded from this group, the number is reduced to only 92 artifacts, a reduction of over 99%. Similarly, the Cabin 5 assemblage drops from 1424 artifacts to only 44 when beads are removed from the analysis, a 97% reduction. While the number of beads in these two cabins are quite numerous, the thousands of beads could have come from a small number of decorated objects, which could easily be accounted for within the scope of normal wear-and-tear and daily activities around the site. While these beads significantly affect the assemblages from Cabins 3 and 5, even when removed from analysis these same two cabins display elevated amounts of Personal artifacts in comparison to the other three assemblages. The majority of these remaining Personal artifacts are buttons, which

[16] Artifact tables for all functional categories, including volume-corrected data, can be found in Appendix C Figures 26 to 47, for comparison

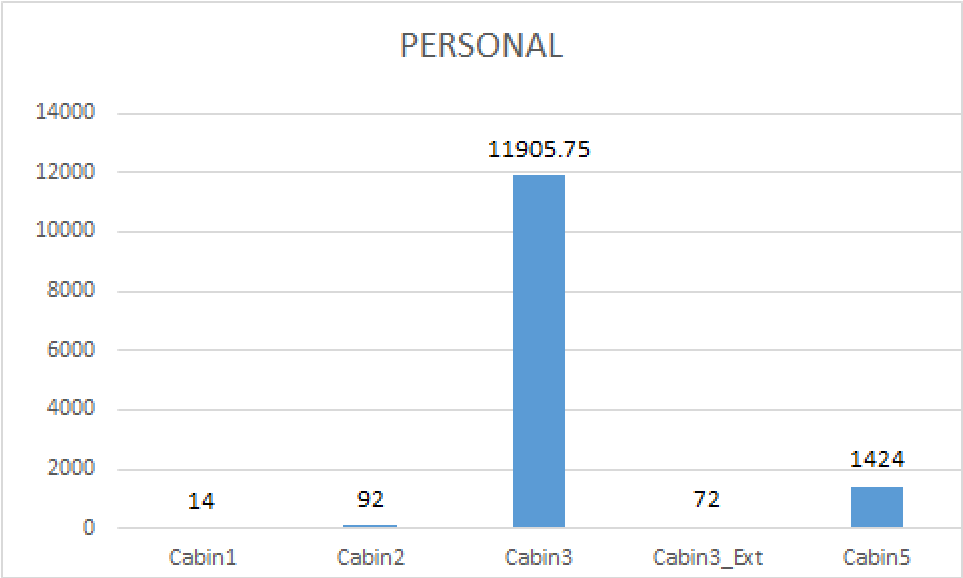

Figure 6.14
Personal artifacts by Cabin Feature

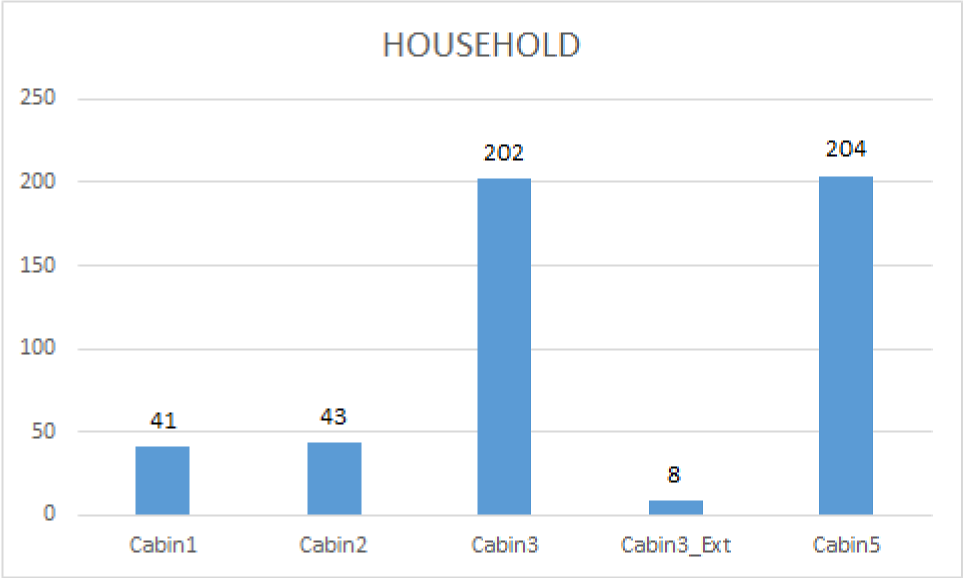

Figure 6.15
Household artifacts by Cabin Feature

depending on the type of garment that was decorated and subsequently discarded could have come from the same source garments.

In contrast, some functional categories such as Household artifacts split the total assemblage essentially into two, with Cabins 1 and 2 showing a pattern separate from the assemblages in Cabins 3 and 5 (Figure 6.15). The Cabin 3 Exterior assemblage also contains a small number of these objects. Given that this category is dominated by kitchen goods such as ceramic dishware, utensils, and food storage containers, their presence outside the cabin structure is not expected.

The small number of artifacts in this category from Cabin 1 (41 total) are almost all ceramic fragments, and almost half of the Cabin 2 Household assemblage (17 of 43 artifacts) are fragments of lead foil that were likely used to wrap tea (Doll et al. 1988:100). In contrast, Cabins 3 and 5 have a significant number of artifacts in the Household category, with the majority of Cabin 3's artifacts (175 of 202 total) being ceramic fragments, and Cabin 5's assemblage being two-thirds ceramic fragments (133 out of 204 total) and one-third fragments of lead and tin foil (71 out of 204 total). This seems to split these four assemblages into two types, at least as far as the household goods that were left behind by their inhabitants appears to concern.

Finally, a small number of the categories do not appear to have enough to draw significant conclusions about their numbers. Most notable here are artifacts pertaining to Transportation (Figure 6.16) and Flora (Figure 6.17), for which each cabin assemblage contained less than 10 artifacts, if they were present within that cabin assemblage at all. As a result, I do not believe that analysis of these categories will have a significant effect upon determining patterns within cabin assemblages.

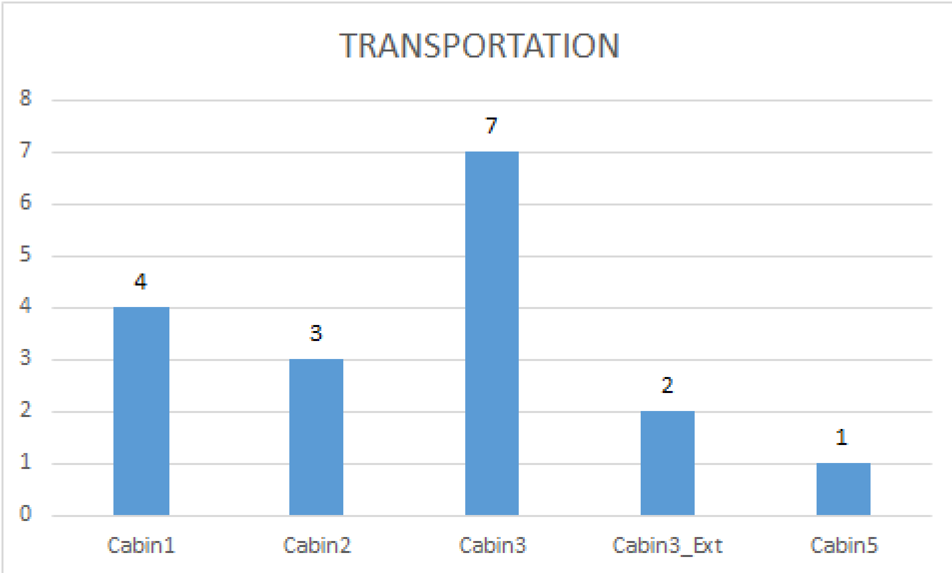

Figure 6.16
Transportation artifacts by Cabin Feature

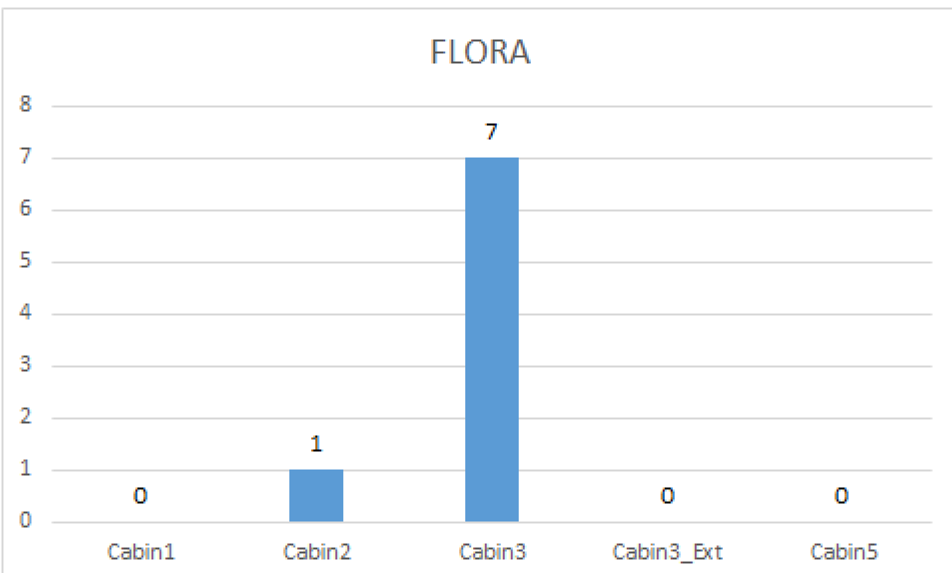

Figure 6.17
Flora by Cabin Feature

Cabin Assemblage Analysis

Although these individual functional artifact categories can show discrepancies between the relative proportions of artifacts between the different cabin assemblages, their analysis does not permit examination of each cabin as a whole. Therefore, this section considers the entirety of each cabin's assemblage to see whether certain artifact categories stand out against the rest, possibly providing evidence for types of activities occurring in these locations.

Cabin 1's artifact assemblage (Figure 6.18) shows a large number of Architectural artifacts, followed by Faunal remains and Household artifacts making up the majority of the assemblage. Although Architectural artifacts are the largest category, they do not tell much about the inhabitants of the cabin structure or their activities, but rather that there was a significant amount of preservation of these components of the cabin structure. Similarly, the Faunal remains and Household artifacts imply that normal daily activities occurred within the space. Perhaps more telling is the lack of artifacts from a few categories, most notably the presence of only three artifacts falling within the Commerce and Industry category. Coupled with a lack of Lithics, no specialized activities appeared to have been occurring within the Cabin 1 area, such as manufacturing or butchering, and Cabin 1 appears to have been a generalized cabin structure based upon these results.

In contrast, Cabin 2's artifact assemblage (Figure 6.19) shows a large number of faunal remains, as well as artifacts from two functional categories. Although I often chose to visualize assemblages without these large outliers in order to allow more subtle patterns to present themselves within the data, if the cabin assemblages are considered as a whole then evidence for specialized activity within the Cabin 2 area becomes more apparent. The large number of Commerce and Industry artifacts are almost entirely Lead Shot that was recovered from a refuse

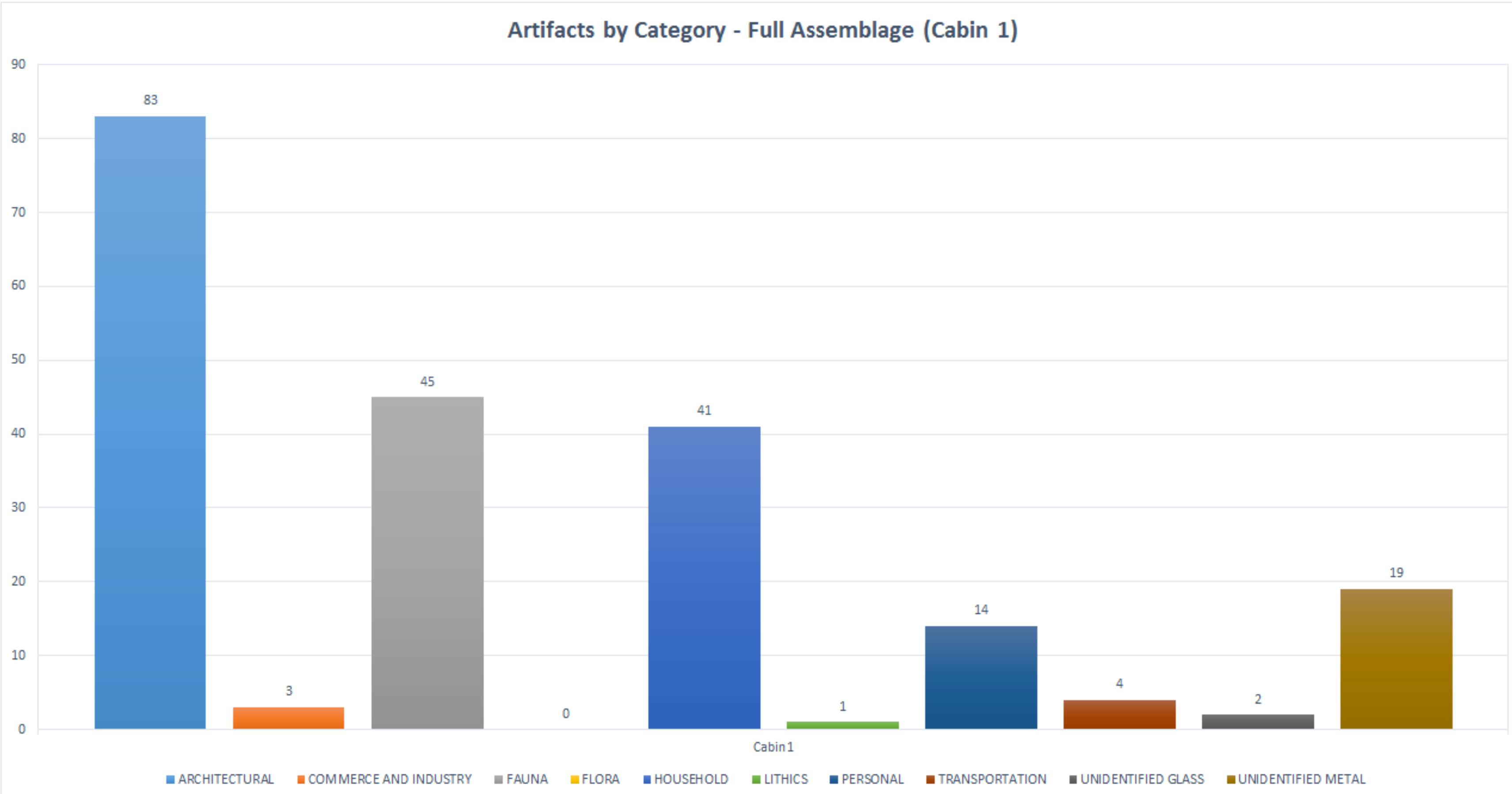

Figure 6.18
Cabin 1 artifacts by Functional Category

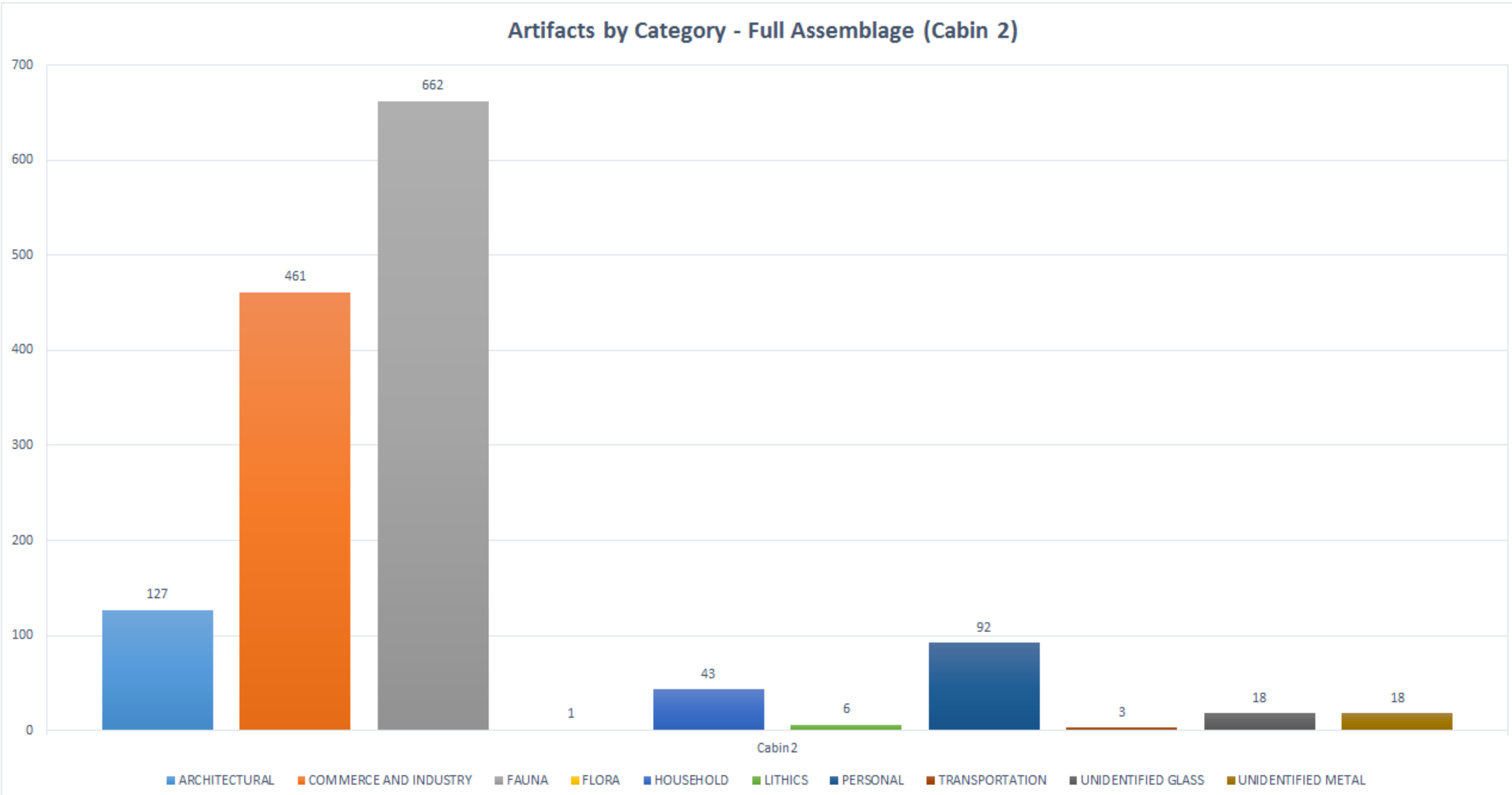

Figure 6.19
Cabin 2 artifacts by Functional Category

pit within the cabin. Coupled with the 662 Faunal remains excavated from Cabin 2, it seems likely that hunting, and subsequently butchering, cooking, and consumption, was a primary activity of the inhabitants of this cabin structure. Removing these outliers from the assemblage, the remaining artifacts appear quite similar to the assemblage from Cabin 1, with Architectural artifacts making up the next most prevalent category, followed again by Household artifacts and a similar number of Personal artifacts and pieces of Unidentified Metal (Figure 6.20).

The full assemblage data from the interior of Cabin 3 (Figure 6.21) is significantly skewed by the number of Personal artifacts; however, these nearly twelve thousand beads could have been from only a small number of decorated objects, and so could come from only a small number of discarded goods. Removing this data from the visualization, the remaining assemblage is still dominated by the presence of over three thousand Faunal remains (Figure 6.22). While the excavations of Cabin 2 also showed a significant amount of Faunal remains, the amount recovered from Cabin 3 is almost five times higher than those already elevated values, showing a large concentration of materials recovered predominately from the two refuse pits within the cabin area (Doll et al. 1988:118-119). In addition, 144 Lithic artifacts were excavated from Cabin 3, including scrapers, projectile points, and other tools and flakes. This seems to be clear evidence of butchering and processing occurring within the cabin structure itself, and although the depressions may have initially been used as storage pits or cellars, the inclusion of other artifacts in addition to the Faunal remains and the lack of cribbing or other lining seems to imply that this was not a meat cache that was forgotten or abandoned. Finally, removing both of these significant outliers (Figure 6.23) shows approximately similar, though elevated, proportions to the previous two cabins already discussed. While each of the categories has a raw.

