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A Stylistic Analysis Using Multivariate Statistics of Oneota Pottery from the Upper Mississippi, Blue Earth, and St. Croix River Valleys

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A Stylistic Analysis Using Multivariate Statistics of Oneota Pottery from the Upper Mississippi, Blue Earth, and St. Croix River Valleys

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Abstract

Pottery is one of the most abundant artifact types recovered from late pre-contact habitations sites in the upper Midwest. As a material with inherent plasticity, pottery reflects changes in people's preferences and traditions in aspects of its form and design quickly through time and space. Analyzing different facets of pottery has the ability to provide extensive information about people in the past: their resource utilization, technology, traditions, economic exchange, regional interaction, ideology, and or group identity. Yet, a significant challenge in pottery analysis is deriving comprehensive and testable conclusions in terms of types and styles that reflect patterned cultural behavior and the changing nature of the archeological record. In order to infer aspects of patterned behavior, archeologists must be clear about the temporal and spatial boundaries of their classifications as well as qualitative and quantitative parameters of vessel morphology and decoration.

The typologies created throughout the 20th century to describe Oneota pottery from the Upper Mississippi, Blue Earth, and St. Croix River valleys were not explained in great detail and need to be reevaluated. Past classifications of Oneota pottery from these geographical locations were too inclusive, using very few attributes of vessel form and design and little to no quantitative parameters to discern what was or was not included in the defined types. Also, archeologists often used small rim, decorated body, etc., sherds to establish their types, but such small pieces do not provide a sound representation of pottery vessels' morphological form or overall decorative design. In addition, these past types no longer reflect the current state of the archeological record given recently excavated material.

This study focuses on the morphological and decorative aspects of late pre-contact Oneota pottery from the Upper Mississippi, Blue Earth, St. Croix River valleys. This research reevaluates the past typological classifications of Oneota pottery in southern Minnesota and parts of western Wisconsin using quantitative and qualitative data acquired from measuring detailed aspects of form and design of vessels and vessel segments. In addition, it uses different aspects of descriptive, exploratory, and multivariate statistical analyses to create typological classifications that are comprehensive in aspects of overall form and design as well as testable and falsifiable.

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Chapter 1: Introduction

"As an archaeologist perched upon a vantage of retrospect,
I enjoy the ability to transport my imagination across the
countless generations of human activities that are
documented by the remains they unknowingly left behind"
(Fleming 2009: 3).

Background

Pottery is extremely common within the global archeological record spanning the past 10,000 years. Clay, the raw material used to make pottery, is a widely distributed substance and almost always locally available. Different to other classes of artifacts, such as lithic, botanical, or zoological material, which are less malleable and thus modified or reduced from their natural form, the production of pottery begins with an amorphous lump of clay and is formed into an artifact based entirely on human ingenuity and shared knowledge within a community concerning technology and traditions. Archeologists can ask many questions regarding the roles pottery vessels played within and between groups concerning economy, political systems, social hierarchy, identity, ideology, and interaction that are not so easily answered by examining other artifact types.

Pottery analyses within archeology have focused on creating seriations to relatively date contexts through time and space. These seriations have also been used to answer questions concerning group interaction, such as trade and social stratification involving status and resource acquisition (Orton et al. 1993: 23). This particular research will focus on the ways in which archeologists can examine aspects of identity, group membership, and regional communication from the pottery people made and utilized, specifically within and between groups, identified as being part of the Oneota tradition, occupying several major river valleys within modern-day southcentral and eastern Minnesota as well as western Wisconsin around AD 1150-1450.

One of the ways in which researchers can discern and analyze behavioral aspects is to create typologies, which mirror noticeable patterns in the material record, and styles, which reflect choices people make during artifact production and use as well as communicative aspects displayed through the regularity of such choices. Archeologists must be extremely clear and explanatory when outlining types and interpreting stylistic behavior. Although the potential for pottery analyses to reveal information concerning many different aspects of cultural behavior is extremely high, researchers must be cautious, for the creation of typologies ad hoc based on an archeologist's visual recognition does not provide a sound basis for classifications that are testable and to which information can be added. Measuring specific pottery attributes in a quantifiable manner creates as well as reaffirms new and past typologies. Typologies are not fixed, they are created by researchers and develop as new archeological material is recovered, analytical methods used, and perspectives applied to inferring past behavior.

Research Objectives

There are five goals of this research. The first is to better define Oneota pottery recovered from the Upper Mississippi River valley, specifically within the Red Wing region, from quantitative and qualitative data acquired by measuring several features of vessel form and decoration. The second objective is to compare pottery attributes from the Red Wing region to somewhat contemporary Oneota sites along the Blue Earth and the St. Croix Rivers using measurable data from the same attributes. Third, this research intends to reevaluate outdated and vague typologies created to describe pottery assemblages from these regions. The fourth goal is to further the use of descriptive statistics and multivariate analysis within pottery studies, to better create testable typologies. Last, this research will use a framework of stylistic behavior to better understand identity and group communication from these three locations.

Original definitions for Oneota pottery from the Upper Mississippi, Blue Earth, and St. Croix River valleys were created during the mid-20th century using a few vague classifications and little quantitative data. Oneota vessels, segments, and sherds recovered from these locations were broadly identified as the same type, falling within the Blue Earth focus/phase (Wilford 1955; Stortroen 1956; Hall 1962; Gibbon 1973; Gibbon 1978; Gibbon 1979; Wilford 1984; Stortroen 1984; Dobbs 1984b). This typological classification has unfortunately stuck throughout more than sixty years of archeological literature concerning the Oneota tradition in southern Minnesota. With decades of more recently excavated material and newly acquired data, old typologies no longer reflect the current archeological record. By analyzing data acquired through the measurement of several attributes of vessel form and design using descriptive, exploratory, and multivariate statistics, it is apparent that Oneota pottery from the Upper Mississippi, Blue Earth, and St. Croix River valleys is locally distinctive with a particular local flavor of forming and decorating vessels.

Geographical Context

The broad geographical setting of southern Minnesota and western Wisconsin displays a series of deep valleys cut by the ancient, fast flowing rivers, which drained from post-glacial Lake Agassiz after the recession of the Pleistocene glaciers. Within these deep river valleys are high and low elevation terraces, which were ideal locations for habituation due to their closeness to abundant aquatic and terrestrial resources and positions as social perches to see people coming from miles along either side of the river. The physical context of this research focuses on late pre-contact sites situated within the vast valleys of the modern-day Upper Mississippi, Blue Earth, and St. Croix Rivers.

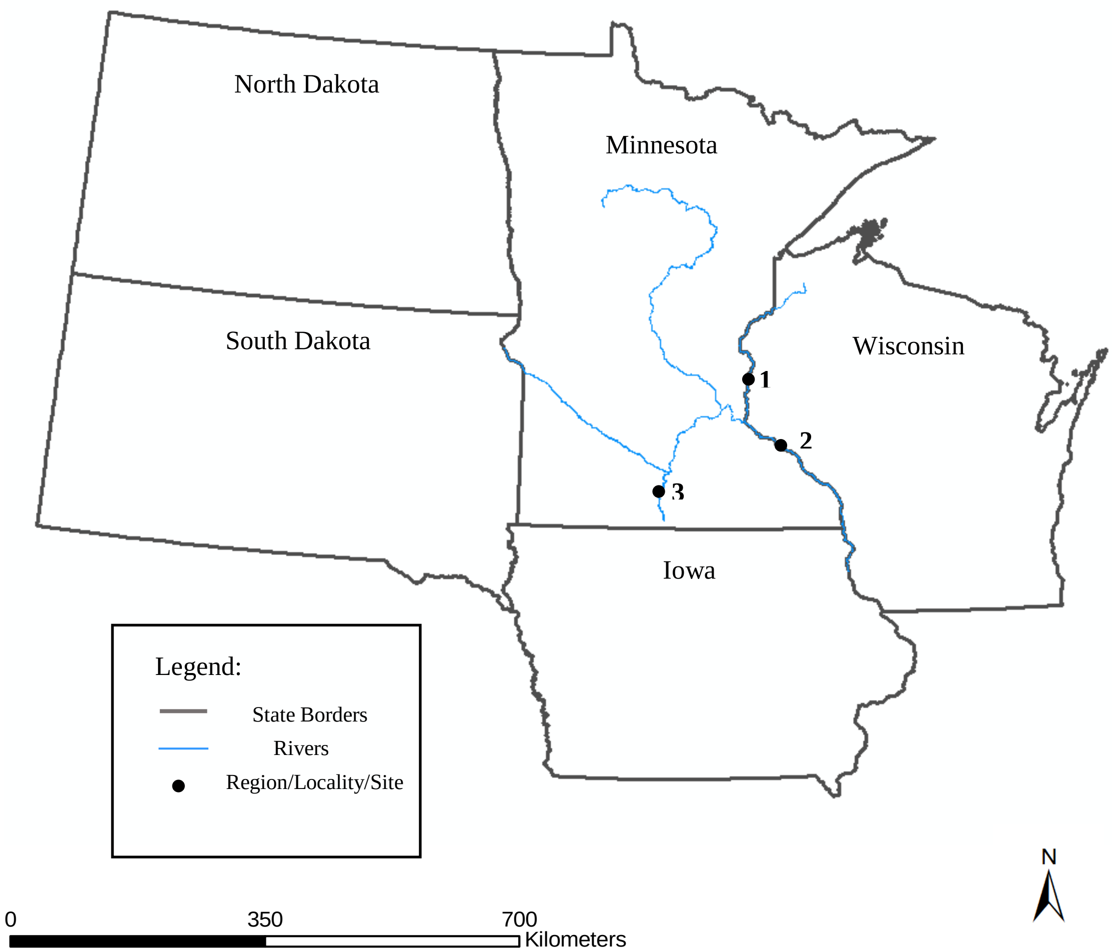

Figure 1.1: The three locations of study for this research in the upper Midwest. 1. Sheffield site along the St. Croix River; 2. Red Wing region along the Upper Mississippi River; 3. Center Creek locality along the Blue Earth River.

Specifically, this research focuses on two taxonomic regions and a single site. First, the Red Wing region lies at the convergence of the Mississippi, Cannon, Trimbelle, and Vermillion Rivers as well as Lake Pepin and the Spring and Hay Creeks. It is around 58 square miles (Henning and Schirmer n.d.: 16) in size and encompasses several large and small village sites in southeastern Minnesota and western Wisconsin, 10 of which are included in this research. Second, the Blue Earth region, comprising of the Center Creek and Willow Creek localities (Dobbs 1984b), is located along the Blue Earth River 30 miles south of the modern city of Mankato. Two large village sites from the Center Creek locality are used in this research as a comparative aspect to pottery from several sites within Red Wing. In addition to sites from these two regions, a single village within the St. Croix River valley, located northeast of St. Paul, will be included as an additional comparative aspect to Red Wing pottery.

During the late pre-contact period, from around AD 1000-1300 Red Wing acted as a large aggregation center (Fleming 2009), in which local and regional people interacted during certain times of the year to engage in public feasts, maintain social ties, participate in symbolic ceremonies, and bury the dead (Gibbon and Dobbs 1991; Dobbs 1993; Dobbs and Holley 1995; Rodell 1997; Henning 1998; Schirmer 2002; Fleming 2009; Schirmer n.d.). To date, there are over a dozen identified late pre-contact village sites within the Red Wing region (Figure 1.2). Along the Cannon River, there are the Silvernale (21GD03), Bryan (21GD04), Energy Park (21GD158), Belle Creek (21GD72), and Area 51 (21GD290) sites. Within the Spring and Hay Creek valleys there are the Sell (21GD96), Burnside School (21GD159), Horse (21GD204), and McClelland (21GD258) villages. Bartron (21GD02) is located along the southern tip of Prairie Island in the Mississippi River. Lastly, along the Mississippi River in Wisconsin there are the Mero (47PI02 and 47PI93), Adams (47PI12), Armstrong (47PE12), and Double (47PI81) sites. Red Wing's location is ideal for an aggregation center: it is a place that many people can reach through different aquatic channels throughout eastern Minnesota and western Wisconsin, which facilitated communication, cultural connection, and trading.

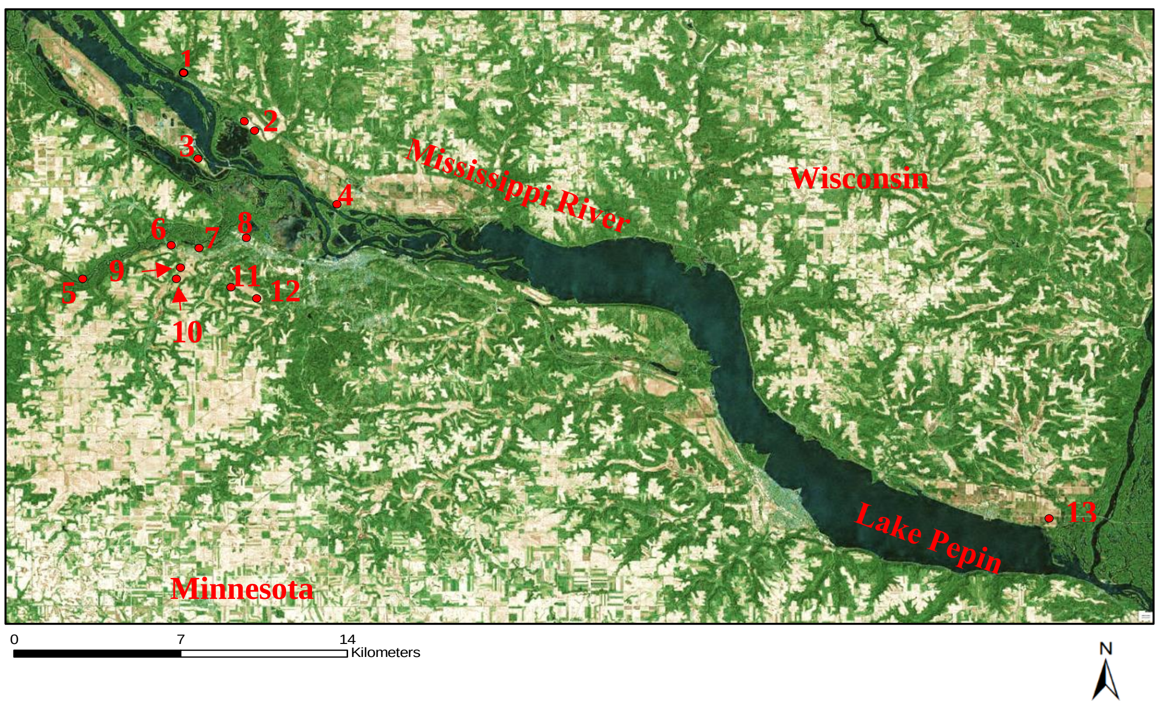

Figure 1.2: Late pre-contact village sites within the Red Wing region with Oneota components. 1. Double (47PI81); 2. Mero (4PI02 and 47PI93); 3. Bartron (21GD02); 4. Adams (47PI12); 5. Belle Creek (21GD72); 6. Bryan (21GD04); 7. Energy Park (21GD158); 8. Silvernale (21GD03); 9. Burnside School (21GD159); 10. Sell (21GD96); 11. Horse (21GD204); 12. McClelland (21GD258); and 13. Armstrong (47PE12). Image from ESRI world imagery.

Located along the Blue Earth River in Faribault County, the Blue Earth region is another large concentration of Oneota occupation in Minnesota. There are two localities within the Blue Earth region: Center Creek and Willow Creek. This research will focus on the Center Creek locality, namely two large village sites: Vosburg (21FA02) and Humphrey (21FA01). These two villages are located next to each other, along the western edge of the Blue Earth River and are closely related in terms of material culture, dating closer to the latter end of Red Wing's pre-contact occupation during AD 1350-1450 (Schirmer 2016). There are several other smaller and lesser known sites within the Center and Willow Creek localities (Dobbs 1984b), which will not be incorporated into this thesis but hopefully will be part of future pottery analyses after additional excavations along the Blue Earth River.

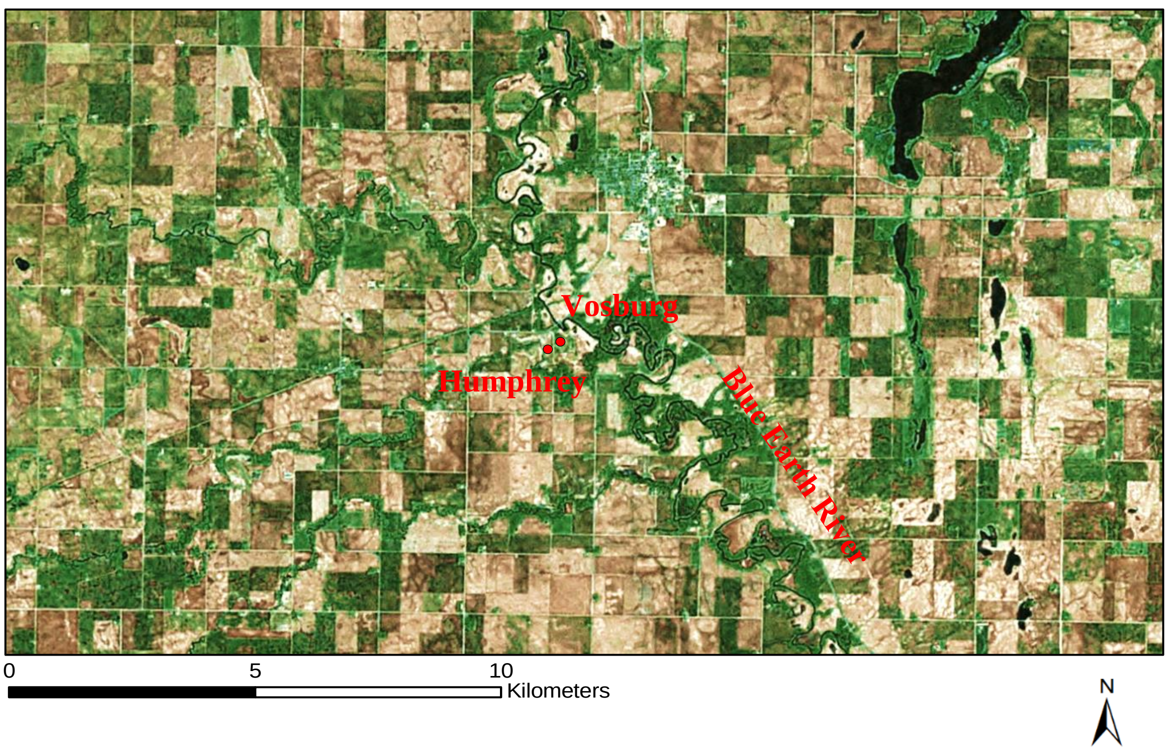

Figure 1.3: The Vosburg (21FA02) and Humphrey (21FA01) sites within the Center Creek locality along the Blue Earth River. Image from ESRI world imagery.

The last geographical location is along the western bank of the St. Croix River, east of St. Paul, Minnesota. The Sheffield site (21WA13 and 21WA03) is another large Oneota village located several miles north of the Red Wing region dating to around AD 1295-1425 (Fleming and Koncur 2015). To date, no other Oneota villages have been identified near Sheffield. Comparative pottery attribute data from the Red Wing and Blue Earth regions as well as the Sheffield site acquired from this research will better illuminate the stylistic relationship between these three locations within major river valleys in Minnesota and Wisconsin.

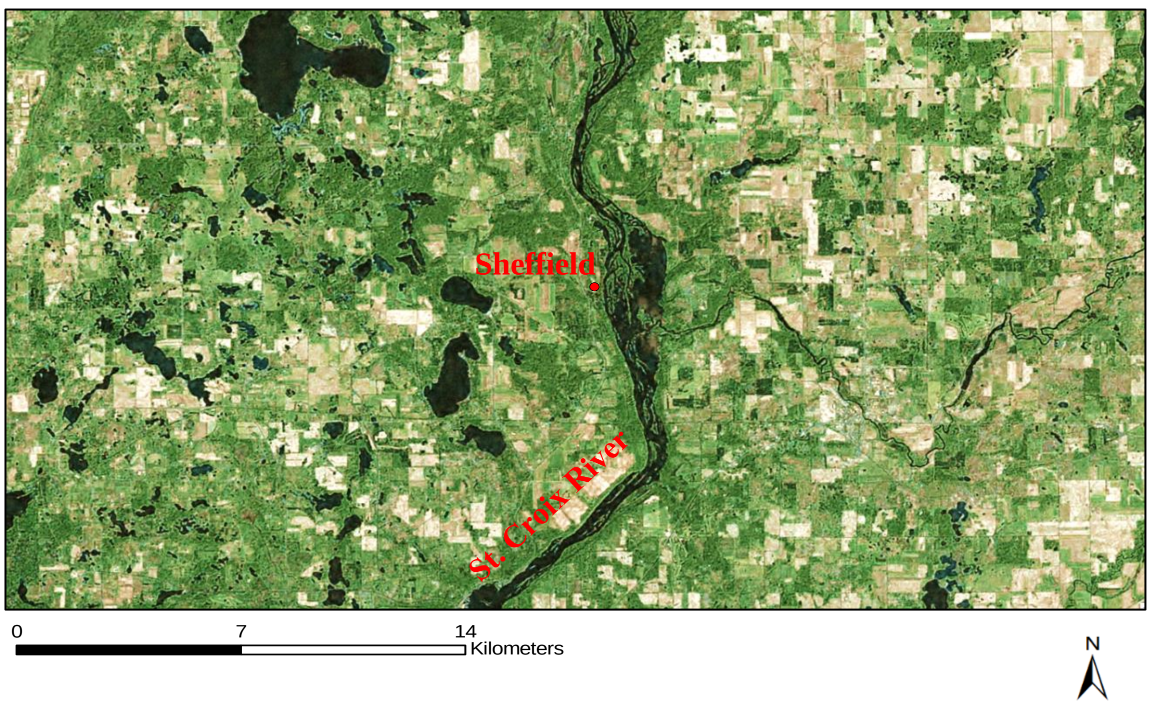

Figure 1.4: The Sheffield (21WA03 and 21WA13) site along the St. Croix River. Image from ESRI world imagery.

Cultural Context

Each village within Red Wing is different, despite being connected within a regional system of similar habitational behavior and material culture. Four of the sites in the Red Wing region, Silvernale, Mero, Bryan, and Energy Park, are multi-component late pre-contact sites. The rest of the sites are considered pure Oneota (Holley n.d.) sites. All the sites within Red Wing are associated with adjacent monumental structures, e.g., mounds and or cairns, along the village borders or atop nearby bluffs.

Individuals living within the Red Wing region practiced both horticulture as well as hunting and gathering. From their carbonized botanical remains and horticultural implements, such as bison scapulae hoes and antler rakes, they grew many domesticated plants, some of which were maize, beans, squash, gourds, and tobacco (Schirmer 2002; Fleming and Koncur 2015; Fleming and Koncur 2016; Schirmer 2016), while also exploiting local plant and animal resources, such as aquatic shell and fish. Botanical research (Schirmer 2002; Schirmer n.d.) on multi-component sites, such as Bryan, in Red Wing suggest that they were seasonally occupied during warm summer and fall months. Additionally, ceremonial activities such as feasting and burying of the dead likely took place during the warm season at these multi-component sites, when regional groups could more easily travel up and down the nearby rivers.

Origins of Oneota

Oneota is a term used to describe particular late pre-contact groups of people who were making similarly styled pottery, living in a similar fashion of social organization, and sharing a similar language pattern and ideological framework. The term comes from a geological formation of dolomite, which outcrops along the Iowa River where some of the first excavated Oneota sites are located, and is tied to the Iroquoian word for a particular type of stone. The word Oneota was first used in 1844, in a publication by H.R. Schoolcraft, as another term to describe the Oneida, a tribe of the Iroquois Confederacy. Although Oneota had been used as an alternative spelling to Oneida, the Oneida do not have any archeological ties to the prehistoric Oneota tradition throughout the Midwest (Hall 1995: 19). Oneota as it is known within the archeological community today is a broad-based assemblage of ancestral Chiwere Siouan-speaking groups. Tribes which have descended from various Oneota regional groups include the Oto, Ioway, Ho Chunk, Winnebago, Missouri, and Dakota (Dobbs 1984b: Staeck 1995: 5).

Oneota presence within the archeological record spans throughout Minnesota, Wisconsin, Iowa, Illinois, and Missouri. Oneota manifestations are generally recognized by artifacts, such as small thumb scrapers and large globular-shaped jars, as well as no distinct social hierarchy within village organization. Oneota jars tend to have long, everted rims, small loop or strap handles located along the superior walls of the vessel, smoothed surfaces, and decorative motifs and elements, such as birdtails, chevrons, hachures, punctate borders, and or lip notching. Some of the earliest known Oneota sites, dating to around AD 950, are in eastern Wisconsin, such as Carcajou Point and Crab Apple Point (Overstreet 1995). There are four recognized temporal horizons of Oneota material culture: Emergent (AD 950-1150), Developmental (AD1150-1350), Classic (AD 1350-1650), and Historic (post AD 1650) (Hall 1962; Henning 1995; Overstreet 1995). As described in Chapter Two, although these horizons reflect shifts in material culture within Oneota regions, such as those in Wisconsin and Iowa, they do not align with the temporal ranges of pottery characteristics seen at sites within the Red Wing region.

In past archeological literature, Oneota has been interpreted as an Upper Mississippian manifestation, tied directly to the city of Cahokia and the social interactions occurring in the American Bottom and mid-continental regions of the Mississippi River. Although some northern sites, such as Fred Edwards, Trempealeau, and Aztalan as well as those along the Apple River in Wisconsin with Mississippian-inspired and traded artifacts as well as parallel site organizations with platform mounds and central plazas can be interpreted as Mississippian sites (Finney 1993; Green and Rodell 1994; Price et al. 2007), many of the Oneota sites within Wisconsin, Minnesota, and Iowa have little to no Mississippian-related material culture. There are southern Oneota manifestations within Illinois, such as the Bold Counselor phase, which interacted with Mississippian culture and are seen at some sites within the Central Illinois River Valley (Conrad 1991; Esarey and Conrad 1998) in the same stratigraphic layers and house basins as Mississippian artifacts. Most Oneota sites have no cultural relation to Mississippian groups.

Decades of archeological discussions concerning Red Wing have centered on the emergence of Oneota groups within the area. As discussed in Schirmer (n.d.), there have been two theoretical positions regarding the origins of Oneota groups in the Red Wing region. The first and earliest theory states that Red Wing Oneota manifestations emerged as an adaptation of Mississippian people migrating north along the Mississippi River and coming into contact with Late Woodland groups living in the area (Griffin 1943; Wilford

1955; Griffin 1960; Hall 1962; Stoltman 1986). According to this position, the presence of Silvernale phase vessel attributes, such as rolled rims, angular shoulders, and scroll motifs is a copied style of Ramey Incised and Powell Plain Mississippian ware and Oneota pottery evolved from the Silvernale pottery style. The second theory outlines an Oneota tradition forming *in situ* from local groups before and during the expansion of Mississippian traditional influence (Gibbon and Dobbs 1991; Overstreet 1995; Holley n.d.). This theory suggests that Oneota pottery is older than previously thought and that Silvernale pottery is a mixture of Mississippian and Oneota traits (Gibbon and Dobbs 1991), not a predecessor to the Oneota tradition.

Archeological excavations and radiocarbon studies conducted within the past decade show an Oneota presence in Red Wing contemporary to the Silvernale phase (Schirmer 2016). Current research suggests an adaptation of the second theory to be more in line with the current archeological record; that is, Oneota emerged *in situ* from local group interacting with many different regional communities in an aggregation setting. Yet, very little to no true Mississippian influence exists in Red Wing beyond a few possibly traded mace-shaped and face mask ornamentation (Fleming 2009 Schirmer and Henning 2013; Henning and Schirmer n.d.). The events, which resulted in the particular pottery assemblages at Red Wing, represent “groups of people with a variety of material cultural traditions actively [contributing] to the construction of a living cultural landscape and ultimately to the formation of the archaeological record” (Fleming 2009: 303). Several groups from all cardinal directions, coming to Red Wing for ceremonial reasons, took part in the formation of the unique material cultural at several sites within the region.

Many archeologists are still asking themselves the question: how do Oneota manifestations relate to each other; how should they be defined? This research addresses this question. By recognizing the choice patterns people make to create particular decorative motifs and vessel forms as well as quantifying the occurrence of these choice patterns, researchers can tap at the regularity of decisions made from a foundation of community-shared knowledge based on traditions, technological development, and available resources. The conclusions of this thesis hopefully will bring to light the possibility of recognizing stylistic behavior derived from the quantifiable and qualifiable differences in vessel morphology and decoration.

Pottery Basics

Pottery, in its simplest form, is a term used to describe vessels made from fired clay. More specifically, the term pottery applies to vessels fired below 1200-1350° Celsius (Sinopoli 1991:28-29). Within this temperature range, the clay body begins to vitrify, e.g., particles begin to fuse together, and form a denser material: ceramic stoneware. The raw materials used to make pottery are clay, temper (see Chapter Five), and water. The main mineral within clay is feldspar, which is what fuses during the process of virtrification. There are several classifications of clays: kaolinite, montmorillonite, smectites, and illites, which are defined by other primary minerals within them (Shepard 1985[1954]: 8; Sinopoli 1991:10).

Many different methods can be used to form a vessel, namely coiling, paddle and anvil, slab folded, preform molded, and wheeled. Late pre-contact vessels from the southern Minnesota area were made using a paddle and anvil method. Preliminary vessel formation consisted of making coils and stacking those coils into a general shape, then a stone anvil was placed along the interior vessel wall and a wooden paddle used to manually weld the coils into the vessel's final desired shape. After vessels were initially formed, they were set out to dry to a leather-hard consistency to decrease the chance of vessel explosion during firing. Surface treatment and vessel decoration were usually done during or after drying the vessel to a leather-hard state. After depleting the vessels of most of their moisture, potters fired their pots in either kilns or open fires. Kilns are prepared structures where heat is funneled into a chamber in which the fired vessels reside and is circulated to ensure thorough vessel baking. Kiln firing can reach temperatures up to 1400° Celsius. Open firing involves the layering of fuel and vessels to create a covered, heated environment for vessel firing. Open fired vessels are baked at a significantly lower temperature (700-900° Celsius) than kiln firing. To date, there is no archeological evidence for kiln-firing in the Red Wing region, Blue Earth region, or Sheffield site; the vessels made and used by individuals within the region were most likely baked by surface fires, leaving little subsurface evidence as to where firing took place.

There are seven basic morphological aspects to pottery vessels: the lip, rim, neck, shoulder, body, base/foot, and handles (Figure 1.5). Some vessels, such as cups or bowls, do not have every aspect of basic vessel morphology, but among the Oneota vessels recovered from Red Wing, Blue Earth, and Sheffield, all seven morphological aspects are commonly represented. Typical to vessel morphology is a geometric representation of shape, such as globular, conical, ovate, spherical, etc. Vessel form is not only dependent on style but also function. Vessels from Red Wing have wide orifice and large globular bodies, ideal for cooking and storing immense amounts of food at a particular time. Detailed information concerning the seven aspects of vessel form and the particular features of morphology measured in this research is outlined in Chapters Five.

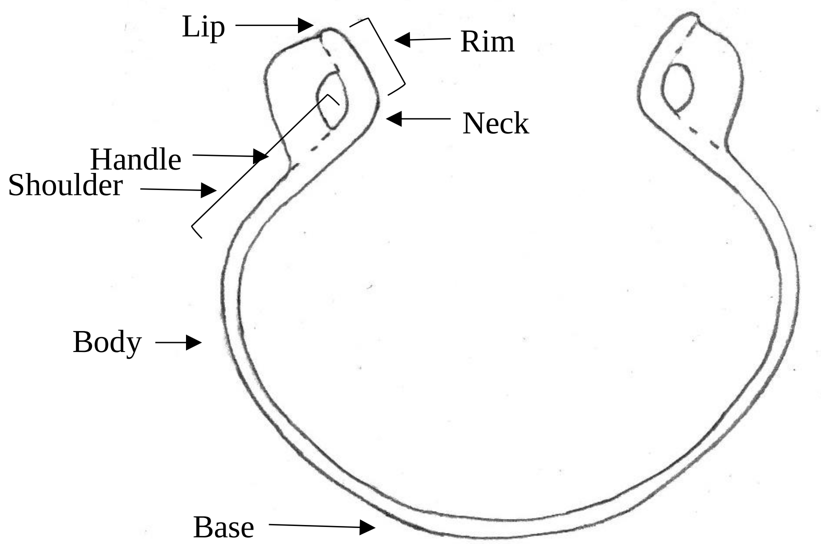

Figure 1.5: Vessel profile with the seven basic aspects of vessel morphology.

There are myriad ways in which people decorated pottery, including impressing tools and textiles into the vessel wall, dragging tools along the surface, or using varying pigments to paint images upon the exterior or interior faces of the vessel. Decoration techniques are not mutually exclusive; often potters in the past used many different methods to create complex, meaningful images upon a vessel's surface. Common to Red

Wing, Blue Earth, and Sheffield, tools were either impressed or dragged along the surface of vessels during and after the leather-hardening process. Most decoration on Oneota vessels from these locations are on the lip, interior rim, exterior shoulder, and exterior handle surfaces. Measurable aspects of decoration and specific motifs present on Oneota pottery are described in Chapters Five through Eight.

Chapter Outlines

This thesis is comprised of nine chapters, including this introduction, which outline several different aspects of this project. Chapter Two summarizes the theoretical framework used in this research concerning the formation types and style in relation to the study of pottery. Early typological classifications for American archeology such as the Midwestern Taxonomic Method and system employed by Willey and Phillips are outlined, the use of these systems within archeological work in Red Wing are explained, and updated terminology is fitted within the spatial and temporal contexts of Oneota characteristics in Red Wing, Blue Earth, and along the St. Croix River.

Chapter Three outlines a background of archeological investigations conducted at pure Oneota sites as well as past research on Oneota pottery at those sites. Red Wing sites included in this chapter are the Bartron, Adams, Burnside School, Sell, McClelland, Horse, Armstrong, and Double villages. Blue Earth sites described in chapter three include Vosburg and Humphrey as well as the Sheffield site, along the St. Croix River. In addition, assemblages for further research are recommended to augment the data and conclusions provided in this research. Chapter Four is outlined in a similar fashion as Chapter Three, yet for multi-component sites within Red Wing, which contain Oneota pottery in addition to other typological styles, such as Silvernale and Link. For each site's pottery assemblage examined in this research, factors such as excavation methods and dates, site organization, general size, temporal occupational frame, and associated mound groups or cairns are described in Chapters Three and Four.

Chapter Five presents the methodology utilized in this study in terms of which attributes were examined on specific morphological sections of each specimen, such as the lip, rim, neck, and shoulder, and exactly how these characteristics were measured. Selected attributes were acquired from the results of past studies of Oneota pottery at Red Wing sites (Hurley 1978; Gibbon 1979; Rodell 1997; Fleming 2009; Holley n.d.) as well general manuals of ceramic analysis (Shepard 1985[1954]; Sinopoli 1991). Different from past research conducted on Red Wing assemblages, this research measures significantly more attributes in a multivariate analysis of many aspects of pottery that incorporate style and reflect typological variation.

Chapter Six is a compilation of the descriptive and exploratory statistic results from data recorded for pottery attributes. Statistical programs, such as Microsoft Excel and IBM SPSS were used to compile ranges, means, standard deviations, and variances for numerically recorded attributes as well as frequencies and percentages of nominal data. Unlike past studies of Red Wing, Blue Earth, and Sheffield pottery, multivariate analysis is also employed to view the relationship between several attributes in terms of morphology and decoration. Chapter Seven outlines the processes and results for the two multivariate statistics methods used in this research: Pearson's Correlation Coefficient and Numerical Taxonomy. These methods were employed using IBM SPSS. The results from these methods outline variation within and between samples, which is utilized to support the validity of pottery types.

Chapter Eight is a discussion of the descriptive and multivariate statistics results and how they relate to the current knowledge of the Oneota tradition and current phases within the Upper Mississippi, Blue Earth, and St. Croix River valleys. Results for the presence or absence of particular motifs and compound motifs on vessels from each site are also located within Chapter Eight. In addition, the data results are situated within a broader social and ideological realm connecting many Oneota groups throughout the Midwest to provide a more holistic view of vessel decoration. Suggestions for new vessel type definitions, with quantifiable and qualifiable morphological and decorative parameters, for the Red Wing region, Center Creek locality, and Sheffield site are additionally located within this chapter.

Chapter Nine offers conclusions to this research and recommendations for further research concerning multivariate analysis in pottery studies and the importance of creating testable classifications for pottery types. Data results are reiterated for the facilitation of more informed interpretations of the relationships between different regions of Oneota manifestations.

Appendix I is a glossary of common terms used within this thesis. Pottery specific terminology used to describe aspects of morphology, surface treatment, and decoration are all defined. Appendix II is a compilation of vessel profiles made from measurable segments at each site examine within this research. Appendix III is an accumulation of extra tables necessary to support the conclusions of this research but removed from

Chapters Six, Seven, and Eight to ease the flow of each chapter. Appendix IV is a table of the data results from measuring specific attributes on each pottery specimen. Also within Appendix IV is a code for interpreting the outlined data. Lastly, within Appendix V are tables that synopsize Gibbon's (1979) cluster analysis for Sheffield and select sites within the Red Wing and Blue Earth regions.

"It is very unusual for an archaeological story to truly have a beginning or an end" (Fleming 2009: 3). This project reevaluates the conclusions of past pottery research within southern Minnesota and is a small step towards better comprehending the complex interaction among several late pre-contact groups within southern Minnesota and western Wisconsin through the intricate ways in which people formed and decorated their pottery.

Chapter Two: Types and Styles

"Data are theory laden. In order to be known, all 'data' are approached in some paradigmatic and theoretical framework, whether they are expressed or not" (Arnold 1985: 4).

Background

Pottery is a useful medium for interpreting the patterned behavior of past cultural groups. One method to determine the spatial and temporal boundaries of a group's identity is to recognize and decipher the stylistic patterns in their production and decoration of pottery vessels. A pottery vessel is an artifact that is created entirely on the basis of human ingenuity and shared ideas. Unlike the formation prehistoric stone or bone tools or ornaments, which involves the reduction of an object into a different size and shaped object of the same essence, pottery production starts with the raw material, a lump of clay, and is formed into a substantially different object. This is because pottery is a plastic medium, it is easily malleable into any shape with any decoration the potter chooses (Shepard 1985[1954]: 14; Sinopoli 1991: 11). Thus, cultural objects made of clay can be formed into a myriad of vessel shapes and sizes as well as multiple shapes of figurines, ornaments, furniture, or smoking implements. Again, unlike stone or bone artifact production, the potters are not limited by the material they are using but instead by the boundaries of technique, personal imagination, and social feedback (Schiffer and Skibo 1997). Subsequently due to its inherent plasticity, pottery changes very rapidly through time and space based on technological development and the sharing of stylistic ideas. Similar to clothing fads or hair styles, change can occur quickly based on creativity and cultural feedback. The same avenue of thinking can be applied to the study of pottery; the shape and decoration of vessels change so rapidly and distinctly based on the transferring of ideas and technology that with enough experience and data, archeologists can recognize the connections between those shared ideas and infer an outline of cultural action, social communication, and group membership.

A way in which archeologists can create an understanding of identity and the sharing of ideas through cultural avenues is to analyze artifacts by identifying choice-related attributes within functional categories of objects, i.e., by creating typological classifications. Examining artifacts in terms of style forces archeologists to think about material culture in terms of people and their actions, communication, and cognition (Hegmon 1992: 518). Thus, stylistic analysis is a powerful tool, but unfortunately not all archeological publications hint to a theoretical framework when using or creating types and asserting stylistic behavior. In addition, many researchers do not agree as to what kinds of information is pertinent within certain types or styles and how they should be defined. This chapter will outline the ways in which style and type classifications are used in this research to better comprehend the identity/identities of late pre-contact groups occupying the river valleys within the modern-day boundaries of southeastern Minnesota and western Wisconsin.

Types are archeologists' arbitrary assortments used to outline temporal and spatial patterns in the material record. They are the basic tools used to quantitatively separate artifact attributes in culture analyses of the past (Ford and Steward 1954: 42) and must be replicable and verifiable (Sinopoli 1991:46; Orton et al. 1993: 152). It is important to keep in mind that they are a scientist's recognition of pattering and typologies can change as new data are created through additional archeological research. Archeologists both intuitively separate artifacts based on recognizable differences, such as an everted rim vs. a rolled rim or a corner notched projectile point vs. a fluted point, as well as quantitatively (Sinopoli 1991: 4-5) divide characteristics, such as the degree of rim angle, vessel wall thickness, or debitage size grade.

There are many different factors that go into creating a type. For example, pottery types often include the form of all the morphological features which comprise a vessel's shape, production techniques, material features of raw clay and temper, and alteration of the vessel's surface during different stages of the pottery making process as well as decoration techniques and combinations (Shepard 1985[1954]; Sinopoli 1991). There are even different types of types, which are separated by specific meanings, such as morphological, historical, functional, and cultural (Ford and Steward 1954: 54-57), which allow archeologists to understand them more in a social context and indicate specific stylistic attributes. Also, types can be understood in temporal and spatial parameters by utilizing taxonomic methods, discussed anon in this chapter, which organize cultural interactions and development through time and across social and geographical landscapes. It is the regularity of specific types used through time and space, which provides a basis for archeologists to identify style. Equally, the recognition of a patterned style gives researchers the opportunity reflect upon the types they create and either refute or reaffirm the typology used to outline similarities or differences within the material record. Each reflects on the other, keeping archeological classifications in check with their actual representation of social behavior. Drawing the lines between different types is complicated and not always apparent, thus archeologists are constantly reevaluating the nature of their classifications against emerging data and methodologies.

In order to understand how style works, one must first understand what style is. Multiple activities and attitudes comprise the creation of style, and interpreting styles when one is separated in time and culture from the source is extremely complex; similar to the word “culture,” “style” cannot be easily defined with one denotative sentence. First, style reflects a specific manner of doing something that is particular to a given place and time. Stylistic expression resides in the choices made by individuals in a specific context (Sackett 1977: 370), i.e., social setting, and reflects ways of thinking, feeling, and acting in that social context (Hodder 1990). For example, pottery style can include the choices made between certain types of decoration or vessel form over others and the use of particular vessels in certain social contexts over others. These choices reflect what an individual has learned from members of his or her social group as well as positive and negative feedback (Arnold 1985: 17; Schiffer and Skibo 1997) from those members about the utilization of specific techniques and decorations. Quite often, archeological stylistic analyses are practiced within the realm of pottery because it occurs in abundance at many archeological sites, has potential for rapid development of morphological and decorative features, and is not mutually exclusive from other aspects of material use among groups (Shepard 1985[1954]). Yet, style is not limited to analyses of vessel formation and decoration. One can think of style represented in all aspects of daily human life from the different ways to form a Paleolithic projectile point to different morning routines all based on choices people make in a particular setting based on their cultural context.

The stylistic aspects of a vessel are intertwined deeply with its function, both utilitarian and social. They ways in which people formed and decorated their vessels involved certain choices of intended use and social communication. Certain morphologies can hint to particular functions. Large globular or conical shaped vessels are useful for cooking and or storing significant quantities of food. Vessels formed with constricting necks are useful for containing and transporting liquids. The wide orifices and lack of a defined/constricting necks on various bowl types are useful for mixing, serving, or consuming. The choices potters make when forming their vessels hint to their intended uses and reflect the shared experience within a community as well as the social transference of that experience temporally and spatially. Different decorative patterns on vessels not only have an aesthetic purpose but also display key information about the context in which each vessel was decorated and its intended social function. Vessels of certain forms and decoration can hint to particular uses for specific social activities or ceremonies or for particular subgroups and or classes within a community. In addition to reflecting choices made by potters operating within particular cultural contexts, style is deeply linked to intra and inter group information exchange.

Second, style is defined as a manner of non-verbal communication (Wiessner 1983), which works as an avenue to transmit certain social information within and between groups (Wobst 1977). For pottery, certain decorative symbols and designs can indicate group membership (Schortman et al. 1989: 53), regional relations, status, folklore, or technological and resource sharing. Like a written language or family crest, intricate design patterns on pottery vessels in certain orders convey specific meaning to certain people in particular contexts. In addition, the visibility of pottery decoration can change the ways in which individuals within a social context have to interact with a vessel in order to understand its communicative meaning (Hegmon 1992: 521). Faint, intricate, or small designs force an individual to interact on a close, personal level with a vessel to visualize and interpret its communicative factors, versus broad and large designs, which can be interpreted from a significant distance. “Researchers have recognized that no single theory can explain all aspects of style or all facets of material culture variation, and they have likewise recognized that style is not a unidimensional phenomenon” (Hegmon 1992: 522). A multi-level definition of style allows archeologists to comprehend different social behaviors, interactions, traditions, divisions, and symbolic meanings (Hegmon 1992: 524), which all have an effect upon the material record in certain cultural settings. One can examine style as both a functional aspect of behavior, in terms of actions and choices but also a social aspect of behavior concerning intra and inter group communication and recognition of meaning solely through cognition. The manner in which archeologists go about indicating the inherent style of material culture is through typological classification.

Since archeologists cannot converse with the people they study, inferring behavior from cultural material is necessary. The connection between style and typological classification permits archeologists to analyze artifact assemblages and create meaningful interpretations of past human behavior and social processes (Fleming 2009).

The cultural actions of past humans influence artifact style in many different ways. For example, the choices made by individuals in a social context and the unspoken communicative aspect of pottery style can indicate the emphasis of group identity. Identity can come in many forms of ethnic, gender, economic, ideological, political, or status subgroups. The expression of identity involves symbols or characteristics conveyed to indicate oneself within a group and an outsider's identification of those emblematic characteristics, which symbolize that group (Schortman 1989; Nagel 1994). Since style has a communicative quality that transmits social information, group membership or identity within the realm of pottery production and use can be indicated through the stylistic choices of decoration, vessel form, morphological techniques, and raw materials that are passed between members of a particular group doing things in a particular way. By examining the range of these choices, archeologists can indicate group lines, socially drawn through the sharing of stylistic attributes through time and space. From this, information about inter and intra group trade relationships (Shepard 1985[1954]), marriage patterns, social stratification, and ethnogenesis (Emberling 1997: 307) can be inferred. Also, by examining pottery styles and identity, archeologists can better understand levels of social interaction and specific conditions in which these interactions occur (Willey et al. 1956; Braun and Plog 1982; Wiessner 1983).

Through the analysis of differences and similarities in pottery style at sites of social aggregation, such as the Red Wing region (Schirmer 2002; Fleming 2009; Schirmer n.d.) where different social groups are coming from a broad geographical range to a single location, archeologists can study the temporal and spatial changes in typological factors, such as vessel shape and decoration, to indicate whether identities are coalescing or remaining distinct. In addition, archeologists can infer mythological symbolism by examining the decorative variation of pottery styles. The amount of cultural information archeologists can obtain from analyzing artifact styles is vast and provides researchers with a deeper comprehension of past human behavior. The relationship between types, styles, and cultural information is extremely complex.

Typological patterning or variation within archeological assemblages indicates stylistic choices and non-verbal communication. Style indicates structured cultural behavior occurring in a social and temporal context among individuals within a group. Cultural behavior indicates the social importance of stylistic patterning and differences, which in turn reaffirm the reality of typological distinctions. This research will utilize the theoretical framework of type classifications and stylistic behavior to interpret data recorded from several different measurable attributes on vessels and vessel segments previously identified as part of the Oneota tradition in the Red Wing region. In addition three large Oneota sites along the Blue Earth and St. Croix rivers in Minnesota will equally be stylistically analyzed and multi-variably compared to the vessels and segments from Red Wing. With a solid understanding of types and styles, archeologists can obtain a better comprehension of identity, social interaction, social stratification, trade, resource acquisition, marriage patterns, and ideology of a past social group.

Early Typological Classifications in Midwestern Archeology

The discussion concerning type classifications within Midwestern archeology originated with a conference in Indianapolis in 1935. Scholastic tension among American archeologists stemmed from the lack of homogenous vocabulary and classification methods. W. C. McKern noted that as archeologists began recognizing the comparative potential among artifacts within a large geographical area, they lacked "a specific terminology that is standard with [their] fellow students, by means of which [they] can clearly express [their] maturing concepts" (1939: 303). As more archeological research and data were being produced, the more essential it was for researchers to be speaking the same language. What stemmed from that foundational conference and subsequently outlined in McKern's (1939) publication four years later, was a set of typological terms called the Midwestern Taxonomic Method (MTM), which described cultural interactions and classifications in terms of space within a smaller intra-site level to larger, regional areas. McKern noted that the MTM was rudimentary and with the lack of temporally significant information derived from absolute dating methods, such as radiocarbon dating, it could not fully apply to what he envisioned as a common and descriptively useful language among archeologists.

Thirteen years after McKern's publication, discussions again arose around the importance of a standardized method for describing spatial and especially temporal delineations within archeological research. These discussions led to a new classification method, still employed within the American archeological community today, known in this research as the Willey and Phillips taxonomic system. Under this system, standardized terms, or "archaeological units," hold specific meaning for organizing cultural behavior into space, time, and context (Willey and Phillips 1958). Spatially, classification terms begin with the lowest level of organization: the site. A familiar term in archeology today, a site is a basic unit of stratigraphic study in the form of occupational remnants. A local grouping of sites is referred to as a locality and a larger grouping of sites and localities, defined often by geographical and cultural boundaries, is termed a region. The largest spatial term, an area, is divided by major physical boundaries and cultural homogeny, generally agreed upon by the archeological community (Willey and Phillips 1958: 18-21). Willey and Phillips did write into their system subcategories for each spatial grouping for unique situations, which did not perfectly fit their proposed definitions. Specific to this thesis, the spatial foci of research are within the Red Wing region, Center Creek locality, and Sheffield site of southern and eastern Minnesota and more locally at several sites within the Red Wing region and Center Creek locality.

To describe contextual behavior within the archaeological record, Willey and Phillips borrowed two terms from McKern's Midwestern Taxonomic Method. The component, similar to McKern's definition, is a cultural level within a site. Single-component sites only contain one occupational stratum, indicated by a single type of pottery or projectile point, whereas a multi-component site has different occupational strata designated by a stylistically varying and different artifact assemblage. The other contextual term, a phase, similar to the MTM's "focus," is a component that is distinguishable for cultural classification but is limited to encompass a space no larger than a region and occurs only for a "brief interval of time" (Willey and Phillips 1958: 22).

Temporally, archeological assemblages are split into two time-sequenced classifications: the local sequence and regional sequence. A local sequence is a series of phase, subphases, or components displayed in stratigraphic levels as a particular site. In addition, Willey and Phillips outline "integrative units," which describe the movement of behavior through time and space. A horizon is a spatial regularity characterized by specific cultural traits within an artifact assemblage, which spread through cultural avenues both broadly and rapidly. The means of establishing horizons is through the creation of a horizon style, which is an artifact trend that encompasses a large amount of space in a small amount of time. A tradition is a temporal continuity signified by shared patterns in artifact technology through a wide amount of time (Willey and Phillips 1958: 24-34).

For pottery studies, the most common terms used from the Willey and Phillips system are the phase, tradition, and horizon. Pottery traditions are a common way for archeologists to describe cultural connection through time based on the shared knowledge of pottery manufacturing through generations. The Oneota tradition is common through the western portion of the Midwest in artifact assemblages from Minnesota, Wisconsin, Iowa, Illinois, and Missouri. It is signified by pottery characteristics, such as globular shaped vessels with everted rims and decorative patterns, which include chevron and birdtail motifs as well as geometric patterns created by horizontal, vertical, and oblique lines and punctate borders drawn into the vessel paste before firing. Within the Oneota tradition, there are four proposed horizons (Emergent, Developmental, Classic, and Historic), which outline shifts in pottery traits during small segments of time from A.D.

950-1650 (Overstreet 1995: 34). Although these horizons fit within the regional sequences and assemblages in central and eastern Wisconsin for which they were developed, they do not correlate with the cultural patterns and time frames for the Oneota manifestations in Red Wing, Center Creek, and Sheffield (personal conversation with Ronald Schirmer 2016) and will not be used for this research. Equally within the Oneota tradition, there are several phases in different geographical locations to describe pottery manufacture continuity during brief time periods. Some of the phases discussed in this research will be the Blue Earth, Bartron, and Spring Creek phases within the Oneota tradition.

Summary

Although the complex network of outlining pottery typologies and styles concerns specific aspects of the material culture, it ultimately leads archeologists down the path of understanding potters and their network of communication and the social context in which they lived. Although archeologists can get caught up in the use of terms or the measuring of thickness and angles of different aspects of a pottery vessel, the role of the potter should never be far out of mind because it is that individual who is the center of pottery research. The vessels and vessel segments measured for this research were all formed by individuals' hands; each vessel is slightly unique in its form and decoration. Thus, the typologies created for prehistoric vessels will reflect some sense of internal variability due to the hand-made nature of vessel production. Yet, this variability in form and decoration does not affect the patterned choices. They were created according to the ideal factors in the potters’ minds (Arnold 1985), in a social context influence by cultural phenomenon such as traditions, technology, social feedback, etc.

Chapter Three: Background I: Oneota Villages

"In as much as Red Wing is a part of the modern community, it was originally a set of ancient communities that were dynamically related in various ways to other regional communities"
(Schirmer n.d.: 1).

Background

This research focuses specifically on pottery recovered from the many habitation sites within the Red Wing region of southeastern Minnesota and southwestern Wisconsin, occupied around AD 1000-1450. Equally, pottery attributes from some village sites located along the Blue Earth River in southcentral Minnesota and the St. Croix River in eastern Minnesota, north of the Red Wing region, will be incorporated into this study. There has been over six decades of archeological research conducted within the Red Wing region. Numerous late pre-contact, large villages and small hamlets have been recorded and excavated as well as tens of thousands of artifacts recovered from field surfaces, house basins, middens, storage/refuse pits, and mound fill.

The Red Wing region is comprised of eleven large and small village sites in addition to numerous other small hamlets, mound groups, and poorly known sites located on the floodplain terraces along the conjunction of the Cannon, Mississippi, Trimbelle, and Vermillion Rivers as well as the Spring and Hay Creeks. In previous research, this area was referred to as the Red Wing locality, which encompassed around 400 square kilometers (Schirmer 2002: 54). This defined area originally included seven villages sites (Silvernale [21GD03], Mero [47PI02], Bryan [21GD04], Energy Park [21GD158], Bartron [21GD02], Adams [47PI12], and Sell [21GD96]) (Rodell 1997) and surrounding mound groups of which five were within the city limits of modern-day Red Wing, Minnesota, one along the southern tip of Prairie Island, and another on the western coast of Wisconsin. These villages were the focus of a great deal of archeological investigation during the mid to late 20th century from institutions, such as the University of Minnesota, Institute for Minnesota Archaeology (IMA), Wisconsin Archaeological Society, and Minnesota State University, Mankato. More recent research within the past decade has spatially expanded the understanding of interaction in Red Wing to include multiple villages in the Spring Creek and Hay Creek valleys (McClelland [21GD258], Horse [21GD204], and Burnside School [21GD159]), up the Cannon River valley (Belle Creek [21GD72] and Area 51[21GD290]), along the southern end of Lake Pepin in Wisconsin (Armstrong [47PE12]), and north of the Mero site in Wisconsin (Double [47PI81]). These site additions to the Red Wing complex, in addition to its multi-phase internal complexity and regional intergroup communication, have pushed it beyond the temporal, spatial, and cultural boundaries of a traditional "locality" outlined in the Willey and Phillips taxonomic system (1958) and correspond more appropriately with the definition of a "region" (Schirmer n.d). Although the location of interest for this study will hence be referred to as the Red Wing region, previous research mentioned within this chapter and Chapter Four utilized the identity of Red Wing locality.

The Red Wing region has been the focus of significant archeological research spanning the past 130 years. Early interests concerning the prehistoric past of the region began in the 1880's with the invaluable maps created by Alfred Hill and Theodore Lewis as part of the Northwestern Archaeological Survey. During a fifteen year expedition, Hill and Lewis mapped more than 10,000 mounds in Wisconsin, Iowa, and Minnesota. In the Red Wing region, they extensively mapped several mound groups, including more than 2,000 mounds (Winchell 1911; Gibbon and Dobbs 1991), surrounding many of the large villages, which lie directly above the Cannon and Mississippi Rivers. Today, these maps are irreplaceable; the intensive agricultural, residential, and industrial development of the 20th century in Red Wing has destroyed many of the prehistoric mounds. The Hill-Lewis maps are some of the only resources archeologists have to understand mound shape, size, and location. Equally invaluable to archeologists today are the maps and personal accounts of Jacob Brower (1903). During the early 20th century, Jacob Brower, with an interest in 17th century fur trading, charted many prehistoric mounds and village sites within modern day Prairie Island and Red Wing before they were profoundly destroyed in the following decades (Figure 3.1). Although Hill, Lewis, and Brower did not focus on detailed site interpretation or excavation, their interests in mound/village placement and behavior in the past sparked a century of intensive research concerning many archeological sites without which this project would not be possible.

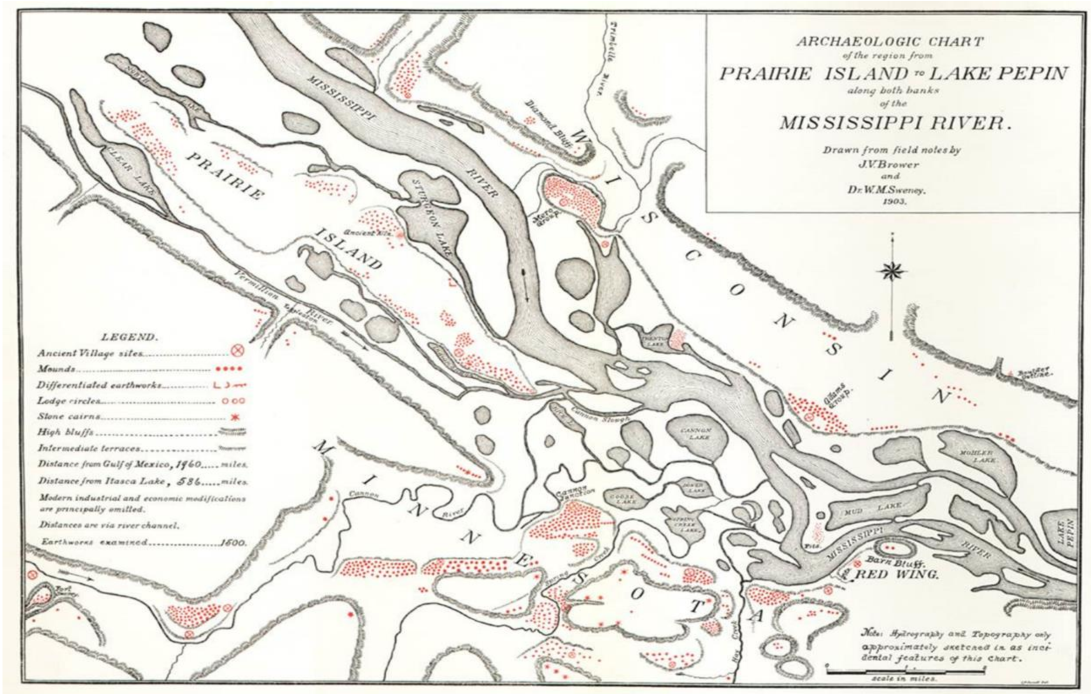

Figure 3.1: Mounds charted by Brower (1903) and Sweeney within the Red Wing region.

Based on decades of field and laboratory work conducted by Wilford, Johnson, Gibbon, Dobbs, Holley, Fleming, and Schirmer, the cultural affiliation of several Red Wing sites have been connected to a broader Oneota complex, which comprises material culture similarities, especially within pottery, among numerous sites within the modern boundaries of Minnesota, Wisconsin, Iowa, and Illinois. Two Oneota phases have been proposed for the Red Wing region: the Bartron and Spring Creek phases (Schirmer 2016; Schirmer 2017; Holley n.d.). These taxonomic separations divide Oneota sites and characteristics within the region both temporally and spatially. The Bartron phase spans from AD 1150-1300 (Schirmer 2016; Schirmer 2017) and is present at the pure Oneota and multi-component sites of Bartron, Adams, Energy Park, Bryan, Silvernale, and Mero.

What is known as the Bartron phase today was originally classified as the "Blue Earth focus" by Wilford in 1955. Wilford used the existing Midwestern Taxonomic Method (MTM) developed by W. C. McKern (1938) to describe the cultural identity of the Bartron site as being within a Minnesota-based Blue Earth focus, belonging to the larger, regional "Oneota aspect," and mentioned the site's stylistic relationship to other Blue Earth focus sites located along the Blue Earth River 30 miles south of Mankato, Minnesota (Wilford 1955: 140; Gibbon and Dobbs 1991). Several decades later, Dobbs and Breakey (1987) reevaluated the Red Wing region in conjunction with the newer Willey and Phillips taxonomic system (1958). They proposed an "Adams phase" designation for the Oneota components in Red Wing. In later research, the previous "Blue Earth focus" and "Adams phase" have been reassigned as the "Bartron phase" connecting it with the original type site identified by Wilford (Fleming 2009; Schirmer 2016; Schirmer 2017; Schirmer n.d.; Holley n.d.). A phase, or "an archaeological unit possessing traits sufficiently characteristic to distinguish it from all other units" (Willey and Phillips 1958: 22), better defines the temporal and spatial parameters of artifacts characteristic of the Oneota component in Red Wing. This research adheres to the use of the Bartron phase for the Oneota cultural material from occupational strata within sites along the Cannon and Mississippi River valleys dating to around AD 1150-1300.

Recent research (Schirmer 2017; Henning and Schirmer n.d.) into Oneota occupations in Red Wing have suggested a second Oneota phase within the region dating to around AD 1300-1400 (Schirmer 2016). Termed the Spring Creek phase, this newly suggested separation in the Oneota pottery complex highlights two distinct time periods:

an earlier Bartron phase within the Cannon and Mississippi River valleys, which would include the Bartron, Silvernale, Bryan, Energy Park, and Mero villages, and a later Spring Creek phase within the Spring and Hay Creek valleys, which would include the Sell, Burnside School, McClelland, and Horse villages. The morphological and decorative aspects of vessel segments from sites included in this more recently identified phase is investigated in this current research.

Red Wing Sites

Each site described below is of particular use in this research as either having pottery identified as being a part of the Oneota tradition or as being identified as a purely Oneota site, absent of other contemporary, local pottery traditions. A majority of the information known, artifacts recovered, and features identified at the numerous sites within the Red Wing region were only possible through the countless hours of excavation conducted by field crews, aspiring archeologists, and hopeful, energetic, and dehydrated university students attending field schools held by the University of Minnesota and Minnesota State University, Mankato.

Bartron (21GD02)

The Bartron Site is a village located along the southern coast of modern-day Prairie Island, in the Mississippi River, north of the current city of Red Wing. It was one of the first sites excavated in the Red Wing region during the mid-20th century. The village area is less than ten acres in size (Fleming 2009: 49) situated near a mound group of around 51 mounds (Winchell 1911: 143-150). These mounds were not all created during the Oneota component at Bartron. The recovery of several grit-tempered sherds of varying styles suggests that the mound group was used and added to continuously from the Middle Woodland period to the late pre-contact (personal conversation with Ronald Schirmer 2017). Lloyd Wilford began an archeological investigation at Bartron during the summer of 1948 under the University of Minnesota. At the time of his excavations, most of Bartron was being used as pasture land (Gibbon 1979: 91), which caused a significantly less amount of damage to the subsurface village as opposed to cultivation or structural construction. During his two week field session, Wilford opened a 609 square-meter block in which he excavated 11 pit features averaging at around 46 centimeters in depth. From these 11 features, his crew recovered more than 4,000 sherds of which a significant amount were shell-tempered (Gibbon 1979: 112; Fleming 2009: 50). Half of the sherds recovered from the 1948 excavation were very small. Wilford referred to these small sherds as crumbs (Gibbon 1979: 112) that contributed very little to understanding Bartron's pottery complex.

Bartron was again excavated in 1968 and 1969 under Elden Johnson and the University of Minnesota. Johnson's excavations during the summer of 1968 were focused on finding the boundaries of the village site. He opened multiple one meter by five meter trenches in which 12 pit features were identified including six fire pits and six cylindrical refuse pits (Gibbon 1979: 95). In addition to the pit features, Johnson identified two structures, one rectangular post mold, and one rectangular feature he originally identified as a wall-trench (Gibbon and Dobbs 1991). Although wall-trench structures are often attributed to a Mississippian tradition influence from southern Illinois, the possible wall trenches found at Bartron came to a completed corner, according to Johnson, which is not characteristic of Mississippian style wall-trench structures (Gibbon and Dobbs 1991). In later excavations conducted by the Minnesota State University, Mankato, this interesting anomaly was re-identified as a conjunction of multiple features to create an illusion of a right-angled structure (personal conversation with Ronald Schirmer 2016). Johnson was also interested in a "linear ridge," which may have indicated a palisade wall. He opened a two meter by two meter excavation unit and uncovered a couple large post molds (Gibbon 1979: 93-99; Fleming 2009). During the following field season in 1969, Johnson opened more trenches in search of site boundaries and identified 26 more pit features. Additionally, he and his students uncovered two other rectangular post mold structures with associated pit features (Gibbon 1979: 99; Fleming 2009: 53). These structures uncovered by Johnson over half a century ago are some of the only archeologically excavated structures within the Red Wing region to date.

Excavations at Bartron ceased for almost 50 years until in 2008 Ronald Schirmer, along with students from the Minnesota State University, Mankato, reopened investigations into the interesting structures and features of the Bartron site. In addition to reinterpreting the anomalous trench feature identified by Johnson in 1968, they also discovered several large pit features below Johnson's old excavation units containing grit-tempered sherds, as well as multiple features concentrated in the eastern part of the site, containing shell-tempered sherds.

Importantly, not present at Bartron are other contemporary and preceding cultural phases to the Red Wing region, such as the Silvernale phase (Schirmer 2016), indicated by particular morphological and decorative pottery characteristics such as rolled rims and scroll motifs (Fleming 2009; Holley n.d.). Thus, the Bartron site is what several archeologists working in Red Wing have termed a “pure Oneota” site within the region. Based on pottery characteristics, the following sites also fall into this pure Oneota categorization.

Adams (47PI12)

The Adams site is another large village within Red Wing, located along a lower terrace on the western edge of Wisconsin in Pierce County. It is directly across the Mississippi River from most of the sites within the Minnesota part of the Red Wing region. It was occupied for a short period of time around AD 1110-1150 (Gibbon 1979). The Adams site, about 80 acres in size (Fleming 2009: 66), is comprised of a nine acre (Wendt 2001) village and mound group along the eastern edge of the habitation area. In 1885, Lewis recorded 97 intact mounds within this group, with the possibility of there being additional mounds destroyed by cultivation (Fleming 2009: 65). Almost twenty years later, Brower (1903: 66) recorded 74 mounds within the Adams site complex, already indicating the rapidity of mounds destruction by agricultural activity. During the summers of 1978 and 1981, Adams was surveyed by the Great River Road Survey to determine the extent of the site, yet only a few non-diagnostic artifacts were recovered from this survey (Penman 1984).

The site was again surveyed in 1983 and 1984 by Clark Dobbs and the Institute for Minnesota Archaeology (IMA) (Dobbs 1986; Gibbon and Dobbs 1991; Fleming 2009). The results of these preliminary surveys outlined discrete clusters of artifacts within the site with a significant number of vessel segments, stone tools, gaming implements, and copper objects. The IMA returned to the Adams site in 1985 in order to conduct limited subsurface excavations (Gibbon and Dobbs 1991) to better explore the clustered areas. Most of the units exposed feature basins directly below the plow zone, suggesting the presence of above ground trash middens at Adams instead of deep refuse pits (Gibbon and Dobbs 1991). The Oneota cultural affiliation of the Adams site, outline by Gibbon and Dobbs (1991) and reaffirmed in Fleming (2009) as well as Holley (n.d.), is closely tied to the Armstrong site, located south of Adams near the southern end of Lake Pepin, and the Bartron site.