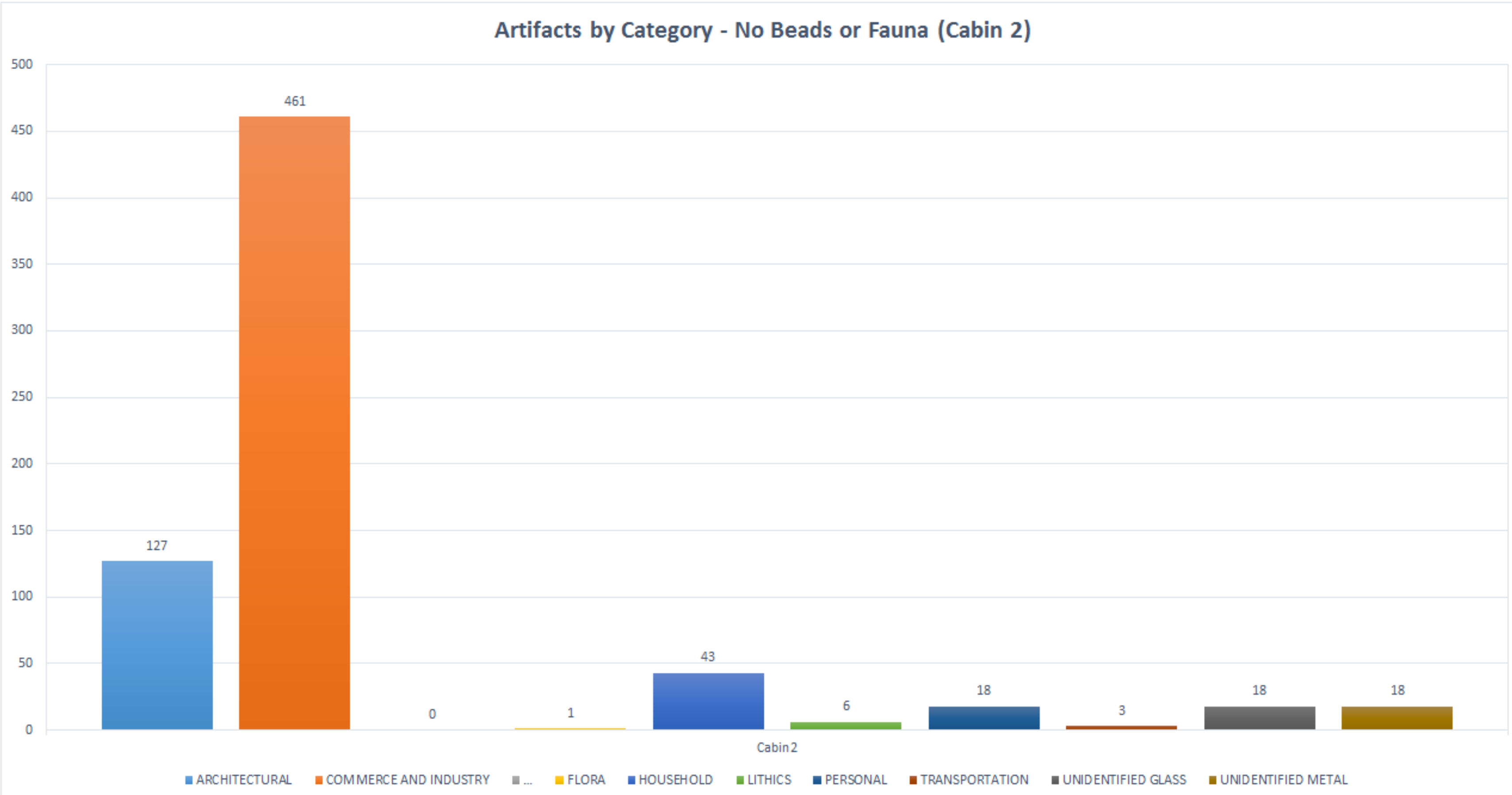

Figure 6.20
Cabin 2 artifacts by Functional Category
(No Beads or Fauna)

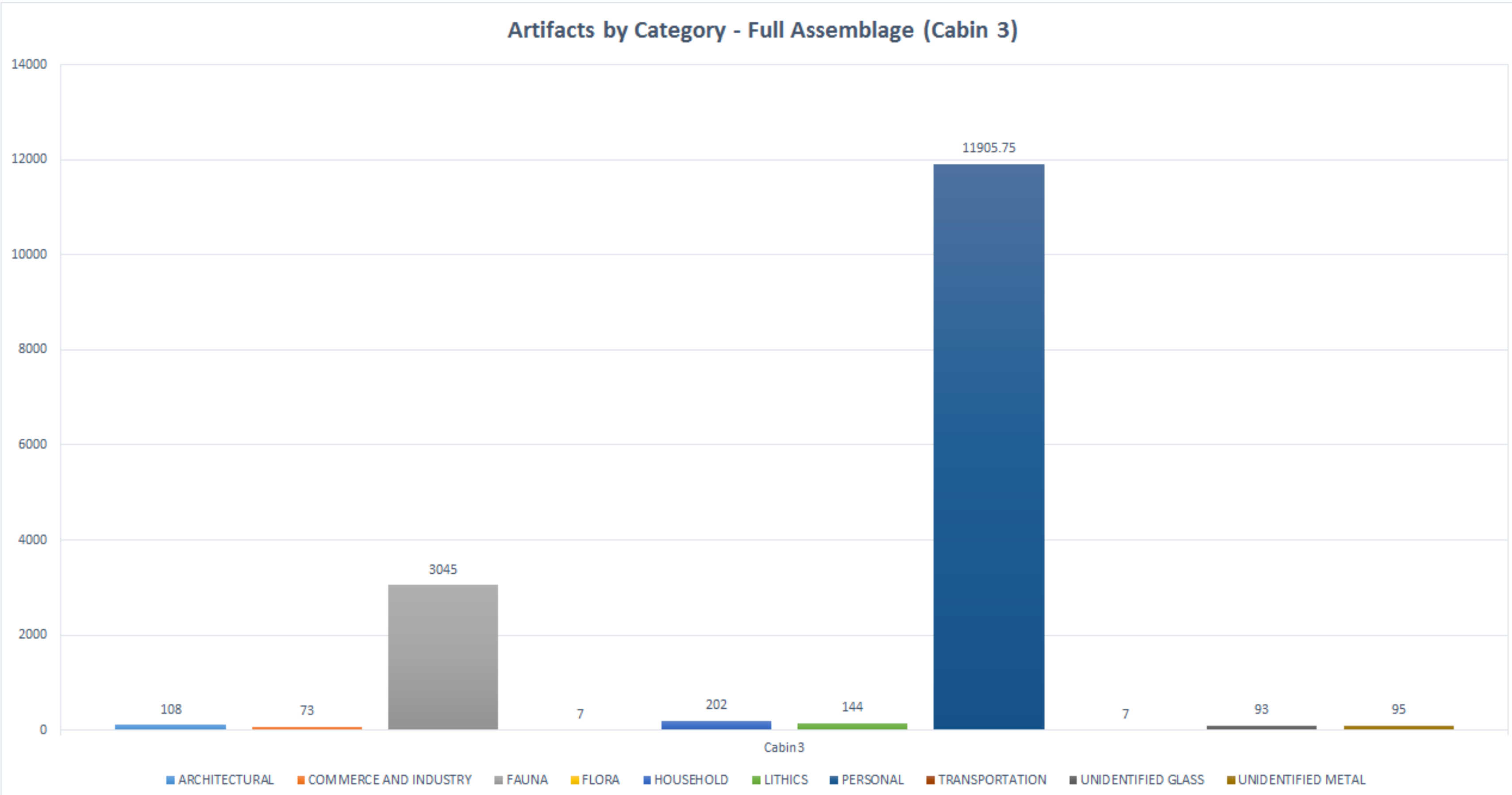

Figure 6.21
Cabin 3 artifacts by Functional Category

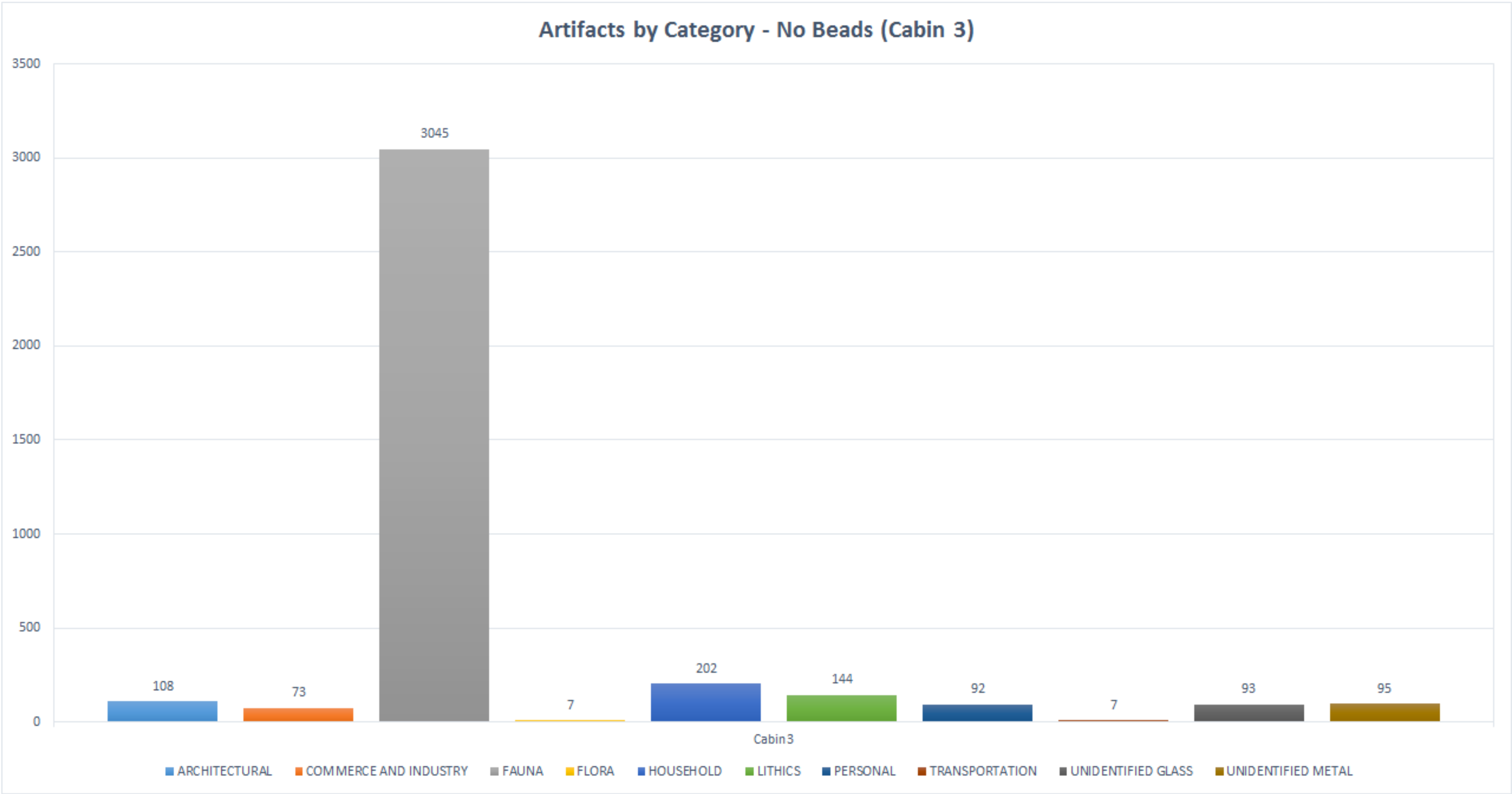

Figure 6.22
Cabin 3 artifacts by Functional Category
(No Beads)

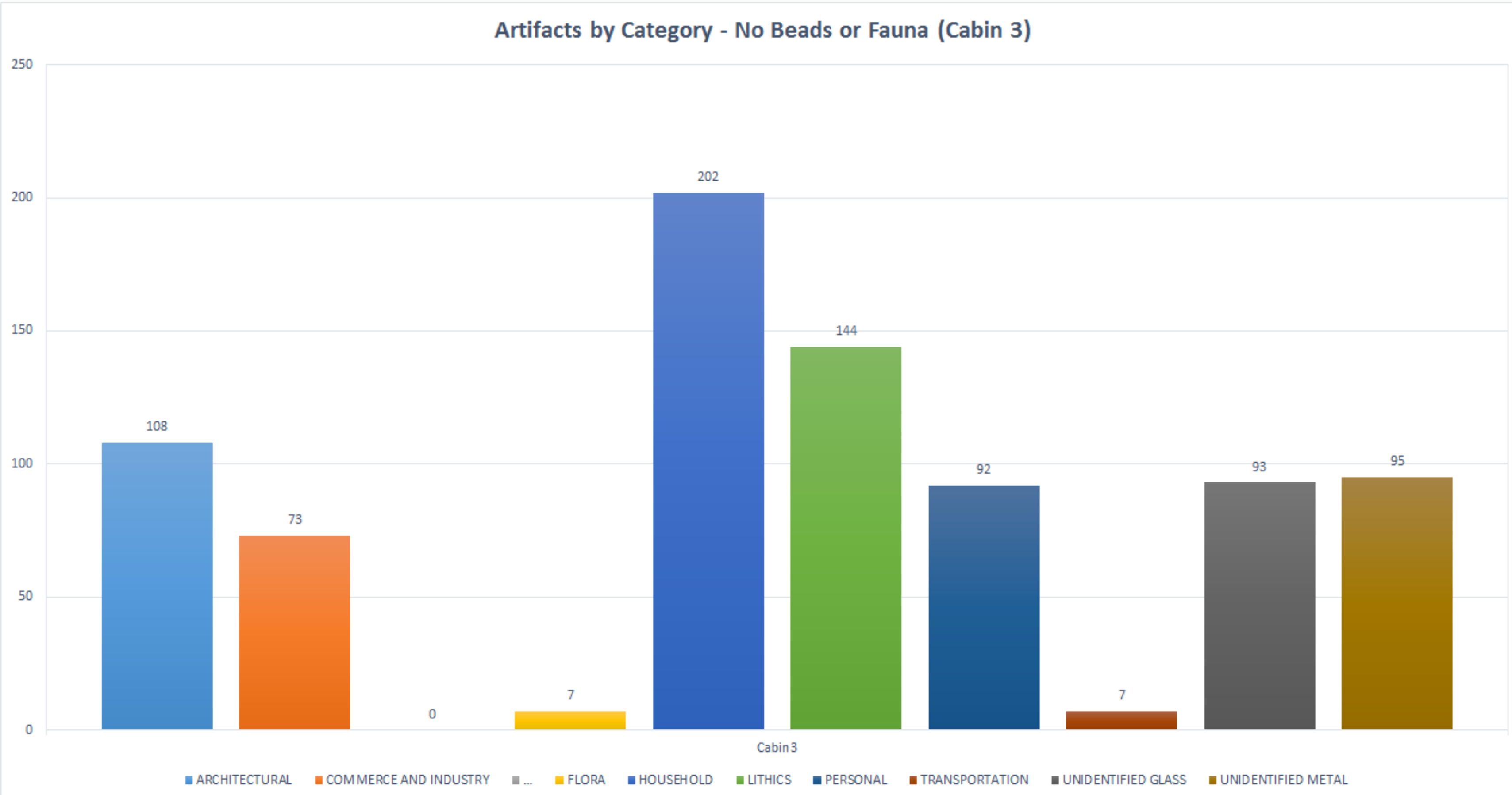

Figure 6.23
Cabin 3 artifacts by Functional Category
(No Beads or Fauna)

count higher than seen in the “normal” assemblages, it is not clear whether this is a result of a more intensive occupation of the cabin structure, or a more intensive excavation of the cabin features

When the assemblage from the Cabin 3 Exterior is examined (Figure 6.24), the elevated amount of Faunal remains again stand out. Because these excavations occurred outside of the known area of a cabin structure, I expected to see a different assemblage signature than in the cabin interiors. When the Faunal counts are removed from the data visualization (Figure 6.25) this is exactly what happens, with Architectural, Household, and Commerce and Industry artifacts being only minimally present. Instead, Lithic artifacts dominate the remaining assemblage. Whether this is a result of butchering activity occurring outside, or the discarding of faunal remains/lithics outside of the cabin structure area, cannot yet be ascertained.

Finally, Cabin 5’s full artifact assemblage (Figure 6.26) initially shows a similar pattern to those observed above, with Faunal remains and Personal artifacts standing as noticeable outliers. Removing the almost 1380 beads and 506 Faunal remains from the assemblage, Household artifacts make up the next most common category (Figure 6.27). These Household artifacts include 134 ceramic fragments, as well as 66 pieces of lead foil within which tea would likely have been stored. Of the remaining artifacts, the assemblage shows a fairly standard distribution of Architectural, Commerce and Industry, Lithic, and Personal artifacts. What activities occurring within Cabin 5 might account for its high number of beads and faunal remains? The nearly fourteen hundred beads could again be from a single decorated object that was discarded, and the remaining 506 Faunal remains does not seem significantly distinct from the 662 pieces of fauna recovered from the Cabin 2 excavations, meaning that this could be evidence for normal daily butchering and discard activities within Cabin 5.

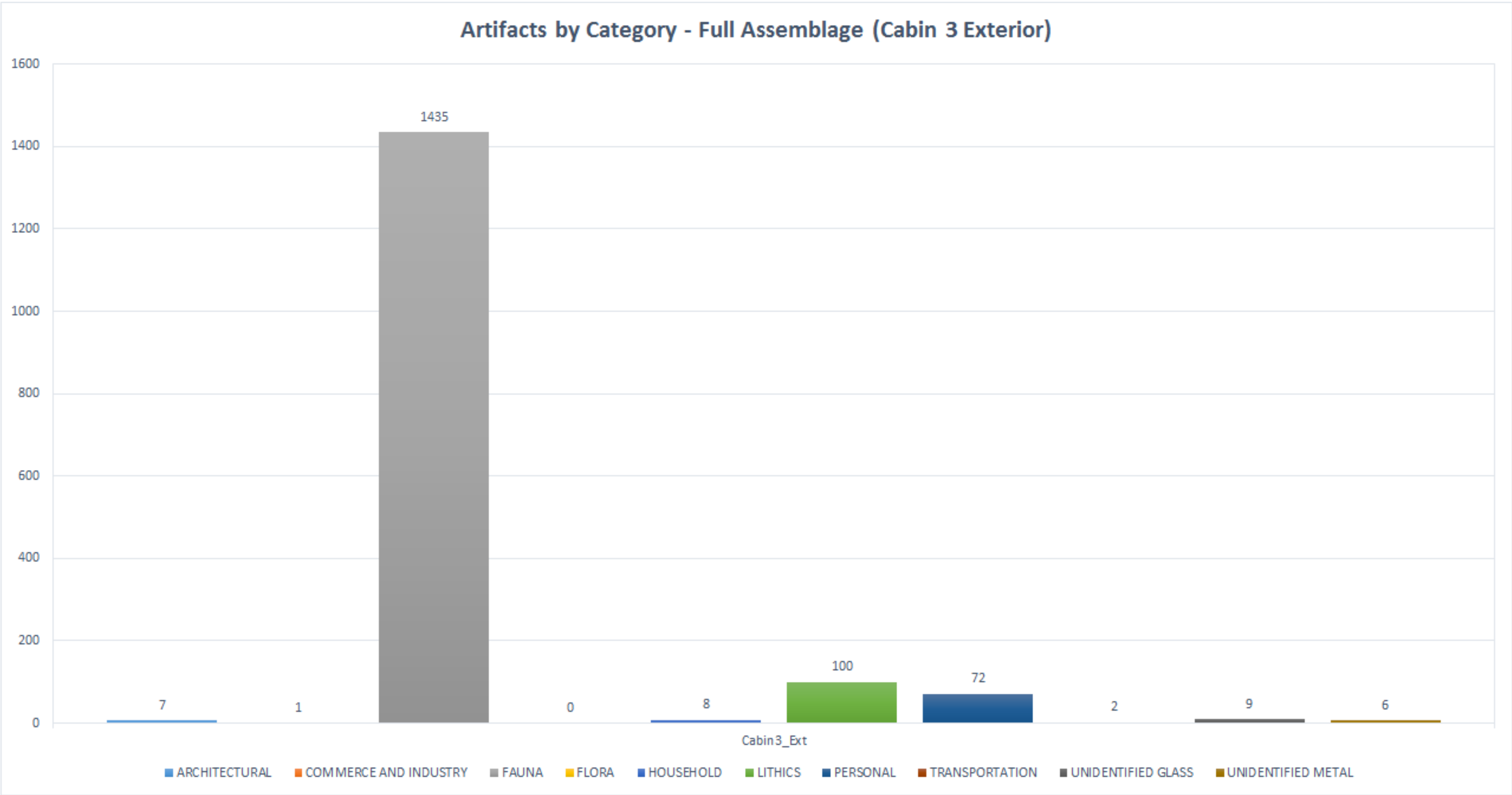

Figure 6.24
Cabin 3 Exterior artifacts by Functional Category

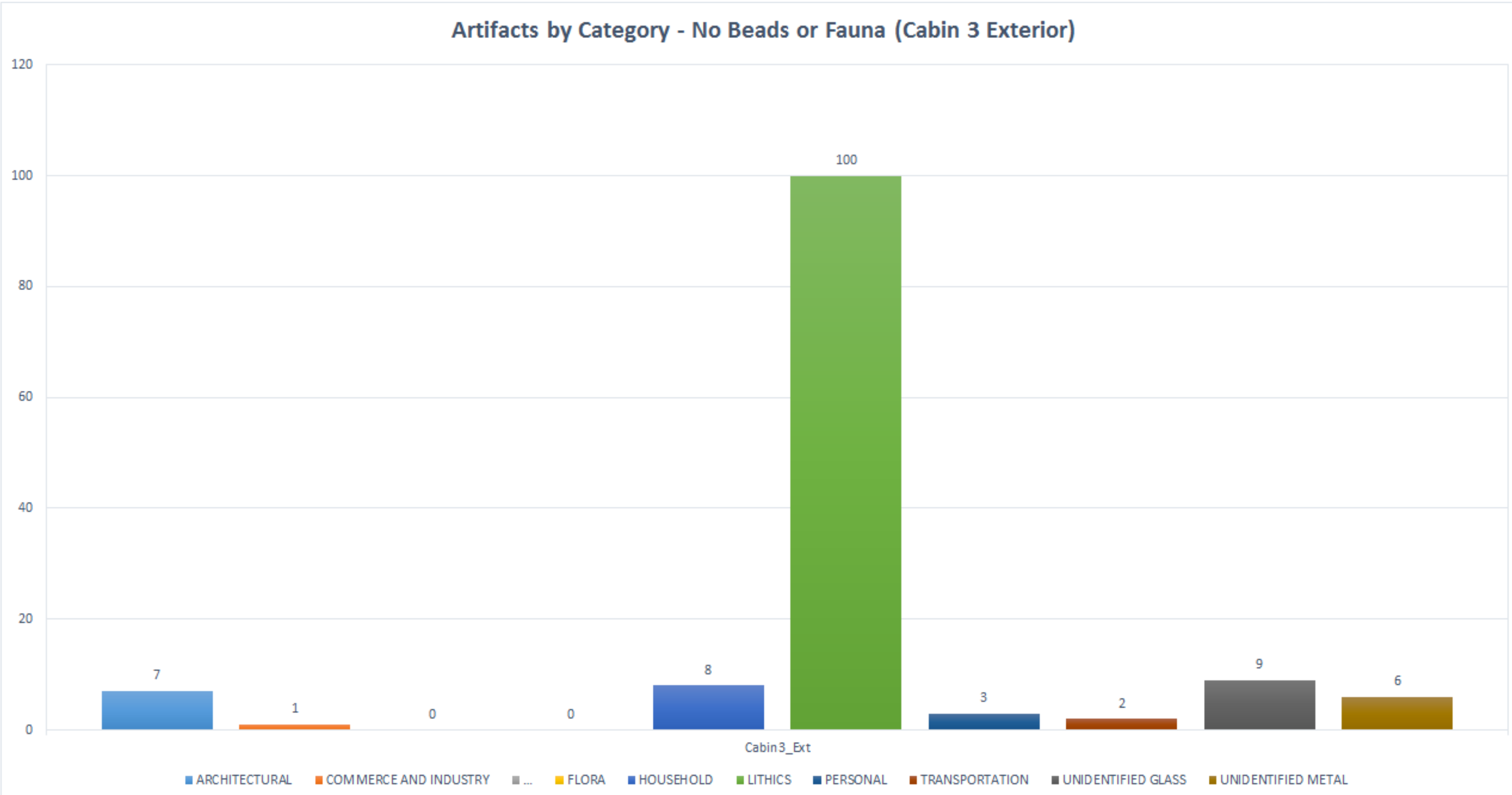

Figure 6.25
Cabin 3 Exterior artifacts by Functional Category
(No Beads or Fauna)