Burnside School (21GD159)

Located within the northern end of the Spring Creek valley, a few miles south of the larger Bryan site (21GD04), Burnside School is a small habitation area, about an acre and a half in size, with a small associated group of four conical mounds (21GD33) (Fleming 2009: 47). The mounds were identified and mapped by Lewis almost a century before the village was discovered (Winchell 1911; Fleming 2009: 470). Recent radiocarbon dates of the site place its occupation to around AD 1290-1400 (Fleming and Koncur 2016; Schirmer 2016). The habitation site was originally identified in 1984 by Clark Dobbs (1985) with the IMA during a broader survey project for the city of Red Wing. It was surface collected in 1989 and 1990 as part of a larger phase II archeological investigation into the prehistoric nature of the Spring Creek valley (Dobbs 1990). In previous archaeological studies of the Red Wing region, Burnside School, and other sites within the Spring Creek valley, were not included in the original Red Wing complex

(Fleming 2009: 49). Yet, this study includes Burnside School because of its presence of Oneota pottery.

Burnside School was the location of a field school excavation during the summer of 1995 in association with the IMA (Boden 2007). The purpose of this investigation was to obtain a better understanding of Burnside's cultural affiliation as well as the nature of smaller villages within the Red Wing region in comparison to the larger villages, such as Bryan and Silvernale, to the north along the Cannon River. During this season, 40 one meter by one meter units were excavated, based on artifact clusters identified during the 1989 and 1990 surface collections as well as previous shovel and geophysical testing. The results of the 1995 excavations included the identification of eight pit features and numerous sherds and vessel segments, which were documented as being shell-tempered jars with distinct constricting necks, high rims, and ornate trailed decoration (Dobbs 1990; Fleming 2009). These preliminary results of the morphological and decorative nature of Burnsides School pottery are more deeply investigated in this study and compared to characteristics at other small villages within the Spring Creek Valley and the larger villages along the Cannon River.

Sell (21GD96)

The Sell site is also located in the Spring Creek valley, which similar to many small and large village sites within Red wing, includes a village area and mound complex. The 20 mounds within this complex vary in shape. The site was first identified by landowner Sidney Mauer who reported the site's existence in 1972; it was originally called the Mauer Lithic Scatter but has also been informally referred to as the Mauer

Farm site and Spring Creek site (Fleming 2009: 48). It has also been called the Sell site in recent literature. Sell is located slightly upstream from Burnside School along the east side of the modern-day Spring Creek (Fleming 2009: 48-49). It was the location of an archeological investigation in 1990 in association with the IMA under Clark Dobbs (1990). More than 10,000 artifact were recovered from the extensive surface collection of numerous five meter by five meter grid units and the site was reported as a village more characteristically associated with Oneota occupations (Dobbs 1990: 36).

Two decades later, Sell was again the focus of archeological investigation, which sought to better interpret the temporal and spatial distribution and cultural affiliation of material remains within the site. The 2010 field school excavations at Sell, led by Ronald Schirmer under Minnesota State University, Mankato, opened five one meter by two meter excavation units revealing one large pit feature and several prehistoric artifacts within the plow zone matrix. Time constraints restricted the excavation of the features but several shell-tempered sherds recovered from the excavation units confirmed Dobbs' original affirmation of an Oneota manufacturing style similar to habitations sites within the Cannon River valley, Mississippi River valley, Prairie Island, and southern Spring Creek valley. The material culture excavated from Sell has yet to be fully analyzed thus only a single pottery specimen, specifically from the 2010 MSU excavations, is included in this study to better illuminate Sell's relationship within the Oneota complex at Red Wing.

McClelland (21GD258)

The McClelland site is a large Oneota village located within the modern city of Red Wing in the Hay Creek valley south of the Cannon River. The site is over 20 acres in size and is representative of later occupations in the Red Wing area, dating to around AD 1330-1420 (Schirmer 2016). It was first identified in 2006 within a cultivated field during a summer field school in association with Minnesota State University, Mankato led by Ronald Schirmer. During this field school, the site was extensively surveyed to determine site boundaries, but no subsurface testing was completed. Many diagnostic artifacts were recovered from the surface, including high, straight rims indicative of Oneota pottery. In addition, few small decorated shoulder sherds with panels of horizontal, vertical, and oblique lines as well as punctate borders were found during initial reconnaissance. Only one neck sherd, with a round interior shape, was recovered from the 2006 surface collection. Subsurface investigation at McClelland began in the summer of 2010, again under Ronald Schirmer and MSU, Mankato. Schirmer and his students opened three, two meter by one meter blocks in the southeast portion of the field where large surface artifact clusters were previously identified (Koncur n.d.). After expanding some of the units, they identified and excavated five large pit features. Several vessel segments were recovered from this excavation season, including a significant portion of an intricately designed segment, termed the McClelland Vessel. The site was again excavated by MSU, Mankato students during the latter weeks of its 2015 field school to better determine the nature of the site, in terms of cultural affiliation, the extent and nature of archeological deposits, and its relationship to nearby sites (21GD95 and 21GD204), excavated weeks prior. During this excavation, two blocks, one containing 15 one meter by one meter excavation units and the other containing ten one meter by one meter units and two one meter by .5 meter units, were opened and an additional five pit features identified and excavated. Within these features, numerous stone and bone tools as well as rim sherds and one large vessel segment were recovered. The analytical results of the pottery recovered from the 2010 and 2015 excavations are included within this study (See Chapter Six, Seven, and Eight).

Horse (21GD204)

The Horse site (also called Struz 1) is located northwest of the McClelland site in the Hay Creek valley. The site was first reported in 1983 by Dan Wendt. It was originally surface collected to determine site boundary and cultural affiliation. In the original report, the Horse site was interpreted as an extension of the nearby mound site, 21GD55; yet upon further investigation, it was given a separate official site number in 1996. Wendt reported a crescent-shaped artifact cluster on the surface of the site about 3.5 acres in size, indicating, possibly, the primary area of habitation at Horse. Twenty-three shell-tempered sherds were recovered from the 1983 survey and Wendt identified the site as connecting culturally to other Oneota villages in the region, such as Bartron. No subsurface testing was conducted when the site was first identified. The Horse site was the focus of a 2014 week-long survey by volunteer graduate students with the assistance of high school students from the Great Rivers School in St Paul, MN. Artifacts were flagged and collected within a grid, but all diagnostic artifacts were plotted using a portable GPS Trimble unit. Artifact clusters were identified by entering artifact types and counts by grid square into a computer program (ArcGIS) imposed upon a satellite image of the site. During the 2014 survey, one undecorated shell-tempered pottery sherd was recovered, as well as unnotched triangular projectile points, end scrapers, one celt, and several flakes made primarily of Prairie du Chien Chert, Grand Meadow Chert, and Hixton Orthoquartizte. These data were utilized, along with geophysical testing of the site conducted by Don Johnson, to determine the most beneficial locations to open excavation units in 2015 during a summer field school session under MSU, Mankato. Three trenches were opened in areas with dense clusters of surface artifacts. Numerous lithic, botanical, zoological, and pottery material were found within these trenches in addition to two identified features: one post mold and two pit features. After excavation, one of the pit features proved to be sterile beyond some organic staining. This feature was most likely an empty pit, which filled naturally after the village was abandoned. Only one heavily burnt vessel segment was recovered from the 2015 excavations at the Horse site, the segment is included within this study but the incomplete lip and exfoliated surface limited the amount of useful information about the segment.

Oneota Sites outside Red Wing

Three additional Oneota sites within south central and east central Minnesota are included within this research. These sites have in the past been identified, similar to the sites in Red Wing, as having Blue Earth Oneota pottery. Two of these sites outside of the Red Wing region have been recently excavated and radiocarbon dated. Vessel segments from these sites, housed at Minnesota State University, the Science Museum of Minnesota, and the Minnesota Historical Society were examined using the same methods and attributes as Oneota vessel segments from the Red Wing region so that a statistical comparison can better delineate the stylistic variation of Oneota characteristics among slightly contemporary regions within southern and eastern Minnesota.

Vosburg (21FA02)

The Vosburg site, located in Faribault County along the Blue Earth River, was first documented in 1938 by Wilford. Vosburg is a large village around 12 acres in size, which currently resides within a cultivated field. It is part of the Center Creek locality, which includes 41 prehistoric sites (Dobbs 1984b) near the convergence of the Center Creek and Blue Earth River. Also part of this locality are two large villages, Humphrey (21FA01) and Durkee (21FA50), which are culturally similar to Vosburg. Wilford began surveying the Blue Earth River valley in the early 1930’s, before his excavations at Red Wing, and began initial excavations at Vosburg in 1947. During this fieldwork, Wilford identified seven features and recovered 1,065 pottery sherds (Wilford 1952: 3-5).

Very little archeological research was conducted in the Blue Earth region during the 1950’s and 60’s beyond amateur artifact collections from local community members. Gravel mining during the mid-1970’s exposed several pit features, which were mapped and some artifact recovered by local historical society volunteers (Dobbs 1984b). Professional investigation began again in the late 1970’s during a summer field school led Guy Gibbon and Michael Scullen under the University of Minnesota and Minnesota State University (then called Mankato State University). Gibbon and Scullen were interested in locating structures to better understand village organization; yet, what they uncovered were 67 bell shaped, shallow basin, and oval shaped features capped with a thick layer of gravel and sand (Dobbs 1984b: 91). Although they found no structures, the high density of features, which often overlapped, suggested a significant occupation at the site, a factor that was reaffirmed by excavations more than thirty years later. In 1980 and 1981, Clark Dobbs extensively surveyed the Blue Earth River valley, including the Vosburg site, to better outline Oneota presence within the Center Creek locality (Dobbs 1984b).

The results of Dobbs' 1980 and 1981 survey of the Vosburg site as well as the 1979 excavation were incorporated into Dobbs' dissertation research focusing on site organization within the region. In addition, Dobbs radiocarbon dated botanical material associated with a few of the pottery sherds he studied. The results from the radiocarbon testing showed a series of disjointed dates ranging from the early 800's to 1900's (Dobbs 1984b: 96). Allowing for some dating errors due to contamination and laboratory variation, Dobbs interpreted these results as a series of occupations more realistically beginning in the early 11th century and ending around the late 17th century with the height of occupation occurring during the 13th to 14th centuries (Dobbs 1984b). The dense concentration of pit features and significant variation of pottery style at Vosburg led Dobbs to conclude that the site had a very long occupation. Recent radiocarbon dating has placed certain contexts of Vosburg within AD 1350-1400 (Schirmer 2016). Some of these dates directly relate to the contexts of several vessel segments measured in this research.

Vosburg was again examined in the summer and fall of 2012 and spring of 2013 by graduate and undergraduate students from Minnesota State University, Mankato. They opened two large blocks with an intersecting trench to better investigate a linear anomaly.

They uncovered a total of 13 features, which were densely packed, overlapping in several instances, and capped with thick layers of gravel, which mirrored the results of the 1979 excavation. Several large vessel segments were recovered from these features, including a particular vessel with a Thunderbird motif and lip tabs (see Chapter Eight). These vessel segments are incorporated into this research as well as those from earlier excavations housed at the Minnesota Historical Society and Science Museum of Minnesota.

Humphrey (21FA01)

The Humphrey site is also part of the Center Creek locality. Humphrey is a multi-component site, about 12 acres in size, and is located a half-mile from the Vosburg site (Wilford 1952). Mainly, the Humphrey site was a large late pre-contact Oneota village with a smaller and earlier Woodland occupation. Excavations at Humphrey began in 1938, when Wilford salvaged part of the site from intensive gravel mining (Dobbs 1984b: 63). During his fieldwork, Wilford's crew unearthed 30 circular and elliptical pit features as well as hundreds of shell and grit-tempered sherds and vessel segments (Wilford 1952). The collection is now housed at the Minnesota Historical Society. Humphrey was the original type site for Wilford's defined Blue Earth focus, now termed Blue Earth phase (Dobbs 1984b). Besides some survey work conducted in the area by Anfinson and Gibbon in the 70's as well as Dobbs in the 80's, no other archeological investigations into the Humphrey site have been attempted.

Although no radiocarbon dates exist for the Humphrey site, its close relationship concerning cultural material to Vosburg can place the village occupation to around AD

1350-1400. Dobbs (1984b) included diagnostic sherds and segments from Humphrey into his dissertation research, to better outline the assemblage and settlement patterns of Blue Earth Oneota habitations (see the “Past Oneota Typologies” section of this chapter for his results). The 1938 assemblage is incorporated into the research as another quantifiable example of vessel characteristics from the Blue Earth River valley in comparison to those from the Red Wing region and Sheffield site.

Sheffield (21WA03 and 21WA13)

The Sheffield site is located in Washington County, Minnesota upon a low terrace along the St. Croix River. It is five acres in size, occupied around AD 1295-1425 (Fleming and Koncur 2015). Sheffield was previously interpreted as a site containing a Blue Earth Oneota component (Wilford 1961; Gibbon 1973; Gibbon 1979), but more recent excavations and interpretations of the site suggest Sheffield within a different temporal and spatial sequence, more closely linked to the Brice Prairie phase in the La Crosse locality (Fleming 2014; Fleming and Koncur 2015).

Archeological investigations at Sheffield began in 1951 under Wilford and the University of Minnesota. Wilford and his crew tested a large area of the village and a nearby Woodland mound, noticing several shell-tempered sherd on the surface near a bisecting road and along a wood line (Wilford 1961). Wilford returned to the site in 1955 for additional testing and began intense subsurface excavations of the village area in 1956 (Wilford 1961; Gibbon 1973: 3). He opened a 100 foot by 50 foot block in which a total of 13 features including shallow basins, charcoal concentrations, and fire hearths as well as an above ground midden were identified. Pottery sherds were the most commonly found artifact at the Sheffield site. Wilford and his crew recovered 1,886 shell-tempered sherds and segments from the surface and within features during the 1951 and 1955 survey seasons as well as the 1956 excavation (Gibbon 1973: 10). Sheffield was again excavated in 1959 and 1960 by Peter Jenson of the Science Museum of Minnesota (Gibbon 1973: 3; Fleming and Koncur 2015).

Excavations at Sheffield resumed in 2013 and 2015 under Ed Fleming, the Science Museum of Minnesota, and University of Minnesota as a research site for summer field schools. During the 2013 field season, 15 square meters were excavated within the northern portion of the site, revealing 10 pit features, post molds, and a stone cairn (Fleming and Koncur 2015). During the 2015 excavation, three blocks were opened, one of which expanded an earlier block from 2013, and 8 features identified (personal conversation with Jasmine Koncur 2016). The assemblages from these two seasons are currently housed at the Science Museum of Minnesota. Vessel segments recovered from the 2013 and 2015 excavations, as well as those recovered during the 20th century by Wilford and Jenson housed at the Minnesota Historical Society and Science Museum of Minnesota respectively, are incorporated into this thesis research.

Additional Data

Due to time and travel constraints, assemblages from the Armstrong and Double sites were not measured for this thesis research; yet, they are described below as part of the Oneota tradition within Red Wing. Both assemblages are currently housed in Madison, Wisconsin at the Wisconsin Historical Society.

Armstrong (47PE12)

The Armstrong site is located in Pepin County, Wisconsin along the eastern bank of the Mississippi River several miles south of the Adams site. The site consists of a single-component habitation area of about 55.7 square meters, dating to around AD 1100-1190 with several recorded mounds located around the village area (Hurley 1978: 10-11). It was first identified in 1949 by the Reverend Thorley Johnson who, in his report, attributes the site to the Orr focus (part of the Oneota aspect), a taxonomic classification from the MTM (McKern 1938).

The Armstrong site was again surveyed in 1971 as part of a wider investigation into the prehistoric past within the surrounding Chippewa and Buffalo River valleys (Hurley 1978: 4) and was chosen for more extensive subsurface testing in the spring and summer months of 1972. The results of these investigations were published by William Hurley in 1978. The 1971 survey consisted of intensive surface collecting and a single one meter by one meter test unit to locate artifact clusters and site boundaries. The 1972 excavations further investigated the artifact clusters identified in 1971, the village boundaries, and the surrounding mounds (Hurley 1978: 9-11). Pit features and post mold structures with house basins in addition to a small separate site (47PE7) consisting of a concentration of artifacts similar to those found within the larger Armstrong site were identified during these excavations.

Double (47PI81)

The Double site is located upon a high terrace in Pierce County, Wisconsin, upstream from the majority of the Red Wing region villages. It is a small village of about two acres, occupied around AD 900-1300 (Rodell 1997), with an associated mound group of 35 linear and conical mounds. Many of the mounds were mapped by Lewis in 1887 but the location of the village area remained unknown for almost a century after Lewis' survey. Due to constant gravel mining during the early and mid-20th century, most of the site had been destroyed by the time it was identified in 1981. The archeological investigations of 1981 and subsequently in 1984, led by John Penman and the Wisconsin Historical Society for the Great River Road Survey, outlined site boundaries and mound locations as well as mitigated remaining portions of the site, which would have been destroyed in upcoming road construction (Penmen 1984; Penmen and Sullivan 1995). Two of the remaining mounds (Mound A and K) were excavated in the survey. A block excavated in the center of Mound A revealed two pit features, interpreted as possible burial pits, and several shell-tempered pottery sherds within the mound fill matrix. Within the fill of Mound K, burned mammal remains and charcoal were recovered as well as a few grit and shell-tempered sherds. No human remains were identified in either mound (Penmen and Sullivan 1995; 130). Additional testing between some of the mounds indicated very little occupational debris (Fleming 2009: 69).

Within the village area, two blocks were excavated, one within the wooded area southwest of the existing mounds and the other near the edge of the existing gravel pit (Penman and Sullivan 1995; Fleming 2009). A single structure was identified, interestingly with no associated storage or refuse pits, as well as vessel rims, displaying the signature Bartron phase high, straight rim, common at Oneota sites. Currently, no other archeological investigations have occurred at Double since the mid-1980's, undoubtedly due to the continuation of gravel mining and destruction within the site area.

Past Oneota Typologies

Many studies throughout the past 60 years have focused on trying to define Oneota pottery from the Upper Mississippi, Blue Earth, and St. Croix River valleys by using select morphological and or decorative features. What all the studies described in this section lack are detailed quantifiable and qualifiable parameters of all possible morphological and decorative features to validate their typological conclusions. Earlier definitions of pottery style throughout the 20th century used the affiliation of Blue Earth Oneota as an umbrella term to describe Oneota characteristics regardless of geographical or temporal differences within Minnesota.

Red Wing region.

Past efforts to define Oneota pottery within the Red Wing region began with Lloyd Wilford. Wilford's (1955) definition of Oneota pottery was based on his 1948 excavations of the Bartron site. A later publication (Wilford 1984) incorporated results from the 1951, 1955, and 1957 excavations at the Bryan site. As mentioned previously, he defined the region's Oneota affiliation as being part of a "Blue Earth focus," the same in taxonomic classifications as the pottery recovered from large habitation sites along the Blue Earth River. Using the MTM, Wilford (1955; 141) stated that this focus belonged to a broader classification called of the "Oneota aspect," which was prevalent in the upper Midwest from the late pre-contact to early historic period.

He categorized the overall vessel morphology created and utilized at Bartron and Bryan as mostly shell-tempered globular shaped jars with high outward flaring, or everted, rims, round shoulders, and mostly plain loop handles, although decorated strap handles did occasionally occur within the assemblage (Wilford 1955: 140-141; Wilford

1984: 30-31). Average orifice diameter for Bartron vessels from Wilford's excavations is around 26-27 centimeters (Gibbon 1979: 113). Wilford stated that Blue Earth focus pottery in Red Wing included a decorative pattern of rectilinear lines configured in chevron motifs often bordered by a row of punctates (Figure 3.2) (Wilford 1955: 140-141). Wilford later identified Oneota pottery in Red Wing as the Cannon Incised type (Wilford 1984: 30-31). Although lacking in specific quantifiable parameters of what "high" or "flaring" rims mean, Wilford's limited definition of Bartron and Bryan pottery was the first attempt to define Oneota material culture in the region. Decades later, in an analysis of pottery from three large Red Wing sites (Bartron, Silvernale, and Bryan), Guy Gibbon (1979) recorded in more detail the morphological and decorative features of Oneota segments and rims. His results gathered from these sites, specifically the results he identifies as being characteristic of an Oneota presence, are reanalyzed in this study in conjunction with more recent excavations, current statistical methods, and a larger assemblages from many different sites in Red Wing and southern Minnesota.

Figure 3.2: Example of "Bartron Focus" pottery from the Bartron (21GD02) site within the MHS collection.

Hurley's (1978) analysis of the ceramic assemblages at Armstrong revealed three major stylistic types: Armstrong Plain, Armstrong Chevron, and Armstrong Trailed, which he asserts are morphologically and decoratively more similar to Oneota assemblages from the Red Wing region than the Orr phase. Features that are representative of Orr phase pottery, such as short rims, flaring handles, narrow and shallow trailing as well as an absence of interior rim decoration (abundantly present at Armstrong), are not represented within the Armstrong assemblage (Hurley 1978: 90) and thus Armstrong is no longer considered an Orr phase site. In his study, Hurley identifies Armstrong as a Silvernale phase site, represented at that time in many assemblages within Red Wing (Hurley 1978: 3). However, his results align more with the Bartron phase as described in Gibbon (1979), Fleming (2009), Schirmer (2016; 2017), and Holley (n.d.). In addition, Hurley (1978: 93) mentions a cultural connection, through pottery style, between the Armstrong site and other later sites located along the Blue Earth and St. Croix rivers in Minnesota but does not explicitly state how these assemblages are related. Some of the main pottery characteristics Hurley examined were maximum rim thickness, maximum lip thickness, orifice diameter, shoulder and neck angles, handle thickness and width as well as thickness and depth of trailed line decoration (Hurley 1978: 32).

Table 3.1: Hurley's Typological Results of the Armstrong Site (1978)

Attributes	*Armstrong Plain*	*Armstrong Chevron*	*Armstrong Trailed*
Specimen Number (Rims)	165	20	23
Orifice Diameter	26 cm	30-34 cm	23-40 cm
Lip Thickness	3-6 mm	4-7 mm	3-5 mm
Lip Decoration	-	Superior notches	-
Decoration Thickness	-	2-5 mm	-
Decoration Depth	-	2 mm	-
Rim Thickness	8-13 mm	8-14 mm	5-12 mm
Rim Height	15-59 mm	49-70 mm	28-66 mm
Rim Decoration	-	Interior chevrons	-
Decoration Thickness	-	8 mm	-
Decoration Depth	-	2mm	-
Shoulder Decoration	-	Oblique lines, Exterior hachured chevrons, and bulls-eye motifs	Horizontal and oblique lines, hachured meandering lines, nested and hachured chevrons, punctate borders, spirals, and "birdtail" motifs
Decoration Thickness	-	1.5 mm	2-3 mm
Decoration Depth	-	-	1 mm
Handle Type	-	-	Loop
Handle Attachment Location	-	-	Lip/Shoulder
Handle Thickness	-	-	43 mm
Handle Width	-	-	19mm

Gibbon's 1979 study of pottery rims from Bartron, Silvernale, and Bryan was an attempt to intricately synthesize decorative and morphological features within the Red Wing region in comparison to sites identified as Blue Earth Oneota, such as Vosburg, Humphrey, and Sheffield. Absent from Gibbon's research are several sites still located within the Red Wing region but on the eastern side of the Mississippi River, such as

Mero, Adams, and Armstrong. Understandably, more recently excavated sites, such as Energy Park, Burnside School, Sell, McClelland, and Horse were also absent from his research. Gibbon's analysis resulted in three large "Type Groups," which encompass all the typological variations within Red Wing and southern Minnesota. Within each Type Group are numerous "Composites" and within each Composite are a few "Varieties." Overall there are seven Composites within the three Type-Groups. Most of his results are compiled into Type-Group 2 within which each Composite is named by site, such as the Bartron Composite, Bryan Composite, Sheffield Composite, Blue Earth Composite, and Humphrey Composite. Although named for specific sites within his study, the typological results for each composite are not exactly site specific; for example, attributes on different rims and segments from the Bartron site occasionally correlate better with the varieties within the Blue Earth or Bryan Composite. General attributes measured by Gibbon for the shell-tempered pottery from the Bartron site are outlined in Table 3.2.

Table 3.2: Gibbon's (1979) Attribute List for Rims and Segments from the Bartron (21GD02), Silvernale (21GD03), and Bryan (21GD04) Sites

Morphology	*Attributes*
Lip	Form, thickness, decoration design, decoration technique
Rim	Form, thickness, height (length), angle, interior and exterior decoration design, decoration technique
Neck	Form, thickness
Shoulder	Thickness, decoration design, decoration technique, line width, design pattern (motif)
Handle	Form, attachment locations, attachment method, decoration design, decoration technique

To reduce confusion, detailed outlines of Gibbon's typological results for each component are compiled in Appendix V due to their sheer size. Within this present research, Gibbon's study was used as a foundational resource from which more detailed, typological analysis could be conducted in conjunction with recently excavated material, additional sites, supplementary pottery attributes, stylistic theory, and more modern statistical methods to better weed out the complex characteristics, which define Red Wing pottery.

In preparation for an upcoming publication, Holley (n.d) measured rims and vessel segments from the Bartron, Bryan, Adams, Energy Park, and Silvernale sites as well as drawings of rims from Armstrong and photographs of pottery from Burnside School. Different from Wilford's 1955 definition, Holley identifies characteristics, which display an Oneota style of pottery making, distinctly referential to the Bartron type-site and other Red Wing villages and hamlets in the region. The general morphology of Bartron phase vessels under Holley's definition have high, straight rims, sharp interior neck junctures, and round shoulders. Holley does identify variations to Bartron vessels to include curved and short rims, especially on smaller vessels; yet, they are still less common than the high, straight rim. The specimens he examined displayed loop and strap handles most often attached below the lip, with occasional rectilinear line and notch decoration (Holley n.d.: 29-31). Quantifiable parameters of Bartron phase morphology, such as wall thicknesses, rim height, shoulder and neck angles as well as handle length, thickness, and width are not given by Holley. Surface treatment, a manufacturing process in which the vessel surface is altered before it is decorated (Sinopoli 1991), of the Bartron pottery is generally smooth or plain with occasional “tooling marks” (Holley n.d: 32) present on the exterior rim and interior shoulder. On occasion, segments from the Adams site were burnished or displayed cordmarking that was not completely smoothed-over.

Bartron phase vessels were predominately decorated with incised lines, cut into the vessels’ surface after they had been leather-hardened. Occasionally, especially in earlier Bartron phase contexts, lines were trailed in wetter paste, leaving an intaglio, or bossed, impression of the line along the opposing vessel surface. Holley (n.d.: 32) states that Bartron phase decoration is “comprised of a series of discrete motifs,” which “rarely are continuous.” Most decorative motifs on Bartron phase vessels incorporate or entirely consist of chevrons. Single chevrons, nested chevrons, hachured chevrons, or inverted chevrons are all common motifs of Bartron phase pottery. Chevron motifs are often isolated to the exterior shoulder or interior rim surfaces. Other common shoulder motifs, identified by Holley, among Oneota vessels in Red Wing are the curtain motif, which is “comprised of units of horizontal and vertical parallel lines” (Holley n.d.: 33), the trio motif, which is identified by three parallel, oblique lines used as filler, and the Thunderbird motif (see Chapter Eight). Punctates are common among Oneota vessels and were often used as borders above, below, or along line motifs located on the shoulder and body of the vessel. Holley (n.d: 33) notes that curved line motifs are rare and when present, consist of small bulls-eyes and spirals. As discussed in the results of this research, recent excavations of Oneota sites in Red Wing reveal a higher frequency of curvilinear motifs, such as continuous meandering lines, hachured arches, and concentric arches, present among vessels displaying other Bartron phase attributes. This thesis will test the parameters of Holley's defined Bartron phase with more recent excavation data and with an emphasis of quantifying the attributes and frequency of morphological and decorative features inherent in Red Wing Oneota pottery.

Center Creek locality.

Typological classifications for the Blue Earth region began in a similar fashion as the Red Wing region: with Lloyd Wilford. From the pottery recovered during his 1938 and 1947 excavations at Humphrey and Vosburg, Wilford (1955) defined pottery from the two sites as belonging to the stylistic taxon he called the Blue Earth focus.

> "Blue Earth pottery is typical Oneota pottery with shell temper, rounded shoulders, short necks that are usually flaring and very wide strap handles…decoration is on the upper body and is made with trailed rectilinear lines. The characteristic design is one in which the upper body is divided into panels by vertical bands of parallel lines, and the panels are spanned by chevrons…commonly bordered by a row of punctates" (Wilford 1955: 140-141).

A few decades later, within his large study of Blue Earth and Red Wing pottery, Gibbon (1979) examined the assemblage from Humphrey and Vosburg and noticed their striking stylistic similarity concerning decorative motifs and morphology. Both villages have been placed within the more modern taxon of the Blue Earth phase (Gibbon 1978; Gibbon 1979; Dobbs 1984b), signified by the high, everted rims and decorative rectilinear motifs of line panels, nested chevrons, and punctate borders. As mentioned above, like Wilford, Gibbon also emphasized the deep similarities between pottery from the Red Wing region, Blue Earth region, and Sheffield site.

Within his dissertation, Dobbs measured 82 vessel segments, 207 rims, and 50 handles from the Vosburg and Humphrey sites recovered during the 1979 excavation and 1980-1981 survey. The results of his measured attributes are outlined in Table 3.3. The only named pottery type linked to Vosburg is Blue Earth Trailed. Originally described by Dobbs (1984b), Blue Earth Trailed characteristics include notched lips, occasional trailed lines on the rim exterior, strap handles, and shoulder decorations of vertical or oblique trailed lines with punctate borders (Figure 3.3). Common shoulder motifs within the Blue Earth Trailed series are chevrons and spirals. Trailed line thickness ranges from 1-8 mm (Anfinson 1979: 39-40). This vague definition, with few quantifiable ranges for morphology and decoration, describes nearly all Oneota pottery throughout the entire Midwest.

Table 3.3: Results from Dobbs' (1984b) Pottery Analysis

Attributes	*Blue Earth Phase Characteristics*
Temper	Shell
Color	Light grey to black
Surface Treatment	Smooth with a few cases of smoothed-over cordmarking
Vessel Form	Globular jars
Orifice Diameter	10-30 cm
Lip Form	Round
Lip Thickness	1-7 mm
Lip Decoration	Oblique tool impressions
Rim Form	Straight and everted
Rim Height	6-54 mm
Rim Thickness	2-13 mm
Rim Decoration	Interior trailed lines
Neck Shape	86% Sharp interior juncture
Shoulder Form	Round
Shoulder Thickness	2-12 mm
Shoulder Decoration	Trailed lines and punctates
Decoration Thickness	0.1-5 mm
Shoulder Motifs	Rectilinear and curvilinear lines, line panels, chevrons, punctate borders, concentric circles
Handle Form	70% Strap handles
Handle Decoration	Occasional vertical trailed lines or punctate borders
Maximum Handle Length	30 mm

Figure 3.3: Example of Blue Earth Trailed pottery from the Vosburg site (21FA02) within the MSU collection.

Sheffield site.

Gibbon (1973), who analyzed the Sheffield collection decades after Wilford's and Jenson's excavations, noted a similarity in vessel morphology and decoration at the site. The characteristic vessel, segment, or diagnostic sherd from Sheffield displayed a common globular shaped jar, with a round base, and everted rim. Plain surfaces and decoration on the lip, rim, and shoulder were also symbolic of the site (Gibbon 1973: 10). This description is characteristic of basic Oneota vessels from several localities and regions throughout the Midwest. More specifically, Gibbon (1973: 10-16; 1979) noted that sherds and segments from the Sheffield site more often had round lips with interior lip impressions, 40-49 mm long rims, constricting exterior rim shapes, round interior neck junctures, narrow trailed lines in panels with punctate borders on the exterior shoulder, and wide strap handles. Although he compared the Sheffield assemblage to the Vosburg and Humphrey pottery in his report on the Sheffield site, Gibbon called for further excavation and pottery analysis to fully understand the relationship between these similar decorative and morphological techniques.

Summary

Over the past 60 years of archeological research within the Red Wing region, a total of nine “pure” Oneota sites (Bartron, Adams, Armstrong, Double, Burnside School, Sell, McClelland, Horse, and Belle Creek) have been identified and investigated in varying amounts. Although there has been almost constant fieldwork within the region since the late 1940’s, due to the sheer size of some of the sites and the immense amount of sites available for field research, there is still a vast amount of archeological material still to be recovered and analyzed.

Throughout the many decades of archeological investigation at Red Wing, most excavations have taken place at large habitation sites more often than smaller hamlets. This bias is to an extent reflected in this research because a great deal of material culture and archeological literature is available for analysis from sites such as Bartron, Silvernale, Mero, and Bryan. Smaller sites such as Sell, Double, Burnside School, Adams, and Armstrong as well as more recently identified and excavated sites, such as McClelland and Horse are not well represented in the past interpretations of the Red Wing region. There is a great deal of potential research among these smaller and newly recorded sites in terms of comprehending the relationship between larger villages along the Cannon and Mississippi Rivers and smaller hamlets within the Spring Creek, Hay Creek, and Trimbelle River valleys. Future archeological investigations and published research will hopefully offset this bias against information concerning these underrepresented villages and hamlets in Red Wing.

In addition to sites within Red Wing, three other Oneota sites are included in the study: Vosburg, Humphrey, and Sheffield. Decades of Oneota studies within Minnesota have emphasized the profound stylistic connection between the Blue Earth and Red Wing regions as well as the St. Croix River valley. In past literature, the pottery recovered from three locations have been linked together under an overarching affiliation of Blue Earth Oneota (Wilford 1955; Gibbon 1978; Gibbon 1979; Anfinson 1979; Dobbs 1984b; Gibbon and Dobbs 1991). More recent studies (Fleming 2014; Fleming and Koncur 2015; Schirmer 2016; Schirmer 2017; Schirmer n.d.) argue against using this umbrella term to describe the material culture of people who are separated geographically and somewhat temporally. In order to better understand how communities relate to each other, researchers must first understand how they are locally unique. This research seeks to analyze the ways in which Oneota vessels and vessel segments recovered from the Red Wing region, Center Creek locality, and Sheffield site are similar and distinct morphologically and decoratively.

The pottery assemblages from many sites in the Red Wing region and along the Blue Earth and St. Croix Rivers, especially those excavated during the mid to late 20th century, have been the focus of multiple archeological studies. Although the results of past pottery analyses are used as a background in this current research, many of the studies lack uniformity in the attributes chosen for measurement. In addition, many interesting attributes, which display minute changes in morphology, such as exterior neck shape or shoulder angle, are not identified within any of the past analyses of Red Wing pottery. Thus, the vessel segments from each site, identified as having Oneota characteristics, described in this chapter are reevaluated within this study to include a uniformity in attributes measured in association with more modern methods of statistical analysis to better define the typological characteristics of Oneota pottery within Red Wing and its relationship to other sites within southern Minnesota.

Chapter Four: Background II: Multi-Component Villages

"The artifacts and built landscape of the Red Wing [region]
point to a setting in which groups of people with a variety
of material cultural traditions actively contributed to the
construction of a living cultural landscape and ultimately to
the formation of the archaeological record"
(Fleming 2009: 303).

Background

In addition to measuring pottery from "pure" Oneota sites within the Red Wing region, this research also examines vessel segments from multi-component sites within the region containing Silvernale and Bartron phases as well as Link style traits (Schirmer 2017; Henning and Schirmer n.d.; Holley n.d.). Special stylistic considerations were taken concerning the inclusion of vessel segments from these multi-component sites within this research. Vessel segments from Silvernale (21GD03), Bryan (21GD04), Mero (47PI02 and 47PI93), and Energy Park (21GD158) that are incorporated into the study are all available segments exhibiting previously identified Oneota characteristics, such as distinct, constricting neck junctures, an absence of rolled rims, and shoulder decoration with motifs such as punctate borders, birdtails, line panels, chevrons, etc. These specimen are currently housed at institutions such as Minnesota State University, Mankato, the Science Museum of Minnesota, and the Minnesota Historical Society.

Silvernale (21GD03)

The Silvernale site is a large village, located near the convergence of the Cannon and Mississippi Rivers, with an associated mound complex to the south of the habitation area along a low floodplain terrace and another along a higher terrace to the southwest of the site. It is one of the earliest known occupation sites within the Red Wing region, dating from AD 1100-1400 (Schirmer 2016). The village area is around 20 acres in size (personal conversation with Ronald Schirmer 2017), with nearby mound groups in the lower and upper terraces south and southwest of the village area. In 1885, Lewis mapped 317 mounds on the terraces around Silvernale (Winchell 1911: 154-156; Wilford 1955: 139; Gibbon 1979: 63; Fleming 2009: 25). However, there are certain areas on the terraces in which Lewis was unable to map and that Silvernale could have had around 50 more mounds that Lewis recorded (personal conversation with Ronald Schirmer 2017). The multi-component nature of the Silvernale site is no surprise since it is located in the center of the Red Wing region and along one of the main waterways leading into the Mississippi River. Contact from people traveling along the river and between sites (Wilford 1955 140; Fleming 2009: 24) made Silvernale a hub of interaction for many different cultural groups, similar to the other multi-component sites in the Red Wing region.

More than 60 years of excavation at the Silvernale site has created a large basis of archeological material and literature about the complex cultural nature of the village. Silvernale was first excavated in 1947 by Lloyd Wilford, a year before his excavations at the Bartron site. He conducted a limited excavation in the eastern section of the village area, north of the historic Cannon Valley railroad line as well as excavated two mounds, one in the lower terrace (Mound 36) and one in the upper terrace (Mound 45) (Gibbon 1979: 70-71; Gibbon and Dobbs 1991; Fleming 2009: 25). During the 1947 excavations, Wilford and his crew recovered 1,482 sherds (Gibbon 1979: 82). He returned a few years later in 1950 to excavate more of the village area (about 65 square meters total (Fleming

2009: 25)). During this excavation, 1,311 sherds were recovered from the site (Gibbon 1979: 82). This massive amount of pottery from the 1947 and 1950 excavations, as well many faunal and lithic artifacts, created a substantial base of material culture from which he began to infer particular behaviors and cultural identities.

Wilford's original assessment of the site connected it to the southern Mississippian cultural tradition, prominent along the Mississippi River extending from present day St. Louis up to southern Wisconsin. Employing the McKern taxonomic system, he identified 21GD03 as the type site for the Silvernale focus (Wilford 1955: 139), which is presently termed the Silvernale phase. Wilford characterized Silvernale pottery as being shell-tempered with a particular morphology of a rolled rim and an absence of a defined neck. The decoration characteristic of Silvernale phase pottery (Figure 4.1) consists of trailed or incised lines more often in a curvilinear motif than rectilinear, often with the presence of intaglio bossing on the interior surface of the vessel as a consequence of drawing designs in wet paste. Scroll and spiral designs are often bordered below by vertical lines or hachures (Wilford 1955: 140). Wilford also noticed the presence of different styles of pottery at the Silvernale site, such as sherds and vessel segments belonging what he assumed was the later Bartron phase, and grit tempered pottery from the Cambria phase, as we as an earlier Woodland occupation (Wilford 1955: 138-141), which indicated a temporal and spatial complexity to cultural interaction and identity at Silvernale.

Figure 4.1: Silvernale phase pottery from the Bryan site (21GD04) from the MSU collection. (a) Vessel exterior with interlocking, hachured scrolls, (b) Vessel interior with intaglio.

During his two seasons of excavation, Wilford identified several storage/refuse pits, fire basins and one intact hearth (Gibbon 1979: 71-73; Fleming 2009). Almost 50% of the pottery Wilford collected is missing and unavailable for reanalysis (Gibbon and Dobbs 1991). The remaining sherds of Wilford's 1947/1950 collection were examined by Guy Gibbon and Clark Dobbs in 1991. Of around 53 shell-tempered rim sherds, 11 have modified rolled rims, 20 have short rims, and 22 display high, unmodified rims (a rim type common among Bartron phase pottery). Of more than 200 decorated shoulder sherds, 160 have rectilinear lines, five with punctate borders, and three display chevron motifs, all traditionally identified as a Bartron phase decoration (Wilford 1955: 141). Seventeen shoulder sherds contained curvilinear lines and two with definitive scroll motifs, traditionally identified as Silvernale phase decoration (Wilford 1955: 139; Gibbon and Dobbs 1991). Excavations at Silvernale continued well into the late 20th and early

21st centuries adding immensely to the knowledge of occupation and ritualistic behavior within the Red Wing region.

Archeological investigations were revitalized at Silvernale during the 1970's in response to intense industrial and residential construction along the upper and lower terraces, where the southern end of the village area and the majority of Silvernale's recorded mounds existed. These excavations were led by the Minnesota Archaeological Society (MAS) in association with Hamline University and the Carleton College Summer Institute during the summer months between 1974 and 1977 (Johnson et al 2003; Fleming 2009: 27). With a main purpose to salvage as much cultural material and information as possible before it was destroyed, crew members excavated around 20 square meters (Johnson et al 2003; Fleming 2009: 27-28) in the northern area of the lower terrace. Industrial and residential development continued well into the late 20th century and to date, nearly all of the 317 mounds originally recorded by Lewis in 1885, and many more that Lewis did not record, no longer exist.

During the 1980's and 1990's, Silvernale was not the focus of archeological research in the Red Wing region. It was not until 2001 that excavations began again in the remnants of the Silvernale village area, north of the historic Cannon Valley railroad tracks. These investigations were conducted by graduate and undergraduate students under the Minnesota State University, Mankato anthropology department and in association with the Cannon Valley Trail (CVT), an organization created to convert the old railroad line into a recreational nature path. In 1999, a significant portion of the northern village area at Silvernale was donated to the CVT (Fleming 2009: 28) and as a sign of due-diligence and respect for prehistoric preservation, the entire eight acres of donated land was protected from further recreational destruction and was archeologically surveyed during the following two years. Geophysical and subsurface shovel testing was conducted to identify site boundaries and areas of patterned artifact clusters and dense occupation (Johnson et al 2003). Anomalies in the geophysical testing were interpreted as possible house basins and several pit features (Schirmer 2004). In the subsequent years of 2003, 2005, 2007 and 2011, MSU, Mankato field school students and field assistants, led by Ronald Schirmer, excavated numerous excavation units to better investigate the many pit features and house basin identified in the preliminary site testing years earlier.

Silvernale has been the location of extensive archeological research for more than 50 years; yet, only a small portion of the original site, around 2-3%, has been excavated. The complex cultural nature of Silvernale and its spatially strategic location at the convergence of two major rivers in the region make it a very interesting site to examine stylistically through the morphological and decorative variation of the pottery vessels made by the inhabitants of the village and its visitors.

Mero (47PI02 and 47PI93)

The Mero site is located on a high terrace along the Mississippi River in Wisconsin, across from the modern city of Red Wing. The entirety of Mero is actually a large complex of village sites and mound groups. Mero 1 (47PI02) is a habitation in the northern area of the terrace along the western bluff edge and is surrounded by a crescent shaped mound group along the eastern edge of the village. Mero 2 (47PI93) is a second habitation area south of Mero 1 and is also surrounded by a crescent shaped mound group to the east of the village area. Two other sites, Mero 3 (47PI132) and Trimbelle (47PI133), represent earlier Woodland components between Mero 1 and 2 as well as to the south of Mero 2. The separate nature of the occupations at Mero were identified during the IMA's intensive surface collections from 1983-1989. The whole complex is around 220 acres in size and contains the remnants of more than 500 mounds (Fleming 2009: 56-58). Although across the river from most of the pre-contact Red Wing occupation sites, the material culture from Mero is intimately linked to the cultural complexity displayed at sites such as Silvernale and Bryan, along the Cannon River.

Similar to many of the large village sites in the Red Wing region, investigations into the prehistoric past of Mero began with mound mapping. Theodore Lewis mapped 396 mounds in 1887 and over a decade later, Jacob Bower mapped 300 mounds in 1902. Both surveyors noticed intense mound destruction occurring during their field work due to agricultural activity. In 1914, the mounds were mapped again by George Squire, who only recorded the existence of 100 mounds along the whole terrace (Fleming 2009: 58). Of all the sites within the Red Wing region, the Mero complex by far had the most estimated mounds within its two crescent shaped earthwork groups. Today, very few mounds can be seen from the surface or from aerial photography and satellite imagery. Most of the remaining mounds exist in wooded and cultivated areas as well as patches of barren field.

Subsurface excavations at Mero began in 1947, during the same season Wilford initiated his research at Silvernale, under Moreau Maxwell (1950) in association with the Wisconsin Archaeological Survey (WAS) and Beloit College. Maxwell excavated six mounds from the northern area of the mound complex and six excavation units within the village area. His crew identified three pit features with grit-tempered and shell-tempered pottery (Rodell 1997: 121). Maxwell's (1950: 442) original assessment from the shell-tempered pottery he excavated during this season was a cultural connection to late pre-contact groups within the Upper Mississippi area.

Additional excavations took place in 1974 under Robert Alex (1974) and the University of Wisconsin, Milwaukee. This archeological season was designed to further investigate the areas in which Maxwell excavated with the village. Alex was interested in better understanding the relationship between earlier Woodland groups, identified by the grit-tempered pottery, and later Oneota and Silvernale groups, signified by the presence of shell-tempered vessels (Rodell 1997; Fleming 2009). During the 1974 excavation, 35 units, which were two meters by two meters in size, two structures, 115 post molds, 57 pit features, and four possible hearths were identified and recovered (Fleming 2009: 61-62). Also revealed within this excavation was a possible palisade wall (Rodell 1997) with post molds of similar size and spacing to those of the palisade wall at the Bryan site (Gibbon Dobbs 1991; Fleming 2009). The excavated material from this excavation is currently housed at the University of Minnesota, Milwaukee and is not included in this current study. Excavations at Mero ceased for well over a decade until subsurface research resumed under the IMA in 1991 and 1992.

After Dobbs intensively examined surface artifact distribution at Mero in 1989 and 1990, he returned for the next two years to better investigate the results of his pedestrian survey as well as to test magnetometer methods on land recently purchased by the Archaeological Conservancy (Christiansen and Dobbs 1991; Fleming 2009). Dobbs and his crew revealed more than 100 features, one being another structure with an intact house basin (Christensen and Dobbs 1991). The Mero site is interpreted as having distinct Woodland, Oneota, and Silvernale components within both main habitation areas of the site complex.

The pottery assemblage, especially the material recovered by the University of Wisconsin, at Mero was examined by Roland Rodell (1997), whose methods and results have been insightful for the current research. From the 512 rim sherds examined for his research, Rodell attributed each one to Woodland, Oneota, or Silvernale traditions. Similar to Hurley's (1978) analysis of the Armstrong pottery assemblage, within his analysis Rodell identifies several separate attributes of vessel morphology and decoration, which can be measured to examine consistency within a typology. For example, measurable aspects concerning the vessel rim include rim form, percentage of rim present, wall thickness, rim height, rim angle, surface treatment, presence or absence of decoration, decoration type, decoration width, and decoration depth (Rodell 1997: 275-284). For each morphological section of a vessel, Rodell measured numerous aspects in order to obtain a more complete understanding of vessel morphology and decoration at Mero.

Rodell's results are broadly separated in terms of rim form, such as unmodified, rolled, and thickened. The unmodified rims he examined represent an Oneota style with high rims, sharply angled necks, round shoulders, and a high amount of rectilinear decoration on the shoulder exterior and rim interior (Rodell 1997: 327) (Figure 4.2). He states that these characteristics all fall under typological terms used by other archeologists in the past to describe Oneota characteristics, such as Wilford's (1955) Cannon Incised, Stortroen's (1957) Type D, Hurley's (1978) Armstrong Chevron, and Hall's (1962) Perrot Punctate. Rodell's typological results for unmodified rims at the Mero site complex are outlined in Table 4.1. This information is used as a model, similar to Hurley's 1978 study on pottery from the Armstrong site. Rodell and Hurley identify many quantifiable attributes which can be applied to pottery analyses in order to create a more detailed picture of minute differences within and between typologies. Outlined in Chapter Five, this research employs many of the methods from Rodell's 1997 research, in addition to other quantifiable and qualifiable attributes, in the examination of vessel segments from Red Wing as well as sites along the St. Croix and Blue Earth Rivers.

Table 4.1: Rodell's (1997) Pottery Attributes and Results for Unmodified Rims

Attributes	*Specimen Number*	*Range*
Orifice Diameter	325	3.6-36.3 cm
Neck Diameter	325	3.5-31.6 cm
Lip Form:		
Round	222	
Flat	99	
Other	3	
Indeterminate	1	
Lip Surface Treatment:		
Smooth	318	
Lip Thickness		1.8-9.0 mm
Lip Decoration:		
Notched	2	
Punctated	4	
Indeterminate	1	
Rim Thickness		3.1-17.2 mm
Rim Height		3.3-64.1 mm
Rim Angle		65-136°
Rim Surface Treatment:		
Smooth	324	
Indeterminate	1	
Rim Decoration:		
None	317	
Interior	6	
Exterior	2	
Thickness		1.4-6.3 mm
Depth		0.2-2.2 mm
Shoulder Form:		
Round	3	
Angular	7	
Indeterminate	315	
Shoulder Surface Treatment:		
Smooth	63	
Indeterminate	262	
Shoulder Decoration:		
Curvilinear	19	
Rectilinear	9	
None	6	
Indeterminate	291	
Thickness		0.15-8.0 mm
Depth		0.10-2.0 mm
Handle Form:		
Loop	4	
Strap	3	

Figure 4.2: Bartron phase pottery at Mero (47PI02) with nested chevron and punctate border motifs from the SMM collection (Catalog # A2001:11:6757:A/B).

Many of Mero's lithic, zoological, and pottery artifacts recovered from specific features during the 1974 and 1989-1992 seasons of research were analyzed by Ed Fleming (2009) to better determine markers which outline individual village identities within the material culture. From his and other contributing research (Dobbs 1985; Schirmer 2002) Fleming interpreted the Red Wing region as an aggregation center to which related social groups from different locations around southern Minnesota and western Wisconsin traveled at particular times of the year to engage in ceremonial activities, such as feasting, maintaining social bonds, and especially burying the dead (Fleming 2009). "As archaeologists, we are confronted with the challenge of converting assemblages of objects into meaningful interpretations of human behavior and social processes" (Fleming 2009: 91). Fleming noted that each site within the Red Wing region has its own local characteristic variations of broader patterns of behavior, which tied the people together through social, economic, and ideological means. For Oneota pottery throughout Red Wing, there is a general similarity of manufacturing, morphology and decoration that make it regionally distinct; yet, there is also a site specific Oneota flavor of motif combination that make each village assemblage unique.

Within his research he also addresses the complex relationship between the Bartron and Silvernale phases at multi-component sites, such as Mero. Sites such as Mero, Silvernale, and Bryan have a temporal context, which spans nearly the entire late pre-contact occupation of the Red Wing region, and are representative of many different stylistic shifts in the material culture of the area. Fleming chose particular house basins (feature 9 and 17) at Mero, due to their stratigraphic complexity, to better weed out the temporal range of pottery attributes. Similar to Holley (n.d.), Fleming (2009: 111) noticed a particular bias towards a higher frequency of Silvernale phase rolled rims in deeper, earlier strata verse a higher frequency of Bartron phase high rims in later stratigraphic layers. A general trend is noticeable, which displays a shift in frequency through time from rolled rims to high rims, with short, everted rims being common throughout every layer of the house basin. Although Fleming did find support for a temporal trend in shifting morphological characteristics, the boundaries of this trend were not distinct and, in fact, rolled and high rims were found in nearly every layer of the house's occupation but in varying regularities (Fleming 2009: 111-123). Today, the expansive collection of material culture recovered from the Mero site is housed within multiple institutions in Minnesota and Wisconsin.

Bryan (21GD04)

Out of all the sites within the Red Wing region, the Bryan village has been the most heavily excavated and researched site. Unfortunately, Bryan has also been the most destroyed archeological site recorded in the Red Wing region; constant gravel mining, cultivation and urban development since the 1930's has left very little intact cultural contexts at Bryan. It also was most likely the largest and most densely occupied village in Red Wing (Fleming 2009: 31). It is located on a middle terrace along the Cannon River two miles west of the Silvernale site. The site consists of a habitation area of about 19 acres in size with an associated mound complex (21GD45) to the south and west of the village along the edge of the low terrace. The main occupation of the Bryan site is dated to around AD 1189-1285 (Schirmer 2002: 143; Schirmer 2016). Like many of the mound complexes in Red Wing, the earthworks at the Bryan site were originally mapped by Lewis who recorded 173 intact mounds, plus many more that were already too plowed down to accurately map. Almost two decades later, the mounds were again surveyed. In 1902, W. M. Sweeney recorded only 77 mounds remaining at the Bryan site (Schirmer 2002: 130; Fleming 2009: 32). The amount of destruction within those twenty years displays the activity of the local community during the 20th century in terms of agricultural and city development. It has been hypothesized that during the pre-contact occupation of Red Wing, a continuous line of mounds may have existed extending through several sites along the Cannon River, including the Bryan, Energy Park, and Silvernale sites (Winchell 1911: 150-159), connecting many villages in a massive complex of ritualistic activity concerning burial of the dead.

The village area of Bryan lies along a peninsula-like formation of the outwash terrace (Schirmer 2002: 129; Fleming 2009: 31) closest to the Cannon River's shore. Archeological investigations at the Bryan site began in 1951 under Wilford and the

University of Minnesota after already decades of gravel mining revealed material culture, intact features, and human remains of great antiquity (Gibbon 1979: 7; Wilford 1984: 21; Schirmer 2002: 130). Wilford concentrated his early subsurface work along the eastern edge of the habitation area; his goal was to investigate areas within and around the gravel pit. During the 1951 season, Wilford and his crew identified seven pit features of varying intactness as well as a some human remains from unrecorded contexts (Schirmer 2002: 130). Around 224 grit and shell-tempered sherds, a significant portion of them being smaller than a quarter (Gibbon 1979: 48), were recovered during this field season. The majority of these sherds were shell-tempered and based on a few of those sherds being rims, Wilford identified the village as being primarily a Silvernale focus site with a lesser Oneota component (Fleming 2009: 34). Restoration of at least one vessel was possible from the sherds collected in September of 1951. This vessel was taxonomically placed into the Silvernale phase (using the Willey and Philips system (1958)) because of its presence of a rolled rim, absence of a neck, and decoration consisting of interlocking scrolls and "filler lines" or hachures below the scrolls (Wilford 1984). In a posthumous publication, Wilford (1984: 24) states that this particular "vessel is virtually identical with the Ramey Incised ware of the Old Village Focus at Cahokia." Today, contemporary scholars identify the diagnostic Silvernale features as being a distinct style to the Red Wing region with traces of inspiration from Mississippian groups to the south (Fleming 2009; Holley n.d.; personal conversation with Ronald Schirmer 2016).

Wilford retuned to the Bryan site in 1952, 1954, 1955, and 1957 for further archeological research and mitigation after extended highway construction and gravel mining revealed more human skeletal remains. He and his crew excavated two burials and three pit features in 1952. Within several storage/garbage pits they recorded 233 pottery sherds, 176 of these being shell-tempered. After the excavations ceased, highway workers uncovered 46 additional sherds and one almost complete vessel all located in areas disturbed by bulldozers (Gibbon 1979: 49). In 1954, Wilford returned to the Bryan site with a field school of students ready to excavate the extensive village area. Previously stripped areas of the habitation site revealed a number of pit features and remnants of middens under the topsoil. Within these areas, Wilford recorded 111 pit features and two rectangular, semi-subterranean house basins (Schirmer 2002: 133). To the west of this excavation area, Wilford opened a few large excavation "squares" and unearthed a linear assortment of large post molds interpreted as a palisade wall (Gibbon 1979: 11; Schirmer 2002: 133). Wilford and his crew recovered 11,656 sherds from this excavation, a significant amount of them being shell-tempered and extremely small (Gibbon 1979: 49). Twenty-two rims from the 1954 excavations at Bryan were identified by Holley (n.d: 29) as High-rim Oneota and five as a curved-rim variety of Oneota production.

The 1955 and 1957 excavations were conducted to better determine the stratigraphic sequence of artifact variations at Bryan. Wilford opened large 80-foot squares and smaller isolated rectangular units along the northwest ridge of the site. Opposed to some of his earlier excavations, Wilford recorded in detail the exact elevations and grid locations of diagnostic, or culturally recognizable artifacts, and features in order to better interpret the temporal and spatial organization of the site.

During these excavations, 32 features were identified encompassing many storage/refuse pits, fire basins, a possible structure and one primary burial (Schirmer 2002: 134) as well as 1,735 shell-tempered sherds (Gibbon 1979: 50) recovered from soil within and around features.

The massive pottery assemblage from the five seasons of excavation was analyzed by one of Wilford's students Charles Stortroen (1957). Using morphological and decorative attributes of the Bryan site pottery, Stortroen separated the assemblage into five defined types (Table 4.2) with four minor shell-temper types (Table 4.3) and six minor grit-tempered types for anomalous sherds which did not fit into his larger sequence (Stortroen 1984: 43). He classified 65% of the assemblage at Bryan as Silvernale, 20% as Oneota, 10% as Woodland, and 5% as Cambria (Stortroen 1957: 53-57). Although Stortroen does not give numerical parameters to his typologies within the study, his classification does represent an early attempt to riddle through the complex pottery types found at various sites in Red Wing.

Due to Wilford's intense focus on recording provenience during the 1955 and 1957 excavations, Stortroen was able to analyze some of the types in terms of stratigraphic and spatial sequences. Similar to Fleming's (2009) and Holley's (n.d.) findings, he notes in his research that rolled rims were more commonly excavated in lower levels, indicating a use during an earlier time of habitation, and straight, high rims were more common in upper levels, indicating a use during a later time of habitation, at Bryan. The short, everted rims, Stortroen notes, are about equally distributed between all levels of occupation at Bryan. In addition, a spatial pattern is evident within the pottery assemblage at Bryan favoring the location of high, straight rims within the western part of the village area outside of the palisaded area (Stortroen 1957: 94). In a later reanalysis of Wilford's collection, Gibbon and Dobbs (1991) noted the existence of rolled rims, short rims, high rims, and grit-tempered sherds within the same stratigraphic level. In addition, within storage and or refuse pits, high rims and rolled rims are found together in 32% of the features (Gibbon and Dobbs 1991). The temporal relationship between rolled and high, straight rims is extremely complex. Although a general trend in frequencies is apparent, poorly recorded contexts and mixing of cultural deposits throughout Red Wing make stratigraphic evidence difficult to decipher.

Table 4.2: Stortroen's Typological Results for the Bryan Site (1957)

Major Types	*A*	*B*	*C*	*D*	*E*
Temper	Shell	Shell	Shell	Shell	Grit
Rim Form	Rolled Rim	Everted Rim	Everted Rim	Straight Rim	Rolled Rim
Rim Height	-	-	Short	High	-
Interior Neck Shape	-	-	Round	Sharp	-
Decoration Type	Rectilinear/ Curvilinear lines	Rectilinear/ Curvilinear lines	Curvilinear lines	Rectilinear lines, punctates	Rectilinear lines
Decoration Location	Shoulder, upper body	Shoulder, upper body	Shoulder, upper body	Shoulder, upper body, lip, interior rim	Shoulder, upper body
Decoration Line Size	Wide	Wide	-	Narrow	Narrow
Motifs	Interlocking scrolls	Interlocking scrolls	-	Chevrons, Inverted Chevrons	-
Handle Form	Loop	Loop	Strap	Loop	Loop
Stortroen's Assigned Phase	Silvernale	Silvernale	Silvernale	Oneota	Cambria

Table 4.3: Stortroen's Shell-tempered Typological Results for the Bryan Site (1957)

Minor Types	*One*	*Two*	*Three*	*Four*
Temper	Shell	Shell	Shell	Shell
Rim Form	Rolled Rim	Straight Rim	Everted	Everted
Rim Height	-	High	-	-
Decoration Type	Punctates	Cord Impressions	Punctates	Incised lines
Decoration Location	Exterior lip	Shoulder, upper body	Exterior lip	Shoulder, upper body

Investigations into the prehistoric occupation of the Bryan site reemerged in 1970 under David Nystuen with the Minnesota Historical Society in order to examine the northern section of the village near Wilford's previous excavations (Schirmer 2002: 133-134) during the Minnesota Trunk Highway Archaeological Reconnaissance Survey (Fleming 2009: 38). During this research, 25 pit features were identified in addition to 20 other smaller unidentified features, and a section of a post mold structure from the northwestern portion of the village as well as to 30 storage/refuse pits in the north-central part of the habitation area (Fleming 2009: 38). Currently the assemblage recovered from this excavation has not been extensively examined to determine cultural relevancy.

In 1983 and 1984, Clark Dobbs under the IMA and University of Minnesota conducted extensive excavations at Bryan with the help of numerous field school students. These two seasons of archeological investigation produced the largest data recovery at any site in Red Wing. Early test excavations in 1982 reveled a significant amount of intact contexts despite heavy construction and gravel mining over numerous decades (Schirmer 2002: 135). Contemporary plans to extend road traffic in that area required immediate mitigation of the prehistoric material. During the next two seasons, a staggering 557 features and more than 500 post molds were identified in 70 excavation units, averaging to one feature per square meter (Dobbs 1984a; Gibbon and Dobbs 1991; Schirmer 2002: 135-136; Fleming 2009: 38-39). Of the originally identified features, 387 were excavated revealing two burials, five structures, numerous storage/refuse pits and more of the palisade originally identified by Wilford in 1954 (Schirmer 2002: 136). The palisade post molds were uniformly spaced 60 centimeters apart (from post center to post center) with diameters of 18-22 centimeters (Fleming 2009: 39). Seven hundred and ninety-six rim sherds were recovered and, in conjunction with more modern excavation methods, were mapped *in situ* (Schirmer 2002: 136), or in the exact location in which they were originally found.

In 1999, additional excavations were conducted by Ronald Schirmer (2002) for his doctoral dissertation. During his field research, Schirmer (2002: 141) identified 44 pit features and 17 post molds, which formed three walls of an above ground structure. Different from some of the earlier excavations at Bryan, Schirmer collected around 2,500 liters of feature fill in order to collect minuscule artifacts, such as carbonized wood, seeds, and smaller pieces of bone and pottery. Schirmer noted a clear difference in the pottery types collected during the 1999 excavation season; a total of seven different types were mentioned. Yet, since his research focused on the botanical remains from the Bryan site, detailed information of the typologies is not provided in the conclusions of his research.

In addition to investigating the stratigraphic relationship of pottery attributes at the Mero site, Fleming (2009) also examined rims and vessel segments from the Bryan site. Fleming was particularly interested in the relationship between two large contemporary habitation sites, which were occupied on opposite sides of the Mississippi River. Using Burghardt's theory of river settlements, which states that towns occupying opposite sides of the river, although may be related communities, tend to be different in terms of size and the raw material exploited by its inhabitants (Burghardt 1959). Using this theory, the Bryan, Silvernale, Energy Park, McClelland, Burnside School, Sell, and Horse sites should display evidence of exploiting different local material and social connections geared towards the plains than the Mero, Adams, Double, and Armstrong sites. Concerning the differences in ceramics between a western village, such as Bryan, and an eastern village, such as Mero, Fleming noticed that the paste used to make vessels at Bryan was more refined, that is, it contained fewer natural and gritty inclusions than the paste used to make local vessels at Mero. This difference in paste reflects a difference in the manufacturing process of pottery or different clay sources. Either potters are choosing to more refine their clay in villages along the western side of the Mississippi River or they are using clay sources that naturally have fewer grain inclusions (Fleming 2009: 203-205). Decoratively, Fleming also stated that the two villages displayed different techniques. Decorated vessels from the Bryan site displayed deeper and wider line decoration with a stronger interior intaglio than vessels at Mero (Fleming 2009; 211). Decorating a vessel when the paste is wet produces a stronger intaglio effect upon the interior surface verse decorating a vessel after the paste has been dried to a leather-hard state. Wider or deeper lines may reflect different tools used to create designs upon a vessels exterior but a stronger intaglio reflects a difference in manufacturing; a difference in choosing to decorate pottery earlier in the manufacturing process versus later, after the paste has dried and hardened. These differences in manufacturing noted by Fleming bring to light differences in shared knowledge within communities between sites located along the western side of the Mississippi River as opposed to the eastern.

Throughout the decades of archeological research at the Bryan site, some interesting information can be gathered about habitation behavior and spatial distribution at the site. Although Dobbs (1985: 55) and Schirmer (2002: 141-142) noted Oneota, Cambria, and Silvernale phase sherds in all areas of the village, there is a distinct concentration of pottery containing Oneota characteristics within the northwestern portion of the site (outside the palisade wall), close to the terrace edge overlooking the Cannon River valley. In addition, 11 structures have been identified at Bryan. These homes are of varying manufacturing styles in particular areas of the site. Closer to the center of the village, square and rectangular semi-subterranean homes are more common opposed to ovate and square above ground, post mold structures near the outer limits of the site, especially within the northwest section (Schirmer 2002: 142) of the village. Schirmer noted that these recorded spatial distributions of particular pottery and structure types reflect distinct occupational components at Bryan.

Energy Park (21GD158)

The Energy Park site, originally identified in 1984 during a survey of the city of Red Wing by the IMA, is a small four acre village site located along the Cannon River between the Silvernale and Bryan village sites. A crescent-shaped complex of 64 mounds (21GD52) encloses the village to the south. When it was identified, Energy Park was associated with the Silvernale phase occupation of Red Wing due to the presence of a flat-topped pyramid-shaped mound, common within Middle Mississippian villages culturally tied to Cahokia (Gibbon and Dobbs 1991). Within the Cahokian complex, flat-topped pyramid mounds were used as elevation bases for socially and religiously important buildings. There is no recorded evidence of a structure being built upon the flat-topped mound at Energy Park; thus, the actual influential connection between Energy Park and Cahokia is highly unlikely (Dobbs 1991a; Gibbon and Dobbs 1991; Dobbs 1993; Schirmer n.d.). Archeological fieldwork at Energy Park began during the fall of 1986. During this season, the site was surface collected and the subsurface was surveyed using soil resistivity. Fieldwork continued during the summers of 1987, 1988, and 1990, which furthered the surface collection of the site and opened several excavation blocks in anomalous areas identified from the remote sensing conducted in 1986. The focus of these investigations was to outline site boundaries and internal site organization.

Thirty-eight out of 98 identified features were excavated during these three years of field research (Fleming 2009: 45) and the analysis identified an interesting concentration of material culture along the western edge of the site versus the eastern with a possible open gathering space within the middle of the village. A denser surface collection was recorded along the western edge of the village than the eastern edge. These concentrations consisted mostly of lithic tools and debitage with little recovered pottery. Conversely, more concentrated areas of pottery surrounded the central area of the village. In addition, several crop marks (showing dark patches five meters in diameter) are visible in aerial photographs taken during the summer of 1988 grouped in a circle around the central section of the site (Gibbon and Dobbs 1991). In their spatial interpretation of Energy Park, Gibbon and Dobbs do not mention the distribution of Silvernale versus Oneota pottery.