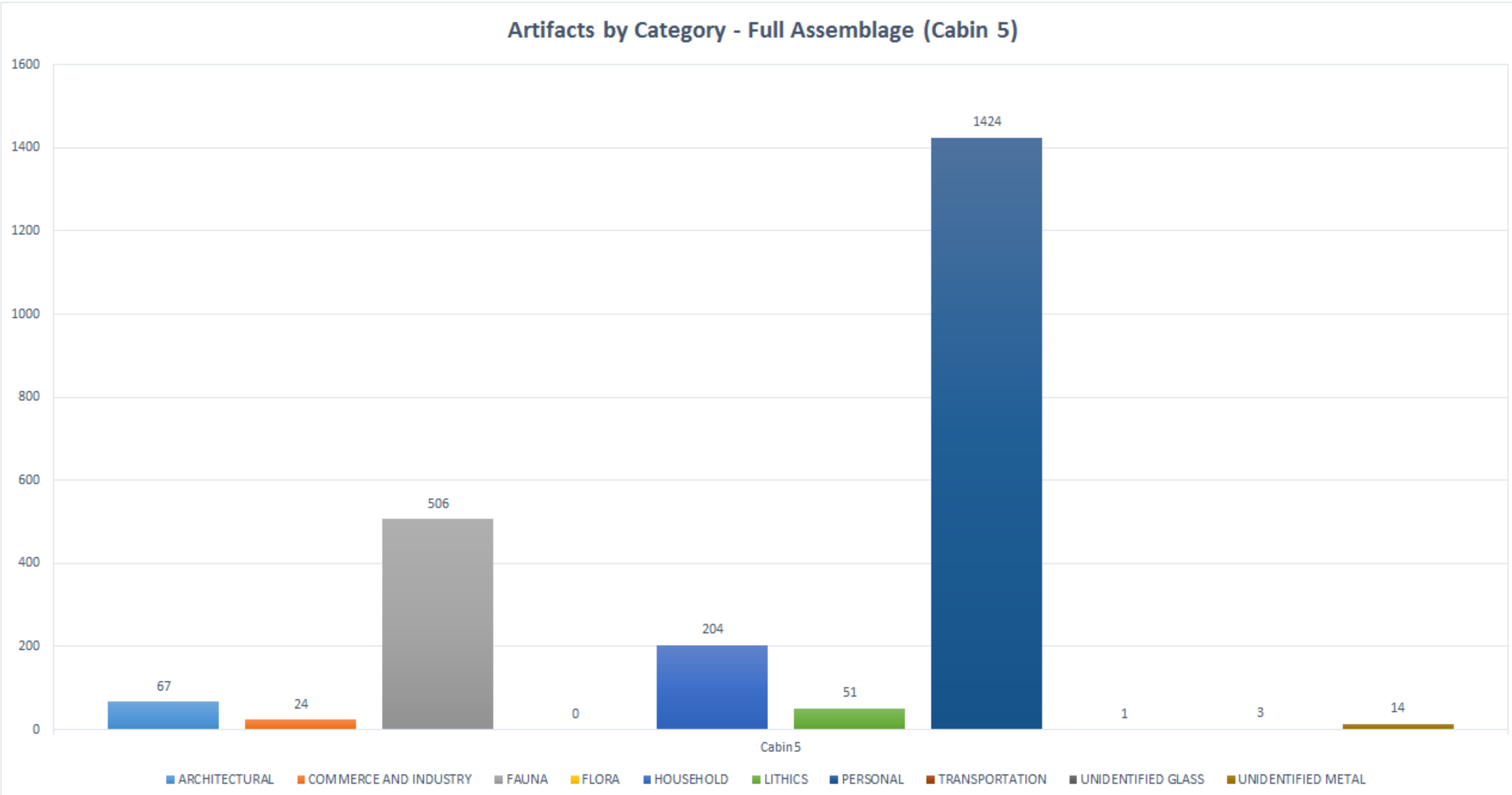

Figure 6.26
Cabin 5 artifacts by Functional Category

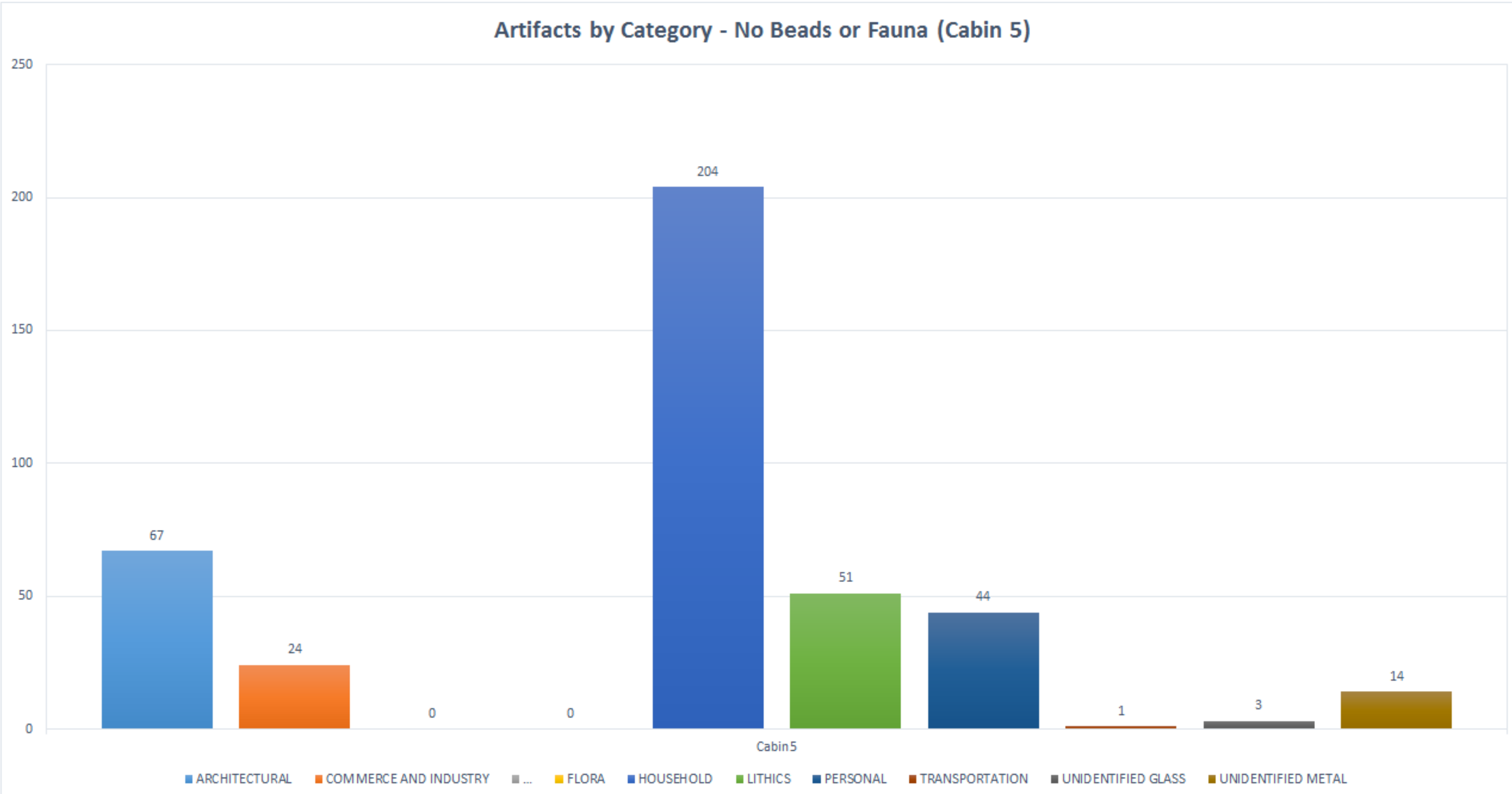

Figure 6.27
Cabin 5 artifacts by Functional Category
(No Beads or Fauna)

6.4 Confirmatory Statistical Analysis of the Buffalo Lake Assemblages

While exploratory statistics allowed me to probe the data and discover new and interesting trends within the archaeological assemblages, they are less useful in helping to determine the probability that the patterns being uncovered are statistically significant. However, a number of statistical tests, called confirmatory statistics, provide robust methods of determining whether or not the conclusions that are being drawn from the exploratory analyses can be relied upon.

Artifact Assemblage as a Product of Excavation Extent

First, I wanted to test the statistical validity of the trend observed within the exploratory data analysis section that the amount of Architectural artifacts increases approximately linearly with the amount of excavations performed for each cabin feature. While this trend was ascertained by examining visualizations of the datasets, I wanted a more robust and objective way to measure the probability of this trend. To accomplish this, a technique called the Spearman's Rank Correlation Coefficient was used, a test for linear correlation that returns a coefficient value from -1 (perfect negative correlation) through 0 (no correlation) and up to +1 (perfect positive correlation), although the extreme values are rare in practice (Drennan 2009:224). Spearman's rank correlation is preferable in this situation because not only is it an easy to calculate statistical test, it does not require data to adhere to a normal distribution, unlike Product Motion Correlation Coefficient (P.M.C.C.) tests which are based upon an assumption of normality (Fletcher and Lock 1991:103-108).

To determine if there is a correlation between the amount of artifacts excavated from a functional category and the volume of excavated materials, I plotted the volume of each cabin's excavations (in cubic metres) against the amount of artifacts recovered for each functional category. Of these analyses (see Appendix C Figures 15 to 25), the strongest positive correlation between the volume of excavated material and artifacts was for the Architectural category, as expected, with a coefficient value (r_s) of 0.5. This implies that an increase in the amount of material excavated in each of the cabin features should continue to uncover Architectural artifacts at an approximately linear rate, and given the types of artifacts that compose this category (predominately nails and other construction materials) this is a logical pattern to expect. Additional tests were conducted on the other functional categories and the results for these varied considerably (Table 6.1), lending further evidence to the belief that the cabin assemblages are not of a homogeneous type. If the cabins were used for similar functions during their occupation, be that as housing units, manufacturing areas, storage spaces, or anything else, the expectation would be for the assemblages to increasingly reflect one another as excavations continued. Instead, Spearman's rank correlation tests on the other functional categories show either relatively little evidence of correlation (Commerce and Industry, Flora, Household, Personal, Transportation), or a strong negative correlation between material excavated and artifacts (Fauna, Lithics). These latter correlations, however, are the result of artifacts of these types only being recovered during the Cabin 3 and Cabin 3 Exterior excavations, the two smallest excavations by volume, and so I believe this speaks more to functional differentiation in the cabin uses.

Association between Functional Categories

To test the assemblages within each cabin feature I used a statistical method called Chi-squared tests, a "technique to ascertain if the data contained in a contingency table provides

Functional Category	ρ Coefficient
Architectural	0.5
Commerce and Industry	0.3
Fauna	-0.8
Flora	-0.1118
Household	0.1
Lithics	-0.9
Personal	-0.4
Personal (No Beads)	0
Transportation	0.2
Unidentified Glass	-0.5
Unidentified Metal	0.4

Table 6.1

Spearman's Rho (ρ) Coefficients for Functional Categories

with regards to Volume Excavated

significant evidence of an association between the two variables"[17] (Fletcher and Lock 1991:116). This is accomplished through a method of comparing "the observed frequencies (the data) with those expected under the null hypothesis of no association (or independence) between the two variables" (Fletcher and Lock 1991:116).

I applied this technique to look at associations between a number of functional categories within the cabin assemblages (Appendix B Figures 45 to 50), and the comparisons I was most interested in were those that might show associations between certain types of industry occurring within the cabin structures. Specifically, I examined whether association existed between specimens from the Commerce and Industry category of artifacts and the Lithics recovered from the excavations. I also tested for association between the prevalence of Faunal remains in a cabin assemblage with artifacts from the Commerce and Industry category, as well as between Lithics and Faunal remains. In each of these three situations the Chi-squared test returned values that displayed a very strong association between artifacts from each of these functional categories (Table 6.2).

Comparative Analysis of Full Cabin Assemblage

Finally, I wanted to determine the degree of correlation between the cabin assemblages, as a whole, across the Buffalo Lake site. To accomplish this I once again used the Spearman's Rank Correlation Coefficient tests, although instead of testing the contents of one functional artifact category against another, I compared the relative proportion of each cabin's artifact assemblage. To control for the amount of excavation undertaken at the different cabin features artifact counts were converted from absolute values to relative percentages, allowing for easy

[17] Contingency tables for these Chi-squared tests can be found in Appendix A Tables 7 to 12

Functional Category 1	Functional Category 2	χ^2
Architectural	Household	142.96
Architectural	Lithics	271.16
Architectural	Personal	67.21
Commerce and Industry	Lithics	544.94
Commerce and Industry	Fauna	1733.2
Lithics	Fauna	53.283

Table 6.2

Chi-squared (χ^2) associations for Functional Categories comparison between the cabin features (for a similar approach using rank-ordered correlation, see McLeod 1985:58-69).

When each cabin assemblage was compared, a few trends became apparent (Table 6.3; Appendix B Figures 51, 53 to 62). Cabin 1's distribution was most similar to those of both Cabin 2 ($r_s = 0.65$) and Cabin 5 ($r_s = 0.63$), although neither of these associations are extremely strong, while the distribution of Cabin 2's assemblage was most similar to Cabin 5 ($r_s = 0.74$). However, the distribution of artifacts between Cabins 3 and 5 are nearly identical ($r_s = 0.95$), as is also apparent when looking at the graphical representations of their distributions (Figures 5.19 and 5.25). In contrast, the Cabin 3 Exterior excavations appear quite distinct from the Cabin 1 ($r_s = 0.33$) and Cabin 2 ($r_s = 0.38$) assemblages, instead most closely matching the assemblage from the interior of Cabin 3 ($r_s = 0.83$). Lastly, these tests were calculated again using distributions in which beads and seed beads were removed from the assemblage totals, due to the significant skew that these artifacts impose upon the data. While removing these outliers had an impact on the specific values recovered from the rank correlation tests, the general trend amongst the data stayed remarkably similar (Appendix B Figures 52, 63 to 72).

Given all of these results, it does not appear as though there is much evidence for a single baseline or standard artifact distribution being recovered from these cabin features. Instead, it is the outliers in these assemblages that provide insight into the types of activities occurring within each area, be that intensive butchering, manufacturing, or hunting activities. The presence of these distinct activities and assemblages, as well as what these patterns and preferences might mean for the lives of those inhabiting the Buffalo Lake area, will be discussed at greater length in the following chapter.

First Excavation	Second Excavation	ρ Coefficient
Cabin 1	Cabin 2	0.6493902
Cabin 1	Cabin 3	0.548781
Cabin 1	Cabin 3 Exterior	0.328269
Cabin 1	Cabin 5	0.626143
Cabin 2	Cabin 3	0.567073
Cabin 2	Cabin 3 Exterior	0.376901
Cabin 2	Cabin 5	0.741645
Cabin 3	Cabin 3 Exterior	0.832831
Cabin 3	Cabin 5	0.948333
Cabin 3 Exterior	Cabin 5	0.709091

Table 6.3

Spearman's Rho (ρ) Coefficients for Full Cabin Assemblages

CHAPTER 7

SUMMARY AND CONCLUSIONS

I set out with this thesis to examine the Buffalo Lake Métis Wintering Site from a number of perspectives. Utilizing both archaeological data and historic documentary evidence can provide a great deal of insight into the daily lives of the groups, and potentially even the individuals that occupied a site. This is perfectly characterized by the initial research undertaken by Maurice F. V. Doll, Robert S. Kidd, and John P. Day, and without their efforts my own research would have been at an extreme disadvantage.

Building upon the extensive site survey that they conducted during the 1970s and 1980s, I applied magnetometry and ground-penetrating radar to conduct non-intrusive surveys at the Buffalo Lake site. These devices highlighted dozens of anomalies throughout the survey grid, many of which then were subject to test excavations. However, the results of this ground-truthing were inconclusive, and based upon follow-up conversations with the current landowners I now suspect that the area where the survey grid was placed was inundated for several years shortly following the period of occupation of the site, making this area of the landscape unsuitable for human habitation.

While I no longer suspect that the survey grid lies within the historic site boundary, relocating the grid over a known cabin feature can still produce geophysical signatures that will assist in locating additional cabin structures in the future. The determination of these geophysical signatures will allow future researchers to more quickly, and more importantly non-intrusively, locate the potentially hundreds of remaining undiscovered cabin features still present at Buffalo Lake. By doing so, they will be able to better judge the final extent of the historic settlement, and could potentially use this information to further conserve the archaeological remains for future generations. Uncovering evidence of the spatial patterning and orientation of the remaining cabin features can provide insight into the less concrete aspects of archaeological research, namely ideologies to which the group being studied ascribed. Finally, conducting a more thorough dialogue with the landowners to identity areas that might have been unsuitable for past habitation can assist in avoiding areas of low archaeological significance in future studies.

As a result of the inconclusive archaeogeophysical studies, I turned towards a statistical analysis of the Buffalo Lake artifact assemblages. By using exploratory data analysis techniques I was able to visualize and examine the data in a number of different ways, using the graphs and tables produced to observe patterns within the data. I expanded upon these observations with a number of confirmatory statistical analyses, including the use of Chi-squared and Spearman's Rank Correlation Coefficients, using the tests to examine the relationships between artifact assemblages.

Based upon these analyses, it became clear that Architectural artifacts increased approximately linearly with the amount of excavations performed on a cabin feature, as I expected. However, certain artifact category counts did not seem to correspond to a simple increase in volume excavated, instead being more closely associated with increases in other artifact categories. Chi-squared tests showed that strong associations occurred between artifacts in the Commerce and Industry, Lithic, and Faunal categories of artifacts (Table 6.2; Appendix A Tables 7 to 12), implying that some degree of specialization was occurring within certain cabin structures. This association was by no means uniform, however, and depending upon the two specific functional categories being examined could trend anywhere between similarity of distributions (ie. an increase in the number of artifacts from one functional category resulted in a significant increase in artifacts in another, such as an increase in lithics corresponding with an increase in faunal remains) to functional categorical independence (ie. the presence of artifacts in one functional category accompanied a lack of artifacts of another).

By considering each cabin assemblage as a whole, I looked to see whether certain patterns could be determined amongst the features. Through the use of Spearman's Rank Correlation Coefficients I was able to find that, while Cabins 1 and 2 were somewhat similar, neither matched any of the other cabin structures particularly closely. Cabin 1 is actually relatively barren with regards to many of the informative artifact categories, with the most prominent category being Architectural artifacts, supporting the original researchers' interpretation that Cabin 1 was a generalized habitation structure.

Cabin 2 also did not appear to match the other cabin structures particularly closely. The seemingly elevated amount of Faunal remains—and especially of artifacts falling into the Commerce and Industry category—seem to set it apart, yet despite these differences the original researchers believed that there was no indication of functional specialization at Cabin 2. While the amount of lead shot recovered from Cabin 2 is excessive and does initially appear to be an outlier, the site of Buffalo Lake would have been occupied primarily by families directly involved in the seasonal bison hunt, and so the presence of these artifacts would not necessarily imply specialization of task in excess of normal daily group activities. While the absolute number of faunal remains appears significant, this value is only approximately 45% of the amount recovered from the Cabin 3 Exterior assemblage, only 20% as many as found within the interior of Cabin 3, and approximately on par with the faunal remains recovered from Cabin 5. Coupled with the remaining functional artifact categories—with the exception of the anomalously high amount of lead shot—this assemblage does not appear significantly different from what appears to be a baseline, or generalized, cabin assemblage.

Both Cabin 3 and Cabin 5 displayed extremely high values of Faunal remains and Personal artifacts in comparison to the rest of the functional categories, and the statistical analyses defined the assemblages as being nearly identical. The presence of such high counts of Faunal remains, as well as the elevated Lithic counts relative to the amounts recovered at the other two cabin structures, implies that some sort of functional specialization was occurring in these areas, be that butchering or food preparation. Additionally, the amounts of Personal artifacts, specifically of seed beads, recovered at both features suggests that either manufacturing or storage of decorated garments was occurring in these cabins. While it may not be possible to distinguish the exact activities occurring in these cabin localities, it does appear as though the artifact patterns set them apart from more general habitation activities.

In addition, when these results are compared against the artifact counts recovered from the Cabin 3 Exterior excavations, the presence of such pronounced levels of Lithics and Faunal Remains shines further light on the likelihood that specialization such as butchery or preparation was occurring in the vicinity. Given the distinct similarities between the assemblages at both Cabin 3 and Cabin 5, I believe that opening up further excavations adjacent to the original Cabin 5 excavations would likely display a similar trend within the artifacts recovered.

To return to a statement I made in Chapter 3, while the application of a methodology may form the structure of a research paper, the true heart of the matter is to ask and answer questions about the archaeological culture being examined. The examination of the presence of lithic artifacts may provide details about the material culture being used at a site, but may also provide a glimpse into the ways these groups self-identity and construct their lives around themselves; by integrating a type of material culture into their daily lives that is strongly associated with another cultural group, they imply a connection and affinity with them. In this case, the retention of lithic technologies such as projectile points, as well as the scrapers recovered from Cabins 3 and 5, allow those Métis inhabiting the Buffalo Lake site to project a connection to the aboriginal groups from which they were descended, but also with the aboriginal groups that they still lived and interacted with regularly.

This conclusion has summarized the differences and similarities of the artifact assemblages at the Buffalo Lake site, and this information can provide insight into patterning found within the site, or into what a typical Métis cabin structure would contain for artifacts. However, it has yet to seriously examine the assemblages as a means of interpreting less concrete details about Métis society, ideologies, and individual and group identities at the site. While it is relatively easy to think of the historic settlement in terms of non-humanistic concepts such as the number of cabins present at the site, or as an aggregate of the artifacts recovered, it becomes much more complex to think of hundreds of individual cabins, each inhabited by individual persons and families, each performing different tasks.

While the exploratory and confirmatory statistics provided me with a robust model of determining the degrees of similarity and difference between the cabin features, more importantly they started to allow me to look at how the artifact assemblages might reflect the roles of these individuals or families within Métis society and the identities that these roles might portray. The homogenization of an archaeological culture becomes too simple when the entire assemblage is treated as a whole, or when it is seen as reflecting upon the ideologies and identities of the full cultural group; by breaking the assemblage down into its constituent components and treating each of these patterns as reflecting their own ideologies and identities, this homogenization can be more easily avoided.

A better model for examining the archaeological culture of the Métis at Buffalo Lake would be to return to Macdougall et al.'s (2012) conception of three elements—mobility, geography, and family—as being the factors that most clearly define what it meant to be Métis at that time, and to instead look towards how the archaeological assemblages at Buffalo Lake can be interpreted in this light. When the artifacts recovered from Buffalo Lake are considered from this perspective, the differences between the assemblage patterns seen in any of the cabin structures, be that between Cabin 1 and Cabin 3 or between any of the broad archetypes that may exist, reflect more than just functional specialization of the cabin's inhabitants, they come to represent different interpretations of what it meant to be Métis at Buffalo Lake, by those Métis that occupied Buffalo Lake. On their own, the patterns to these assemblages do not necessarily define an individual as being Métis, though they may allow archaeologists to hypothesize that the individual or family to whom the assemblage belonged may have been Métis. However, these assemblages accomplish two broad tasks: 1) they allow a Métis individual to express their niche within Métis society, be that as a voyageur, an interpreter, a dog driver, or whatever their personal role(s) may be; and 2) these pieces of material culture help to constitute these same roles, in turn causing other members of society to respond to the material culture as such. These artifacts, the accoutrements and regalia of a life lived, would serve to signify to those around the individual or the family their roles and identities within this collective group and how they choose to present themselves at the site, in much the same way that other aspects of one's material culture such as patterns of dress and decoration provide a framework for navigating social spaces.

These inhabitants, at least according to the archaeological materials recovered from the cabin features, did not feel the need to act and present themselves uniformly within their cultural group; each of these assemblages shows that the cabin's occupants filled a distinct role within Métis society. These distinct assemblages, and by extension the possibility of numerous distinct identities, likely occurred all throughout the Buffalo Lake site at numbers well beyond those examined here, especially when considered relative to the potential assemblages still waiting to be discovered and studied at the site. Those Métis inhabiting the Buffalo Lake site should not be conceptualized as a monoculture, but instead recognized as a complex society of individuals, each with their own conceptions of identity and what it means to be "Métis".

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APPENDIX A

ARTIFACT TABLES

Appendix A Table 1

Artifacts: Full Assemblage

Category	**Cabin 1**	**Cabin 2**	**Cabin 3**	**Cabin 3 Ext.**	**Cabin 5**
Architectural	83	127	108	7	67
Commerce and Industry	3	461	73	1	24
Fauna	45	662	3045	1435	506
Flora	0	1	7	0	0
Household	41	43	202	8	204
Lithics	1	6	144	100	51
Personal	14	92	11905.75	72	1424
Transportation	4	3	7	2	1
Unidentified Glass	2	18	93	9	3
Unidentified Metal	19	18	95	6	14

Appendix A Table 2

Artifacts: No Beads

Category	Cabin 1	Cabin 2	Cabin 3	Cabin 3 Ext.	Cabin 5
Architectural	83	127	108	7	67
Commerce and Industry	3	461	73	1	24
Fauna	45	662	3045	1435	506
Flora	0	1	7	0	0
Household	41	43	202	8	204
Lithics	1	6	144	100	51
Personal	10	18	92	3	44
Transportation	4	3	7	2	1
Unidentified Glass	2	18	93	9	3
Unidentified Metal	19	18	95	6	14

Appendix A Table 3

Artifacts: No Beads or Faunal Remains

Category	**Cabin 1**	**Cabin 2**	**Cabin 3**	**Cabin 3 Ext.**	**Cabin 5**
Architectural	83	127	108	7	67
Commerce and Industry	3	461	73	1	24
Fauna	0	0	0	0	0
Flora	0	1	7	0	0
Household	41	43	202	8	204
Lithics	1	6	144	100	51
Personal	10	18	92	3	44
Transportation	4	3	7	2	1
Unidentified Glass	2	18	93	9	3
Unidentified Metal	19	18	95	6	14

Appendix A Table 4

Artifacts: Full Assemblage (Volume Corrected)

Category	**Cabin 1**	**Cabin 2**	**Cabin 3**	**Cabin 3 Ext.**	**Cabin 5**
Architectural	65	134	171	23	96
Commerce and Industry	2	485	116	3	34
Fauna	35	697	4833	4783	723
Flora	0	1	11	0	0
Household	32	45	321	27	291
Lithics	1	6	229	333	73
Personal	11	97	18898	240	2034
Transportation	3	3	11	7	1
Unidentified Glass	2	19	148	30	4
Unidentified Metal	15	19	151	20	20

Appendix A Table 5

Artifacts: No Beads (Volume Corrected)

Category	**Cabin 1**	**Cabin 2**	**Cabin 3**	**Cabin 3 Ext.**	**Cabin 5**
Architectural	65	134	171	23	96
Commerce and Industry	2	485	116	3	34
Fauna	35	697	4833	4783	723
Flora	0	1	11	0	0
Household	32	45	321	27	291
Lithics	1	6	229	333	73
Personal	8	19	146	10	63
Transportation	3	3	11	7	1
Unidentified Glass	2	19	148	30	4
Unidentified Metal	15	19	151	20	20

Appendix A Table 6

Artifacts: No Beads or Faunal Remains (Volume Corrected)

Category	**Cabin 1**	**Cabin 2**	**Cabin 3**	**Cabin 3 Ext.**	**Cabin 5**
Architectural	65	134	171	23	96
Commerce and Industry	2	485	116	3	34
Fauna	0	0	0	0	0
Flora	0	1	11	0	0
Household	32	45	321	27	291
Lithics	1	6	229	333	73
Personal	8	19	146	10	63
Transportation	3	3	11	7	1
Unidentified Glass	2	19	148	30	4
Unidentified Metal	15	19	151	20	20

Appendix A Table 7

Chi-squared (χ^2) Contingency Tables: Architectural v. Household

	Architectural	Household
	83	41
	127	43
	108	202
	7	8
χ^2 = 142.96	67	204

Appendix A Table 8

Chi-squared (χ^2) Contingency Tables: Architectural v. Lithics

	Architectural	Lithics
	83	1
	127	6
	108	144
	7	100
χ^2 = 271.16	67	51

Appendix A Table 9

Chi-squared (χ^2) Contingency Tables: Architectural v. Personal

	Architectural	Personal
	83	10
	127	18
	108	92
	7	10
χ^2 = 67.21	67	44

Appendix A Table 10

Chi-squared (χ^2) Contingency Tables: Commerce and Industry v. Lithics

	Commerce and Industry	Lithics
	3	1
	461	6
	73	144
	1	100
χ^2 = 544.94	24	51

Appendix A Table 11

Chi-squared (χ^2) Contingency Tables: Commerce and Industry v. Fauna

	Commerce and Industry	Fauna
	3	45
	461	662
	73	3045
	1	1435
χ^2 = 1733.2	24	506

Appendix A Table 12

Chi-squared (χ^2) Contingency Tables: Lithics v. Fauna

	Lithics	Fauna
	1	45
	6	662
	144	3045
	100	1435
χ^2 = 53.283	51	506

APPENDIX B

EXPLORATORY/CONFIRMATORY STATISTICS: RESULTS

Appendix B Figure 1

Stem-and-Leaf: Architectural

```
 0 | 7
 1 |
 2 |
 3 |
 4 |
 5 |
 6 | 7
 7 |
 8 | 3
 9 |
10 | 8
11 |
12 | 7
```

Appendix B Figure 2

Stem-and-Leaf: Commerce and Industry

```
 0 | 13
 1 |
 2 | 4
 3 |
 4 |
 5 |
 6 |
 7 | 3
 8 |
 9 |
10 |
11 |
12 |
13 |
14 |
15 |
16 |
17 |
18 |
19 |
20 |
21 |
22 |
23 |
24 |
25 |
26 |
27 |
28 |
29 |
30 |
31 |
32 |
33 |
34 |
35 |
36 |
37 |
38 |
39 |
40 |
41 |
42 |
43 |
44 |
45 |
46 | 1
```

Appendix B Figure 3

Stem-and-Leaf: Fauna

```
 0 | 5
 1 |
 2 |
 3 |
 4 |
 5 | 1
 6 | 6
 7 |
 8 |
 9 |
10 |
11 |
12 |
13 |
14 | 4
15 |
16 |
17 |
18 |
19 |
20 |
21 |
22 |
23 |
24 |
25 |
26 |
27 |
28 |
29 |
30 | 5
```

Appendix B Figure 4

Stem-and-Leaf: Flora (Two Styles)

```
0 | 00017
```

```
0 | 000
1 | 0
2 |
3 |
4 |
5 |
6 |
7 | 0
```

Appendix B Figure 5

Stem-and-Leaf: Household

```
 0 | 8
 1 |
 2 |
 3 |
 4 | 13
 5 |
 6 |
 7 |
 8 |
 9 |
10 |
11 |
12 |
13 |
14 |
15 |
16 |
17 |
18 |
19 |
20 | 24
```

Appendix B Figure 6

Stem-and-Leaf: Lithics

```
 0 | 16
 1 |
 2 |
 3 |
 4 |
 5 | 1
 6 |
 7 |
 8 |
 9 |
10 | 0
11 |
12 |
13 |
14 | 4
```

Appendix B Figure 7

Stem-and-Leaf: Personal

```
 0 | 179      60 |
 2 |          62 |
 4 |          64 |
 6 |          66 |
 8 |          68 |
10 |          70 |
12 |          72 |
14 | 2        74 |
16 |          76 |
18 |          78 |
20 |          80 |
22 |          82 |
24 |          84 |
26 |          86 |
28 |          88 |
30 |          90 |
32 |          92 |
34 |          94 |
36 |          96 |
38 |          98 |
40 |         100 |
42 |         102 |
44 |         104 |
46 |         106 |
48 |         108 |
50 |         110 |
52 |         112 |
54 |         114 |
56 |         116 |
58 |         118 | 1
```

Appendix B Figure 8

Stem-and-Leaf: Personal (No Beads)

```
0 | 3
1 | 08
2 |
3 |
4 | 4
5 |
6 |
7 |
8 |
9 | 2
```

Appendix B Figure 9

Stem-and-Leaf: Transportation

```
0 | 12347



1 | 0
2 | 0
3 | 0
4 | 0
5 |
6 |
7 | 0
```

Appendix B Figure 10

Stem-and-Leaf: Unidentified Glass

```
0 | 239
1 | 8
2 |
3 |
4 |
5 |
6 |
7 |
8 |
9 | 3
```

Appendix B Figure 11

Stem-and-Leaf: Unidentified Metal

```
0 | 6
1 | 489
2 |
3 |
4 |
5 |
6 |
7 |
8 |
9 | 5
```

Appendix B Figure 12

Resistant Statistics: Architectural

7		67		83		108		127
	60		16		25		19	
		76		41		44		

Appendix B Figure 13

Resistant Statistics: Commerce and Industry

1		3		24		73		461
	2		21		49		388	
		23		70		437		

Appendix B Figure 14

Resistant Statistics: Fauna

45		506		662		1435		3045
	461		156		773		1610	
		617		929		2383		

Appendix B Figure 15

Resistant Statistics: Flora

0		0		0		1		7
	0		0		1		6	
		0		1		7		

Appendix B Figure 16

Resistant Statistics: Household

8		41		43		202		204
	33		2		159		2	
		35		161		161		

Appendix B Figure 17

Resistant Statistics: Lithics

1		6		51		100		144
	5		45		49		44	
		50		94		93		

Appendix B Figure 18

Resistant Statistics: Personal

14		72		92		1424		11905
	58		20		1332		10481	
		78		1352		11813		

Appendix B Figure 19

Resistant Statistics: Personal (No Beads)

3		10		18		44		92
	7		8		26		48	
		15		34		74		

Appendix B Figure 20

Resistant Statistics: Transportation

1		2		3		4		7
	1		1		1		3	
		2		2		4		

Appendix B Figure 21

Resistant Statistics: Unidentified Glass

6		14		18		19		95
	8		4		1		76	
		12		5		77		

Appendix B Figure 22

Resistant Statistics: Unidentified Metal

6		14		18		19		95
	8		4		1		76	
		12		5		77		

Appendix B Figure 23

PMCC: Architectural

Table Data: allcabins_arch	R: cor.test(allcabins_arch$ARCHITECTURAL, allcabins_arch$Ratio)
Cabin **ARCHITECTURAL** **Ratio** *Cabin1* 83 1.275 *Cabin2* 127 0.95 *Cabin3* 108 0.63 *Cabin3_Ext* 7 0.3 *Cabin5* 67 0.7	data: allcabins_arch$ARCHITECTURAL and allcabins_arch$Ratio t = 1.347, df = 3, p-value = 0.2707 alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.5854697 0.9705137 sample estimates: cor 0.613902

Appendix B Figure 24

PMCC: Commerce and Industry

Table Data: allcabins_comm	R: cor.test(allcabins_comm$COMMERCE, allcabins_comm$Ratio)
Cabin **COMMERCE** **Ratio** *Cabin1* 3 1.275 *Cabin2* 461 0.95 *Cabin3* 73 0.63 *Cabin3_Ext* 1 0.3 *Cabin5* 24 0.7	data: allcabins_comm$COMMERCE and allcabins_comm$Ratio t = 0.44493, df = 3, p-value = 0.6865 alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.8116227 0.9274784 sample estimates: cor 0.2488046

Appendix B Figure 25

PMCC: Fauna

Table Data: allcabins_fauna			R: cor.test(allcabins_fauna$FAUNA, allcabins_fauna$Ratio)
Cabin	**FAUNA**	**Ratio**	data: allcabins_fauna$FAUNA and allcabins_fauna$Ratio
Cabin1	45	1.275	t = -1.2388, df = 3, p-value = 0.3035
Cabin2	662	0.95	alternative hypothesis: true correlation is not equal to 0
Cabin3	3045	0.63	95 percent confidence interval:
Cabin3_Ext	1435	0.3	-0.9674587 0.6174130
Cabin5	506	0.7	sample estimates:
			cor
			-0.5817409

Appendix B Figure 26

PMCC: Flora

Table Data: allcabins_flora			R: cor.test(allcabins_flora$FLORA, allcabins_flora$Ratio)
Cabin	**FLORA**	**Ratio**	data: allcabins_flora$FLORA and allcabins_flora$Ratio
Cabin1	0	1.275	t = -0.31966, df = 3, p-value = 0.7702
Cabin2	1	0.95	alternative hypothesis: true correlation is not equal to 0
Cabin3	7	0.63	95 percent confidence interval:
Cabin3_Ext	0	0.3	-0.9169343 0.8343798
Cabin5	0	0.7	sample estimates:
			cor
			-0.1814887

Appendix B Figure 27

PMCC: Household

Table Data: allcabins_house			R: cor.test(allcabins_house$HOUSEHOLD, allcabins_house$Ratio)
Cabin	**HOUSEHOLD**	**Ratio**	data: allcabins_house$HOUSEHOLD and allcabins_house$Ratio
Cabin1	41	1.275	t = -0.23048, df = 3, p-value = 0.8325
Cabin2	43	0.95	alternative hypothesis: true correlation is not equal to 0
Cabin3	202	0.63	95 percent confidence interval:
Cabin3_Ext	8	0.3	-0.9084502 0.8491858
Cabin5	204	0.7	sample estimates:
			cor
			-0.1319047

Appendix B Figure 28

PMCC: Lithics

Table Data: allcabins_lithics			R: cor.test(allcabins_lithics$LITHICS, allcabins_lithics$Ratio)
Cabin	**LITHICS**	**Ratio**	data: allcabins_lithics$LITHICS and allcabins_lithics$Ratio
Cabin1	1	1.275	t = -2.1131, df = 3, p-value = 0.125
Cabin2	6	0.95	alternative hypothesis: true correlation is not equal to 0
Cabin3	144	0.63	95 percent confidence interval:
Cabin3_Ext	100	0.3	-0.9841412 0.3427436
Cabin5	51	0.7	sample estimates:
			cor
			-0.7733887

Appendix B Figure 29

PMCC: Personal

Table Data: allcabins_pers	R: cor.test(allcabins_pers$PERSONAL, allcabins_pers$Ratio)
Cabin **PERSONAL** **Ratio** *Cabin1* 14 1.275 *Cabin2* 92 0.95 *Cabin3* 11905.75 0.63 *Cabin3_Ext* 72 0.3 *Cabin5* 1424 0.7	data: allcabins_pers$PERSONAL and allcabins_pers$Ratio t = -0.42209, df = 3, p-value = 0.7014 alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.9256688 0.8159435 sample estimates: cor -0.2367658

Appendix B Figure 30

PMCC: Personal (No Beads)

Table Data: allcabins_nobeads	R: cor.test(allcabins_nobeads$PERSONAL, allcabins_nobeads$Ratio)
Cabin **PERSONAL** **Ratio** *Cabin1* 10 1.275 *Cabin2* 18 0.95 *Cabin3* 92 0.63 *Cabin3_Ext* 3 0.3 *Cabin5* 44 0.7	data: allcabins_nobeads$PERSONAL and allcabins_nobeads$Ratio t = -0.30741, df = 3, p-value = 0.7786 alternative hypothesis: true correlation is not equal to 0 95 percent confidence interval: -0.9158190 0.8364821 sample estimates: cor -0.1747495

Appendix B Figure 31

PMCC: Transportation

Table Data: allcabins_trans			**R: cor.test(allcabins_trans$TRANSPORTATION, allcabins_trans$Ratio)**
Category	**TRANSPORTATION**	**Ratio**	data: allcabins_trans$TRANSPORTATION and allcabins_trans$Ratio
Cabin1	4	1.275	t = 0.28893, df = 3, p-value = 0.7915
Cabin2	3	0.95	alternative hypothesis: true correlation is not equal to 0
Cabin3	7	0.63	95 percent confidence interval:
Cabin3_Ext	2	0.3	-0.8396117 0.9141069
Cabin5	1	0.7	sample estimates:
			cor
			0.1645383

Appendix B Figure 32

PMCC: Unidentified Glass

Table Data: allcabins_glass			**R: cor.test(allcabins_glass$GLASS, allcabins_glass$Ratio)**
Cabin	**GLASS**	**Ratio**	data: allcabins_glass$GLASS and allcabins_glass$Ratio
Cabin1	2	1.275	t = -0.42252, df = 3, p-value = 0.7011
Cabin2	18	0.95	alternative hypothesis: true correlation is not equal to 0
Cabin3	93	0.63	95 percent confidence interval:
Cabin3_Ext	9	0.3	-0.9257033 0.8158628
Cabin5	3	0.7	sample estimates:
			cor
			-0.2369935

Appendix B Figure 33

PMCC: Unidentified Metal

Table Data: allcabins_metal			**R: cor.test(allcabins_metal$METAL, allcabins_metal$Ratio)**
Cabin	**METAL**	**Ratio**	data: allcabins_metal$METAL and allcabins_metal$Ratio
Cabin1	19	1.275	t = -0.14418, df = 3, p-value = 0.8945
Cabin2	18	0.95	alternative hypothesis: true correlation is not equal to 0
Cabin3	95	0.63	95 percent confidence interval:
Cabin3_Ext	6	0.3	-0.8993957 0.8624319
Cabin5	14	0.7	sample estimates:
			cor
			-0.08295305

Appendix B Figure 34

Spearman: Architectural

Table Data: allcabins_arch			R: cor.test(allcabins_arch$ARCHITECTURAL, allcabins_arch$Ratio, method="spearman")
Cabin	**ARCHITECTURAL**	**Ratio**	data: allcabins_arch$ARCHITECTURAL and allcabins_arch$Ratio
Cabin1	83	1.275	S = 10, p-value = 0.45
Cabin2	127	0.95	alternative hypothesis: true rho is not equal to 0
Cabin3	108	0.63	sample estimates:
Cabin3_Ext	7	0.3	rho
Cabin5	67	0.7	0.5

Appendix B Figure 35

Spearman: Commerce and Industry

Table Data: allcabins_comm			R: cor.test(allcabins_comm$COMMERCE, allcabins_comm$Ratio, method="spearman")
Cabin	**COMMERCE**	**Ratio**	data: allcabins_comm$COMMERCE and allcabins_comm$Ratio
Cabin1	3	1.275	S = 14, p-value = 0.6833
Cabin2	461	0.95	alternative hypothesis: true rho is not equal to 0
Cabin3	73	0.63	sample estimates:
Cabin3_Ext	1	0.3	rho
Cabin5	24	0.7	0.3

Appendix B Figure 36

Spearman: Fauna

Table Data: allcabins_fauna	**R: cor.test(allcabins_fauna$FAUNA, allcabins_fauna$Ratio, method="spearman")**
Cabin **FAUNA** **Ratio** *Cabin1* 45 1.275 *Cabin2* 662 0.95 *Cabin3* 3045 0.63 *Cabin3_Ext* 1435 0.3 *Cabin5* 506 0.7	data: allcabins_fauna$FAUNA and allcabins_fauna$Ratio S = 36, p-value = 0.1333 alternative hypothesis: true rho is not equal to 0 sample estimates: rho -0.8

Cabin	FAUNA	Ratio
Cabin1	45	1.275
Cabin2	662	0.95
Cabin3	3045	0.63
Cabin3_Ext	1435	0.3
Cabin5	506	0.7

Appendix B Figure 37

Spearman: Flora

Table Data: allcabins_flora	**R: cor.test(allcabins_flora$FLORA, allcabins_flora$Ratio, method="spearman")**
Cabin **FLORA** **Ratio** *Cabin1* 0 1.275 *Cabin2* 1 0.95 *Cabin3* 7 0.63 *Cabin3_Ext* 0 0.3 *Cabin5* 0 0.7	data: allcabins_flora$FLORA and allcabins_flora$Ratio S = 22.236, p-value = 0.8579 alternative hypothesis: true rho is not equal to 0 sample estimates: rho -0.1118034 Warning message: In cor.test.default(allcabins_flora$FLORA, allcabins_flora$Ratio, : Cannot compute exact p-value with ties

Appendix B Figure 38

Spearman: Household

Table Data: allcabins_house			R: cor.test(allcabins_house$HOUSEHOLD, allcabins_house$Ratio, method=”spearman”)
Cabin	**HOUSEHOLD**	**Ratio**	data: allcabins_house$HOUSEHOLD and allcabins_house$Ratio
Cabin1	41	1.275	S = 18, p-value = 0.95
Cabin2	43	0.95	alternative hypothesis: true rho is not equal to 0
Cabin3	202	0.63	sample estimates:
Cabin3_Ext	8	0.3	rho
Cabin5	204	0.7	0.1

Appendix B Figure 39

Spearman: Lithics

Table Data: allcabins_lithics			R: cor.test(allcabins_lithics$LITHICS, allcabins_lithics$Ratio, method=”spearman”)
Cabin	**LITHICS**	**Ratio**	data: allcabins_lithics$LITHICS and allcabins_lithics$Ratio
Cabin1	1	1.275	S = 38, p-value = 0.08333
Cabin2	6	0.95	alternative hypothesis: true rho is not equal to 0
Cabin3	144	0.63	sample estimates:
Cabin3_Ext	100	0.3	rho
Cabin5	51	0.7	-0.9

<u>Appendix B Figure 40</u>

Spearman: Personal

Table Data: allcabins_pers	**R: cor.test(allcabins_pers$PERSONAL, allcabins_pers$Ratio, method=”spearman”)**
Cabin **PERSONAL** **Ratio** *Cabin1* 14 1.275 *Cabin2* 92 0.95 *Cabin3* 11905.75 0.63 *Cabin3_Ext* 72 0.3 *Cabin5* 1424 0.7	data: allcabins_pers$PERSONAL and allcabins_pers$Ratio S = 28, p-value = 0.5167 alternative hypothesis: true rho is not equal to 0 sample estimates: rho -0.4

Cabin	PERSONAL	Ratio
Cabin1	14	1.275
Cabin2	92	0.95
Cabin3	11905.75	0.63
Cabin3_Ext	72	0.3
Cabin5	1424	0.7

<u>Appendix B Figure 41</u>

Spearman: Personal (No Beads)

Table Data: allcabins_nobeads	**R: cor.test(allcabins_nobeads$PERSONAL, allcabins_nobeads$Ratio, method =”spearman”)**
Cabin **PERSONAL** **Ratio** *Cabin1* 10 1.275 *Cabin2* 18 0.95 *Cabin3* 92 0.63 *Cabin3_Ext* 3 0.3 *Cabin5* 44 0.7	data: allcabins_nobeads$PERSONAL and allcabins_nobeads$Ratio S = 20, p-value = 1 alternative hypothesis: true rho is not equal to 0 sample estimates: rho 0

<u>Appendix B Figure 42</u>

Spearman: Transportation

Table Data: allcabins_trans	**R: cor.test(allcabins_trans$TRANSPORTATION, allcabins_trans$Ratio, method=”spearman”)**
Category **TRANSPORTATION** **Ratio** *Cabin1* 4 1.275 *Cabin2* 3 0.95 *Cabin3* 7 0.63 *Cabin3_Ext* 2 0.3 *Cabin5* 1 0.7	data: allcabins_trans$TRANSPORTATION and allcabins_trans$Ratio S = 16, p-value = 0.7833 alternative hypothesis: true rho is not equal to 0 sample estimates: rho 0.2

Category	**TRANSPORTATION**	**Ratio**
Cabin1	4	1.275
Cabin2	3	0.95
Cabin3	7	0.63
Cabin3_Ext	2	0.3
Cabin5	1	0.7

<u>Appendix B Figure 43</u>

Spearman: Unidentified Glass

Table Data: allcabins_glass	**R: cor.test(allcabins_glass$GLASS, allcabins_glass$Ratio, method=”spearman”)**
Cabin **GLASS** **Ratio** *Cabin1* 2 1.275 *Cabin2* 18 0.95 *Cabin3* 93 0.63 *Cabin3_Ext* 9 0.3 *Cabin5* 3 0.7	data: allcabins_glass$GLASS and allcabins_glass$Ratio S = 30, p-value = 0.45 alternative hypothesis: true rho is not equal to 0 sample estimates: rho -0.5

Appendix B Figure 44

Spearman: Unidentified Metal

Table Data: allcabins_metal	**R: cor.test(allcabins_metal$METAL, allcabins_metal$Ratio, method="spearman")**
Cabin **METAL** **Ratio** *Cabin1* 19 1.275 *Cabin2* 18 0.95 *Cabin3* 95 0.63 *Cabin3_Ext* 6 0.3 *Cabin5* 14 0.7	data: allcabins_metal$METAL and allcabins_metal$Ratio S = 12, p-value = 0.5167 alternative hypothesis: true rho is not equal to 0 sample estimates: rho 0.4

Appendix B Figure 45

Chi-Squared: Architectural x Household

Table Data: arch_household		R: chisq.test(arch_household)
ARCHITECTURAL	**HOUSEHOLD**	data: arch_household X-squared = 142.96, df = 4, p-value < 2.2e-16
83	41	
127	43	
108	202	
7	8	
67	204	

Appendix B Figure 46

Chi-Squared: Architectural x Lithics

Table Data: arch_lithics		R: chisq.test(arch_lithics)
ARCHITECTURAL	**LITHICS**	data: arch_lithics X-squared = 271.16, df = 4, p-value < 2.2e-16
83	1	
127	6	
108	144	
7	100	
67	51	

Appendix B Figure 47

Chi-Squared: Architectural x Personal

Table Data: arch_personal		R: chisq.test(arch_personal)
ARCHITECTURAL	**PERSONAL**	data: arch_personal X-squared = 67.21, df = 4, p-value = 8.804e-14
83	10	
127	18	
108	92	
20	10	
67	44	