Preliminary examinations of the pottery assemblage at Energy Park revealed a significant amount of undecorated shell-tempered vessels with distinct neck junctures and a surprising absence of rolled rims (Gibbon and Dobbs 1991; Fleming 2009: 45); yet, during the data collection for this study, the author observed the presence of multiple rolled rims in the Energy Park assemblage housed at the Science Museum of Minnesota. In his analysis of Red Wing pottery, Holley (n.d.) identifies a significant amount of pottery from Energy Park with short, everted rims and rim tabs, which he associates with a transitional Link phase in Red Wing. Described more in Chapter Six and Eight, this current research identifies a distinct Oneota presence at Energy Park, stylistically similar to that at the Bartron and McClelland sites. It has been hypothesized that Energy Park acted as a shortly occupied bridging site, connecting the people and mound groups between the Bryan and Silvernale villages (Gibbon and Dobbs 1991; Fleming 2009). Although field schools led by Minnesota State University, Mankato have mapped and continued small scale surveys at Energy Park, no additional excavations have been conducted there for more than 20 years.

Summary

Early interpretations of pre-contact behavior from AD 1000-1450 in the Red Wing region emphasized a deep connection with contemporary Middle Mississippian groups living at sites south of Red Wing along the Mississippi River. The phrase “Middle Mississippian” is given to groups displaying similar material culture to that of the city

Cahokia, east of modern-day St. Louis. Middle Mississippian cultural material and settlement patterns suggest high levels of social stratification based heavily on ideology. The geographic extent of Mississippian culture can be interpreted as broad, covering most of the Mississippi and Ohio River valleys. Mississippian sites have been recorded as far north as southern and southwestern Wisconsin, e.g., Aztalan and Trempealeau, respectively, and western Wisconsin at Red Wing. Yet, with each year of research and analysis of excavated material from the Red Wing region, the evidence for Middle Mississippian influence upon communities in Red Wing is becoming less and less apparent. More modern interpretations of late pre-contact groups living in near the convergence of the Cannon and Mississippi Rivers reveal a behavioral pattern and material culture unique and distinctly local to the Red Wing region with few examples of Middle Mississippian artifacts or overarching outside influence upon Silvernale, Link, or Bartron phase artifacts.

These large multi-component sites were the focus of most of the archeological research within the Red Wing region during the 20th century. What has emerged over the many decades of pottery analysis is a better defined Silvernale phase stylistically represented by a morphology of rolled rims, absence of defined necks, angular shoulders, and curvilinear line motifs consisting of interlocking scrolls and hachured scrolls emerging around AD 1100 and heavily decreasing in popularity by AD 1250. Unfortunately within Red Wing research, especially during the 20th century, the few studies that focused on Bartron phase pottery were always conducted in combination with Silvernale and or Link phase attributes; more current excavations and analysis within the region, including this research, look to study the Oneota component within the region in its own context. This research seeks to eradicate this lack of a well-defined Oneota pottery style in Red Wing in terms of detailed quantifiable and qualifiable parameters. In addition, many recently identified and excavated sites have not been included in any previous studies of pottery attributed to the Bartron and Spring Creek phases and are thus included in the definitions created by this study.

Chapter Five: Methods

"The similarities of ceramics within the type cluster and ceramic system are conceived as the product of shared ideas or normative concepts concerning ceramic form, decoration, and production techniques and also result from high intensity of interaction between potters"
(Sinopoli 1991: 52).

Background

As a part of style, morphology symbolizes a standardized, specific technique for forming a vessel, which is learned and shared among individuals of a particular social group. Generally, a pottery vessel is broken down into six different morphological sections: the lip, rim, neck, shoulder, body, and base (Shepard 1985[1954]) (Figure 5.1). Complete vessels will always contain these features albeit in different shapes and proportions. There are, of course, vessel exceptions in which function dictates a morphology with an absence of a defined neck or shoulder, such as certain jars, cups, bowls, or plates. Yet for the globular jar, which is the typical late pre-contact Oneota pottery vessel within the upper Midwest, the lip, rim, neck, shoulder, body, and base are all represented in each vessel's basic form. For these globular jars, handles can be added as a seventh attribute of vessel morphology. Although handles are technically filleted features added to a vessel after its initial formation, handles are so common on Oneota vessels that archeologists often consider them an attribute within the basic vessel morphology since the addition of a functional or decorative handle alters the morphology of a vessel (Shepard 1985[1954]: 251) within the lip to shoulder area.

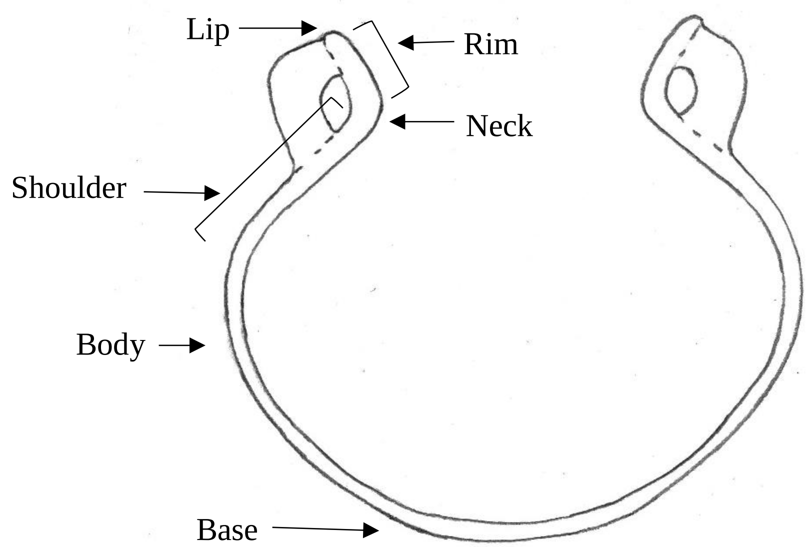

Figure 5.1: Vessel profile with the six basic aspects of vessel morphology.

When available, completely reconstructed or intact vessels were examined in this research; yet, whole vessels within the archeological record pertaining to Midwestern prehistoric North American contexts are less common than fragmented sherds. In order to still obtain a sound understanding of vessel morphology and decoration among Oneota assemblages in Red Wing, Blue Earth, and Sheffield, vessel segments were also measured. In this study, a "segment" of a vessel includes a complete lip, rim, neck, shoulder, and part of the body. It is enough of the original vessel to obtain wall thicknesses, angles, and a representation of decoration, if any decoration originally existed, i.e., a vessel segment conveys a reliable sense of the overall design program of a vessel. Initially, this research project planned to stick closely to this definition of a vessel segment to properly measure all desired attributes. Unfortunately, too few sherds meet the defined threshold of "vessel segment" from Oneota components within the Upper

Mississippi, Blue Earth, and St. Croix River valleys to establish unambiguous sets of typical measurements. Thus, if measurements from the lip, rim, neck, and part of the shoulder could be acquired, the segment was included in this research.

Morphology

Several attributes for each morphological section of the vessel segment were measured and examined for the presence or absence of particular features, and are described within the following pages under a heading identifying the associated form. For example, in terms of the vessel's rim, the basic form, wall thicknesses, angle, and morphologically specific attributes, such as rim attachment method, were recorded and will be described within the section titled "Rim." Further information concerning surface treatment and decoration from all morphological sections are additionally described under the "Surface Treatment" and "Decoration" headings. A great deal of inspiration for the methodology of this research was taken from Hurley (1978), Gibbon (1979), Shepard (1985[1954]), Sinopoli (1991), Edwards (1993), Rodell (1997), Fleming (2009), and Holley (n.d).

Vessel Orifice

A vessel's orifice, or mouth, is its superior opening formed by a complete lip and rim. For each specimen, orifice shape and diameter were recorded. These attributes are significant because they are linked to vessel morphology and relative vessel size. Within the Red Wing region, common vessel orifice shapes are either round or ovate. For vessels with a complete lip and rim, orifice diameter was recorded using a metric ruler to the nearest centimeter. For round-orifice vessel segments, a radii chart was used. A radii chart graphically depicts concentric arcs with predetermined diameter widths, increasing in size by a half-centimeter. They allow researchers to examine the probable diameter of a circular artifact based on the object's curvature. A specific diameter was obtained by placing the vessel segment upside-down so that the lip was touching the grid. Then the lip was aligned with an arc on the chart of matching curvature. For ovate vessels, two measurements for orifice diameter were taken for a maximum and minimum width of the oval orifice.

Lip

A vessel's lip is the most superior part of its morphology. It is the end point of a vessel, which is connected inferiorly to the rim. Specific attributes measured for lips were form, thickness, surface treatment, and decoration. A specimen's lip form was identified as either flat, round, pointed, beveled exterior, or beveled interior (Edwards 1993) (Figure 5.2). The differences in lip form represent different manufacturing techniques to finish the top of a vessel. Rounded or pointed lips were often formed by utilizing the thumb and fingers to round-off or pinch up the end of the vessel whereas flattened or beveled lips were formed from a straight-edged tool or finger to level the lip surface (Shepard 1985[1954]: 247).

Lip thickness measurements (Sinopoli 1991: 61) were taken perpendicular to the long axis of the lip from the interior to exterior surfaces of the vessel (Figure 5.3). They were measured by using a sliding caliper and recorded to a hundredth of a millimeter. Lip treatment (Rodell 1997: 275) is split in this research between surface treatment and decoration. Possible lip decoration types on the vessels examined were notches (impressions) or tabs. Lip tabs are protruding features added to the vessel after lip formation or pinched up from the lip paste. Tabs can be interpreted as either decorative or functional, similar to a handle and or as pot rests. Lip tabs were measured in terms of their presence or absence as well as maximum thickness and height using a sliding caliper to a hundredth of a millimeter.

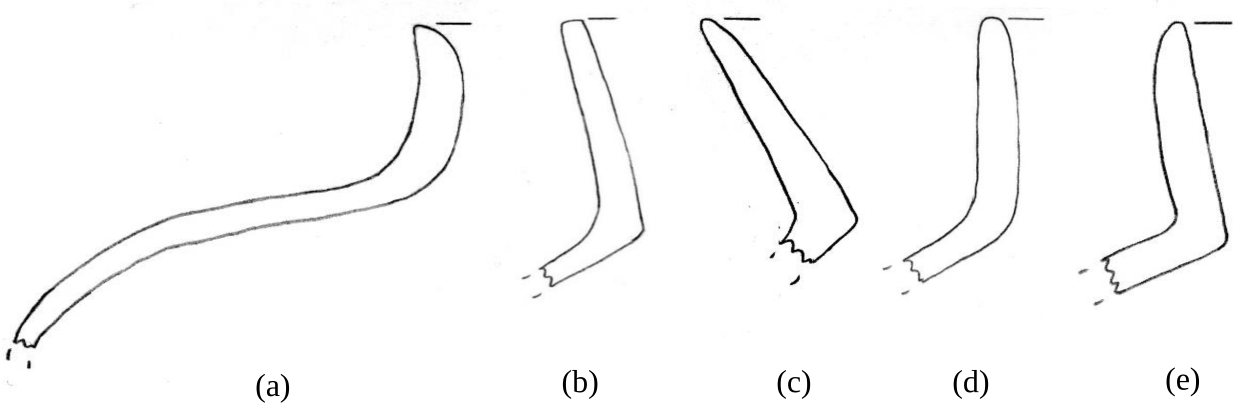

Figure 5.2: Lip Forms. (a) Beveled Interior; (b) Flat; (c) Pointed; (d) Round; (e) Beveled Exterior.

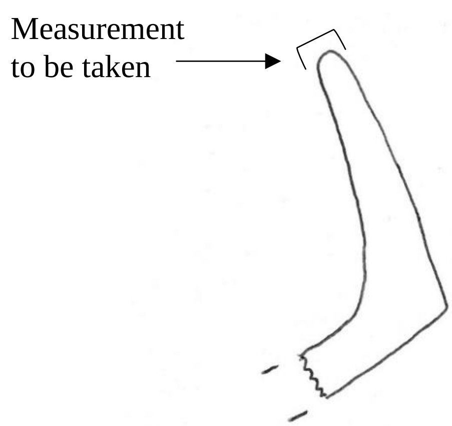

Figure 5.3: Method of measuring lip thickness using sliding calipers.

Rim

A vessel's rim is the morphological entity between the lip and neck. Within pre-contact North American pottery analyses, rims have traditionally been used as a key element in the analysis of stylistic morphology and decoration. Rims with a complete neck juncture and at least a centimeter of shoulder were examined; sherds with only a lip and rim were not measured in this research because of their lack of diagnostic neck and shoulder features. Attributes measured for the rim were form, angle, maximum thickness, maximum length, surface treatment, decoration, percentage of rim segment compared to the original rim, and the rim attachment method.

In order to understand rim form and angle, a two-dimensional profile or cross-section (Deetz 1965: 57; Edwards 1993: 26) of the rim was drawn on 1-centimeter square grid paper. When oriented accurately, vessel profiles illustrate the unique shape of each morphological location and variation of wall thickness from hand-molded manufacturing (Shepard 1985[1954]: 252). In order to correctly orient the vessel segment, the specimen was superiorly aligned with a horizontal surface, such as a book or box top, so that as much of the lip was in contact with the surface as possible. Once properly aligned within its original orientation, the distinct interior and exterior shape of the vessel segment was captured using a contour instrument, such as an Empire Level 2754, 6-inch profile gauge, and then traced onto the grid paper. The accuracy of profile wall thickness was checked by using a sliding caliper. Although profiles were created for every sherd measured, vessel segments with less than 8% of the original rim were not fully trusted to provide an accurate orientation. The percentage of original rim was identified along with the orifice diameter on a radii chart. All other measurements were still taken from segments with less than 8% of the rim to provide extended data in rim length, wall thicknesses of the lip, rim neck, and shoulder as well as the presence or absence of any decorative motifs. Rim features measured from the vessel profiles include the rim form and angle as well as neck and shoulder angle.

Traditionally within the Red Wing region, rim forms were categorized into three broad types: unmodified, thickened, or rolled (Wilford 1995; Gibbon 1979; Rodell 1997; Fleming 2009; Holley n.d.). The rim forms examined in this research all qualify as unmodified and thus were further identified as either vertical, everted, or curved. Vertical and everted rim forms display a straightened rim that either is parallel to the vertical axis of the vessel interior or flaring out from it. Rim forms identified as vertical displayed a rim angle between 90 and 76 degrees and everted rims had rim angles less than 76 degrees. Rims with an angle at or below 75 degrees display significant flaring towards the exterior of the vessel. To obtain a rim angle for each vessel or segment examined, a horizontal line was drawn through the neck profile and a bisecting vertical line was drawn along the interior of the neck so that the neck juncture was along a 90 degree axis. An additional line was drawn from the axis point through the middle of the lip to create a triangle off of the interior rim surface (Figure 5.4) (Sinopoli 1991: 61-62; Rodell 1997: 281-282). A hemispherical protractor was utilized to determine how many degrees the rim extended from the 90 degree vertical axis.

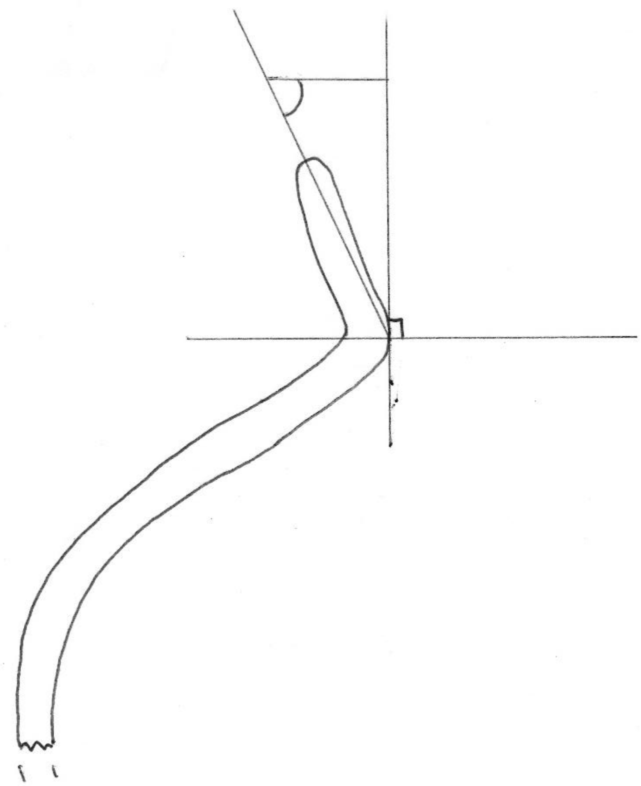

Figure 5.4: Method of rim angle measurement from a vessel profile.

Additional rim features such as wall thickness and length were measured using a sliding caliper to the hundredth of a millimeter. Rim wall thickness was measured at the upper, middle, and lower rim from the interior to exterior vessel surface until a maximum value was identified. The maximum rim length, also known as rim height (Gibbon 1979; Sinopoli 1991: 61; Edwards 1993: 27), was measured along the interior vessel surface from the apical lip to the interior neck juncture.

The Rim Attachment Method describes the way in which the potter formed the rim from the neck and shoulder. Methods include either drawn up or attached (Figure 5.5). The “drawn up” method simply means that the rim was not formed separately and subsequently added to the vessel but instead continuously formed from the same slab of paste as the shoulder and neck. In this research it was identified by the absence of an interior crease located at the superior end of the shoulder, below the neck juncture. It was also identified by an absence of added layers within the paste, seen in the profile of the vessel. An "attached" rim is one that was added to the vessel separately from the formation of the shoulder, making it technically a filleted feature of the vessel. It is recognized by a distinct crease below and parallel to the interior neck juncture and a discrete layer within the bisection of the paste at the neck. These different methods represent distinct manufacturing techniques for vessel formation and thus different type of shared knowledge within a community.

Figure 5.5: Method of rim attachment. (a) Attached rim from McClelland (21GD258) within the MSU collection, (b) Drawn up rim from Adams (47PI12) within the SMM collection (Catalog # 2005:19:1355).

Neck

The neck is a constricted point (Shepard 1985[1954]) of a vessel. It is the area in which the rim transitions into the shoulder. Neckless pottery vessels exist within the Silvernale (rolled rim vessels) Red Wing region pottery type (Fleming 2009; Holley n.d.), and were not analyzed here. Attributes examined pertaining to the neck were maximum wall thickness, neck shape, neck diameter, and neck angle. The maximum neck thickness was measured, similarly to all wall thicknesses, from the interior to exterior surfaces. For vessel segments, this measurement was taken at the broken edge of the sherd with a sliding caliper. For complete vessels a spreading caliper was used to measure neck thickness. Both measurement methods identified values to the nearest hundredth of a millimeter.

The neck shape was examined along the interior and exterior sides of the vessel. The interior neck shape indicates the shape of the vessel's neck juncture as either round or sharp (Edwards 1993). Sharp junctures are represented by a distinct bend in the interior neck, where the inferior end of the interior rim and superior end of the interior shoulder meet in a pointed fashion. Round junctures are represented by no distinct bend in at the interior neck; the end of the rim is transitionally formed into the interior shoulder. The exterior neck shape describes the manner in which the exterior rim transitions into the exterior shoulder. Exterior next shapes were identified as parallel, expanding, or constricting (Edwards 1993) (Figure 5.6). The exterior neck shape directly affects the maximum thickness of the neck wall.

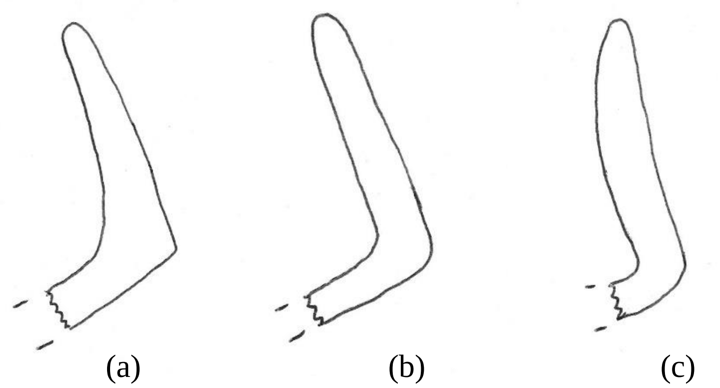

Figure 5.6: Exterior neck shapes. (a) Expanding; (b) Parallel; (c) Constricting.

The neck angle was taken from the two-dimensional vessel profile. A parallel line was drawn along the interior shoulder as well as along the interior rim to create an angled intersection which was then measured with a hemispherical protractor to the nearest degree (Figure 5.7) (Henning and King 1992: 102; Edwards 1993). The neck diameter was measured either by using a radii chart or from the vessel profile using the 90 degree axis point also utilized to measure the rim angle (Figure 5.7). A distance in terms of centimeters was recorded from the vertical axis to the interior lip of the profile. This value was then doubled and subtracted from the vessel's orifice diameter (Rodell 1997: 282).

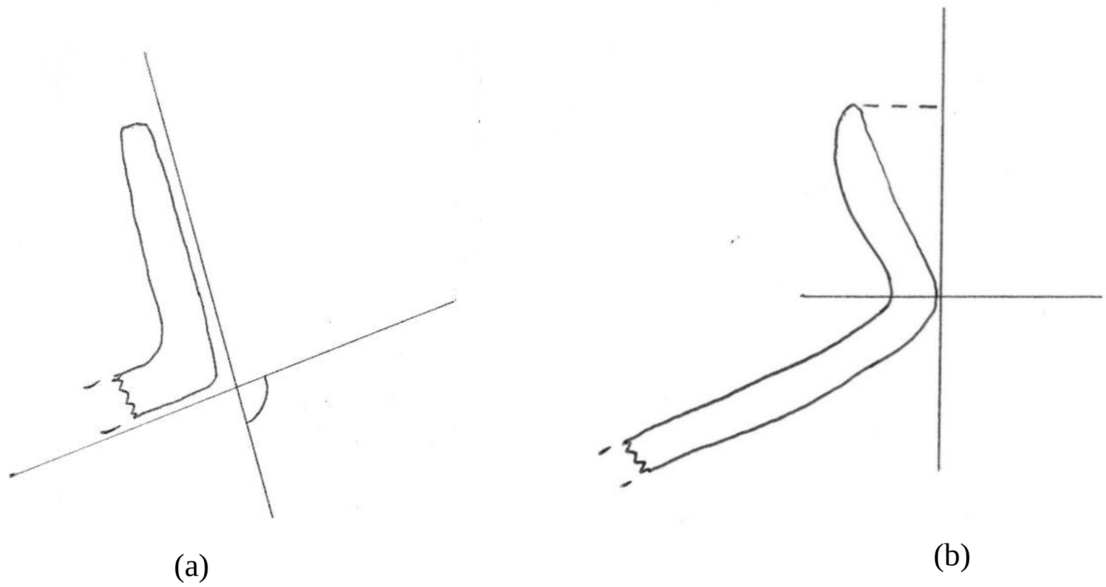

Figure 5.7: (a) Method of neck angle measurement from a vessel profile; (b) Method of neck diameter measurement. The length of dotted line is multiplied by two and subtracted from the vessel's orifice diameter.

Shoulder

The shoulder of a vessel is its broadest plane. This is the most common location for decoration, especially decoration with complex motifs, for pre-contact vessels in the Upper Mississippi, Blue Earth, and St. Croix River valleys. Since the shoulder is the broadest area, it is one of the first things an individual would see when interacting with a vessel. Thus, it would be the best place to communicate non-verbal social information through symbolic representations (Weissner 1983). For the shoulder area, thickness, form, angle, length, surface treatment, and decoration were measured. The maximum shoulder thickness of each vessel was measured a centimeter below the neck juncture (Edwards 1993) from the interior to exterior surface, where the shoulder is at its thickest. For vessel segments, a sliding caliper was used to calculate this measurement to the hundredth of a millimeter and for complete or fully restored vessels, spreading calipers were used.

The shoulder form describes the particular shape of the inferior end of the shoulder as it meets the body of the vessel. Shoulder forms were identified as either round or sharp. Shoulder angles were measured, similarly as the neck angle, from the two-dimensional vessel profile. A parallel line was drawn along the shoulder and another along the body of the vessel, the angle made by the intersection of these two lines was calculated using a hemispherical protractor to the nearest degree (Figure 5.8).

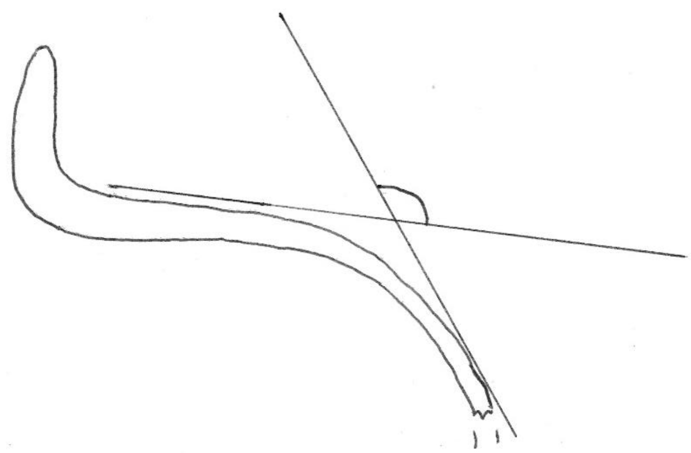

Figure 5.8: Method of shoulder angle measurement from a vessel profile.

Handle

Not every segment measured in this research had an intact handle, but for those that did, the length, width, and thickness of the handles were recorded as well as handle form, attachment locations, surface treatment, and decoration. The length of the handle was measured along a straight line from the superior to inferior end of the handle, the width was measured perpendicular to the length, and the thickness was measured from the anterior to posterior side of the handle. All these measurements were taken using a sliding caliper to a hundredth of a millimeter. Handle forms were identified as either loop or strap shaped (Figure 5.9). Loop handles are circular in cross-section whereas strap handles are ovular in cross-section and thus often wider than they are longer or thicker. Attachment locations were identified as either the lip and shoulder or rim and shoulder. Different morphological locations for handle attachment reflect methods of vessel formation shared within a community.

(a) (b)

Figure 5.9: Handle forms: (a) Vessel segment with a loop handle from the McClelland (21GD258) site within the MSU collection (Catalog # 2006.1.2918); (b) Vessel segment with a strap handle from the Vosburg (21FA02) site within the MHS collection.

Surface Treatment

Surface treatments were recorded for all morphological aspects of each segment or vessel. They are any alterations to a vessel's surface done during manufacturing. Surface treatment usually occurred before, during, or right after a vessel was dried to a leather-hard state. Identifying different methods of treating the surface of a vessel is important because it has the ability to inform archeologists about "the scale of production and labor investment" (Sinopoli 1991: 63). They reflect time spent by the potter carefully finishing the vessel walls before decoration and firing. Surface treatment options for each aspect of morphology were smoothed, smoothed-over cordmarked, brushed, or burnished.

Decoration

Many different types of decoration were common to pre-contact North American vessels, which include various impressions of tools or textiles. Yet for Oneota vessels within the Red Wing, Center Creek, and Sheffield locations, decorative motifs were created by drawing lines and punctates. The frequency, width, depth, and application orientation of decorative elements were recorded for every aspect of each specimen's present morphology.

Punctates are variously shaped impressions pressed into the interior or exterior vessel surface. Many different attributes of punctates were measured for each vessel containing that decoration. Punctate forms were identified for Oneota vessels as either round, ovate, elongated, or irregular as well as the application orientation for each punctate as either directly, gradually, or steeply impressed (Figure 5.10). For each vessel displaying punctate decoration, the maximum thickness and depth of the punctates was measured with a sliding caliper to the hundredth of a millimeter. Impressions recorded upon the vessel lip are called notches. Notches were recorded in terms of presence or absence as well as frequency and location (on the exterior, interior, or apical surface of the lip). In addition, the maximum thickness and depth of the notches was recorded using a sliding caliper to the hundredth of a millimeter.

Figure 5.10: (a) Vessel segment with directly applied punctates from the Bartron (21GD02) site within the MHS collection; (b) Vessel segment with gradually applied punctates from the Silvernale (21GD03) site within the MHS collection; (c) Vessel segment with steeply applied punctates from the Bartron (21GD02) site within the MHS collection.

Figure 5.11: Vessel segment from the Humphrey (21FA01) site with lip notches on the interior surface within the MHS collection.

Decorative lines are created by taking a pointed, angular, or rounded tool or one's finger and dragging it across the exterior or interior vessel surface to create straight or curved lines. For each decorated vessel, the orientation of line application was identified as horizontal, vertical, or oblique. Vessels can contain a combination of line applications. Lines were also identified as having a curvilinear or rectilinear form. Maximum thickness and depth of trailed or incised lines were calculated with a sliding caliper to the hundredth of a millimeter. On occasion, decorative lines were drawn along the vessel exterior in wet paste, when the vessel was still quite malleable, forming an embossed line on the interior surface, termed intaglio (Fleming 2009: 212; Holley n.d.). Presence or absence of intaglio was recorded as well as the amount of intaglio as either strong or weak. Strong intaglio was identified as protruding into the vessel at more than a half centimeter.

The presence or absence of particular elements, motifs, and compound motifs were recorded when distinguishable. Elements are discrete units of decoration, such as an oblique line or a punctate, which in combination with other elements create meaningful motifs. Compound motifs, such as the birdtail, are comprised of several motifs and elements. Some common motifs identifiable as symbols of the Oneota tradition are the chevron, nested chevron, hachured chevron, birdtail, line panel, and punctate border. Motifs are further described and explained in Chapter Eight. "The organization and layout of design configurations follow specific cultural rules or norms governing what constitutes an appropriate design" (Sinopoli 1991: 65). These different measurable attributes of vessel decoration display intricate variations in design application linked to stylistic behavior.

In addition to several features within each morphological segment of a vessel, certain non-morphologically specific attributes were recorded, such as temper, smudging, and burning. Temper is a term used to describe non-plastic inclusions mixed into clay by the potter to create a paste mixture from which a vessel is made. By mixing a temper, such as crushed shell or grit (rock) into clay, the potter reduces the chance of vessel shrinkage and fracturing during the firing process (Shepard 1985[1954]: 53; Sinopoli 1991: 12-14). The type of temper for each specimen was recorded as well as inclusion size and frequency. Temper size was determined using the Wentworth (1922) grain scale and the percentage of inclusion was acquired by employing a comparative scale created by Matthew, Wood, and Oliver (1991). A particular type of temper is significant to understanding vessel production because it reflects a distinct choice made by the individual potter to add shell, grit, grog (crushed pottery), or ash in particular quantities based on desired results. Additionally, the amount of temper added and the size of the inclusions reflect properties of particular clay deposits, such as stickiness, wetness, and texture, as well as the potter's experience with clay types.

Both smudging and burning alter the vessel by darkening the surface or clay body. Smudging is done purposefully or incidentally by exposing the vessel to a carbon-rich or sooty environment often done during the manufacturing process (Shepard 1985[1954]: 88). This results in the partial or complete blackening of the vessel interior and or exterior surface. When viewed in cross section, the smudged surface will appear black, but will not seep into the inner paste on the vessel. Burning is the result of unintentional accumulation of carbon material due to usage, such as cooking, which burns away any organic temper, such as shell. Burnt pottery is blackened throughout the clay body. Figure 5.12 displays the differences between smudging and burning on specimen included in this research.

Figure 5.12: Vessels with darkened surfaces. (a) Smudging on a vessel from Vosburg (21FA02) within the SMM collection (Catalog # A79:6:17:9); (b) Burning on a vessel from Adams (47PI12) within the SMM collection (Catalog # A2005:19:5).

Summary

This research seeks to record quantifiable and qualifiable data in order to create not only meaningful typologies, which reflect stylistic choices made my individuals during the pottery manufacturing process, but also a better interpretation of the presence or absence of decorative motifs among Oneota pottery at several archeological sites. The attributes selected for this research are a combination of several pottery studies (Wilford

1955; Stortroen 1957; Hurley 1978; Gibbon 1979; Shepard 1985[1954]; Sinopoli 1991; Edwards 1993; Rodell 1997; Fleming 2009; Holley n.d.), which have used varying characteristics to study the morphological and decorative aspects of style. This research seeks to explore more attributes than previous studies concerning pottery from the Upper Mississippi, Blue Earth, and St. Croix River valleys to more intricately explore the quantifiable differences of stylistic variation among pottery assemblages.

Chapter Six: Results I: Descriptive Statistics and Exploratory Analysis

> "… in order to determine the manner in which stylistic attributes combine and recombine through time, a great quantity of data must be considered." (Deetz 1965: 45).

Background

To truly define an artifact typology or several typologies within a region, researchers need to assess as many attributes as possible to collect a significant body of data from which the most informed conclusions can be determined. This chapter outlines all the descriptive statistics of vessel attributes gathered from the relevant sites in the Red Wing region, Center Creek locality, and the Sheffield site. All data collected for this research are split into three scales of measurement: ratio, interval, and nominal data. Ratio data are numerical measurements with an exact zero value (VanPool and Leonard 2011). This includes the data recovered from measuring rim length, orifice diameter, wall thicknesses, etc. Interval data also are gauged numerically; yet, without a true zero. These values are measured in regular increments, such as the grain size for temper, with all values within the increment present on a particular specimen. Nominal data are measured using words instead of numerical values, such as the presence or absence of particular rim or lip forms, decoration types, etc. (VanPool and Leonard 2011). For nominal data, frequencies and percentages of frequencies are recorded instead of any particular numerical measurement. Programs, such as Microsoft Excel 2013 and IMB SPSS version 23, were used to statistically analyze the ratio, interval, and nominal measurements gathered within this research.

This chapter is divided into several sections outlining morphology, temper, surface treatment, decoration, smudging, and burning. Within each section are organized outlines of the ratio, interval, and nominal data summary of 184 vessels and segments from 10 sites within the Red Wing region, two from the Center Creek locality, and the Sheffield Site along the St. Croix River. The summary of this chapter includes a shortened synopsis of the statistical results as well as comparative aspects between multi-component and pure Oneota samples in Red Wing, Bartron phase and Spring Creek phase assemblages in Red Wing, Center Creek and Red Wing pottery, as well as Red Wing and Sheffield pottery.

In addition to descriptive statistics for ratio data, additional exploratory analyses, such as ANalysis of VAriance (ANOVA) and t-tests, are used to compare samples within the Red Wing region as well as between the Red Wing region, Center Creek locality, and Sheffield site. ANOVA is a "conceptually explicit framework for deriving meaning from the comparison of means" (VanPool and Leonard 2011: 153). It allows a researcher to explore the variation of means within a dataset and determine whether observed differences are random or not. For this research, single-factor ANOVAs were conducted for the ratio data between three or more samples to compare variance between sites. Within the ANOVA results, information for the sum of squared differences (SS), degrees of freedom (DF), mean of squared differences (MS), f-distribution value (F), the probability of variance (p-value) and f critical value (F-Crit) are given.