Appendix B Figure 48

Chi-Squared: Commerce and Industry x Lithics

Table Data: commerce_lithics		**R: chisq.test(commerce_lithics)**
COMMERCE	**LITHICS**	data: commerce_lithics
3	1	X-squared = 544.94, df = 3, p-value < 2.2e-16
461	6	
73	144	
1	100	
24	51	

Appendix B Figure 49

Chi-Squared: Commerce and Industry x Fauna

Table Data: commerce_fauna		**R: chisq.test(commerce_fauna)**
COMMERCE	**FAUNA**	data: commerce_fauna
3	45	X-squared = 1733.2, df = 4, p-value < 2.2e-16
461	662	
73	3045	
1	1435	
24	506	

Appendix B Figure 50

Chi-Squared: Lithics x Fauna

Table Data: lithics_fauna		**R: chisq.test(lithics_fauna)**
FAUNA	**LITHICS**	data: lithics_fauna
45	1	X-squared = 53.283, df = 4, p-value = 7.434e-11
662	6	
3045	144	
1435	100	
506	51	

Appendix B Figure 51

Spearman: Full Assemblage (Relative Proportion of Cabin Assemblage)

	ARCH	COMMERCE	FAUNA	FLORA	HOUSEHOLD	LITHICS	PERSONAL	TRANSPORT	GLASS	METAL
Cabin1	0.391566	0.012048	0.210843	0	0.192771	0.006024	0.066265	0.018072	0.012048	0.090361
Cabin2	0.088977	0.322045	0.462815	0.000664	0.02988	0.003984	0.064409	0.001992	0.012616	0.012616
Cabin3	0.006871	0.004661	0.194182	0.000442	0.012897	0.009201	0.759291	0.000442	0.005946	0.006067
Cabin3Ext	0.004208	0.000549	0.875046	0	0.00494	0.060922	0.043908	0.001281	0.005488	0.003659
Cabin5	0.029304	0.010379	0.220696	0	0.088828	0.022283	0.620879	0.000305	0.001221	0.006105

Appendix B Figure 52

Spearman: No Beads (Relative Proportion of Cabin Assemblage)

	ARCH	COMMERCE	FAUNA	FLORA	HOUSEHOLD	LITHICS	PERSONAL	TRANSPORT	GLASS	METAL
Cabin1	0.398773	0.01227	0.214724	0	0.196319	0.006135	0.04908	0.018405	0.01227	0.092025
Cabin2	0.093838	0.339636	0.488095	0.0007	0.031513	0.004202	0.013305	0.002101	0.013305	0.013305
Cabin3	0.027864	0.018902	0.787518	0.001792	0.052306	0.037315	0.02379	0.001792	0.024116	0.024605
Cabin3Ext	0.004393	0.000573	0.913484	0	0.005157	0.063598	0.00191	0.001337	0.00573	0.00382
Cabin5	0.073563	0.026054	0.554023	0	0.222989	0.055939	0.048276	0.000766	0.003065	0.015326

Appendix B Figure 53

Spearman: Full Assemblage (Cabin 1 x Cabin 2)

```
data:  allcabins_comp$Cabin1 and allcabins_comp$Cabin2
S = 57.851, p-value = 0.04216
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.6493902

Warning message:
In cor.test.default(allcabins_comp$Cabin1,
allcabins_comp$Cabin2,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 54

Spearman: Full Assemblage (Cabin 1 x Cabin 3)

```
data:  allcabins_comp$Cabin1 and allcabins_comp$Cabin3
S = 74.451, p-value = 0.1004
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.5487805

Warning message:
In cor.test.default(allcabins_comp$Cabin1,
allcabins_comp$Cabin3,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 55

Spearman: Full Assemblage (Cabin 1 x Cabin 3 Exterior)

```
data:  allcabins_comp$Cabin1 and allcabins_comp$Cabin3Ext
S = 110.84, p-value = 0.3544
alternative hypothesis: true rho is not equal to 0
sample estimates:
     rho
0.328269

Warning message:
In cor.test.default(allcabins_comp$Cabin1,
allcabins_comp$Cabin3Ext,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 55

Spearman: Full Assemblage (Cabin 1 x Cabin 5)

```
data:  allcabins_comp$Cabin1 and allcabins_comp$Cabin5
S = 61.686, p-value = 0.05278
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.6261427

Warning message:
In cor.test.default(allcabins_comp$Cabin1,
allcabins_comp$Cabin5,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 57

Spearman: Full Assemblage (Cabin 2 x Cabin 3)

```
data:  allcabins_comp$Cabin2 and allcabins_comp$Cabin3
S = 71.433, p-value = 0.08736
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.5670732

Warning message:
In cor.test.default(allcabins_comp$Cabin2,
allcabins_comp$Cabin3,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 58

Spearman: Full Assemblage (Cabin 2 x Cabin 3 Exterior)

```
data:  allcabins_comp$Cabin2 and allcabins_comp$Cabin3Ext
S = 102.81, p-value = 0.283
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.3769014

Warning message:
In cor.test.default(allcabins_comp$Cabin2,
allcabins_comp$Cabin3Ext,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 59

Spearman: Full Assemblage (Cabin 2 x Cabin 5)

```
data:  allcabins_comp$Cabin2 and allcabins_comp$Cabin5
S = 42.629, p-value = 0.01408
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.7416448

Warning message:
In cor.test.default(allcabins_comp$Cabin2,
allcabins_comp$Cabin5,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 60

Spearman: Full Assemblage (Cabin 3 x Cabin 3 Exterior)

```
data:  allcabins_comp$Cabin3 and allcabins_comp$Cabin3Ext
S = 27.583, p-value = 0.002778
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.8328306

Warning message:
In cor.test.default(allcabins_comp$Cabin3,
allcabins_comp$Cabin3Ext,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 61

Spearman: Full Assemblage (Cabin 3 x Cabin 5)

```
data:  allcabins_comp$Cabin3 and allcabins_comp$Cabin5
S = 8.5251, p-value = 2.929e-05
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.9483326

Warning message:
In cor.test.default(allcabins_comp$Cabin3,
allcabins_comp$Cabin5,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 62

Spearman: Full Assemblage (Cabin 3 Exterior x Cabin 5)

```
data:  allcabins_comp$Cabin3Ext and allcabins_comp$Cabin5
S = 48, p-value = 0.02751
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.7090909
```

Appendix B Figure 63

Spearman: No Beads (Cabin 1 x Cabin 2)

```
data:  allcabins_comp_nb$Cabin1 and allcabins_comp_nb$Cabin2
S = 54.318, p-value = 0.03374
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.6707978

Warning message:
In cor.test.default(allcabins_comp_nb$Cabin1,
allcabins_comp_nb$Cabin2,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 64

Spearman: No Beads (Cabin 1 x Cabin 3)

```
data:  allcabins_comp_nb$Cabin1 and allcabins_comp_nb$Cabin3
S = 67.409, p-value = 0.0717
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.5914634

Warning message:
In cor.test.default(allcabins_comp_nb$Cabin1,
allcabins_comp_nb$Cabin3,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 65

Spearman: No Beads (Cabin 1 x Cabin 3 Exterior)

```
data:  allcabins_comp_nb$Cabin1 and
allcabins_comp_nb$Cabin3Ext
S = 101.81, p-value = 0.2747
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.3829805

Warning message:
In cor.test.default(allcabins_comp_nb$Cabin1,
allcabins_comp_nb$Cabin3Ext,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 66

Spearman: No Beads (Cabin 1 x Cabin 5)

```
data:  allcabins_comp_nb$Cabin1 and allcabins_comp_nb$Cabin5
S = 51.656, p-value = 0.02821
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.6869333

Warning message:
In cor.test.default(allcabins_comp_nb$Cabin1,
allcabins_comp_nb$Cabin5,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 67

Spearman: No Beads (Cabin 2 x Cabin 3)

```
data:  allcabins_comp_nb$Cabin2 and allcabins_comp_nb$Cabin3
S = 69.55, p-value = 0.07978
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.5784862

Warning message:
In cor.test.default(allcabins_comp_nb$Cabin2,
allcabins_comp_nb$Cabin3,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 68

Spearman: No Beads (Cabin 2 x Cabin 3 Exterior)

```
data:  allcabins_comp_nb$Cabin2 and
allcabins_comp_nb$Cabin3Ext
S = 101.22, p-value = 0.2699
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.3865322

Warning message:
In cor.test.default(allcabins_comp_nb$Cabin2,
allcabins_comp_nb$Cabin3Ext,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 69

Spearman: No Beads (Cabin 2 x Cabin 5)

```
data:  allcabins_comp_nb$Cabin2 and allcabins_comp_nb$Cabin5
S = 42.506, p-value = 0.01393
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.7423872

Warning message:
In cor.test.default(allcabins_comp_nb$Cabin2,
allcabins_comp_nb$Cabin5,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 70

Spearman: No Beads (Cabin 3 x Cabin 3 Exterior)

```
data:  allcabins_comp_nb$Cabin3 and
allcabins_comp_nb$Cabin3Ext
S = 19.559, p-value = 0.0007469
alternative hypothesis: true rho is not equal to 0
sample estimates:
     rho
0.881463

Warning message:
In cor.test.default(allcabins_comp_nb$Cabin3,
allcabins_comp_nb$Cabin3Ext,  :
  Cannot compute exact p-value with ties
```

Appendix B Figure 71

Spearman: No Beads (Cabin 3 vs Cabin 5)

```
data:  allcabins_comp_nb$Cabin3 and allcabins_comp_nb$Cabin5
S = 18.556, p-value = 0.0006097
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.8875421

Warning message:
In cor.test.default(allcabins_comp_nb$Cabin3,
allcabins_comp_nb$Cabin5,  :
  Cannot compute exact p-value with ties
```

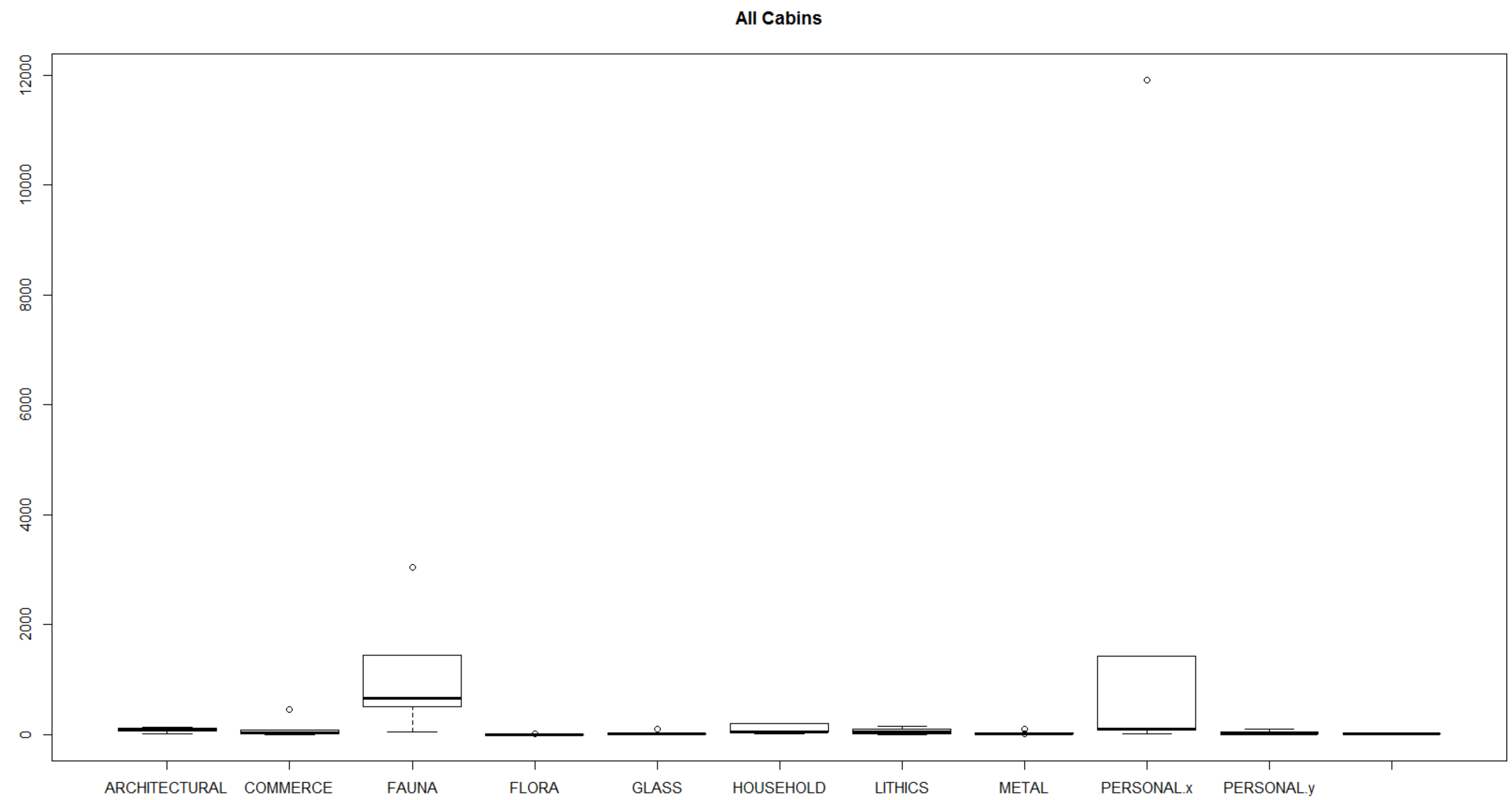
Appendix B Figure 72

Spearman: No Beads (Cabin 3 Exterior vs Cabin 5)

```
data:  allcabins_comp_nb$Cabin3Ext and
allcabins_comp_nb$Cabin5
S = 52, p-value = 0.03509
alternative hypothesis: true rho is not equal to 0
sample estimates:
      rho
0.6848485
```

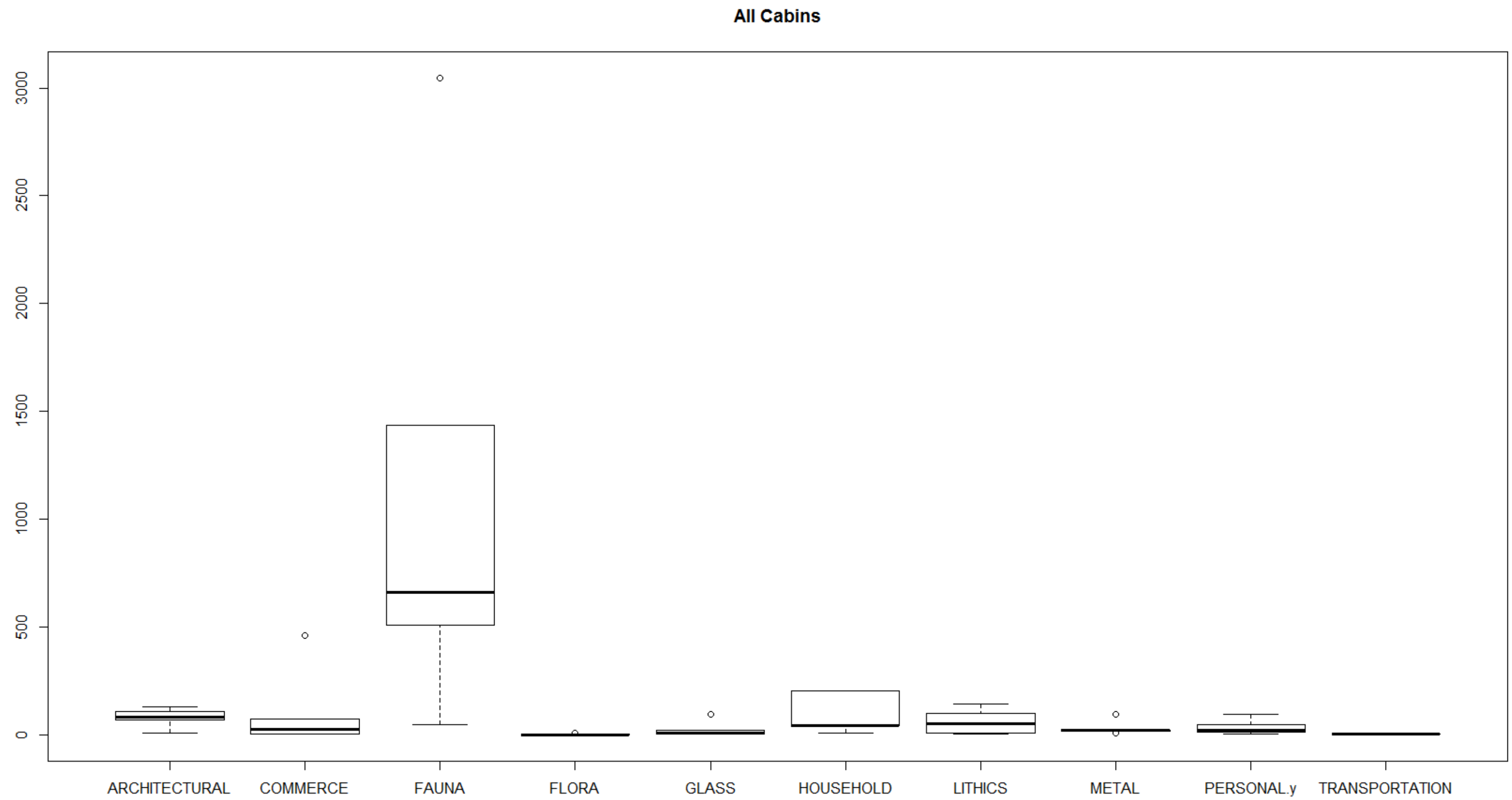
APPENDIX C

EXPLORATORY/CONFIRMATORY STATISTICS: ALL FIGURES



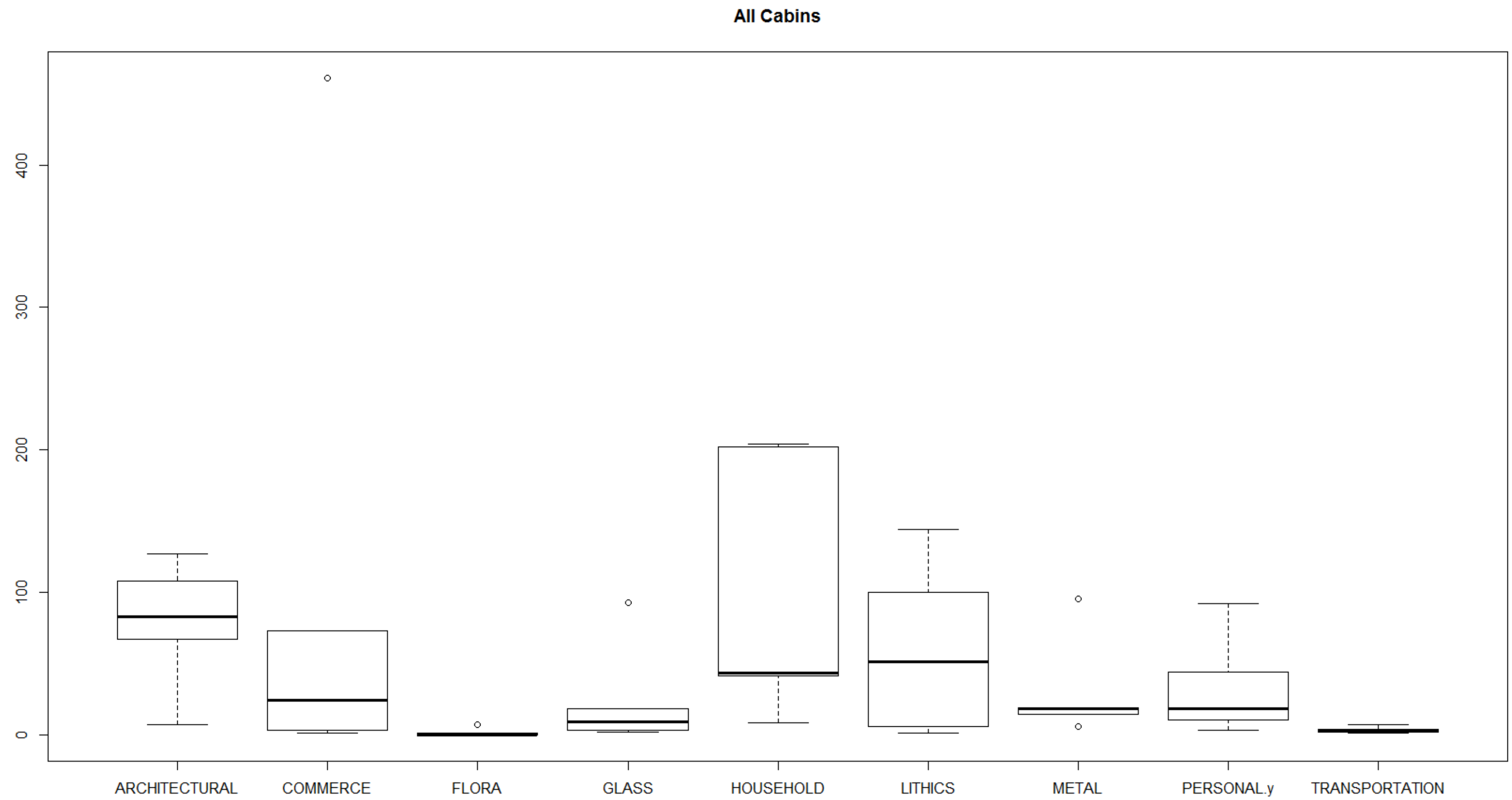
<u>Appendix C Figure 1</u>

Box plot: All Cabins (Full Assemblage)



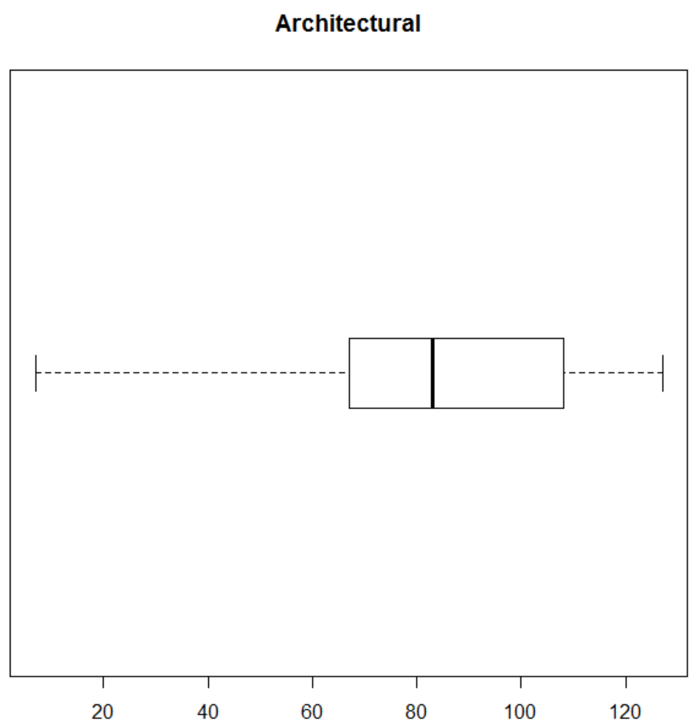
Appendix C Figure 2

Box plot: All Cabins (No Beads)