The results of the p-value, f-value, and f-critical value particularly allow researchers to assess statistical differences between samples by either rejecting or confirming the null hypothesis (VanPool and Leonard 2011), which states that the differences between samples are not statistically discernable from random variation. To statistically reject the null hypothesis, the present study uses a threshold for the p-value to be at or below 0.05. The p-value of 0.05 is a common threshold for rejecting the null hypothesis but it was particularly chosen for this study because it provides an exploration of differences between samples with a 95% confidence that the null hypotheses will not be rejected if it is actually true. Within this particular study, rejecting the null hypothesis means that there is statistically significant difference not attributed to random processes between two samples given morphological and decorative attributes. Using this 95% confidence or p-value of 0.05 avoids possible typological classifications that are vague and too inclusive, such as the past types created to describe Oneota pottery from Red Wing, Center Creek, and Sheffield. A lower threshold of 0.01 (99% confidence that the null hypothesis will not be rejected if it is true) was not used because it increases the chances of failing to make a distinction when necessary and runs the risk of creating the same over-inclusive typologies that were outlined in the 20^{th} century. In addition within ANOVA tests, the null hypothesis may be rejected if the f-value calculated for a given sample is higher than the critical value. For example, the f-value of 4.74 calculated in Table 6.1 exceeds the critical value of 3.77. In this case, the null hypothesis would be rejected stating that the differences observed between the two samples examined is not attributed to random variation. To save space within this chapter, all ANOVA results are included within Appendix III, which is an extension of results tables.

Table 6.1: Example of ANOVA Results Table

ANOVA						
Source of Variation	SS	DF	MS	F	P-value	F Crit
Between Groups	10.16	2	5.08	4.74	0.05	3.77
Within Groups	180	168	1.07			
Total	190.16	170				

T-tests were used for comparison between two samples, such as between multi-component and pure Oneota sites as well as Bartron and Spring Creek phase sites within the Red Wing region, between Red Wing and Center Creek samples, as well as between Red Wing and the Sheffield site. T-tests evaluate hypotheses based on the t-distribution, which is an altered distribution to reflect the limits of the archeological sample versus the predicted population of artifacts present during a site's occupation, to either reject or confirm the null hypothesis. In other words, t-tests assess whether two samples are statistically different from each other. Similar to the ANOVA, t-tests give a probability value. A p-value less than 0.05 displays significant difference in which the null hypothesis can be rejected. For sites with a sample size of one, such as one available measurement for shoulder angle or notch thickness, statistical testing could not be conducted, and thus those sites/samples were not incorporated in ANOVA tests or t-tests. Although not within the exploratory analysis, these data were included in the tables below for completeness so that all available information is apparent for further analyses with additional data acquisition. A table of full t-test results are included in Appendix III.

For nominal data, frequencies of morphological and decorative attributes for each specimen were recorded in addition to the percentage of each variation of morphological or decorative features, such as the presence of vertical, everted, or curved rims or the frequency and percentage of lip notch types at each site assemblage examined. For the ratio data, the minimum (Min), maximum (Max), and average (Mean) values were recorded within a table for each variable in addition to the sum, variance (V), and standard deviation (SD) of all values. The variance and standard deviation of values are used to define and compare the degree of distribution within an assemblage (VanPool and Leonard 2011: 50). The variance is calculated by subtracting the mean from each value recorded for a particular measurement within a sample, squaring that difference, and then dividing it by the number of observations within the sample. The standard deviation is calculated by taking the square root of the variance (VanPool and Leonard 2011). Both values allow researchers to analyze the average divergence of means within a dataset, yet the standard deviation evades the use of squared values.

Morphology

All of the data results for each morphological variable are under their respective headings for the Red Wing region, Center Creek locality, and the Sheffield site. For example, the nominal and ratio measurements for a vessel's lip, such as lip form or lip thickness, are under the "Lip" heading. Result tables for nominal, interval, and ratio data from Red Wing vessels are horizontally divided into pure Oneota Bartron phase sites (Bartron and Adams), pure Oneota Spring Creek phase sites (Burnside School, McClelland, Sell, and Horse), and multi-component sites (Silvernale, Mero, Bryan, and Energy Park).

Vessel Orifice

<u>Red Wing.</u>

Overall, the orifice shapes of Red Wing vessels are predominately round. A few cases of ovular vessels exist in the assemblages from the Bartron and Bryan sites as well as several cases from the McClelland site, yet, round vessels are still the majority orifice shape for Oneota pottery from this region. Detecting a true oval shape to a vessel opening requires a larger section of rim and lip than is typically encountered, thus creating a potential or likely bias against documentation of this orifice shape. With additional excavations of larger vessels, the bias against oval vessel shapes may change. A table containing the results of orifice shape frequencies within the Red Wing region sample is located in Appendix III.

Orifice diameters for the region range from 9-50 cm with an average of 24.3 cm. For this research, orifice diameter ranges are divided into four ranges. These ranges were created by dividing up the observed range for possible orifice diameters from all three locations into more or less equal ranges. Small vessels have an orifice diameter within 9-19 cm, medium size vessels have orifice diameters within the 20-29 cm range, large vessels are between 30 and 39 cm, and very large vessels are above 40 cm in diameter. Orifice diameter is used as a proxy for overall vessel size on globular-shaped jars because there are no recorded specimen within this study sample with inverted rims. Inverted rims taper inwards towards the vessel interior instead of everting towards the vessel exterior, which would suggest that vessels with small, constricted orifice openings could have a large overall size. With everted, vertical, or curved rim forms, which either are flush with the vessel's vertical axis or flare outwards from it, orifice diameters will only widen as vessel size increases. Compared to the segments recovered from the Center Creek locality and Sheffield site, vessels from the Red Wing region are quite large. These large vessels would have been ideal for preparing, serving, and storing meals for large site populations or perhaps during several feasts, a unique trait of an aggregate region (Fleming 2009).

There is very little difference between sites in terms of the mean value for orifice diameter (Table 6.2). The ANOVA results, compiled in Appendix III, show that the probability of statistical difference, or p-value, is 0.11, well over the p-value threshold of 0.05. Yet, a few sites show some deviance. At Adams, the range of present diameters is much wider than the surrounding sites. The Bryan site has a single extremely large vessel well above the average range for Red Wing orifice diameters. Small vessels are interestingly absent from the McClelland assemblage. The McClelland site's range and mean values for orifice diameters are within the medium to large vessel ranges for the Red Wing region. Additional t-tests show no significant difference between multi-component and pure Oneota sites (p-value: 0.83) as well as between Bartron phase and Spring Creek phase (p-value: 0.40) sites. Regardless of location and time within the region, medium and large Oneota jars are present at all sites examined in this research.

Table 6.2: Orifice Diameter Results (cm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Bartron	15	12	35	24.30	364.50	50.92	7.14
Adams	34	9	38	24.07	818.50	71.43	8.45
Burnside School	3	15	20	16.67	50	8.33	2.89
McClelland	8	20	35	30.57	214	28.95	5.38
Silvernale	12	18	34	25.54	306.50	25.88	5.09
Mero	9	12	30	20.22	182	36.44	6.04
Bryan	9	15	50	24.78	223	106.94	10.34
Energy Park	22	14	35	24.36	536	27.48	5.24
Total	111	9	50	24.27	2694.5	53.56	7.32

Center Creek and Sheffield.

Similar to the Red Wing region, orifice shapes for globular jars are predominately round. A single vessel from the Vosburg site was recognizably ovular and two segments were too small to accurately determine orifice shape. Tabulated results for orifice shape for the Center Creek and Sheffield assemblages are located in Appendix III. ANOVA results (p-value: 0.17) do not support significant statistical difference between the sizes of Red Wing, Center Creek, and Sheffield vessels. Yet, a more detailed examination of diameter frequencies (Table 6.3) shows that vessels from the Center Creek locality and Sheffield site are on average smaller than those from Red Wing, mostly within the 12-25 cm range. There are a few specimens with orifice diameters in the large vessel range and a single one from Humphrey with a diameter of 40 cm but typically vessels from the Center Creek and Sheffield are small or medium in size.

Table 6.3: Orifice Diameter Results (cm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Vosburg	20	12	36	21.95	421	46.17	6.68
Humphrey	18	9	40	21.28	369	73.72	8.53
Total	38	9	40	21.63	822	56.42	7.51
Sheffield	9	12	34	32.17	208.5	53.75	7.33

Lip

Red Wing.

Round lips are the most frequent lip form on Oneota vessels from the Red Wing region, present at every site with an Oneota component, making up 91% of the sample. Yet, at most of the sites, there are several other types of lip form present. Table 6.4 displays the results for the presence or absence of round (R.), pointed (P.), flat (F.), beveled interior (B. I.), beveled exterior (B. E.), and indeterminate (Ind.) lip forms. Lip thicknesses range from 2.6-8.5 mm with an average of 4.7 mm. The ANOVA results (p-value: 0.12) for variation between each site displays a low probability of significant variation. Equally, t-tests comparing the variation of lip thicknesses between multi-component and pure Oneota sites (p-value: 0.61) and between Bartron phase and Spring Creek phase sites (p-value: 0.86) also display a low chance of significant statistical difference among lip thicknesses within Red Wing. Concerning added features to the lip surface, there are no recorded lip tabs among vessels in the Red Wing sample with Oneota morphological and decorative characteristics.

Table 6.4: Lip Form Results for Sites within the Red Wing Region

	Frequency							*Percent*						
Site Name	*R.*	*P.*	*F.*	*B.I.*	*B.E.*	*Ind*	*Total*	*R.*	*P.*	*F.*	*B.I.*	*B.E.*	*Ind*	*Total*
Bartron	9	-	4	2	1	1	17	52.9	-	23.5	11.8	5.9	5.9	100
Adams	29	-	4	1	2	2	38	76.3	-	10.5	2.6	5.3	5.3	100
Burnside School	4	-	-	-	1	-	5	80	-	-	-	20	-	100
McClelland	4	-	3	-	-	1	8	50	-	37.5	-	-	12.5	100
Sell	1	-	-	-	-	-	1	100	-	-	-	-	-	100
Silvernale	9	1	1	-	-	1	12	75	8.3	8.3	-	-	8.3	100
Mero	8	-	2	-	-	-	10	80	-	20	-	-	-	100
Bryan	10	-	-	-	-	-	10	100	-	-	-	-	-	100
Energy Park	17	2	2	-	6	-	27	63	7.4	7.4	-	22.2	-	100
Total	91	3	16	3	10	5	128	71.1	2.34	12.5	2.34	7.82	3.9	100

Table 6.5: Lip Thickness Results (mm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Bartron	16	3	8.50	4.89	78.25	2.44	1.56
Adams	36	2.60	6.50	4.49	161.80	0.94	0.97
Burnside School	5	2.70	5.20	4.23	21.15	1	1
McClelland	8	4.47	6.87	5.42	37.95	0.58	0.76
Sell	1	3.92	3.92	3.92	-	-	-
Silvernale	10	3.55	7.41	5.12	51.16	1.77	1.33
Mero	10	3	6.65	4.84	48.35	1.22	1.11
Bryan	10	2.70	5	4.02	40.20	0.55	0.74
Energy Park	27	3.40	7.10	4.88	131.75	0.74	0.86
Total	122	2.6	8.5	4.71	574.53	1.18	1.09

Center Creek and Sheffield.

Similar to Red Wing, round lips are the most common lip form within the Center Creek locality and the Sheffield site. Yet unlike Red Wing Oneota sites, this frequency is significantly lower (40.9%) and there is a more noteworthy presence of beveled interior and beveled exterior lips at both the Vosburg and Humphrey sites. The range of lip thicknesses at Center Creek sites is 2.5-7 mm and it is 2.9-6.1 mm at Sheffield, which are both smaller than that of Red Wing. In addition the deviation from the mean of 4.16 mm at Vosburg and Humphrey and 4.6 mm at Sheffield is significantly lower than the standard deviation at Red Wing sites. Differences of thickness are reflected in the low p-value of 0.01 from the ANOVA results, which display a high probability of non-random variation between the regions. There is one instance of the presence of a lip tab on a vessel from the Vosburg site. This vessel, termed the Thunderer Vessel, is unique among the Center Creek Oneota assemblage. Although it displays Oneota-like decorative themes of the Upperworld Thunderbird or Thunderer (Benn 1989: 243), it is morphologically more similar to Link type vessels than Oneota (see Chapter Eight). The table for lip tab frequencies is located in Appendix III.

Table 6.6: Lip Form Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency							*Percent*						
Site Name	*R.*	*P.*	*F.*	*B.I.*	*B.E.*	*Ind*	*Total*	*R.*	*P.*	*F.*	*B.I.*	*B.E.*	*Ind*	*Total*
Vosburg	13	1	5	1	5	-	25	52	4	20	4	20	-	100
Humphrey	5	-	3	5	6	-	19	26.3	-	15.8	26.3	31.6	-	100
Total	18	1	8	6	11	-	44	40.9	2.28	18.18	13.64	25	-	100
Sheffield	9	-	1	1	1	-	12	75	-	8.3	8.3	8.3	-	100

Table 6.7: Lip Thickness Results from Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Vosburg	25	2.50	5.80	4.16	104	0.61	0.78
Humphrey	19	2.80	7	4.13	78.55	1.05	1.02
Total	44	2.5	7	4.15	182.55	0.78	0.88
Sheffield	11	2.90	6.10	4.60	50.65	0.86	0.93

Rim

Red Wing.

Vertical and Everted rim forms are present at Oneota component sites within this region, yet, there are significantly more everted rims than vertical. There does not seem to be a difference in the presence or absence of vertical rims at pure Oneota sites versus multi-component sites, but curved rims only appear within the multi-component assemblages at the Mero, Bryan, and Energy Park sites. With the exception of one rim present within the Burnside School collection, vertical rims are nearly absent from Spring Creek phase sites. ANOVA results display a low probability of significance in the observed variation (p-value: 0.17) among the Red Wing sites in terms of rim thicknesses. Additional t-tests between multi-component verse pure Oneota sites (p-value: 0.78) as well as between Bartron and Spring Creek phase sites (p-value: 0.83) also display low statistical significance within the observable differences among the assemblages in terms of rim thickness. Thicknesses range from 3-10.8 mm with a mean value of 7.3 mm (Table 6.9).

Table 6.8: Rim Form Results for Sites within the Red Wing Region

	Frequency				*Percent*			
Site Name	*Vertical*	*Everted*	*Curved*	*Total*	*Vertical*	*Everted*	*Curved*	*Total*
Bartron	3	14	-	17	17.6	82.4	-	100
Adams	11	27	-	38	28.9	71.1	-	100
Burnside School	1	4	-	5	20	80	-	100
McClelland	-	8	-	8	-	100	-	100
Sell	-	1	-	1	-	100	-	100
Silvernale	-	12	-	12	-	100	-	100
Mero	1	8	1	10	10	80	10	100
Bryan	1	8	1	10	10	80	10	100
Energy Park	4	19	4	27	14.8	70.4	14.8	100
Total	21	101	6	128	16.4	78.9	4.7	100

Table 6.9: Rim Thickness (mm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Bartron	17	5.23	10	7.16	121.79	2.16	1.47
Adams	38	4.70	10.65	7.44	282.85	2.14	1.46
Burnside School	5	3.70	9	6.20	31.00	4.03	2.01
McClelland	8	5.68	10.81	7.66	61.28	4.22	2.05
Sell	1	8.93	8.93	8.93	-	-	-
Horse	1	8	8	8	-	-	-
Silvernale	12	5.89	10.31	8.13	97.55	2.44	1.56
Mero	10	3.40	8.50	6.82	68.20	2.17	1.47
Bryan	10	4.50	9.30	6.62	66.15	2.07	1.44
Energy Park	27	4.70	10.50	7.60	205.15	2.11	1.45
Total	129	3.4	10.81	7.37	942.9	2.42	1.56

The ANOVA results for rim length show a high probability of non-random differences (p-value: 0.00) between each Red Wing site's sample. T-tests also show a significant statistical variation (p-value: 0.00) between multi-component and pure Oneota sites. The range of rim lengths for vessels from multi-component sites is wide, ranging from 15.4-65.6mm; yet for pure Oneota sites, the range is much tighter at 17.4-52.5 mm. Equally, t-tests demonstrate statistical significance in the differing rim lengths (p-value: 0.01) among the vessel segments from Bartron and Spring Creek phase sites. Rim length for vessels within the Bartron phase range from 15.4-65.6 mm, similar to the multi-component sites. Short rims are absent from Spring Creek phase site assemblages; rims are generally longer and the range is tighter (22.8-52.5 mm) than the earlier Bartron phase.

Table 6.10: Rim Length Results (mm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Bartron	17	17.40	50	35.66	530.55	72.21	8.29
Adams	37	16.40	64.30	37.48	1386.85	138.95	11.79
Burnside School	5	22.75	50.90	34.15	696.05	108.84	11.64
McClelland	8	35.56	52.48	45.36	317.53	27.62	5.26
Sell	1	42.73	42.73	42.73	-	-	-
Silvernale	12	16.71	46.30	34.91	380.86	56.92	7.52
Mero	10	15.35	31.05	23.34	280.20	25.58	5.59
Bryan	10	18.90	60	35.32	353.20	164.57	12.83
Energy Park	27	20.20	65.60	32.98	890.35	104.38	10.22
Total	124	15.35	65.60	34.52	4349.35	116.30	10.78

The ANOVA and t-test results also show significance in the differences for rim angles between multi-component and pure Oneota sites (p-value: 0.01) but not between Bartron and Spring Creek phase sites (p-value: 0.25). The range of rim angles for multi-component sites is 51-84º (Table 6.11). The range of rim angles for pure Oneota sites is 34-83º. Rim angles at pure Oneota sites vary more widely. With the exception of a single vessel from Bartron, average rim angles for pure Oneota sites are higher, thus more vertical, than those from multi-component sites, with Adams being the site at which the most vertical rims (76º or higher) are present.

Table 6.11: Rim Angle Results (degrees) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Bartron	17	34	80	62.88	1069	168.36	12.98
Adams	37	56	86	71.41	2642	54.41	7.38
Burnside School	5	58	83	68.40	342	107.80	10.38
McClelland	8	57	75	67.75	542	46.79	6.84
Sell	1	51	51	51	-	-	-
Silvernale	11	52	65	60.45	665	15.27	3.91
Mero	10	51	77	62.20	622	56.18	7.50
Bryan	10	51	81	63.40	634	124.71	11.17
Energy Park	27	51	84	66.07	1784	103.61	10.18
Total	126	34	86	66.28	8351	95.61	9.78

Rim attachment methods for vessels from the Red Wing region are predominantly "drawn up" (82%) from the same paste that formed the shoulder and neck juncture. Although attached rims are the minority attachment method at these sites (13.3%), they are present at nearly every site in Red Wing with the exception of the Burnside School and Sell sites. However, these two sites have very small assemblages, five segments or less, thus with more excavation and cataloging attached rims may become present. A few segments from Adams, Energy Park, and McClelland have fractured or recreated junctures in which the rim attachment method was indiscernible.

Table 6.12: Rim Attachment Method Results for Sites within the Red Wing Region

	Frequency				*Percent*			
Site Name	*Attached*	*Drawn Up*	*Ind.*	*Total*	*Attached*	*Drawn Up*	*Ind.*	*Total*
Bartron	4	13	-	17	23.5	76.5	-	100
Adams	6	29	3	38	15.8	76.3	7.9	100
Burnside School	-	5	-	5	-	100	-	100
McClelland	1	5	2	8	12.5	62.5	25	100
Sell	-	1	-	1	-	100		100
Silvernale	3	9	-	12	25	75	-	100
Mero	1	9	-	10	10	90	-	100
Bryan	1	9	-	10	10	90	-	100
Energy Park	1	25	1	27	3.7	92.6	3.7	100
Total	17	105	6	128	13.28	82.03	4.69	100

Center Creek and Sheffield.

Similar to the Red Wing region, the Center Creek locality and Sheffield site have a high frequency of everted rims. The ratio of vertical to everted rims within the Center Creek locality is slightly more equal than that of Red Wing. Curved rims are nearly absent from these sites. In contrast to Red Wing and Center Creek, everted rims dominate the assemblage at the Sheffield site with only single instances of a vertical and a curved rim (Table 6.13). Rim thicknesses within the Center Creek locality and at the Sheffield site are smaller compared to those at Red Wing, ranging from 4.4-10.5 mm in Center Creek and 5.2-9.5 mm at Sheffield. Yet, the ANOVA test results argue for little non-random difference (p-value: 0.28) among Red Wing, Center Creek, and Sheffield.

Table 6.13: Rim Form Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency				*Percent*			
Site Name	*Vertical*	*Everted*	*Curved*	*Total*	*Vertical*	*Everted*	*Curved*	*Total*
Vosburg	6	19	-	25	24	76	-	100
Humphrey	3	15	1	19	15.8	78.9	5.3	100
Total	9	34	1	44	20.46	77.27	2.27	100
Sheffield	1	10	1	12	8.3	83.3	8.3	100

Table 6.14: Rim Thickness Results (mm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Vosburg	25	5	10.50	7.17	179.32	1.89	1.38
Humphrey	19	4.40	9.50	7.07	134.35	1.21	1.10
Total	44	4.40	10.51	7.12	313.67	1.57	1.25
Sheffield	12	5.20	9.50	6.84	82.05	1.41	1.19

Rim lengths at Center Creek and Sheffield are much smaller than those at Red Wing. Average rim length for Center Creek sites is 29.6 mm with an observed range of 14.1-53.9 mm. Average rim length for Sheffield of 34.6 mm is slightly longer than that of Center Creek but the range of 21.4-51 mm is smaller than that of the Center Creek locality. Both of these assemblages differ greatly from the range of 15.4-65.6 mm at Red Wing. The ANOVA results confirm this difference with a p-value of 0.01.

Table 6.15: Rim Length Results (mm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Vosburg	25	14.05	53.85	30.02	750.47	80.97	9.00
Humphrey	19	16.75	43	28.98	550.65	65.98	8.12
Total	44	14.05	53.85	29.57	1301.12	73.08	8.55
Sheffield	12	21.40	51	34.52	414.25	70.91	8.42

Rim angle results (Table 6.16) for the Center Creek locality and Sheffield site reflect little difference from the assemblages within the Red Wing region. The average rim angle for Center Creek is 67.9° and 66.8° at Sheffield compared to 66.3° within Red Wing. ANOVA results confirm this similarity with an overall probability value of 0.61, well above the 0.05 indicating significant non-random difference. In actuality, there is more variation among rim angles within the Red Wing sample than between Red Wing and its regional neighbors.

Table 6.16: Rim Angle Results (degrees) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Vosburg	23	53	82	68.52	1576	59.53	7.72
Humphrey	19	49	87	67.21	1277	94.62	9.73
Total	42	49	87	67.93	2853	73.92	8.60
Sheffield	12	60	81	66.83	802	36.33	6.03

The rim attachment method results for the Center Creek locality are similar to those of the Red Wing region: predominantly drawn up from the paste that formed the shoulder and neck juncture (86.4%). Attached rims make up significantly less of the Center Creek sample (13.6%) and are entirely absent within the sample from Sheffield, although a quarter of the Sheffield assemblage had broken or reconstructed junctures.

Table 6.17: Rim Attachment Method Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency				*Percent*			
Site Name	*Attached*	*Drawn Up*	*Ind.*	*Total*	*Attached*	*Drawn Up*	*Ind.*	*Total*
Vosburg	5	20	-	25	20	80	-	100
Humphrey	1	18	-	19	5.3	94.7	-	100
Total	6	38	-	44	13.64	86.36	-	100
Sheffield	-	8	4	12	-	66.7	33.3	100

Neck

Red Wing

General neck thicknesses (Table 6.18) for Oneota sites within the Red Wing region range from 4.3-15.8 mm with an average of 7.9 mm. The largest range of neck thicknesses is at the Mero site (5.6-16.6 mm). Neck junctures from Silvernale are generally thicker (10.5 mm) and those from Burnsides School are commonly the thinnest (7.4 mm). ANOVA results show that the differences among the Red Wing sites are not statistically significant (p-value: 0.28). Additional t-tests also display little difference between the multi-component and pure Oneota sites (p-value: 0.97) as well as Bartron and Spring Creek phase sites (p-value: 0.06).

Table 6.18: Neck Thickness Results (mm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Bartron	17	5	12.50	8.54	145.10	5.42	2.33
Adams	38	5	14.30	8.84	335.98	4.81	2.19
Burnside School	5	4.90	9.20	7.40	37	2.46	1.57
McClelland	8	5.96	11.97	9.16	73.26	4.54	2.13
Sell	1	8.33	8.33	8.33	-	-	-
Horse	1	11	11	11	-	-	-
Silvernale	10	8.08	15.80	10.47	125.59	6.42	2.53
Mero	10	5.55	16.60	9.10	90.95	10.25	3.20
Bryan	10	5.50	12	8.55	85.45	5.86	2.42
Energy Park	27	4.90	12.55	8.30	224	4.61	2.15
Total	128	4.30	15.80	7.85	1113.36	5.15	2.27

Neck diameters among the Red Wing sites reflect patterns in orifice diameters. Amidst the sites assemblages, diameters range from 10-48.8 cm displaying both large and small vessels within the samples. Average diameter size for Red Wing is 21.7 cm. ANOVA and t-test results reflect the low probability of significance to the observed variation between each site (p-value: 0.38), between pure Oneota and multi-component sites (p-value: 0.99), and between Bartron and Spring Creek phase sites (p-value: 0.46).

Table 6.19: Neck Diameter Results (cm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Bartron	15	11	32.50	20.53	308	44.59	6.68
Adams	34	10	37	22.18	754	64.77	8.05
Burnside School	3	13.50	17	15	45	3.25	1.80
McClelland	6	10	32	23.25	151.50	59.78	7.73
Silvernale	12	14	29	22.25	267	24.89	4.99
Mero	9	11.50	27.50	18.22	164	26.19	5.11
Bryan	8	12.50	48.75	23.19	185	126.98	11.27
Energy Park	22	12	34.50	22.23	515	24.86	5.04
Total	109	10	48.75	21.69	2364	49.51	7.04

Similar to rim angle results, neck angles vary greatly among the site samples within Red Wing (p-value: 0.00). Generally, neck angles in this region range broadly from 76-142º, with an average of 104°. The Energy Park assemblage has the widest range and highest value for neck angles, that is, the sample varies more than the other Red Wing assemblages in terms of observed values and has the most obtuse neck angles recorded for the Red Wing region. The most acute angles are from the McClelland sample. T-tests between the Bartron and Spring Creek phase sites (p-value: 0.80) as well as the multi-component and pure Oneota sites (p-value: 0.44) are not as statistically significant as the intra-site probability values from the ANOVA results. This shows that variation of neck angle exists on a more local, site-based level than by component or phase.

Table 6.20: Neck Angle Results (degrees) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Bartron	17	89	113	98.82	1680	53.03	7.28
Adams	37	90	131	105.41	3900	104.58	10.23
Burnside School	5	100	122	113.30	566.50	81.95	9.05
McClelland	8	76	117	101.13	809	146.13	12.09
Sell	1	84	-	-	-	-	-
Horse	1	101	-	-	-	-	-
Silvernale	10	85	104	94	943	32.01	5.66
Mero	10	90	137	110	1109	220.77	14.86
Bryan	10	89	116	101	1010	55.78	7.47
Energy Park	27	91	142	107.44	2901	187.10	13.68
Total	126	76	142	104.02	13002.50	135.97	11.66

Interior neck shapes for Red Wing sites are mostly sharp (60.9%). Although round neck junctures are less common within the whole region, they do dominate the Oneota vessel segment samples at the Bartron, Mero, and Bryan sites, which are part of the earlier Bartron phase along the Cannon and Mississippi Rivers. Exterior neck shapes are predominantly either parallel (Paral.) (46.1%) or expanding (Expan.) (43%), with a smaller amount of constricting (Const.) (8.7%) necks at the Bartron, Adams, McClelland, and Energy Park sites. Two sites: Sell and Burnsides School show no variation in exterior neck shape among the pottery segment assemblage. Again, this may be because of the sites' small sample sizes.

Table 6.21: Interior Neck Shape Results for Sites within the Red Wing Region

	Frequency				*Percent*			
Site Name	*Round*	*Sharp*	*Ind.*	*Total*	*Round*	*Sharp*	*Ind.*	*Total*
Bartron	9	8	-	17	52.9	47.1	-	100
Adams	14	24	-	38	36.8	63.2	-	100
Burnside School	2	3	-	5	40	60	-	100
McClelland	1	7	-	8	12.5	87.5	-	100
Sell	-	1	-	1	-	100	-	100
Silvernale	4	8	-	12	33.3	66.7	-	100
Mero	6	4	-	10	60	40	-	100
Bryan	7	3	-	10	70	30	-	100
Energy Park	7	20	-	27	25.9	74.1	-	100
Total	50	78	-	128	39.06	60.94	-	100

Table 6.22: Exterior Neck Shape Results for Sites within the Red Wing Region

	Frequency					*Percent*				
Site Name	*Paral.*	*Expan.*	*Const.*	*Ind.*	*Total*	*Paral.*	*Expan.*	*Const.*	*Ind.*	*Total*
Bartron	7	7	3	-	17	41.2	41.2	17.6	-	100
Adams	18	15	4	1	38	47.4	39.5	10.5	2.6	100
Burnside School	5	-	-	-	5	100	-	-	-	100
McClelland	3	3	2	-	8	37.5	37.5	25	-	100
Sell	-	1	-	-	1	-	100	-	-	100
Silvernale	4	6	-	2	12	33.3	50	-	16.7	100
Mero	3	7	-	-	10	30	70	-	-	100
Bryan	4	6	-	-	10	40	60	-	-	100
Energy Park	15	10	2	-	27	55.6	37	7.4	-	100
Total	59	55	11	3	128	46.09	42.97	8.6	2.34	100

Center Creek and Sheffield.

Neck thicknesses for the Center Creek locality sample range from 5-15.6 mm, which is very similar to the 4.3-15.8 mm sample range of the Red Wing region. The range for neck thicknesses within the Sheffield site sample is more concentrated at 7-9.1 mm than the other two samples. Yet statistically, the variation between all three locations: the Red Wing region, Center Creek locality, and Sheffield site is not significant (p-value: 0.71).

Table 6.23: Neck Thickness Results (cm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Vosburg	25	5.40	15.55	8.43	210.82	3.77	1.94
Humphrey	19	4.95	12.50	8.88	168.80	4.80	2.19
Total	44	4.95	15.55	8.63	379.62	4.17	2.04
Sheffield	11	7	9.10	7.85	86.35	0.50	0.71

Table 6.24: Neck Diameter Results (cm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Vosburg	19	10.50	32	19.55	371.50	40.64	6.37
Humphrey	18	7.30	40	19.32	347.80	78.49	8.86
Total	37	7.30	40	19.44	719.30	57.39	7.59
Sheffield	9	11	31	22.11	199	31.47	5.61

Neck angles for the Center Creek sample range from 78-114° with a mean value of 97.7°. Angles on segments from the Sheffield site range from 85-131° with an average of 104.6°. Both the Center Creek and Sheffield neck angle ranges are tighter than that of Red Wing. ANOVA results display a high probability of significant differences between the three locations (p-value: 0.01) with most of the differences existing between the Red Wing and Center Creek angles (p-value: 0.00). Neck angles for vessels recovered from the Center Creek locality are on average (97.7º) more acute than those from Red Wing (104º) and Sheffield (104.6º).

Table 6.25: Neck Angle Results (degrees) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Vosburg	23	89	114	101.43	2333	48.35	6.95
Humphrey	19	78	111	93.26	1772	82.54	9.09
Total	42	78	114	97.74	4105	79.12	8.90
Sheffield	12	85	131	104.58	1255	187.72	13.70

Similar to Red Wing, the Center Creek locality's assemblage has both round and sharp interior neck shapes with slightly more sharp junctures (59.1%) than round (40.9%). Equally similar are the majority of parallel (43.2%) and expanding (38.6%) exterior neck shapes with a smaller presence of constricting necks (18.2%). Concerning overall neck shape, the Red Wing and Center Creek assemblages are very similar and the difference instead lies within each population between the choices of manufacturing which result in different neck shapes. Unlike those two assemblages, substantial difference lies within the Sheffield sample, where there are significantly more round neck junctures (75%) than sharp (25%). In addition, there are considerably more parallel exterior neck shapes (91.7%) than expanding (8.3%) and constricting (0%) necks. The overall neck shape and thickness within the Sheffield pottery assemblage is unique to that site and bares little similarity to Red Wing or Center Creek.

Table 6.26: Interior Neck Shape Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency				*Percent*			
Site Name	*Round*	*Sharp*	*Ind.*	*Total*	*Round*	*Sharp*	*Ind.*	*Total*
Vosburg	7	18	-	25	28	72	-	100
Humphrey	11	8	-	19	57.9	42.1	-	100
Total	18	26	-	44	40.9	59.1	-	100
Sheffield	9	3	-	12	75	25	-	100

Table 6.27: Exterior Neck Shape Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency					*Percent*				
Site Name	*Paral.*	*Expan.*	*Const.*	*Ind.*	*Total*	*Paral.*	*Expan.*	*Const.*	*Ind.*	*Total*
Vosburg	10	7	8	-	25	40	28	32	-	100
Humphrey	9	10	-	-	19	47.4	52.6	-	-	100
Total	19	17	8	-	44	43.18	38.64	18.18	-	100
Sheffield	11	1	-	-	12	91.7	8.3	-	-	100

Shoulder

Red Wing.