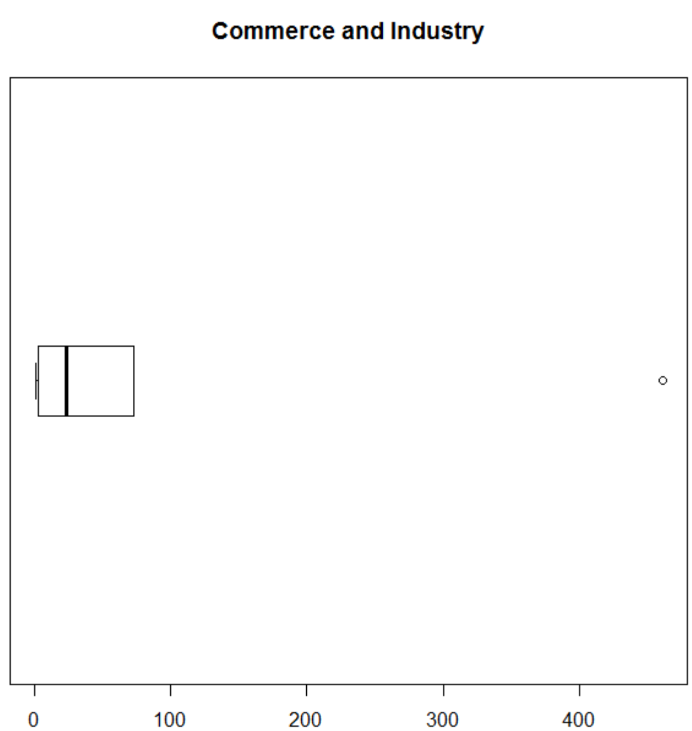
Appendix C Figure 3

Box plot: All Cabins (No Beads or Fauna)



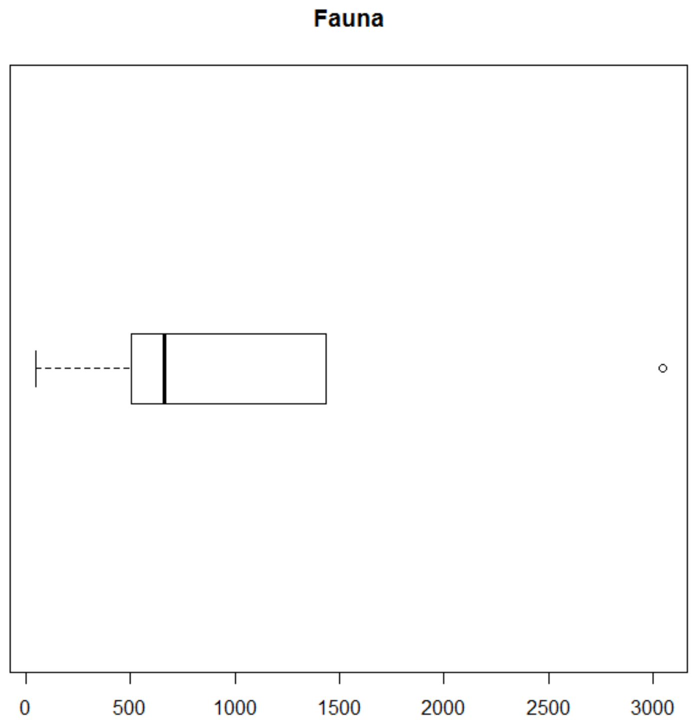
<u>Appendix C Figure 4</u>

Box plot: Architectural



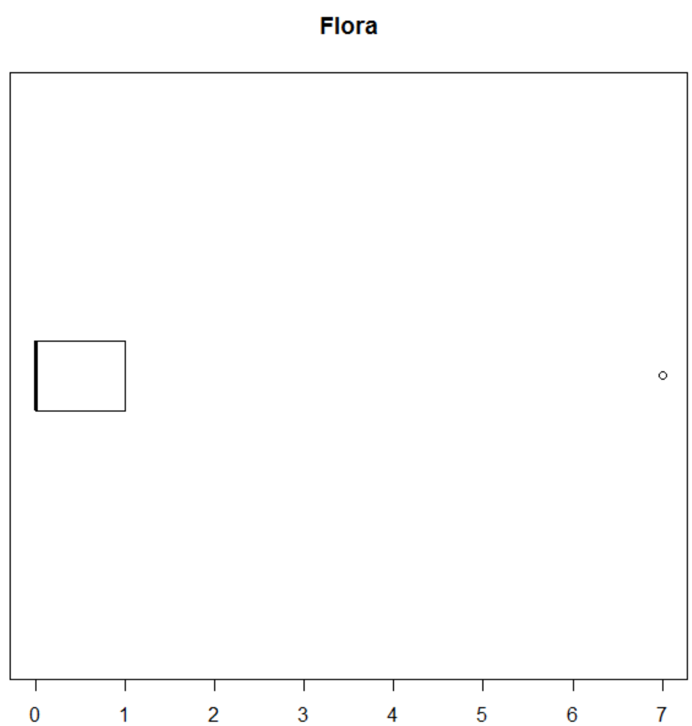
<u>Appendix C Figure 5</u>

Box plot: Commerce and Industry



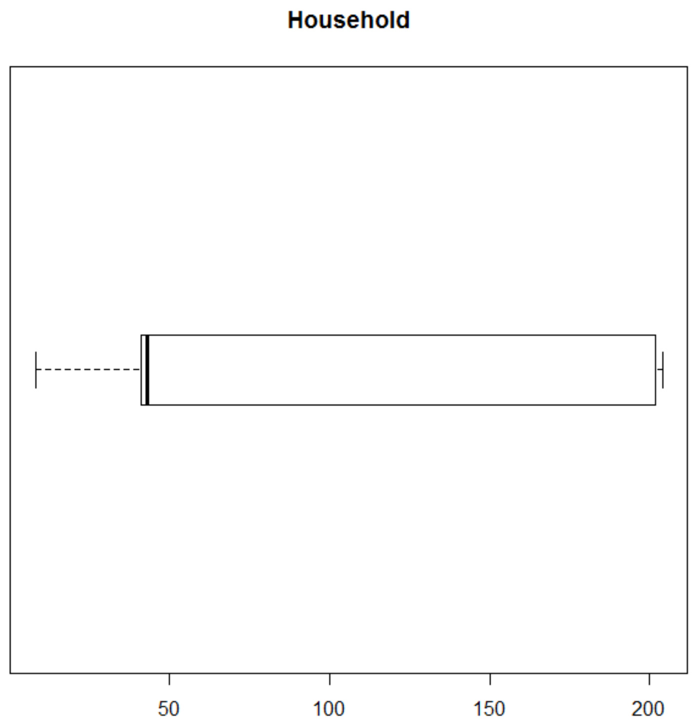
Appendix C Figure 6

Box plot: Fauna



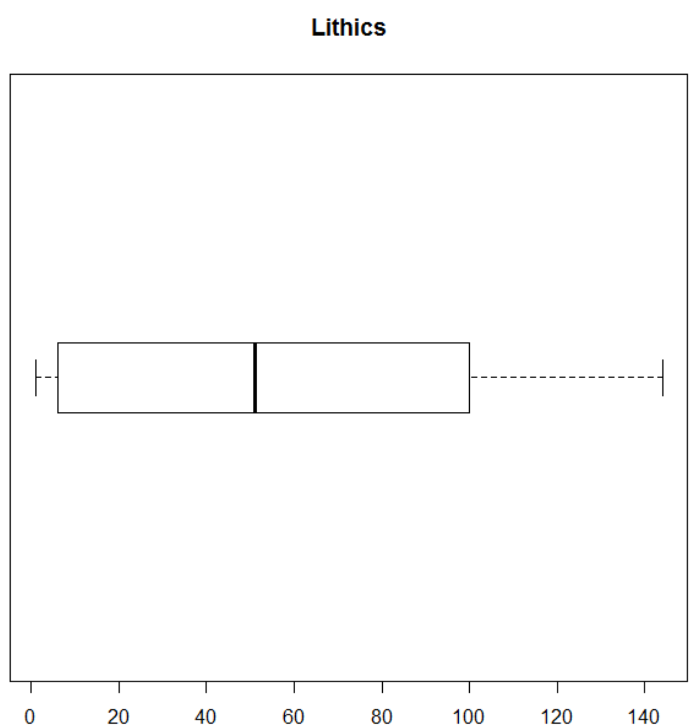
Appendix C Figure 7

Box plot: Flora



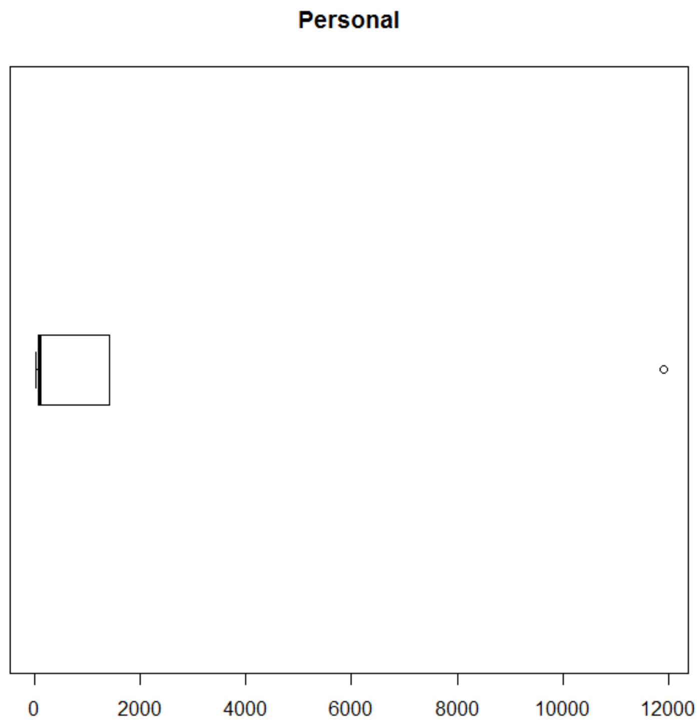
Appendix C Figure 8

Box plot: Household



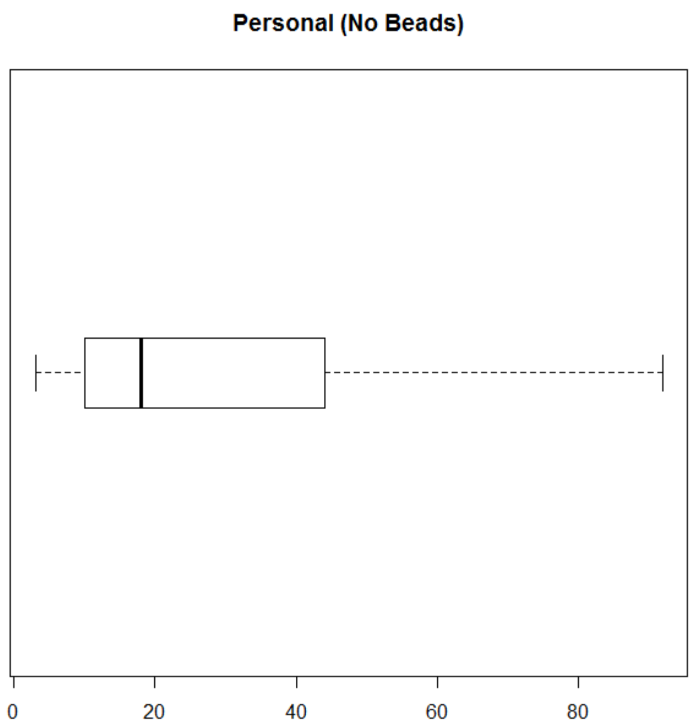
Appendix C Figure 9

Box plot: Lithics



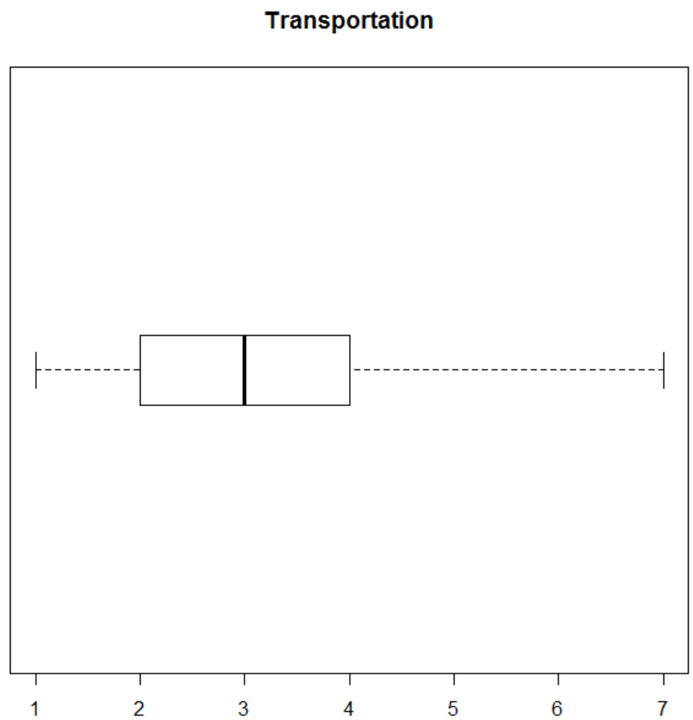
Appendix C Figure 10

Box plot: Personal



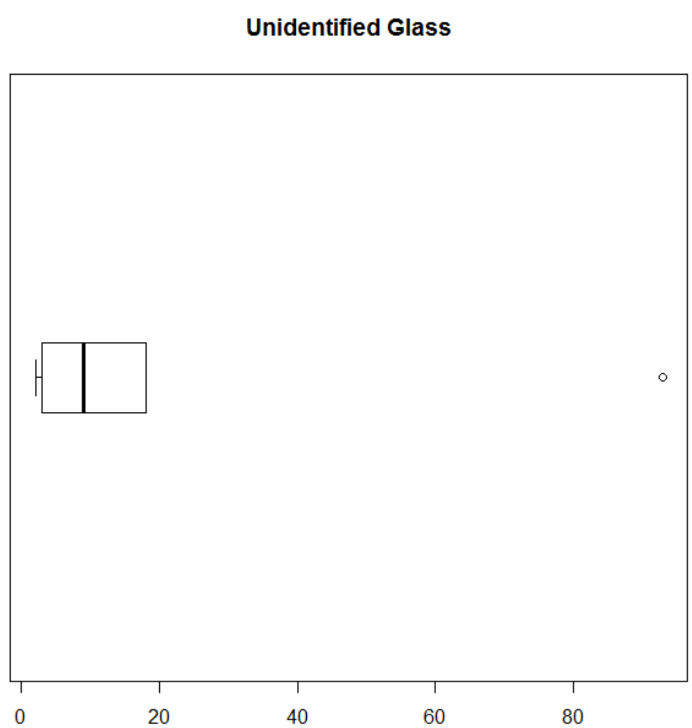
Appendix C Figure 11

Box plot: Personal (No Beads)