As a feature of most Oneota vessels throughout the Midwest, round shoulders are overwhelmingly present on vessels recovered from the Red Wing region. For vessel segments without a complete shoulder juncture, shoulder forms were marked as indeterminate. As stated within the Methods Chapter of this thesis, an ideal vessel segment contains nearly a complete representation of vessel morphology from the lip to the body; yet, for this research too few specimens within the archeological record of Red Wing fit that exact requirement. Eighty-two percent of the vessel sample used for this study were fragmented above the shoulder juncture. A table of shoulder form frequencies is located in Appendix III. With the notable absence of complete shoulders, the results for shoulder angle, which again is taken from the shoulder juncture, were quite minimal in terms of specimen. Twelve shoulders from the Bartron, Adams, Silvernale, McClelland, and Bryan sites were complete enough for an angle measurement ranging from 120 to 149°. ANOVA results for these samples do not show significant statistical variation in the observed frequencies (p-value: 0.09) between the Red Wing sites.

Table 6.28: Shoulder Angle Results (degrees) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Bartron	5	120	134	128.2	641	5.67	32.2
Adams	2	139	149	144	288	7.07	50
McClelland	1	122	-	-	-	-	-
Silvernale	3	121.5	135	129.5	388.5	7.09	50.25
Bryan	1	130	-	-	-	-	-
Total	12	120	149	131.59	1447.50	8.13	66.04

Shoulder thicknesses for sites within the Red Wing region range from 3.5-10.3 mm with a mean value of 6.2 mm. Although ANOVA results (p-value: 0.59) and additional t-tests for Bartron phase verse Spring Creek phase sites (p-value: 0.43) and pure Oneota verse multi-component sites (p-value: 0.52) show no statistically significant difference between sites, vessel segments with the thickest shoulders are present within the Adams, Bartron, Energy Park, and Silvernale sites assemblages, which are all part of the Bartron phase. Additionally these site assemblages have the highest amount of variance and largest ranges among shoulder thicknesses for the vessel segments. Spring Creek phase sites, such as Burnside School, McClelland, Sell, and Horse have smaller ranges and less variance for shoulder thicknesses.

Table 6.29: Shoulder Thickness (mm) Results for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Bartron	17	3.50	9.25	6.10	103.75	3.29	1.81
Adams	37	4.30	10.30	6.29	232.55	1.98	1.41
Burnside School	4	3.55	6.10	5.05	20.20	1.55	1.25
McClelland	8	4.13	8.55	6.32	50.59	2.89	1.70
Sell	1	4.90	-	-	-	-	-
Horse	1	4.50	-	-	-	-	-
Silvernale	12	4	9.35	6.84	82.05	2.27	1.51
Mero	10	3.60	8.50	5.77	57.65	1.59	1.26
Bryan	10	4.00	8.80	6.09	60.85	2.07	1.44
Energy Park	27	4.30	9.45	6.19	167.05	1.91	1.38
Total	126	3.50	10.30	6.19	779.59	2.17	1.47

Center Creek and Sheffield.

Similar to the Red Wing region, round shoulder forms are the only shape present within the Vosburg, Humphrey, and Sheffield assemblages. Equally similar to Red Wing, very few specimen have complete enough shoulder junctures for an accurate measurement of shoulder angle. Five shoulders were measured from the Center Creek locality and one from the Sheffield site. Shoulder angles for Center Creek range from 118-140° with an average of 127.6°. The shoulder angle from Sheffield is 130°, which fits within both the ranges of angles for the Red Wing region and Center Creek locality. ANOVA results (p-value: 0.89) support the similarity among the three locations concerning shoulder angle. Tables for shoulder form frequencies and ANOVA results are located in Appendix III.

Table 6.30: Shoulder Angle Results (degrees) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Vosburg	3	128	140	132	396	6.93	48
Humphrey	2	118	120	119	238	1.41	2
Total	5	118	140	127.6	638	8.99	80.8
Sheffield	1	130	-	-	-	-	-

Shoulder thicknesses for the Vosburg and Humphrey sites range from 4-12.3 mm with an average of 6.7 mm. Shoulders are slightly thicker and their thicknesses vary more at Humphrey than Vosburg. Shoulder thicknesses at the two Center Creek sites are slightly thicker than at Red Wing. Shoulder thicknesses for the Sheffield assemblage range from 3.7-7.1 mm with an average of 5.6 mm, which is slightly smaller than the Red Wing and Center Creek sample ranges. Although there are slight differences in thicknesses among the Red Wing, Center Creek, and Sheffield segments, ANOVA results (p-value: 0.11) and additional t-tests between the Red Wing and Center Creek locality (p-value: 0.09) as well as between Red Wing and Sheffield (p-value: 0.05) support an overall similarity among the assemblages.

Table 6.31: Shoulder Thickness Results (mm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Vosburg	25	4.70	9.10	6.37	159.18	1.26	1.12
Humphrey	19	4	12.25	7.08	134.50	4.78	2.19
Total	44	4	12.25	6.67	293.68	2.83	1.68
Sheffield	12	3.70	7.05	5.56	66.70	0.84	0.91

Handle

Red Wing.

Most vessel segments recovered from sites within the Red Wing region either did not originally have handles or most likely were portions of the vessel on which handles were not located. For those segments in which handles did survive, 64% were loop handles and 24% strap handles, 12% of the recorded handles were too incomplete to determine a particular form. Loop handles are present at every site in Red Wing with the exception of the Sell site. Strap handles are only present within the Bartron, Burnside School, Bryan, and Energy Park samples. The strap handle from Burnside School is unique among Red Wing handles. A filleted lug had been added to the exterior surface as a decorative element, with a single punctate in its center. A profile of this interesting handle can be found in Appendix II.

Table 6.32: Handle Form Results for Sites within the Red Wing Region

	Frequency					*Percent*				
Site Name	*Abs.*	*Loop*	*Strap*	*Ind.*	*Total*	*Abs*	*Loop*	*Strap*	*Ind.*	*Total*
Bartron	14	1	2	-	17	82.4	5.9	11.5	-	100
Adams	32	5	-	1	38	84.2	13.3	-	2.6	100
Burnside School	3	1	1	-	5	60	20	20	-	100
McClelland	6	2	-	-	8	75	25	-	-	100
Sell	1	-	-	-	1	100	-	-	-	100
Silvernale	10	1	-	1	12	83.3	8.3	-	8.3	100
Mero	8	1	-	1	10	80	10	-	10	100
Bryan	6	3	1	-	10	60	30	10	-	100
Energy Park	23	2	2	-	27	85.2	7.4	7.4	-	100
Total	103	16	6	3	128	80.47	12.50	4.69	2.34	100

Handles measured for this research were more commonly attached at the superior end to the exterior rim and at the inferior end to the exterior shoulder (51.9%). At all sites with recovered handles, this attachment method is present. Handles attached at the exterior lip and shoulder comprised 40.7% of the Red Wing sample and are present within the Adams, McClelland, Mero, Bryan, and Energy Park assemblages. Two specimen recovered from the Bartron and Silvernale sites have handles that were attached at both the superior and inferior ends to the exterior shoulder only. Currently, no handles have been cataloged from the Sell site.

Table 6.33: Handle Attachment Location Results for Sites within the Red Wing Region

	Frequency						*Percent*					
Site name	*Abs.*	*L/S.*	*R/S.*	*S.*	*Ind*	*Total*	*Abs.*	*L/S.*	*R/S.*	*S.*	*Ind*	*Total*
Bartron	14	-	2	1	-	17	82	-	12	6	-	100
Adams	30	2	4	-	-	38	84	5.3	11	-	-	100
Burnside School	3	-	2	-	-	5	60	-	40	-	-	100
McClelland	6	1	1	-	-	8	75	13	13	-	-	100
Sell	1	-	-	-	-	1	100	-	-	-	-	100
Silvernale	10	-	1	1	-	12	83	-	8.3	8	-	100
Mero	8	1	1	-	-	10	80	10	10	-	-	100
Bryan	6	2	2	-	-	10	60	2	2	-	-	100
Energy Park	23	3	1	-	-	27	85	11.1	3.7	-	-	100
Total	101	9	14	2	-	128	78.91	8.59	10.94	1.56	-	100

Statistical results establish an overall similarity among the Red Wing sites in terms of handle lengths, widths, and thicknesses for both loop and strap forms. Handle lengths range from 21.5-53 mm with an average of 39.3 mm (Table 6.34). The longest handles are present within the Adams, McClelland, and Energy Park samples, the shortest within the Mero and Adams collections. The ANOVA results for handle lengths among the eight sites with handles present within their assemblages display a p-value of 0.28. Additional t-tests between Spring Creek and Bartron phase samples as well as pure Oneota and multi-component sites confirm the similarities with p-values of 0.82 and 0.97, respectively.

Table 6.34: Handle Length Results (mm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Bartron	3	40.40	44	42.13	126.40	1.80	3.25
Adams	4	25.90	46.70	35.84	143.35	9.93	98.64
Burnside School	2	34.50	38.90	36.70	73.40	3.11	9.68
McClelland	2	42.03	44.32	43.18	86.35	1.62	2.62
Silvernale	1	37.78	-	-	-	-	-
Mero	1	21.50	21.50	21.50	21.50	-	-
Bryan	4	31	53	43.50	174	9.71	94.33
Energy Park	3	38.90	44.10	41	123	2.74	7.51
Total	20	21.50	53	39.29	785.78	7.70	59.53

Handle widths range from 8.95-37.5 mm with an average of 19.9 mm. ANOVA results (p-value: 0.16) confirm the null hypothesis of a lack of non-random difference among the samples as well as the additional t-tests between multi-component and pure Oneota sites (p-value: 0.21) and Bartron verse Spring Creek phase sites (p-value: 0.87). Yet, the widest handles in Red Wing, of both loop and strap form, are present within the Burnside School, Energy Park, and Bryan samples.

Table 6.35: Handle Width Results (mm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Bartron	3	15.50	20.50	54.50	18.17	2.52	6.33
Adams	5	8.95	23.40	80.10	16.02	6.59	43.40
Burnside School	2	12.50	37.50	50	25.00	17.68	312.50
McClelland	2	17.75	18.76	36.51	18.26	0.71	0.51
Silvernale	1	11.45	-	-	-	-	-
Mero	1	9.80	-	-	-	-	-
Bryan	3	20	31.50	73.00	24.33	6.25	39.08
Energy Park	4	18.25	33.40	102.15	25.54	6.22	38.74
Total	21	8.95	37.50	19.88	417.51	7.73	59.74

Handle thicknesses range from 8.5-23.4 mm with an average of 13.3 mm. The thinnest handles are present within the Bryan and Mero collections and the thickest handles are within the Adams and Energy Park samples. ANOVA results for handle thickness within the Red Wing region display a p-value of 0.87 and t-tests display p-values of 0.38 and 0.98 between multi-component and pure Oneota sites as well as Bartron and Spring Creek phase sites, again confirming the overall lack of significant differences in handle attributes among these sites.

Table 6.36: Handle Thickness Results (mm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Bartron	3	11	14	12	36	1.73	2.99
Adams	5	13	23.40	13.95	69.75	2.46	30.
Burnside School	2	9	11	10	20	1.41	1.98
McClelland	2	14.08	15.53	14.81	29.61	5.52	30.49
Silvernale	1	11.41	-	-	-	-	-
Mero	1	8.65	-	-	-	-	-
Bryan	3	8.50	16	13	39	3.97	15.75
Energy Park	4	11.60	22.80	15.80	63.20	5.00	25.02
Total	20	8.5	23.40	13.33	266.62	4.08	16.64

Center Creek and Sheffield.

Handles of the strap form (75%) dominate the Sheffield sample and are more common within the Center Creek locality (46.2%) than loop handles (38.5%). This is opposite to the Red Wing region in which loop handles are more common. Two handles from the Center Creek locality could not be identified in terms of form due to their incompleteness. Similar to the Red Wing region, handles from Center Creek sites are more commonly attached to the exterior rim and shoulder (53.8%) than the lip and shoulder (30.8%). For the Sheffield site, half of the handles were attached at the rim and shoulder and the other half at the lip and shoulder. Unlike the Red Wing region, no rims were attached to the exterior shoulder only.

Table 6.37: Handle Form Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency					*Percent*				
Site Name	*Absent*	*Loop*	*Strap*	*Ind.*	*Total*	*Absent*	*Loop*	*Strap*	*Ind.*	*Total*
Vosburg	17	3	4	1	25	68	12	16	4	100
Humphrey	14	2	2	1	19	73.7	10.5	10.5	5.3	100
Total	31	5	6	2	44	70.45	11.36	13.64	4.55	100
Sheffield	8	1	3	-	12	66.7	8.3	25	-	100

Table 6.38: Handle Attachment Location for Sites within the Center Creek Locality and Sheffield Site

	Frequency						*Percent*					
Site Name	*Abs.*	*L/S.*	*R/S.*	*S.*	*Ind*	*Total*	*Abs.*	*L/S.*	*R/S.*	*S.*	*Ind*	*Total*
Vosburg	17	1	6	-	1	25	68	4	24	-	4	100
Humphrey	14	3	1	-	1	19	73.7	15.8	5.3	-	5.3	100
Total	31	4	7	-	2	44	70.45	9.09	15.91	-	4.55	100
Sheffield	8	2	2	-	-	12	66.7	16.7	16.7	-	-	100

Lengths for Center Creek handles range from 24-44.9 mm with an average of 32.96 mm. Handle lengths for the Sheffield site range from 24.1-41 mm with and a mean value of 30.5 mm. In terms of handle length, the Vosburg, Humphrey, and Sheffield sites are extremely similar and are generally longer than handles at Burnside School, Silvernale, and Bryan, within the Red Wing region. ANOVA results show a low p-value of 0.01, indicating a statistically significant difference among the three locations. Additional t-tests show that the significance lies between the Red Wing and Center Creek (p-value: 0.03) samples rather than Red Wing and Sheffield (p-value: 0.11).

Table 6.39: Handle Length Results (mm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Vosburg	7.00	26.20	44.85	35.59	249.15	7.02	49.23
Humphrey	4.00	24.00	40.40	28.35	113.40	8.05	64.76
Total	11	24	44.85	32.96	362.55	7.89	62.32
Sheffield	4.00	24.10	41.00	30.53	122.10	7.86	61.71

Different from handle lengths, handle widths among the Red Wing region, Center Creek locality, and Sheffield site are statistically similar (p-value: 0.32). For the Center Creek locality, handles widths range from 14-52.3 mm with an average of 26.3 mm. Handle widths for the Sheffield site range from 17.6-35.3 mm with a mean value of 26.3 mm.

Table 6.40: Handle Width Results (mm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Vosburg	7	15.70	52.30	30.90	216.31	13.17	173.34
Humphrey	4	14	40.30	22.45	89.80	12.41	154.11
Total	11	14	52.30	27.83	306.11	12.98	168.42
Sheffield	4	17.60	35.30	26.28	105.10	8.60	73.92

Handle thicknesses for the Center Creek locality range from 6-15.7 mm with a mean of 9.2 mm. The range of handle thicknesses is slightly smaller for the Sheffield site ate 5.5-8.3 mm with an average of 9.4 mm. ANOVA results display statistical differences between the three locations with a p-value of 0.02. Handle thicknesses range more broadly within the Red Wing region than the Center Creek locality or Sheffield site.

Table 6.41: Handle Thickness Results (mm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Vosburg	7	6.40	15.65	10.23	71.60	3.18	10.08
Humphrey	4	6	8	7.40	29.60	0.95	0.91
Total	11	6	15.65	9.20	101.20	2.89	8.36
Sheffield	4	5.50	8.30	7.38	29.50	1.28	1.65

Temper

Red Wing.

Since shell temper is a common trait among Oneota vessels, it is unsurprising that shell temper is dominant among the Red Wing sites. What is interesting is that a single vessel at the Silvernale site contains shell and grit tempering. This vessel contains Oneota decorative motifs and morphological signatures of a round shoulder, superior lip notches, everted rim, and a high rim of 35.8 mm; yet, it is uniquely mixed in temper. Grain size of cultural inclusions range from 0.5-4 mm in diameter with a majority of the segments existing within the 0.5-2 mm range. The largest temper sizes are present at the Bartron, Adams, Silvernale, Bryan, and Energy Park sites, which are all within the Bartron phase. Tabulated results for temper type is located in Appendix III.

Table 6.42: Temper Size Results (mm) for Sites within the Red Wing Region

	Frequency							*Percent*						
Site Name	*.5*	*.5-1*	*.5-2*	*.5-3*	*.5-4*	*Ind.*	*Total*	*.5*	*.5-1*	*.5-2*	*.5-3*	*.5-4*	*Ind.*	*Total*
Bartron	-	4	7	3	2	1	17	-	23.5	41.2	17.6	11.8	5.9	100
Adams	3	10	15	7	2	1	38	7.9	26.3	39.4	18.4	5.3	2.6	100
Burnside School	-	3	2	-	-	-	5	-	60	40	-	-	-	100
McClelland	-	-	4	4	-	-	8	-	-	50	50	-	-	100
Sell	-	-	-	1	-	-	1	-	-	-	100	-	-	100
Silvernale	-	2	4	1	3	2	12	-	16.7	33.3	8.3	25	16.7	100
Mero		5	2	3	-	-	10	-	50	20	30	-	-	100
Bryan	-	4	3	1	2	-	10	-	40	30	10	20	-	100
Energy Park	-	11	10	5	1	-	27	-	40.7	37	18.5	3.7	-	100
Total	3	39	47	25	10	4	128	2.34	30.47	36.72	19.53	7.81	3.13	100

Inclusion frequency for the Red Wing region ranges from 5-20%. The evidence suggests that potters' decisions about exactly how much temper to add to clay paste are made locally within Red Wing; ANOVA scores (p-value: 0.00) display a statistical significance to differences between the inclusion percentages for each site within the region. The widest ranges for temper amount exist within the Bartron and Adams assemblages and the narrowest range within the Energy Park sample. The Mero site is interesting in that it contains no variation in terms of inclusion amount, all ten specimens contain around 5% temper.

Table 6.43: Percent Inclusion for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Bartron	16	5	20	12.50	200	20	4.47
Adams	37	5	20	10.14	375	17.34	4.16
Burnside School	5	5	15	10	50	12.50	3.54
McClelland	8	10	20	15	120	21.43	4.63
Sell	1	10	-	-	-	-	-
Silvernale	10	10	20	15	150	16.67	4.08
Mero	10	5	5	-	-	-	-
Bryan	10	5	15	10.50	105	8.06	2.84
Energy Park	27	5	10	6.11	165	4.49	2.12
Total	124	5	20	9.88	1225	21.73	4.66

Center Creek and Sheffield.

Similar to the Red Wing region, the Center Creek locality and Sheffield site are dominated by shell-tempered pottery (100%) within the Oneota components. There were no recorded specimens with mixed shell and grit temper. Grain size for both locations range from 0.5-5 mm with a majority of the specimen containing 0.5-2 mm grain sizes.

This average range is similar to the Red Wing region, although there are instances in which temper sizes within the Center Creek locality and Sheffield assemblages exceed the range seen within the Red Wing region sample.

Table 6.44: Temper Size Results (mm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*Frequency*							*Percent*						
	.5-1	*.5-2*	*.5-3*	*.5-4*	*.5-5*	*Ind.*	*Total*	*.5-1*	*.5-2*	*.5-3*	*.5-4*	*.5-5*	*Ind.*	*Total*
Vosburg	5	16	3	-	1	-	25	20	64	12	-	4	-	100
Humphrey	10	6	3	-	-	-	19	52.6	31.6	15.8	-	-	-	100
Total	15	22	6	-	1	-	44	34.09	50	13.64	-	2.27	-	100
Sheffield	1	4	2	2	1	2	12	8.3	33.3	16.7	16.7	8.3	16.7	100

The range of inclusion percentages within Center Creek pottery also exceeds the range seen within the Red Wing sample. Segments within the Humphrey assemblage varied considerably between sparsely and densely tempered paste. Cultural inclusion ranges within the Sheffield assemblage resemble those of the Bartron and Adams sites. ANOVA results for the Red Wing region, Center Creek locality and the Sheffield site display a high probability of non-random variation (p-value: 0.00) between the samples. Additional t-tests show that the variation lies between the Red Wing and Center Creek samples (p-value: 0.00) rather than the Red Wing and Sheffield assemblages (p-value: 0.56).

Table 6.45: Percent Inclusion Results for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Vosburg	25	5	10	7	175	6.25	2.50
Humphrey	19	5	25	7.63	145	23.25	4.82
Total	44	5	25	7.27	320	13.32	3.65
Sheffield	10	5	20	11	110	32.22	5.68

Surface Treatment

As a set of nominal data, surface treatments were recorded in terms of frequencies and percentages. No ANOVA or t-tests were conducted on surface treatment data. Due to space constraints, tables displaying surface treatment results are included in Appendix III.

Red Wing.

Surface treatment results for the lip, rim, and shoulder display the commonality of smoothing (94.8%) vessel surfaces. Since smoothed surfaces have been recognized as an Oneota attribute (Wilford 1955) in past literature, it is not surprising that the vessel surfaces within the Red Wing Oneota component are predominantly smooth. Any variation of surface treatment within the Red Wing sample exists within the Adams, Energy Park, and Silvernale assemblages. Concerning the vessel segment sample for this research, there is a single instance from the Adams site in which a segment's lip, rim, and shoulder surfaces were burnished and several cases from the Bartron, Adams, McClelland, Sell, and Silvernale sites in which lip surfaces were too exfoliated to determine a particular surface treatment method. From both the Energy Park and Adams samples, one segment displays evidence of smoothed-over cordmarking on the exterior rim and one with a burnished rim surface. A single rim from Silvernale has brushing on the rim surface and four rim surfaces from four different sites have exfoliated exteriors.

Center Creek and Sheffield.

Similar to Red Wing, surfaces of the lip, rim, and shoulder are predominantly smooth. There is one specimen from each the Vosburg and Sheffield site, which both display evidence of burnishing on the lip surface and one segment from the Sheffield site with an exfoliated lip. No evidence of smoothed-over cordmaking or brushing was recorded.

Decoration

Within this subsection, decorative aspects are split into category types, such as notching, lines, and punctates. Results tables, such as for line thickness and depth, are in Appendix III with the rest of the additional tables for this chapter. Results for motifs present on vessels from the Red Wing region, Center Creek locality, and Sheffield site are located in Chapter Eight.

Notches

Red Wing.

Notching on the lip surface within the Red Wing region is largely absent (83.6%) from the overall sample and is completely absent from the Sell and Mero assemblages. For specimen with decorated lips, superior lip notching is the most common type of lip decoration and is the only notch type present within the McClelland and Silvernale samples. In addition to superior notches, interior notches are present within the Bartron, Adams, Burnside School, and Energy Park site assemblages. There is a single instance of interior and exterior notching from the Adams site – all other sites are void of exterior notching upon segments within their assemblages.

Table 6.46: Lip Notch Results for Sites within the Red Wing Region

	Frequency						*Percent*					
Site Name	*Abs.*	*Sup.*	*In.*	*Ext.*	*Int/ Ext.*	*Total*	*Abs.*	*Sup.*	*Int.*	*Ext.*	*Int/ Ext.*	*Total*
Bartron	16	-	1	-	-	17	94.1	-	5.9	-	-	100
Adams	30	4	3	-	1	38	78.9	10.5	7.9	-	2.6	100
Burnside School	3	1	1	-	-	5	60	20	20	-	-	100
McClelland	7	1	-	-	-	8	87.5	12.5	-	-	-	100
Sell	1	-	-	-	-	1	-	-	-	-	-	100
Silvernale	11	1	-	-	-	12	91.7	8.3	-	-	-	100
Mero	10	-	-	-	-	10	100	-	-	-	-	100
Bryan	7	3	-	-	-	10	70	30	-	-	-	100
Energy Park	22	4	1	-	-	27	81.5	14.8	3.7	-	-	100
Total	107	14	6	-	1	128	83.59	10.94	4.69	-	0.78	100

Notching thicknesses range from 2-6.1 mm with an average of 3.68 mm. ANOVA results support an overall similarity in notching thickness (p-value: 0.73) among the Red Wing sites. Additional t-tests confirm the lack of statistically significant variation among the multi-component and pure Oneota sites (p-value: 0.53) as well as the Bartron and Spring Creek phase sites (p-value: 0.44).

Table 6.47: Notch Thickness Results (mm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Bartron	1	4	-	-	-	-	-
Adams	8	2.30	5.10	3.67	29.35	0.87	0.76
Burnside School	2	3.10	3.70	3.40	6.80	0.42	0.18
McClelland	1	3.95	-	-	-	-	-
Silvernale	1	2.75	-	-	-	-	-
Bryan	3	2	4	3.08	9.25	1.01	1.02
Energy Park	5	3	6.10	4.22	21.10	1.32	1.75
Total	21	2	6.10	3.68	77.20	0.96	0.91

Notching depth for lip decoration in the Red Wing region ranges from 0.5-2.2 mm with an average of 1.1 mm. ANOVA results display little evidence for statistically significant variation among the Red Wing sites (p-value: 0.17); yet, additional t-tests shows statistical significance in the observed variation between both pure Oneota and multi-component sites (p-value: 0.04) as well as between Bartron and Spring Creek phase sites (p-value: 0.02). Notching is generally deeper on segments from multi-component sites (0.5-2.2 mm) and Bartron phase sites (0.5-2.2 mm) than Spring Creek (0.6-0.8 mm) and pure Oneota sites (0.6-1.2 mm).

Table 6.48: Lip Notch Depth Results (mm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Bartron	1	0.74	-	-	-	-	-
Adams	8	0.60	1.20	0.95	7.57	0.23	0.06
Burnside School	2	0.60	0.80	0.70	1.40	0.14	0.02
McClelland	1	0.75	-	-	-	-	-
Silvernale	1	0.75	-	-	-	-	-
Bryan	3	1.00	2	1.67	5	0.58	0.33
Energy Park	5	0.50	2.20	1.30	6.50	0.62	0.39
Total	21	0.50	2.20	1.08	22.71	0.48	0.23

Center Creek and Sheffield.

Lip notching on segments from the Center Creek locality and Sheffield site is extremely common. Notching comprises 68.2% of the Center Creek sample and 83.3% of the Sheffield sample as opposed to 16.4% of the Red Wing sample. Interior notching is the most common within the Center Creek (42.2%) and Sheffield assemblages (83.4%). Exterior notching is absent among the Red Wing site assemblages but is present in both the Sheffield and Center Creek samples. Interior and exterior notching is absent from Vosburg, Humphrey and Sheffield, but exists in one instance within the Red Wing region.

Table 6.49: Lip Notch Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency						*Percent*					
Site Name	*Abs.*	*Sup.*	*Int.*	*Ext.*	*Int./ Ext.*	*Total*	*Abs.*	*Sup.*	*Int.*	*Ext.*	*Int./ Ext.*	*Total*
Vosburg	10	1	11	3	-	25	40	4	44	12	-	100
Humphrey	4	2	8	5	-	19	21.1	10.5	42.1	26.3	-	100
Total	14	3	19	8	-	44	31.82	6.82	43.18	18.18	-	100
Sheffield	1	-	10	1	-	12	8.3	-	83.4	8.3	-	100

Notch thicknesses for the Center Creek locality ranges from 1.8-6.4 mm with an average of 3.5 mm. Thicknesses for the Sheffield site range from 3.5-6 mm with an average of 4.4 mm. ANOVA results and additional t-tests display a low probability of statistically significant difference (p-value: 0.17) among the three locations.

Table 6.50: Lip Notch Thickness (mm) Results for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Vosburg	16	2.20	6.35	3.87	61.92	1.32	1.73
Humphrey	15	1.80	6	3.08	46.25	1.10	1.21
Total	31	1.80	6.35	3.49	108.17	1.26	1.59
Sheffield	11	3.50	6	4.40	48.40	0.85	0.73

Notch depths for the Center Creek locality range from 0.2-1.9 mm with an average of 0.9 mm. Depth range for the Sheffield site are 0.4-1.6 mm with an average of 1 mm. From the ANOVA results, there does not appear to be statistical significance to the amount of observed variation for notch depth among the three locations, this is supported by addition t-tests for the Red Wing and Center Creek samples (p-value: 0.07) as well as the Red Wing and Sheffield assemblages (p-value: 0.66).

Table 6.51: Lip Notch Depth Results (mm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Vosburg	16	0.20	1.60	0.76	12.21	0.36	0.13
Humphrey	15	0.50	1.85	0.95	14.20	0.36	0.13
Total	31	0.20	1.85	0.85	26.41	0.36	0.13
Sheffield	11	0.40	1.60	1.01	11,15	0.39	0.15

Lines

Red Wing.

Line decoration was recorded separately for the rim and shoulder. Decoration on the vessel rim is not common (10.9%) at the Red Wing sites. For those vessels that do have rim decoration, interior lines and chevrons are the most common decoration type. Interior chevrons make up 50% of the present rim decoration and are found within the Adams, Burnside School, McClelland, and Bryan samples. Among these sites, interior chevrons are more common at pure Oneota and Spring Creek phase sites, such as Burnside School and McClelland, than multi-component or Bartron phase sites. Horizontal and oblique interior lines comprise of 42.9% of the rim decoration and are present in the Bartron, Adams, Burnside School, Bryan, and Energy Park site assemblages. A single instance of interior arc decoration was identified from the Bryan site. Decoration on the rim’s exterior surface is absent from the Red Wing sample.

Table 6.52: Rim Decoration Results for Sites within the Red Wing Region

	Frequency						*Percent*					
Site Name	*Abs.*	*Int. Line*	*Ext. Line*	*Int. Chev.*	*Int. Arc*	*Total*	*Abs.*	*Int. Line*	*Ex. Line*	*Int. Chev.*	*Int. Arc*	*Total*
Bartron	16	1	-	-	-	17	94.1	5.9	-	-	-	100
Adams	36	1	-	1	-	38	94.7	2.6	-	2.6	-	100
Burnside School	2	1	-	2	-	5	40	20	-	40	-	100
McClelland	5	-	-	3	-	8	62.5	-	-	37.5	-	100
Sell	1	-	-	-	-	1	100	-	-	-	-	100
Silvernale	12	-	-	-	-	12	100	-	-	-	-	100
Mero	10	-	-	-	-	10	100	-	-	-	-	100
Bryan	7	1	-	1	1	10	70	10	-	10	10	100
Energy Park	25	2	-	-	-	27	92.6	7.4	-	-	-	100
Total	114	6	-	7	1	128	89.06	4.69	-	5.47	0.78	100

Line decoration on the exterior shoulder is common (60.9%) within the Red Wing sample. Sixty-nine percent of decorated shoulders have only rectilinear lines. Rectilinear line decoration is present at all sites with shoulder decoration. Curvilinear lines make up 19.2% of the line decoration. This type of decoration is present at the Bartron, Adams, Silvernale, Bryan, and Energy Park sites. Shoulders with only curvilinear lines are not present at Spring Creek phase sites, such as Burnside School, McClelland, and Sell. Decoration including both curvilinear and rectilinear lines do occur at the McClelland site as well as the Bartron, Adams, Silvernale, Mero, and Bryan sites but is overall less common (11.6%) within the Red Wing region vessel segment sample.

Table 6.53: Shoulder Line Decoration Results for Sites within the Red Wing Region

	Frequency					*Percent*				
Site Name	*Absent*	*Curv.*	*Rect.*	*Curv./ Rect.*	*Total*	*Absent*	*Curv.*	*Rect.*	*Curv./ Rect.*	*Total*
Bartron	4	2	10	1	17	23.5	11.8	58.8	5.9	100
Adams	12	3	21	2	38	31.6	7.9	55.3	5.3	100
Burnside School	2	-	3	-	5	40	-	60	-	100
McClelland	3	-	4	1	8	37.5	-	50	12.5	100
Sell	1	-	-	-	1	100	-	-	-	100
Silvernale	4	4	3	1	12	33.3	33.3	25	8.3	100
Mero	6	-	3	1	10	60	-	30	10	100
Bryan	1	1	5	3	10	10	10	50	30	100
Energy Park	17	5	5	-	27	63	18.5	18.5	-	100
Total	50	15	54	9	128	39.06	11.72	42.19	7.03	100

For sites within the Red Wing region, the orientation of decorative lines on the exterior shoulder vary greatly. Although this research deals with mostly vessels segments, and a complete picture of decoration can only be obtained with the whole vessel, oblique lines (28.8%) and horizontal lines (17.2%) are the most common. For shoulder decoration, 8.6% of vessel segments contain vertical and oblique lines, 3.1% display horizontal and vertical lines, 1.6% have of horizontal and oblique lines, 3.1% have all three line types present, and 1.6% display lines but orientation was indeterminate. Tabulated results for shoulder line orientation are located in Appendix III.

Intaglio is present on 23.1% of line decoration on the interior shoulder; 55.6% of the recorded intaglio is strong and 44.4% of weak intaglio is present on the vessel interior. Intaglio is considered strong when applying decoration leaves a bossed impression on the interior vessel wall that is deeper than half a centimeter. Strong intaglio is more commonly present at the Silvernale, Mero, and Energy Park sites, which are all multi-component sites. Weaker intaglio is present more at the Adams and McClelland sites, which are both pure Oneota sites. Weak and strong intaglio are equally present at the Bartron and Bryan sites and completely absent from the Burnside School and Sell sites.

Table 6.54: Shoulder Line Intaglio Results for Sites within the Red Wing Region

	Frequency				*Percent*			
Site Name	*Absent*	*Weak*	*Strong*	*Total*	*Absent*	*Weak*	*Strong*	*Total*
Bartron	13	2	2	17	76.4	12	12	100
Adams	34	3	1	38	89.5	8	2.6	100
Burnside School	5	-	-	5	100	-	-	100
McClelland	7	1	-	8	87.5	13	-	100
Sell	1	-	-	1	100	-	-	100
Silvernale	7	1	4	12	58.3	8	33	100
Mero	9	-	1	10	90	-	10	100
Bryan	8	1	1	10	80	10	10	100
Energy Park	26	-	1	27	96.3	-	3.7	100
Total	110	8	10	128	85.94	6.25	7.81	100

Decoration on the handle is not common within the Red Wing region. Of the 25 handles identified from the Red Wing sample, only five were decorated. Of those handles that were decorated, all have at least one vertical line drawn into the exterior surface. Again, one strap handle from the Burnside School site had a lug with a punctate in its center, in addition to vertical lines.