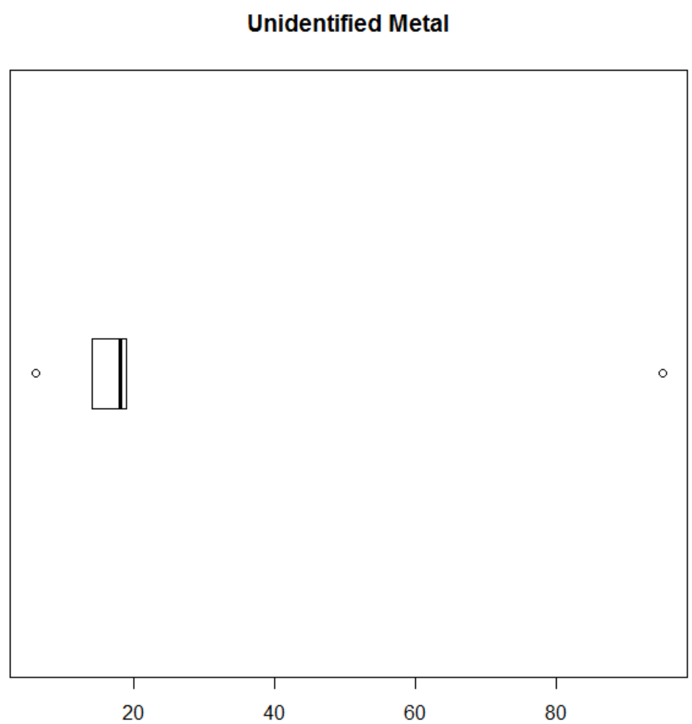
Appendix C Figure 12

Box plot: Transportation



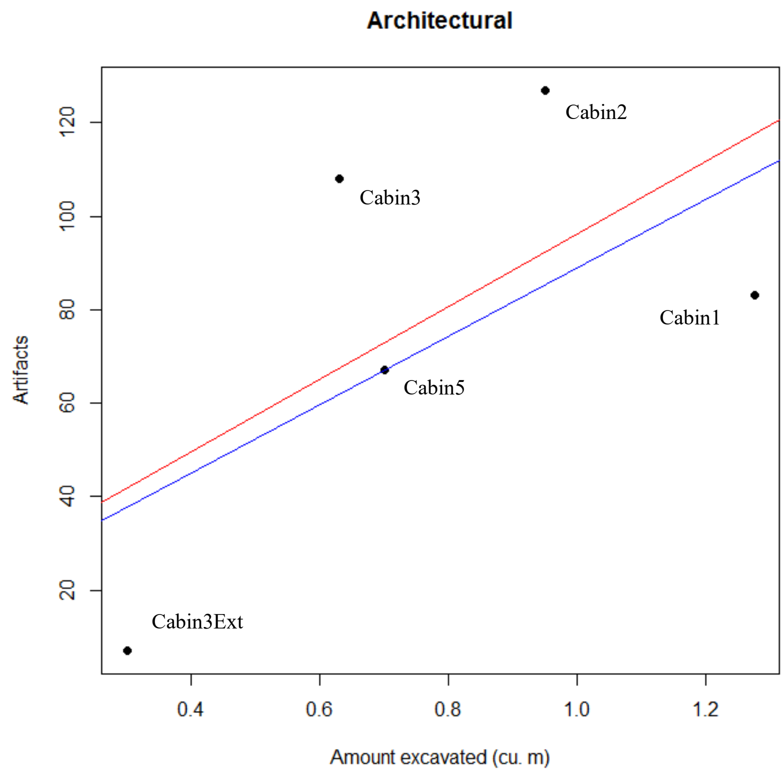
Appendix C Figure 13

Box plot: Unidentified Glass



Appendix C Figure 14

Box plot: Unidentified Metal



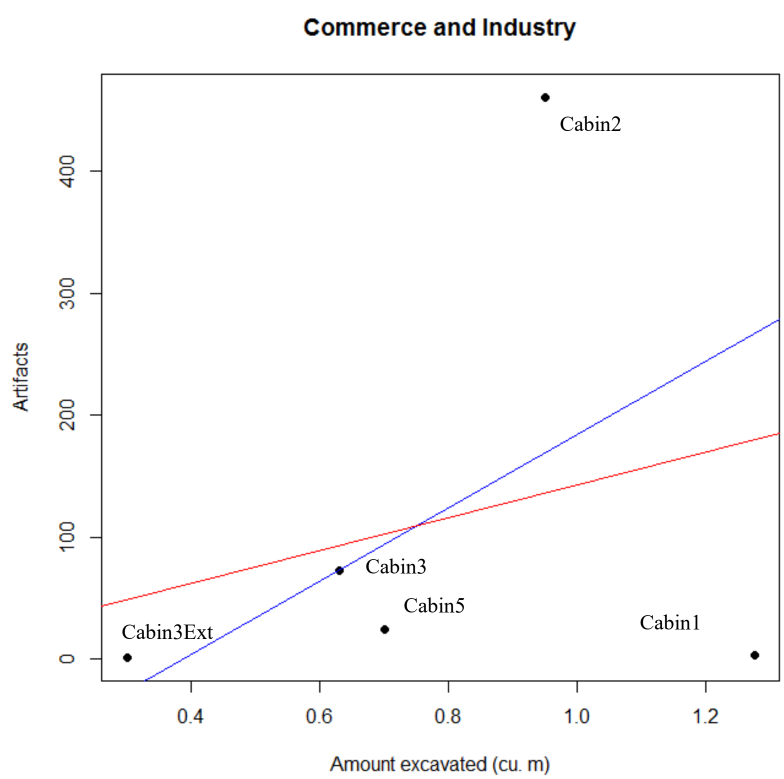
Appendix C Figure 15

Scatter plot: Architectural

Linear Regression Line

Tukey Line

Rho = 0.5



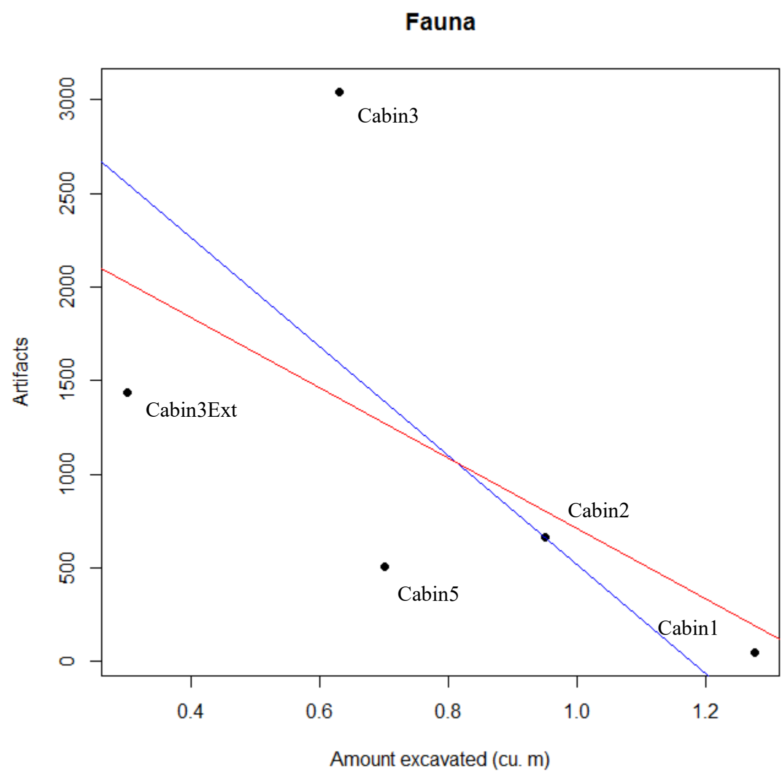
Appendix C Figure 16

Scatter plot: Commerce and Industry

Linear Regression Line

Tukey Line

Rho=0.3



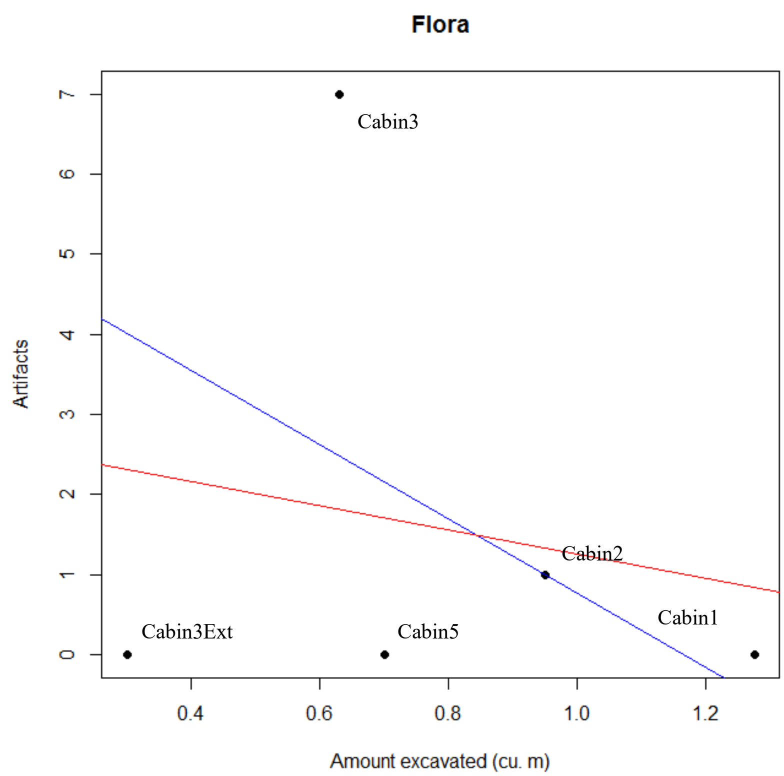
Appendix C Figure 17

Scatter plot: Fauna

Linear Regression Line

Tukey Line

Rho = -0.8



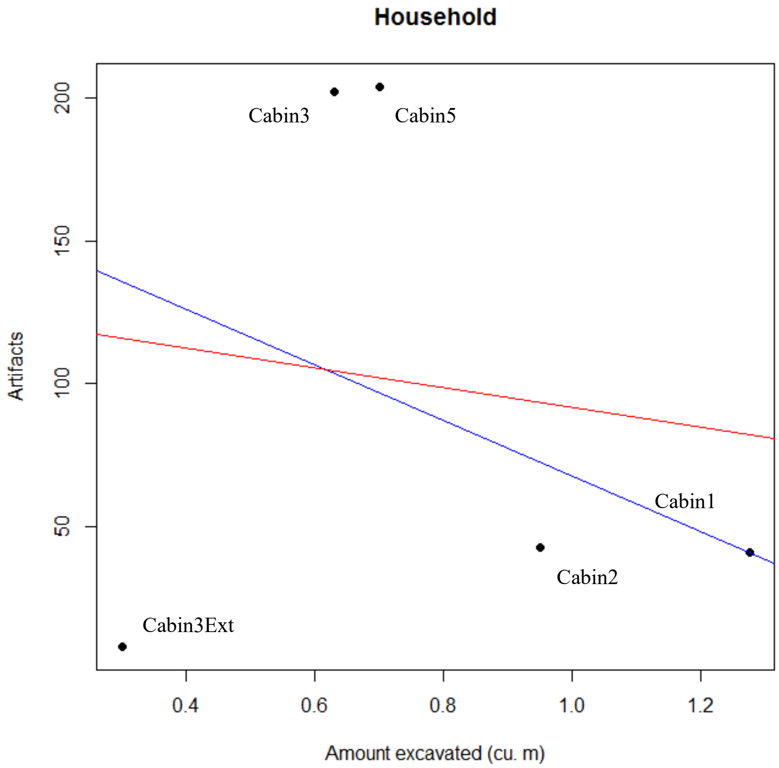
Appendix C Figure 18

Scatter plot: Flora

Linear Regression Line

Tukey Line

Rho = -0.1118



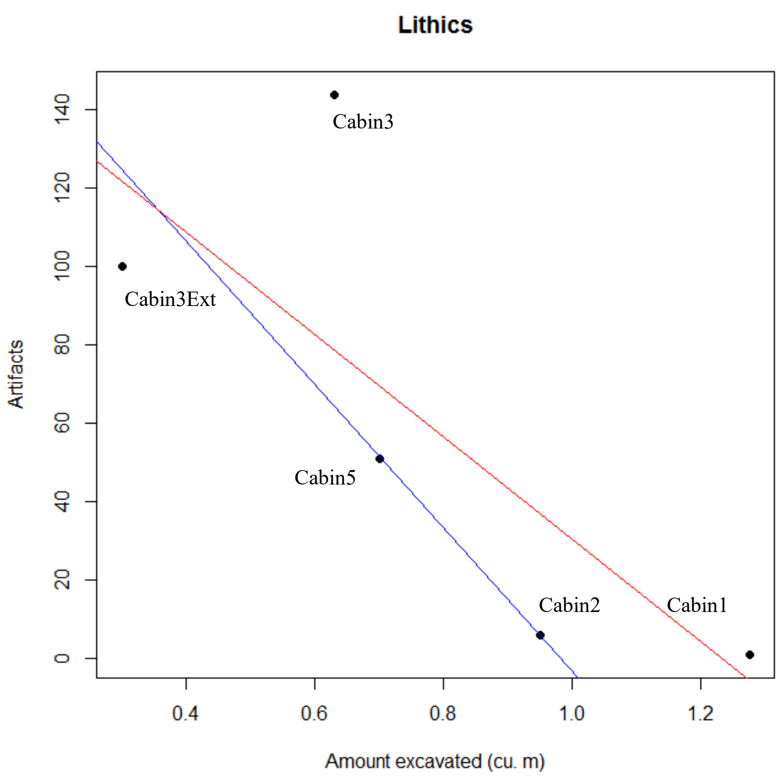
<u>Appendix C Figure 19</u>

Scatter plot: Household

Linear Regression Line

Tukey Line

Rho = 0.1



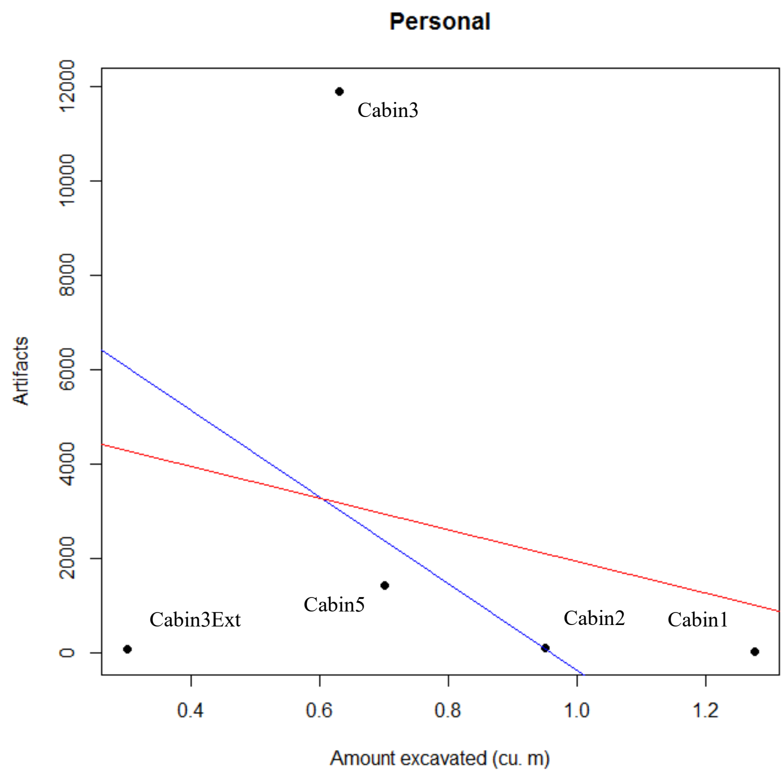
<u>Appendix C Figure 20</u>

Scatter plot: Lithics

Linear Regression Line

Tukey Line

Rho = -0.9



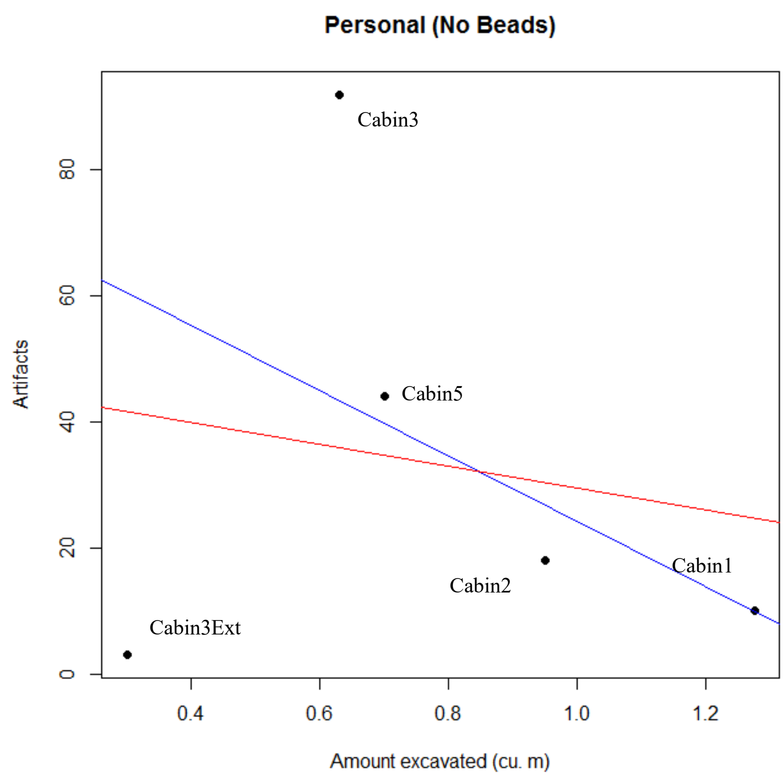
<u>Appendix C Figure 21</u>

Scatter plot: Personal

Linear Regression Line

Tukey Line

Rho = -0.4



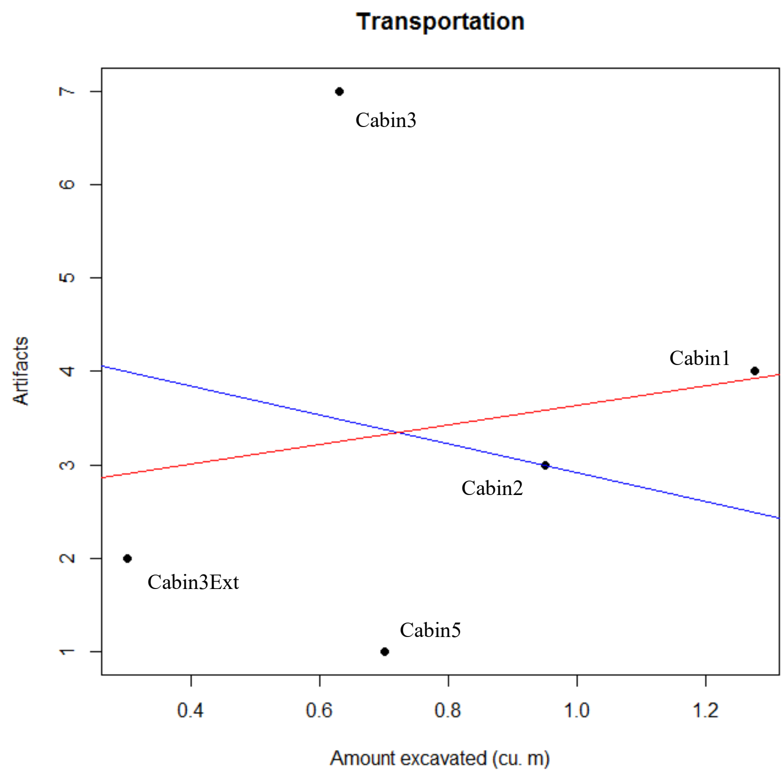
<u>Appendix C Figure 22</u>

Scatter plot: Personal (No Beads)

Linear Regression Line

Tukey Line

Rho = 0



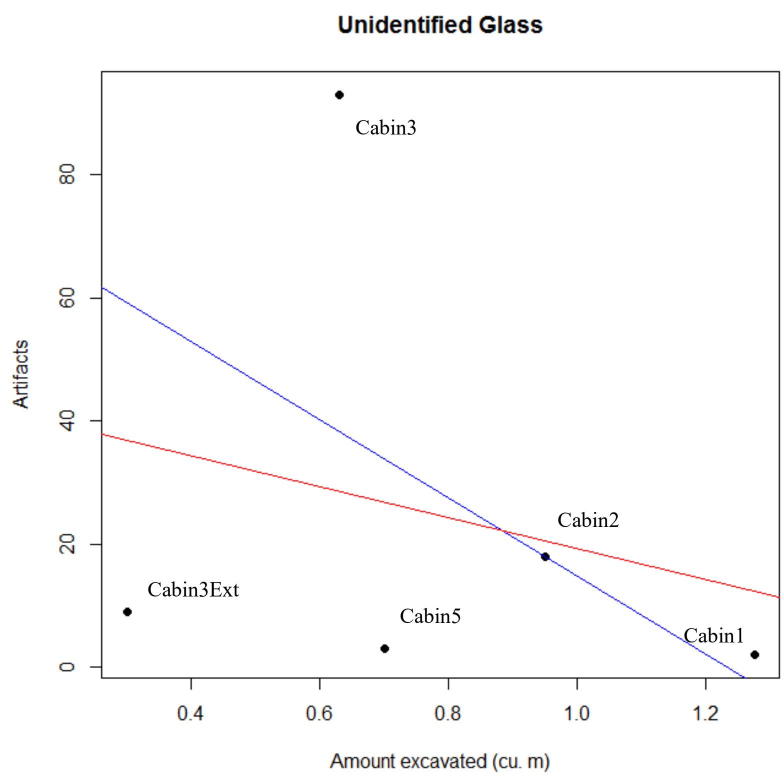
Appendix C Figure 23

Scatter plot: Transportation

Linear Regression Line

Tukey Line

Rho = 0.2



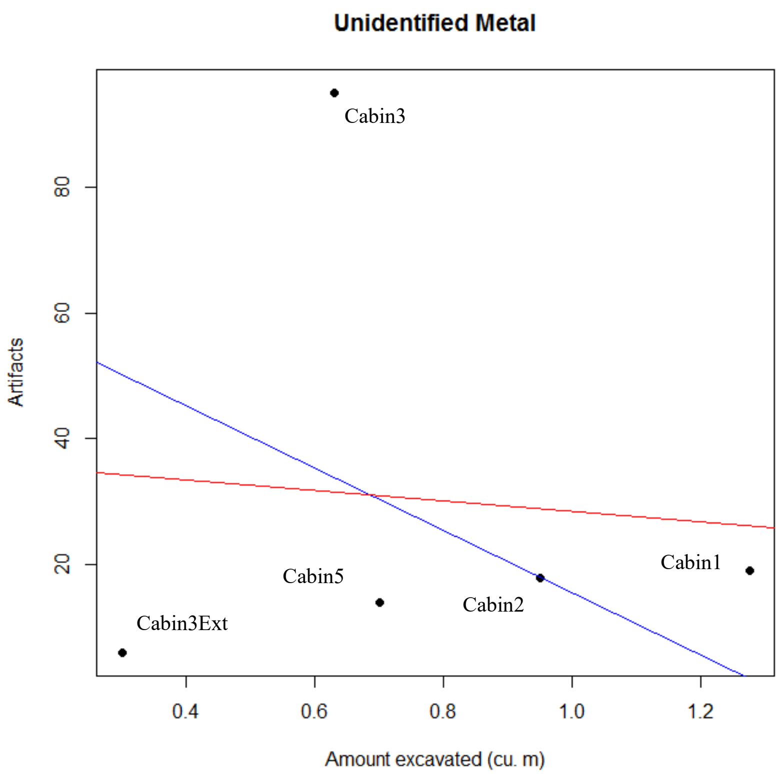
Appendix C Figure 24

Scatter plot: Unidentified Glass

Linear Regression Line

Tukey Line

Rho = -0.5



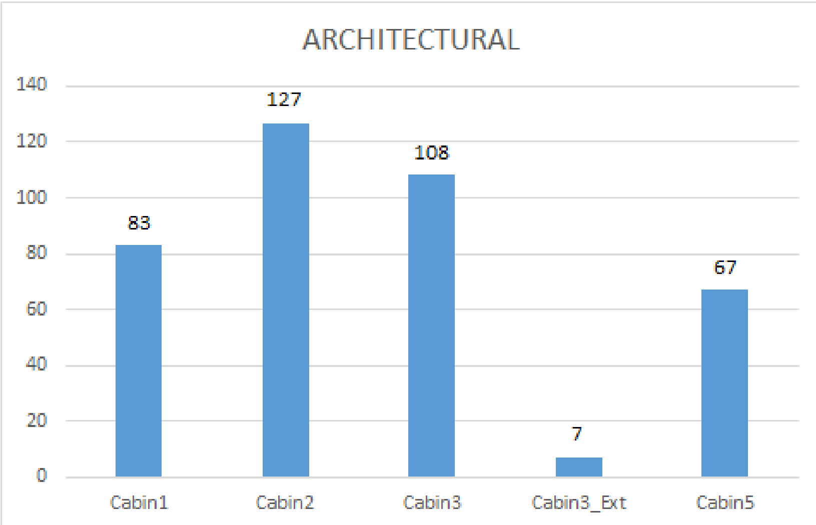
Appendix C Figure 25

Scatter plot: Unidentified Metal

Linear Regression Line

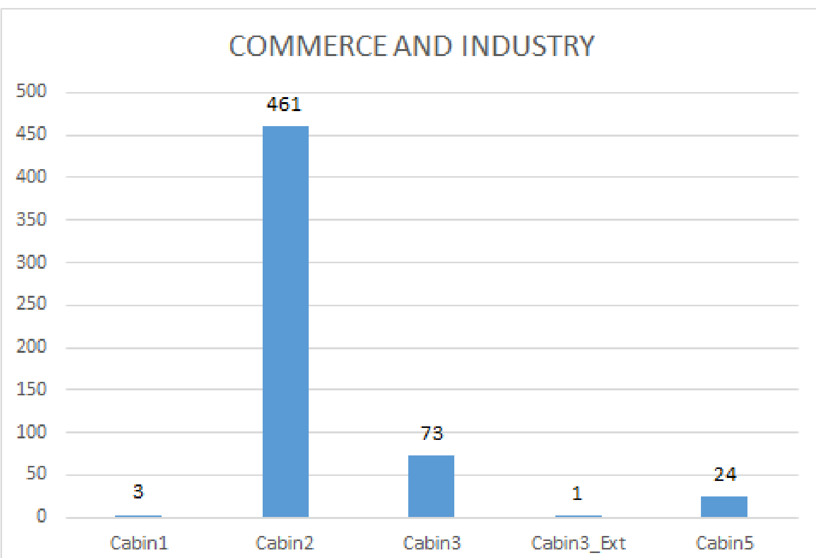
Tukey Line

Rho = 0.4



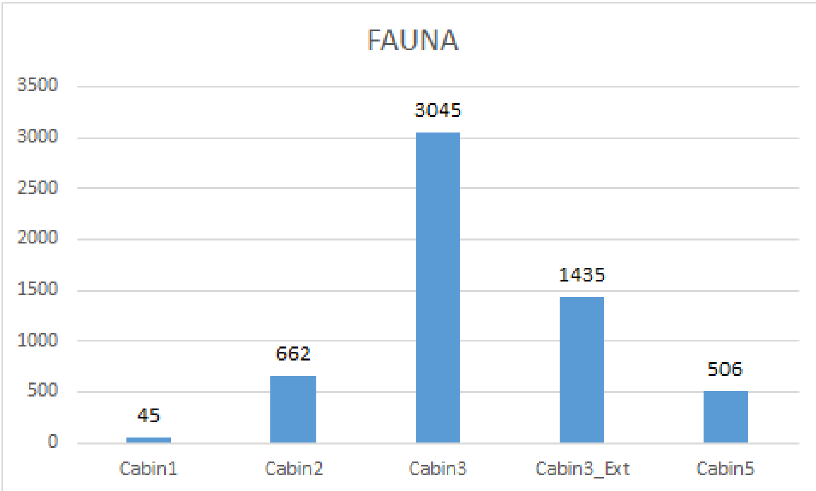
Appendix C Figure 26

Artifact Counts:
Architectural



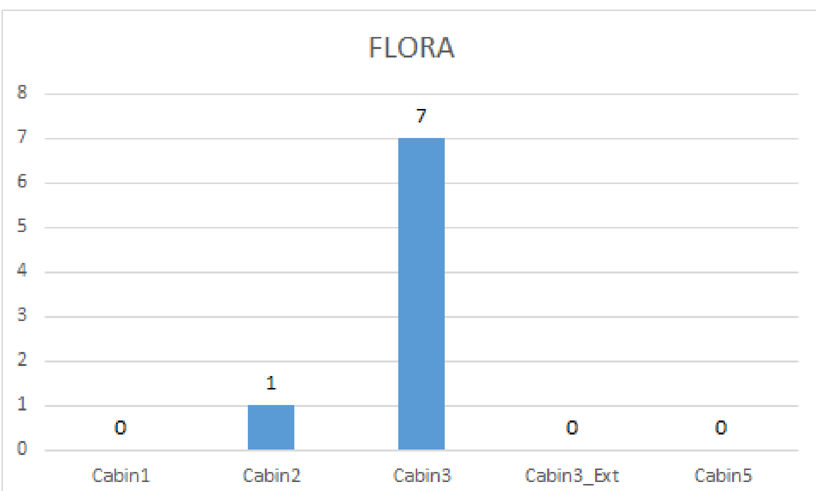
Appendix C Figure 27

Artifact Counts:
Commerce and Industry



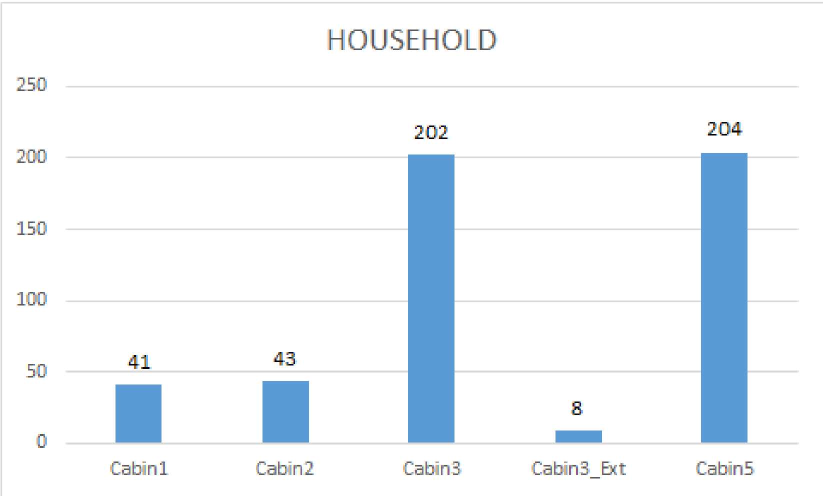
Appendix C Figure 28

Artifact Counts: Fauna



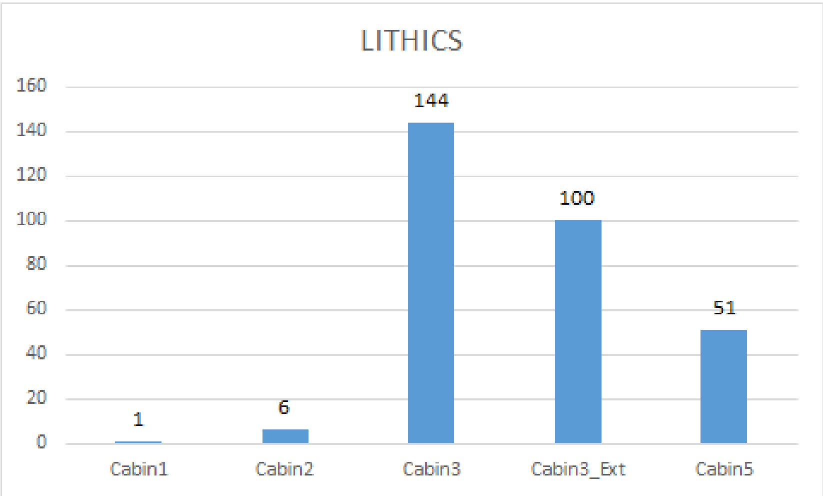
Appendix C Figure 29

Artifact Counts: Flora



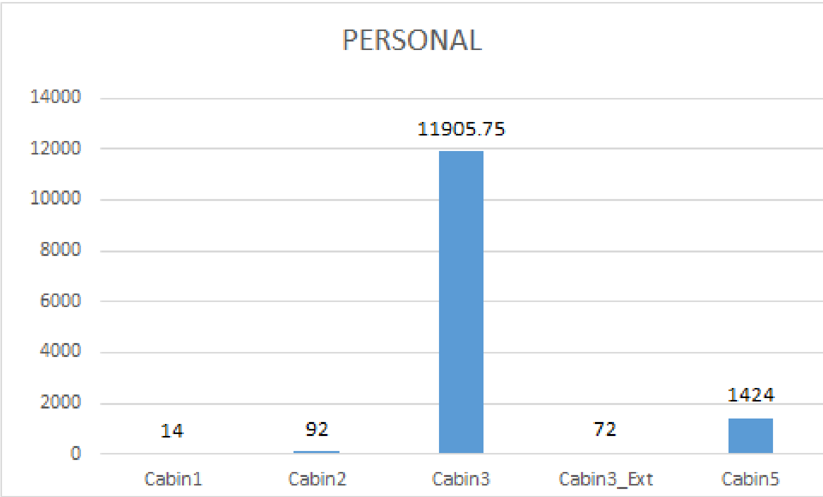
Appendix C Figure 30

Artifact Counts: Household



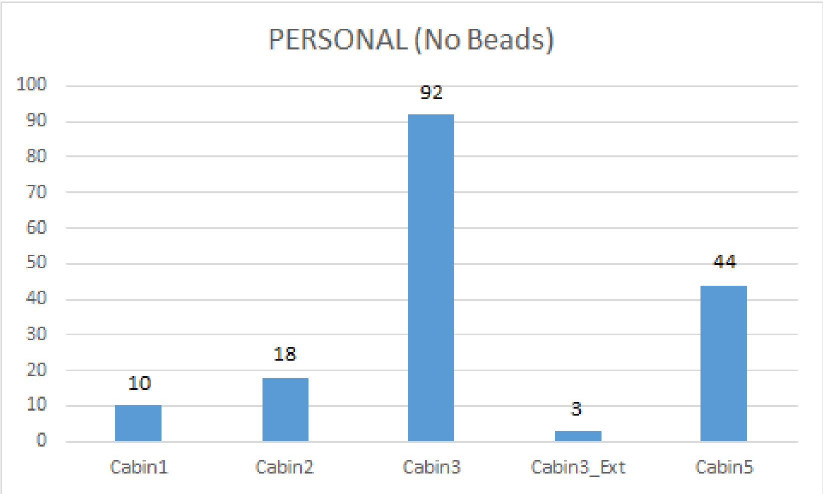
Appendix C Figure 31

Artifact Counts: Lithics



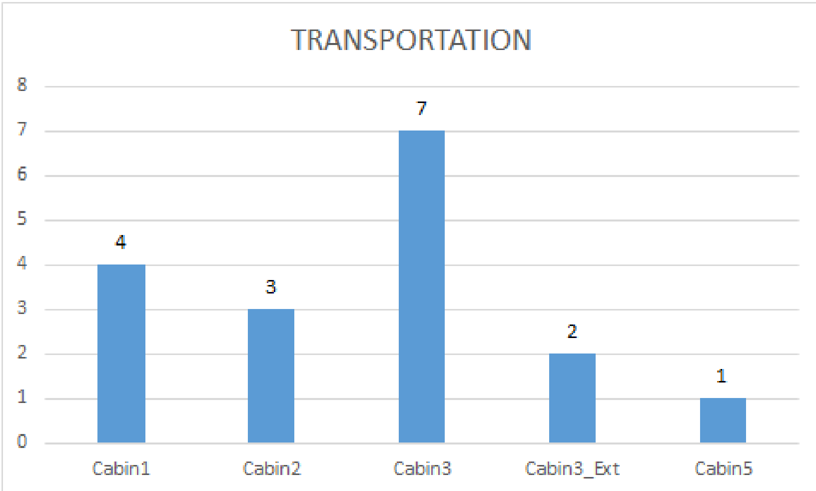
Appendix C Figure 32

Artifact Counts: Personal



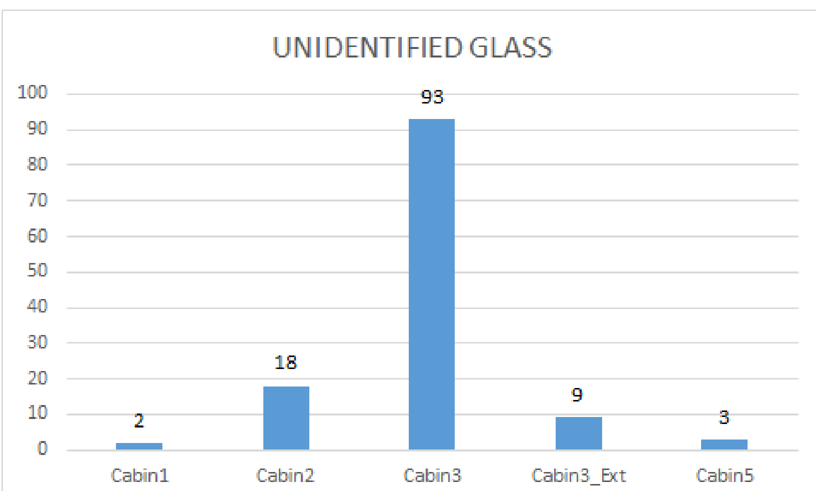
Appendix C Figure 33

Artifact Counts: Personal (No Beads)



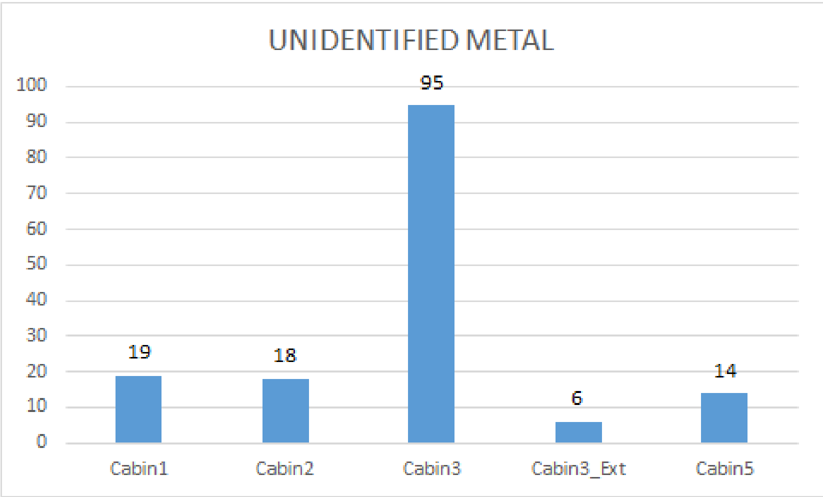
Appendix C Figure 34

Artifact Counts: Transportation



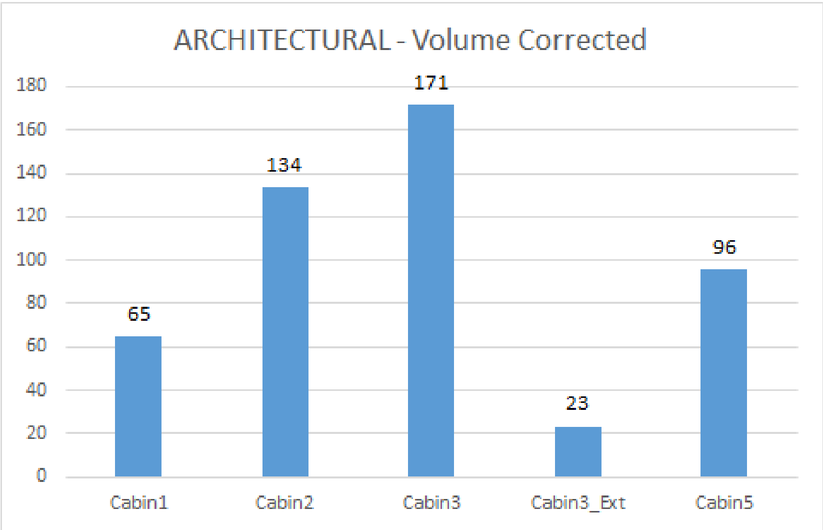
Appendix C Figure 35

Artifact Counts: Unidentified Glass



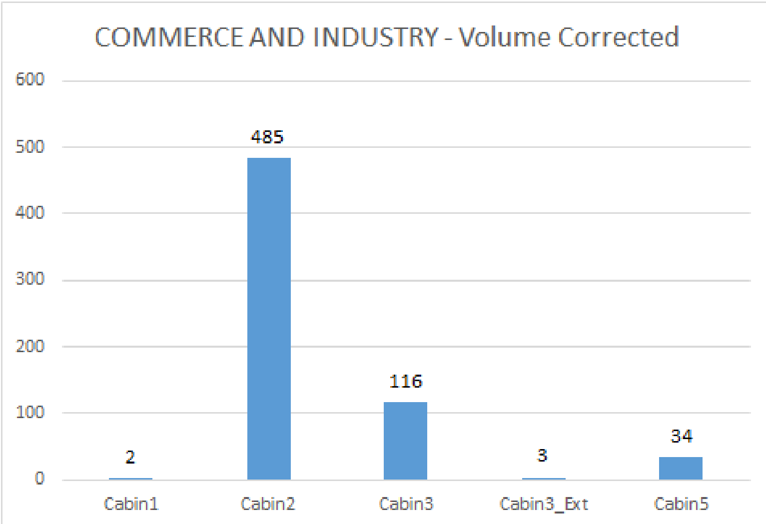
Appendix C Figure 36

Artifact Counts:
Unidentified Metal



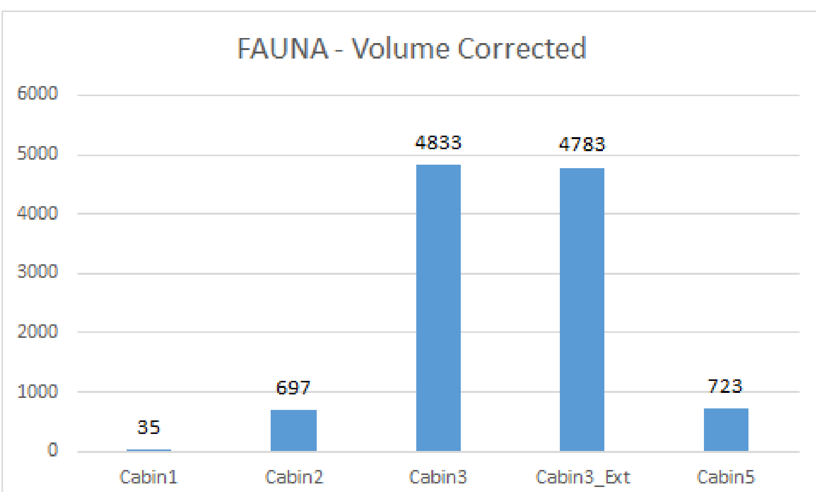
Appendix C Figure 37

Artifact Counts:
Architectural
(Volume Corrected)



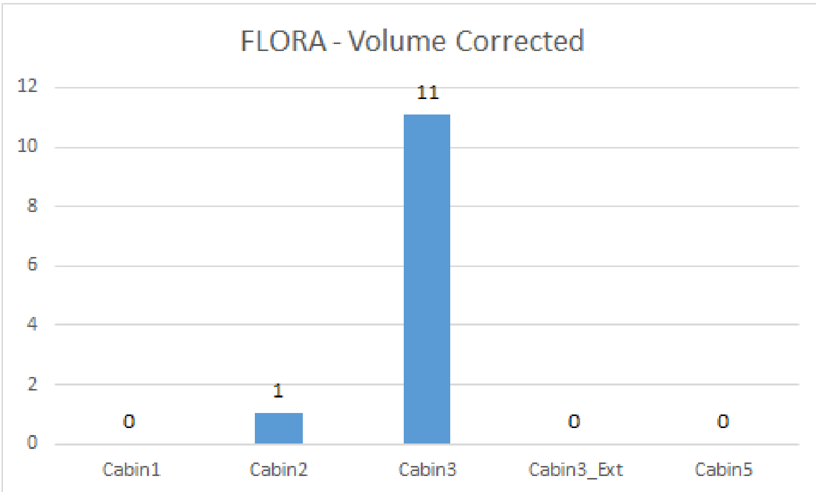
Appendix C Figure 38

Artifact Counts:
Commerce and Industry
(Volume Corrected)



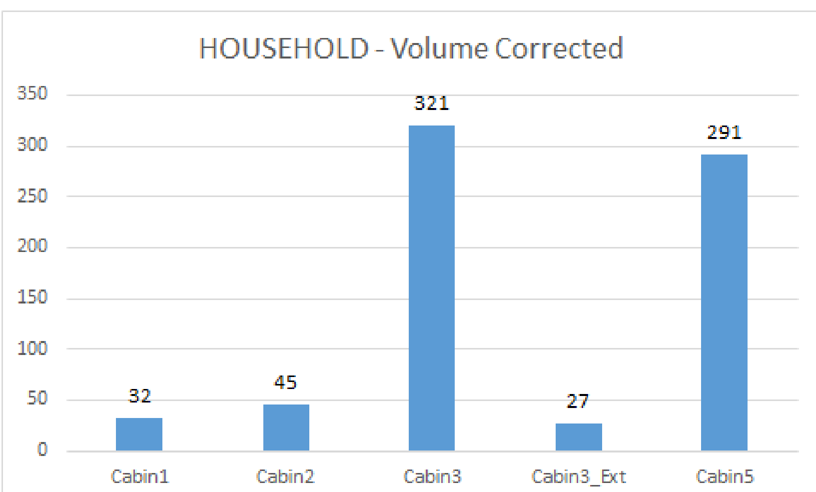
Appendix C Figure 39

Artifact Counts:
Fauna
(Volume Corrected)



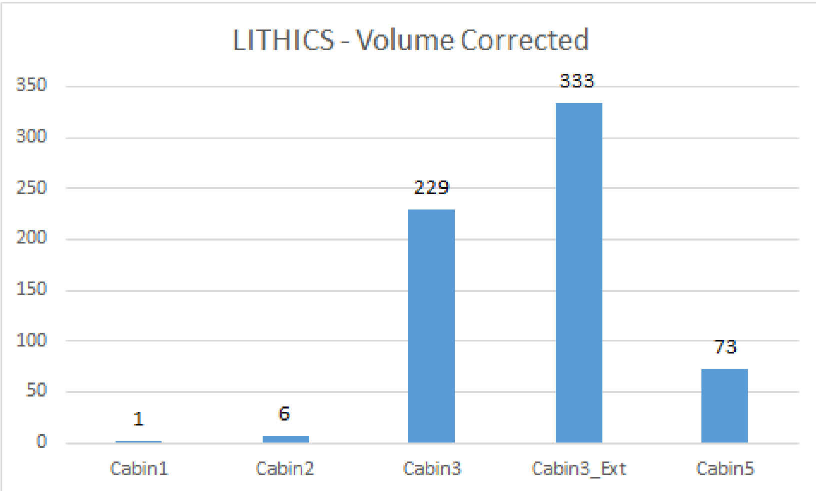
Appendix C Figure 40

Artifact Counts:
Flora
(Volume Corrected)



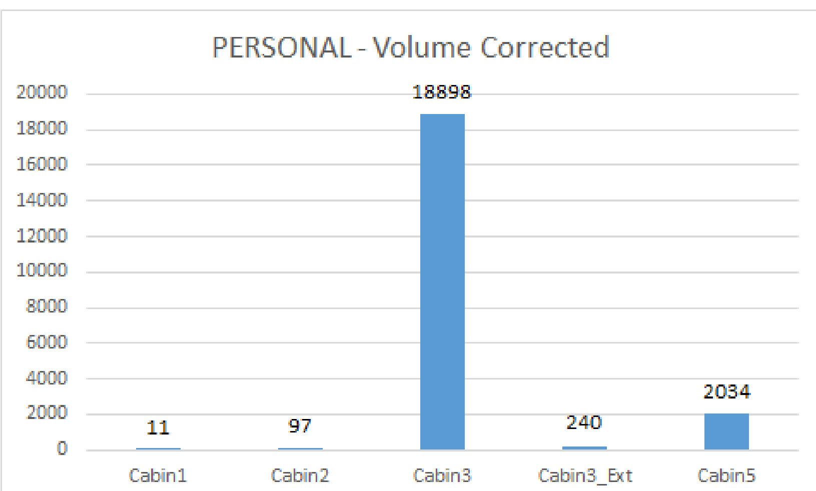
Appendix C Figure 41

Artifact Counts:
Household
(Volume Corrected)



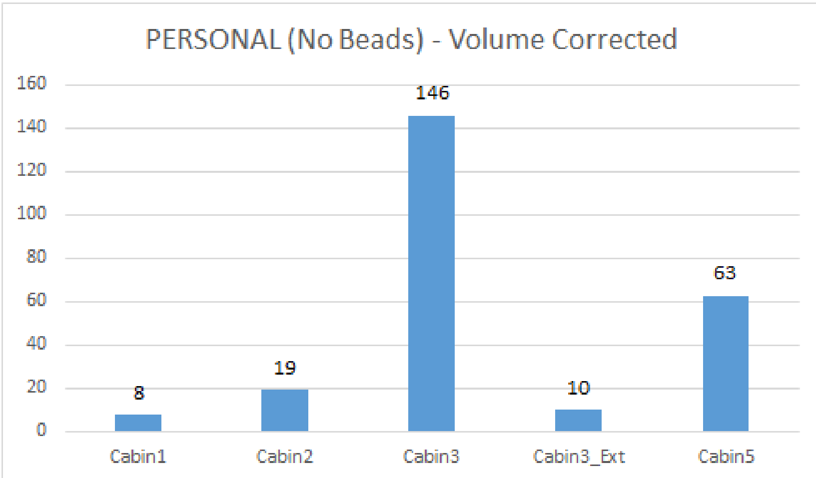
Appendix C Figure 42

Artifact Counts:
Lithics
(Volume Corrected)



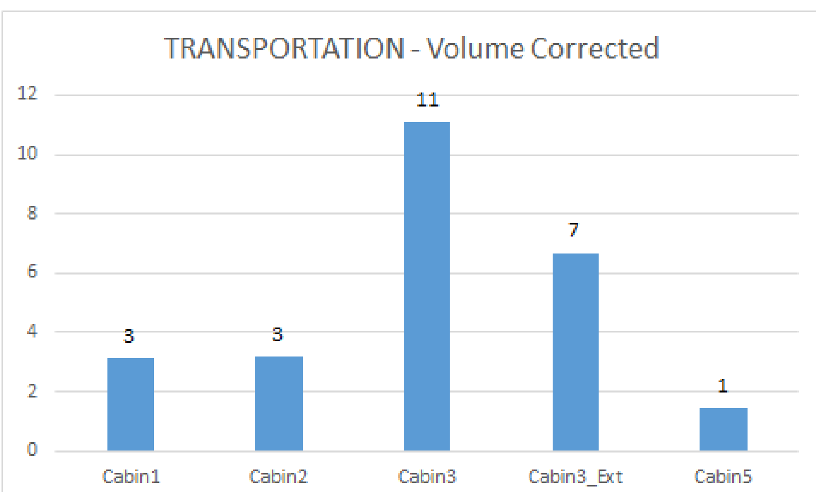
Appendix C Figure 43

Artifact Counts:
Personal
(Volume Corrected)



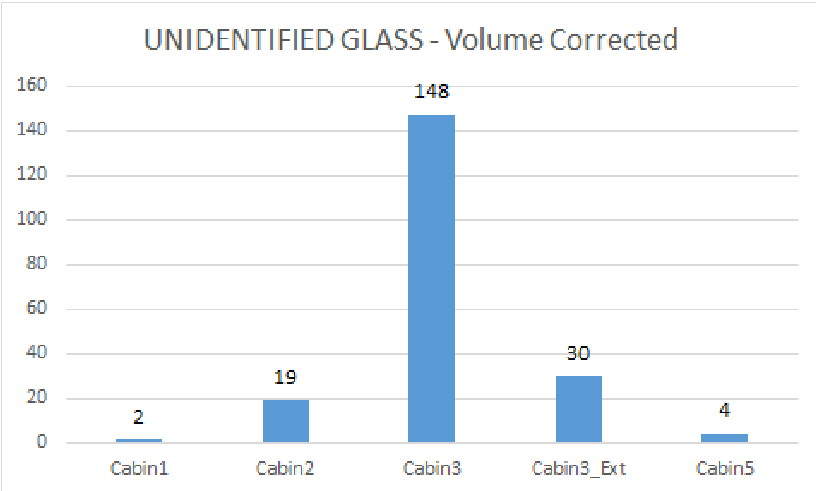
Appendix C Figure 44

Artifact Counts:
Personal (No Beads)
(Volume Corrected)



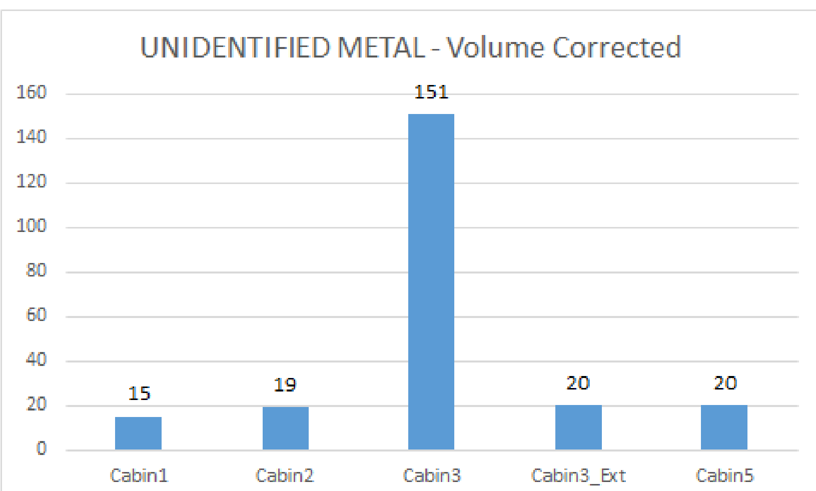
Appendix C Figure 45

Artifact Counts:
Transportation
(Volume Corrected)



Appendix C Figure 46

Artifact Counts:
Unidentified Glass
(Volume Corrected)



Appendix C Figure 47

Artifact Counts:
Unidentified Metal
(Volume Corrected)

APPENDIX D

SHOVEL TEST PHOTOGRAPHS

Appendix D Figure 1

ST1
Layer B
Level 1

Appendix D Figure 2

ST1
Layer B
Level 2

Appendix D Figure 3

ST1
Layer C
Level 1

Appendix D Figure 4

ST1
Layer C
Level 2

Appendix D Figure 5

ST1
Layer D
Level 1

Appendix D Figure 6

ST1
Wall Profile
North

Appendix D Figure 7

ST1
Wall Profile
East

Appendix D Figure 8

ST1
Wall Profile
South

Appendix D Figure 9

ST1
Wall Profile
West

Appendix D Figure 10

ST2
Layer B
Level 1

Appendix D Figure 11

ST2
Layer B
Level 3

Appendix D Figure 12

ST2
Layer C
Level 1

Appendix D Figure 13

ST2
Wall Profile
North

Appendix D Figure 14

ST2
Wall Profile
South

Appendix D Figure 15

ST2
Wall Profile
West

Appendix D Figure 16

ST2E
Layer A
Level 3

Appendix D Figure 17

ST2E
Layer B
Level 1

Appendix D Figure 18

ST2E
Layer C
Level 1

Appendix D Figure 19

ST2E
Wall Profile
North

Appendix D Figure 20

ST2E
Wall Profile
East

Appendix D Figure 21

ST2E
Wall Profile
South

Appendix D Figure 22

ST3
Layer B
Level 1

Appendix D Figure 23

ST3
Layer B
Level 2

Appendix D Figure 24

ST3
Layer B
Level 3

Appendix D Figure 25

ST3
Layer B
Level 4

Appendix D Figure 26

ST3
Layer C
Level 1

Appendix D Figure 27

ST3
Layer C
Level 2

Appendix D Figure 28

ST3
Layer D
Level 1

Appendix D Figure 29

ST3
Wall Profile
North

<u>Appendix D Figure 30</u>

ST3
Wall Profile
East

<u>Appendix D Figure 31</u>

ST3
Wall Profile
South

Appendix D Figure 32

ST3
Wall Profile
West