Table 6.55: Handle Decoration Results for Sites within the Red Wing Region

	Frequency					*Percent*				
Site Name	*Abs.*	*V. Line*	*V. Line/ Punct./ Lug*	*Ind.*	*Total*	*Abs.*	*V. Line*	*V. Line/ Punct./ Lug*	*Ind.*	*Total*
Bartron	17	-	-	-	17	100	-	-	-	100
Adams	37	-	-	1	38	97	-	-	2.6	100
Burnside School	4	-	1	-	5	80	-	20	-	100
McClelland	8	-	-	-	8	100	-	-	-	100
Sell	1	-	-	-	1	100	-	-	-	100
Silvernale	11	-	-	1	12	92	-	-	8.3	100
Mero	9	-	-	1	10	90	-	-	10	100
Bryan	7	2	-	1	10	70	20	-	10	100
Energy Park	25	2	-	-	27	93	7.4	-	-	100
Total	119	4	1	4	128	92.96	3.13	0.78	3.13	100

Line thicknesses for interior and exterior rim decoration range from 1.5-7.7 mm with an average of 3.82 mm. The shallowest rim decoration is present at the Bartron and Adams sites and the thickest at the Adams, Burnside School, and Energy Park sites. The Adams site overall has the widest range of thicknesses from 1.8-7.7 mm. Yet, ANOVA results display results show no significance to the observable differences (p-value: 0.67) among the sites within Red Wing. Line thicknesses for exterior shoulder decoration are similar to lines drawn on the rim, ranging from 1.7-6.7 mm with an average value of 3.9 mm. The thinnest lines were drawn on vessels from the Adams, Bartron, and McClelland sites and the thickest lines were drawn on vessels from the Mero, Adams, and Silvernale sites. Also similar to the shoulder decoration thickness, ANOVA results show statistical significance to the amount of observed variation (p-value: 0.46) within the region. Line thicknesses for the exterior handle surface are generally thicker than those drawn on the rim or shoulder, ranging from 3-7 mm with an average of 4.9 mm. The thinnest handle decoration is from the Burnside School sample and the thickest from Bryan. The overall similarity among the Red Wing sites is apparent within the ANOVA results (p-value: 0.58). The results table for line thickness of the rim, shoulder, and handle decoration is located in Appendix III.

Line depths for rim decoration range from 0.3-1.6 mm with an average of 1 mm. Although the deepest lines were drawn on vessels from the Burnside School, Bartron, and Adams sites and the shallowest were drawn on specimens from the Adams, Bryan, and Energy Park sites, ANOVA results for rim decoration depth show no significance to the observable variation (p-value: 0.67) among the sites. Line depth for shoulder decoration among the Red Wing sites is also similar (p-value 0.46), ranging from 0.1-2.2 mm with an average of 1.1 mm. Lastly, handle decoration depth ranges from 0.8-2.2 mm with an average of 1.5 mm. Similar to overall vessel decoration thickness and depth, ANOVA results for handle line depth display little statistical variation (p-value: 0.55) between the Red Wing sites. The results table for line depth of rim, shoulder and handle decoration is located in Appendix III.

Center Creek and Sheffield.

Rim decoration is more common on vessels from the Center Creek locality than the Red Wing region. Similar to the Red Wing region, interior chevrons (56.3%) as well as horizontal and oblique interior lines (25%) are the most prevalent type of rim decoration. Unlike the Red Wing region, horizontal lines drawn upon the rim’s exterior surface are also present (18.7%), although less common than the other two decorative types. In addition, interior arcs are absent within the Center Creek site assemblages. Rim decoration is not common in the Sheffield sample; only two Sheffield specimens were recorded with horizontal line decoration on the exterior rim.

Table 6.56: Rim Decoration Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency						Percent					
Site Name	*Abs.*	*Int. Line*	*Ext. Line*	*Int. Chev.*	*Int. Arc*	*Total*	*Abs.*	*Int. Line*	*Ext. Line*	*Int. Chev.*	*Int. Arc*	*Total*
Vosburg	14	4	2	5	-	25	56	16	8	20	-	100
Humphrey	14	-	1	4	-	19	73.7	-	5.3	21.1	-	100
Total	28	4	3	9	-	44	63.64	9.09	6.82	20.45	-	100
Sheffield	10	-	2	-	-	12	83.3	-	16.7	-	-	100

Shoulder decoration is extremely common within the Center Creek assemblage, and rectilinear line decoration dominates the sample. Rectilinear line elements make up 92.5% of the decoration present within the region. Three specimens from the Vosburg site have both curvilinear and rectilinear lines but no segments display curvilinear lines only. Rectilinear lines are dominant in the Sheffield sample, but vessel segments with curvilinear lines only and specimens with curvilinear and rectilinear lines are also present.

Table 6.57: Shoulder Line Decoration Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency					Percent				
Site Name	*Abs.*	*Curv.*	*Rect.*	*Curv./ Rect.*	*Total*	*Abs.*	*Curv.*	*Rect.*	*Curv./ Rect.*	*Total*
Vosburg	3	-	19	3	25	12	-	76	12	100
Humphrey	1	-	18	-	19	5.3	-	94.7	-	100
Total	4	-	37	3	44	9.09	-	84.09	6.82	100
Sheffield	3	2	6	1	12	25	16.7	50	8.3	100

Similar to the Red Wing region, the orientation of shoulder line decoration for vessel segments recovered from the Center Creek locality varies greatly. Oblique lines (29.5%) and lines with vertical and oblique orientation (22.7%) are the most common decoration alignments in the Center Creek sample. Horizontal lines make up 6.8% of the sample, vertical lines comprise 4.6%, horizontal and vertical lines also encompass 4.6%, horizontal and oblique lines formulate 15.9%, and lastly lines with horizontal, oblique, and vertical orientations make up 6.8% of the Center Creek assemblage. Lines with horizontal only (33.3%), oblique only (16.7%), horizontal and oblique (8.3%), as well as vertical and oblique (8.3%) orientations are present within the Sheffield sample. Lines with vertical only, oblique only, and horizontal, vertical, and oblique lines are absent. A table of shoulder line orientation results for the Center Creek locality and Sheffield site is located in Appendix III.

Line intaglio on the interior shoulder is present on 15% of the specimens recovered from the Vosburg and Humphrey sites with shoulder decoration. This is less than the 23.1% present on vessels from the Red Wing region. For the vessels from the Center Creek locality with intaglio present, weak intaglio is more common than strong. No line intaglio was recorded on vessel segments from the Sheffield site.

Table 6.58: Shoulder Line Intaglio Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency				*Percent*			
Site Name	*Absent*	*Weak*	*Strong*	*Total*	*Absent*	*Weak*	*Strong*	*Total*
Vosburg	22	3	-	25	88	12	-	100
Humphrey	16	2	1	17	84.2	10.5	5.3	100
Total	38	5	1	44	86.37	11.36	2.27	100
Sheffield	12	-	-	12	100	-	-	100

Of the 11 handles measured from Center Creek sites, seven of them were decorated with vertical lines, which is the only handle decoration type present within the Vosburg and Humphrey collections. Two handles from these assemblages were too incomplete to determine the presence or absence of decoration. A single handle from the Sheffield site displayed vertical lines drawn upon a handle's exterior surface. Handle decoration is not common among the three locations, but it is most present within the Center Creek assemblage than the other two Oneota samples in this study.

Table 6.59: Handle Decoration Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency					*Percent*				
Site Name	*Abs.*	*V. Line*	*V. Line/ Punct./ Lug*	*Ind.*	*Total*	*Abs.*	*V. Line*	*V. Line/ Punct./ Lug*	*Ind.*	*Total*
Vosburg	21	3	-	1	25	84	12	-	4	100
Humphrey	14	4	-	1	19	73.7	21.1	-	5.3	100
Total	35	7	-	2	44	79.55	15.90	-	4.55	100
Sheffield	11	1	-	-	12	91.7	8.3	-	-	100

Line thicknesses for decoration on the interior and exterior rim surfaces from the Center Creek locality range from 1.4-4.3 mm with an average of 2.7 mm. For the Sheffield site, rim decoration is generally thicker, ranging from 2.3-5.6 mm with an average of 3.9 mm. Rim decoration from the Center Creek locality and Sheffield site is thicker than that from the Red Wing region. ANOVA results reflect these observed difference among the three locations (p-value: 0.02). Shoulder line thicknesses for the Vosburg and Humphrey sites range from 0.8-4.5 mm with an average of 2.8 mm.

Line thicknesses on the exterior shoulders of specimens from the Sheffield site are also thicker than the Center Creek locality, ranging from 2.3-5.6 mm with an average of

3.4 mm. ANOVA results also show significant statistical variation (p-value: 0.00) between the three locations. Handle decoration line thicknesses for the Center Creek locality range from 1.7-3.2 mm with an average of 2.5 mm. The single decorated handle from Sheffield has a line thickness of 2.2 mm. Since the Sheffield assemblage has only one specimen with handle decoration, ANOVA tests among the three regions could not be assessed. A table of line thickness results for the rim, shoulder, and handle is located in Appendix III.

Rim decoration line depth for sites within the Center Creek locality range from 0.2-1.6 mm with a mean of 0.7 mm. The range for rim decoration depth within the Sheffield assemblage is slightly tighter at 0.3-1.1 mm with an average of 0.7 mm. There is an overall similarity (p-value: 0.67) among the Red Wing region, Center Creek locality, and Sheffield site in terms of rim decoration depth.

Line depth on the shoulders for the Center Creek sample range from 0.2-2 mm with an average of 0.8 mm. Similarly, line depth for the Sheffield site ranges from 0.2-2 mm with an average of 0.8 mm. ANOVA results comparing the variance of all three locations shows significant statistical variation (p-value: 0.00). Line decoration on vessels from the Red Wing region is generally deeper than that of the Center Creek and Sheffield samples. Handle decoration depth on specimens from the Vosburg and Humphrey sites range from 0.2-1.7 mm with an average of 0.9 mm. The single decorated handle from Sheffield contains a line depth of 0.3 mm. Again, because Sheffield only has a single measurement for handle decoration depth, ANOVA tests cannot be assessed among all three locations. Tabulated results for line decoration depth on the rim, shoulder, and handle resides in Appendix III.

Punctates

Red Wing.

Although punctates are an identifying feature of vessels of the Oneota tradition, they are not common on the specific Red Wing vessel segments in this study. This does not mean that punctates are particularly infrequent in Red Wing; during data collection, the author noted that punctates were present on incomplete shoulder sherds from all Red Wing sites, but due to the parameters of this research, they were not included in this particular data set. From the vessel segments within this study that display punctate decorations, round punctates are the most common (60.3%) form present among the McClelland, Silvernale, Mero, Bryan, and Energy Park site pottery specimens. With the exception of the Bryan vessels, round punctates are the only form present within these assemblages. Ovular punctates are less common, occurring at only the Bartron, Adams, and Bryan sites. Again, with the exception of Bryan site segments, ovular punctates are the only form present at these sites; Bryan is the only site with both round and ovular punctate forms present among its sample. Irregular and elongated punctates are not present on vessel segments from the Red Wing region. Again, this does not exactly mean that they are absent from all sherds within the region’s assemblage.

Table 6.60: Punctate Form Results for Sites within the Red Wing Region

	Frequency				*Percent*			
Site Name	*Absent*	*Round*	*Oval*	*Total*	*Absent*	*Round*	*Oval*	*Total*
Bartron	13	-	4	17	76.5	-	24	100
Adams	37	-	1	38	97.4	-	2.6	100
Burnside School	5	-	-	5	100	-	-	100
McClelland	6	2	-	8	75	25	-	100
Sell	1	-	-	1	-	-	-	100
Silvernale	10	2	-	12	83.3	17	-	100
Mero	9	1	-	10	90	10	-	100
Bryan	5	4	1	10	50	40	10	100
Energy Park	26	1	-	27	96.3	4	-	100
Total	112	10	6	128	87.5	7.81	4.69	100

Punctates impressed upon vessel surfaces from the Red Wing region were applied either directly, gradually, or steeply. Fifty percent of punctates were applied directly. This application method is present within the McClelland, Silvernale, Bryan, and Energy Park samples. Direct punctate application is the only method present among the Bryan and Energy Park site vessel segments. Punctates that were gradually applied comprise 31.3% of the Red Wing sample and are present in the Bartron, Adams, McClelland, Silvernale, and Mero assemblages. This method is the only one present from the Adams and Mero sites. Punctates that were steeply applied are only present among the Bartron vessels.

Table 6.61: Angle of Punctate Application for Sites within the Red Wing Region

	Frequency					*Percent*				
Site Name	*Absent*	*Direct*	*Gradual*	*Steep*	*Total*	*Absent*	*Direct*	*Gradual*	*Steep*	*Total*
Bartron	13	-	1	3	17	76.5	-	5.9	18	100
Adams	37	-	1	-	38	97.4	-	2.6	-	100
Burnside School	5	-	-	-	5	100	-	-	-	100
McClelland	6	1	1	-	8	75	12.5	12.5	-	100
Sell	1	-	-	-	1	100	-	-	-	100
Silvernale	10	1	1	-	12	83.3	8.3	8.3	-	100
Mero	9	-	1	-	10	90	-	10	-	100
Bryan	5	5	-	-	10	50	50	-	-	100
Energy Park	26	1	-	-	27	96.3	3.7	-	-	100
Total	112	8	5	3	128	87.5	6.25	3.91	2.34	100

Punctate thicknesses for decorated vessels from the Red Wing region range from 1.6-5.9 mm with an average of 3.9 mm. The thinnest punctates were applied to a single vessel from the Adams site, a pure Oneota site, and the thickest punctates are from the Mero and Bryan sites, which are multi-component. ANOVA (p-value: 0.26) and t-test results show no significance to the observable differences among the sites within the Red Wing region.

Table 6.62: Punctate Thickness Results (mm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Bartron	4	2	4	3.25	13	0.96	0.92
Adams	1	1.60	-	-	-	-	-
McClelland	2	3.35	4.88	4.12	8.23	0.77	1.17
Silvernale	1	4.75	-	-	-	-	-
Mero	1	5.90	-	-	-	-	-
Bryan	5	2	5	4.13	16.50	1.44	2.06
Total	12	1.60	5.90	3.89	46.63	1.41	1.98

Punctate depths range from 0.5-2.5 mm with an average of 1.3 mm. Similar to punctate thickness, the Adams site has the shallowest punctates, and deeply applied punctates are seen on vessel segments recovered from the Bryan and Silvernale sites. Equally similar to punctate thickness, AONVA (p-value: 0.89) and additional t-tests support overall similarity within the Red Wing sample concerning punctate depth.

Table 6.63: Punctate Depth Results (mm) for Sites within the Red Wing Region

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Bartron	4	1	2	1.25	5	0.50	0.25
Adams	1	0.50	-	-	-	-	-
McClelland	2	0.95	1.20	1.01	2.15	0.13	0.03
Silvernale	1	2	-	-	-	-	-
Mero	1	0.90	-	-	-	-	-
Bryan	4	0.50	2.50	1.56	6.25	0.83	0.68
Total	12	0.50	2.50	1.32	15.85	0.63	0.40

Center Creek and Sheffield.

Punctates on vessel segments are more common in the Center Creek sample than the Red Wing sample. Seventy-five percent of vessel segments from this region have punctates. Round, ovular, elongated, and irregular punctate forms are all present within the Center Creek assemblage. Similar to the Red Wing region, round punctate are the most common form, making up 57.6% of the overall shapes. Ovular punctates are present among 36.4% of vessel segments, a single case of elongated punctates was recorded from the Humphrey site, and a single case of irregularly shaped punctates was present at the Vosburg site. Punctate forms at the Sheffield site more align with the Red Wing region results; punctates are not very common overall, and among them round punctates are present among 60% of the sample, and elongated and irregular punctate forms are absent.

Table 6.64: Punctate Form Results for Sites within the Center Creek Locality and Sheffield Site

	Frequency						*Percent*					
Site Name	*Abs.*	*Round*	*Oval*	*Elon.*	*Irr.*	*Total*	*Abs.*	*Round*	*Oval*	*Elon.*	*Irr.*	*Total*
Vosburg	7	12	5	-	1	25	28	48	20	-	4	100
Humphrey	4	7	7	1	-	19	21.1	36.8	36.8	5.3	-	100
Total	11	19	12	1	1	44	25	43.19	27.27	2.27	2.27	100
Sheffield	7	3	2	-	-	12	58.3	25	16.7	-	-	100

Punctates from the Center Creek locality were applied directly, gradually, or steeply. Directly applied punctates are the most common (54.5%) within the region, with gradually applied punctates comprising 39.4% of the sample. Steeply applied punctates are also rare within this region. Only two specimen from the Vosburg site display this type of punctate application. At the Sheffield site, direct punctate application comprises 60% of the sample and gradual application comprises 40%. No steeply applied punctates were recorded.

Table 6.65: Angle of Punctate Application for Sites within the Center Creek Locality and Sheffield Site

	Frequency					*Percent*				
Site Name	*Absent*	*Direct*	*Gradual*	*Steep*	*Total*	*Absent*	*Direct*	*Gradual*	*Steep*	*Total*
Vosburg	7	11	5	2	25	26	44	20	8	100
Humphrey	4	7	8	-	19	21.1	36.8	42.1	-	100
Total	11	18	13	2	44	25	40.91	29.54	4.55	100
Sheffield	7	3	2	-	12	58.3	25	16.7	-	100

Punctate thicknesses for the Center Creek locality range from 0.7-5.2 mm with an average thickness of 2.9 mm. Thicknesses from the Sheffield site range from 3.1-4.8 mm with an average of 3.8 mm. Compared to punctate thicknesses on vessel segments from the Red Wing region, Center Creek punctates are generally thinner. The five specimens from the Sheffield site with punctates have thicknesses that fall into both the Red Wing and the Center Creek ranges. ANOVA results display statistical significance to the variation between the three locations with a p-value of 0.03. Additional t-tests show that variation in punctate thickness lies between Red Wing and Center Creek (p-value: 0.04) rather than between Red Wing and Sheffield (p-value: 0.79).

Table 6.66: Punctate Thickness Results (mm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Vosburg	18	0.70	5.20	3.09	55.65	0.97	0.95
Humphrey	15	1	4.75	2.62	39.30	1.06	1.12
Total	33	0.70	5.20	2.88	94.95	1.02	1.05
Sheffield	5	3.1	4.80	3.77	18.85	0.32	0.50

Depths for punctates applied to vessels from the Center Creek locality range from 0.2-2.5 mm, with an average of 1 mm. Punctate depths for Sheffield vessels range from 0.5-1.3 mm, with an average of 0.9 mm. ANOVA results (p-value: 0.03) suggest significant statistical variation between the Red Wing region, Center Creek locality, and Sheffield site. Additional t-tests show that this observable variation lies between Red Wing and Sheffield punctates (p-value: 0.05) rather than between Red Wing and Center Creek (p-value: 0.09). Although the Sheffield site and Red Wing region both have a depth minimum at 0.5 mm, punctates applied to vessels from the Sheffield site are on average, as well as within the sample and expected population ranges, much shallower than punctates applied to vessels from Red Wing and Center Creek sites.

Table 6.67: Punctate Depth Results (mm) for Sites within the Center Creek Locality and Sheffield Site

Site Name	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Vosburg	18	0.30	2.40	0.94	17	0.55	0.30
Humphrey	15	0.20	2.50	1.09	16.40	0.70	0.49
Total	33	0.20	2.50	1.01	33.40	0.62	0.38
Sheffield	5	0.50	1.30	0.86	4.30	0.29	0.08

Smudging

Red Wing.

Although present at most sites within the region, smudging is not a common attribute (21.9%) among Red Wing vessel segments. Smudging is absent from the Burnside School, Sell, and Bryan samples – it is most heavily concentrated within the Bartron (41.2%) and Silvernale samples (50%). There seems to be no correlation between different phases or components when smudging is concerned. It is present in both Bartron and Spring Creek phase assemblages, as well as multi-component and pure Oneota sites.

Table 6.68: Presence or Absence of Smudging at Sites within the Red Wing Region

	Frequency			*Percent*		
Site Name	*Present*	*Absent*	*Total*	*Present*	*Absent*	*Total*
Bartron	7	10	17	41.2	58.8	100
Adams	4	34	38	11.5	89.5	100
Burnside School	-	5	5	-	100	100
McClelland	3	5	8	38.5	62.5	100
Sell	-	1	1	-	100	100
Silvernale	6	6	12	50	50	100
Mero	1	9	10	10	90	100
Bryan	-	10	10	-	100	100
Energy Park	6	21	27	22.2	77.8	100
Total	27	101	128	21.09	78.91	100

Center Creek and Sheffield.

Unlike the Red Wing region, smudging is more common (40.9%) among Center Creek vessel segments. It is more common at the Vosburg site (52%) than the Humphrey site (26.3%). Smudging is completely absent from the Sheffield site.

Table 6.69: Presence or Absence of Smudging at Sites within the Center Creek Locality and Sheffield Site

	Frequency			*Percent*		
Site Name	*Present*	*Absent*	*Total*	*Present*	*Absent*	*Total*
Vosburg	13	12	25	52	48	100
Humphrey	5	14	19	26.3	73.7	100
Total	18	26	44	40.91	59.09	100
Sheffield	-	12	12	-	100	100

Burning

Burning is not a primary attribute of vessel production, such as morphology or decoration, but instead a result of use wear while the vessel was in its systemic context. Its relevance lies within the understanding of the behaviors involved in using and disposing pottery, not manufacture.

Red Wing.

Burnt pottery comprises almost 30% of the vessel segment sample within the region. As either a result of use ware or depositional processes, burning is present at the Bartron, Adams, Burnside School, Sell, Horse, Bryan, and Energy Park sites. It is absent from the McClelland, Silvernale, and Mero samples, yet only among the vessel segments.

Table 6.70: Presence or Absence of Burnt Pottery at Sites within the Red Wing Region

	Frequency			*Percent*		
Site Name	*Present*	*Absent*	*Total*	*Present*	*Absent*	*Total*
Bartron	2	15	17	12	88.2	100
Adams	20	18	38	53	47.4	100
Burnside School	4	1	5	80	40	100
McClelland	-	8	8	-	100	100
Sell	1	-	1	100	-	100
Horse	1	-	1	100	-	100
Silvernale	-	12	12	-	100	100
Mero	-	10	10	-	100	100
Bryan	8	2	10	80	20	100
Energy Park	2	25	27	7.4	92.6	100
Total	38	91	129	29.46	70.54	100

Center Creek and Sheffield.

The existence of burning among the Vosburg and Humphrey vessel segments is similar to that of the Red Wing region, yet slightly more common at 34.1% of the overall sample. Burning is not common upon specimen from the Sheffield site: only a single case was recorded.

Table 6.71: Presence or Absence of Burnt Pottery at Sites within the Center Creek Locality and Sheffield Site

	Frequency			*Percent*		
Site Name	*Present*	*Absent*	*Total*	*Present*	*Absent*	*Total*
Vosburg	6	19	25	24	76	100
Humphrey	9	10	19	47.4	52.6	100
Total	15	29	44	34.09	65.91	100
Sheffield	1	11	12	8.3	91.7	100

Summary

There are many ways in which the features of vessel form and design are similar and different between the Red Wing region, Center Creek locality and Sheffield site.

Overall patterns of vessel morphology and decoration are described below for each major location in this study. For more detailed information including frequencies, percentages, means, variance, etc. see the tables and paragraphs within the main body of this chapter.

Red Wing.

Although vessels from the Red Wing region, Center Creek locality, and Sheffield site share vessel attributes that make them part of the Oneota tradition, vessels made, used, and eventually deposited within the Red Wing region are distinctly local in certain aspects of decoration and morphology. Orifice diameters range from 9-50 cm, and orifice shapes are predominantly round with very few of the region's sample having ovular shaped orifices. Eleven of the 128 Red Wing vessels were too incomplete to determine orifice form. These vessels have round, pointed, flat, beveled interior, and beveled exterior lip forms. Round and flat lips are the most common form among all the site assemblages. Lip thicknesses range from 2.6-8.5 mm. Everted rims are the most common rim form for Red Wing Oneota vessels, but vertical and curved rims are also present within this sample. Curved rims are rare on Oneota vessels from the region and exist only in multi-component assemblages. Rim thicknesses range from 3.4-10.81 mm, rim lengths range from 15.35-65.6 mm, and rim angles range from 34-86°. Vessel rims were primarily formed in a "drawn-up" fashion from the shoulder and neck. Rims which were attached to the neck are less common. Interior neck forms are mainly sharp. Round necks are less common but are present at every site with more than one vessel segment within its assemblage. Exterior neck shapes are generally parallel or expanding. Vessels with constricting exterior necks are present among Red Wing Oneota vessels but are far less common than parallel or expanding necks. Neck thicknesses range from 4.3-15.8 mm, neck angles range from 76-142°, and neck diameters range from 10-48.75 cm. On all specimens, shoulders were either round or absent; no evidence for sharp shoulders exists on Oneota vessels from this region. Shoulder thicknesses range from 3.5-10.3 mm and shoulder angles range from 120-149°. Loop handles are the most common form with strap handles only present on a few segments. Loop and strap handles were most often attached to the rim at their superior end and the shoulder at their inferior end. Two specimens were attached only to the shoulder. Handle lengths range from 21.5-53 mm, handle widths range from 8.95-37.5 mm, and handle thicknesses range from 8.5-23.4 mm.

Most exterior surfaces on the lip, rim, shoulder, and handle are smoothed. A single vessel from the Adams site had burnished surfaces and another with smoothed-over cordmarking, and a single vessel from Silvernale has a brushed rim surface. Three percent of the Red Wing sample have surfaces which were too exfoliated to determine a purposeful treatment. All Oneota vessels recovered from the Red Wing region have bivalvian shell tempering. A single vessel from Silvernale contains small amounts of crushed grit in addition to the shell tempering. Grain sizes range from 0.5-4 mm. The most common range of temper size is 0.5-2 mm. Percent of tempering ranges from 5-20%. Smudging is present on 21.1% of Red Wing vessels. Burning is slightly more common than smudging and is present on 29.5% of vessel segments.

Minute variations in decorative features also characterize the Red Wing region as opposed to the Center Creek locality and Sheffield site. For the lips that were decorated, they were primarily notched on the superior aspect of the lip. Six specimen were notched on the interior and one notched on the interior and exterior surfaces. No segments display notching on the exterior lip only. Notch thicknesses range from 2-6.1 mm and notch depths range from 0.5-2.2 mm. Decorative lines were drawn on the interior rim, exterior shoulder, and exterior handle. Interior chevrons and interior oblique lines are the most common form of rim decoration. One segment displays nested arcs or possibly rounded chevrons on the interior rim from the Bryan site. Lines drawn on the interior rim range in thickness from 1.5-7.7 mm and range in depth from 0.35-1.6 mm. Lines drawn on the exterior shoulder are most commonly rectilinear. Curvilinear lines are present on 11.7% of decorated shoulders. Lines were mostly oriented in an oblique or horizontal fashion, but these orientations are only a small indication on vessel segments of decorative patterns indiscernible on incomplete vessels. Shoulder line thicknesses range from 1.7-6.7 and depths range from 0.1-2.15 mm. Intaglio is present on only 14.1% of decorated shoulders and weak impressions are the most widely recorded form of intaglio. All decorated handles display vertically drawn lines ranging in thickness from 3-7 mm and ranging in depth from 0.8-2.2 mm. A single handle from the Burnside School site had a decorative lug in addition the vertical lines on the exterior handle. Round and ovular punctates are the only shapes present on Red Wing vessel segments applied either in a direct, gradual, or steep angled fashion. Direct punctate application is the most common form. Punctate thickness ranges from 1.6-5.9 mm and their depth ranges from 0.7-5.2 mm.

Multi-component and pure Oneota sites are for the most part similar in terms of vessel form and decoration, but they do differ in lip form, rim form, rim lengths, rim angles, percent inclusion, and lip notch depths. Lips with a beveled form are absent from multi-component site assemblages and pointed lips are absent from pure Oneota sites samples. Compared to pure Oneota sites, multi-component sites have generally shorter rims and curved rim forms are only present within the assemblages of these sites. The range of rim angles is wider at pure Oneota sites than multi-component. Overall, temper is less concentrated and smaller in multi-component sites. Lastly, multi-component and pure Oneota sites differ in terms of lip notch depth: notches are on average deeper on segments from multi-component sites opposed to notch depth within pure Oneota samples.

Bartron phase and Spring Creek phase sites overall are very similar. However, there are slight differences in lip form, rim length, rim attachment method, interior neck shape, temper size and frequency, and lip notch depth. There is very little lip form variety among Spring Creek phase sites; round lips heavily dominate the site samples. Pointed and beveled interior lips are completely absent, and flat and beveled exterior lips are rare and found at only one site: McClelland. Rim lengths for the Spring Creek phase site assemblages are on average longer than those within the Bartron phase. Attached rims are more common on vessels from Bartron phase locations, especially the Bartron, Adams, and Silvernale sites. Additionally, round interior necks are more common at Barton phase sites than Spring Creek sites. Spring Creek sites have segments with generally more temper. Lastly, vessels recovered from Spring Creek sites have shallower lip notches than specimens within Bartron phase assemblages. Pottery assemblages from the Spring Creek sites are small and with additional excavation in this location and cataloging of the Sell site, these differences between the two Red Wing phases may change. In addition, Spring Creek and Bartron phase sites differ more in other factors than pottery style, such as site organization, site location, and temporal occupation (personal conversation with Ronald Schirmer 2017).

Center Creek.

Vessels from Center Creek assemblages have orifice diameters ranging from 9-40 cm with mostly round orifices. Lip forms are most commonly round or beveled to the exterior. Lip thicknesses range from 2.5-7 mm. Rim forms are predominantly everted with a single case of a curved rim from the Humphrey site. Rim thicknesses range from 4.4-10.5 mm, rim lengths range from 14.05-53.85 mm, and rim angles range from 49-87°. Rims are primarily drawn up with a few cases of attached rims from both the Vosburg and Humphrey sites. Interior neck shapes are mostly sharp and exterior neck shapes are largely parallel or expanding. The range of neck thicknesses is 4.95-15.55 mm, neck diameters range from 7.3-40 cm, and neck angles range from 78-114°. All shoulder junctures were round with angles ranging from 118-140°. Shoulder thicknesses range from 4-12.25 mm. The most common handle form for Center Creek segments is strap. Handle lengths range from 24-44.85 mm, widths range from 14-52.3 mm, and handle thicknesses range from 6-15.65 mm. Handles were mostly attached at the rim and shoulder. No handles were attached to the shoulder only.

All lip, rim, shoulder, and handle surfaces were smoothed with the exception of one specimen with a burnished lip. No evidence of mixed temper exists within the Center Creek assemblage; all vessels examined were tempered with bivalvian shell. Grain sizes range from 0.5-5 mm with most segments having 0.5-2 mm grain inclusion sizes. Percent of temper ranges from 5-25%. Smudging is common among segments from the Vosburg and Humphrey sites. Burning is also frequent, although less than smudging.

Lip notches are nearly ubiquitous on Center Creek segments with notches on the interior surface being the most common. Lip notch thicknesses range from 1.8-6.35 mm and notch depths range from 0.5-1.85 mm. Rim decoration appears on the interior and exterior surfaces of many specimens. The most common form of decorative motifs on rim surfaces are interior nested chevrons with interior horizontal lines flagging either side of the chevron motif. Line thicknesses for rim decoration range from 1.4-4.3 mm and depths range from 0.2-1.6 mm. Lines drawn on the exterior shoulder were mainly rectilinear with no cases of curvilinear lines only. Horizontally and obliquely oriented lines are the most common forms of alignment on these vessel segments. Shoulder line thicknesses range from 0.8-4.5 mm with depths ranging from 0.2-2 mm. Intaglio is not common, and when it is present it is usually weak. Handle decoration is exclusively vertically drawn lines. Thicknesses for these lines range from 1.7-3.2 mm and depths range from 0.2-1.7 mm. Punctates on the exterior shoulder are mostly round in form with a single case of both elongated and irregular shapes present within the locality assemblage. Direct and gradually angled punctates are common. Punctate thicknesses range from 0.7-5.2 mm with depths ranging from 0.2-2.5 mm.

Vessels from the Red Wing region and Center Creek locality differ mostly in terms of orifice diameter, lip form, lip thickness, rim form, rim angle, rim thickness, rim length, neck angle, handle form, handle length, handle width, handle thickness, grain size, percent temper, and lip decoration location. They share only a few morphological and decorative traits, such as round shoulders, smooth surfaces, and rectilinear lines, which are recognized as broad characteristics representative of pottery within the Oneota tradition. Although Red Wing and Center Creek have vessels with small orifice diameters, the range of diameters is significantly smaller among Center Creek pottery than Red Wing. Beveled lips are more common among Center Creek sites than Red Wing sites, especially beveled exterior lips. Also, vessel lips within the Center Creek assemblage are smaller. Center Creek rims are on average thicker and shorter than Red Wing rims. Neck angles among Red Wing vessels have a wider range than Center Creek vessels. Strap handles are more common to the Center Creek assemblage and the range of handle length, width, and thickness is tighter than that of the Red Wing sample. Temper sizes and percent inclusion ranges for Center Creek pottery is wider than that of Red Wing. Lip decoration is more common within the Center Creek sample than the Red Wing assemblage. When present, lip notches were located predominantly on either the interior or exterior surfaces whereas lip notches on Red Wing pottery were recorded mostly on the superior surface of the vessels.

Sheffield.

Orifice shapes from the Sheffield site are all round with diameters ranging from 12-34 cm. Round lip forms dominate the site assemblage with only single cases of flat, beveled interior, and beveled exterior lips. Lip thicknesses range from 2.9-6.1 mm. Rims are largely everted with single cases of a vertical and a curved rim. Rim thicknesses range from 5.2-9.5 mm, rim lengths range from 21.4-51 mm, and rim angles range from 60-81°. Rims from the Sheffield site were drawn up; no evidence of attached rims so far exists in the assemblage. Interior neck shapes are mostly round, and exterior shapes are overwhelmingly parallel. Neck thicknesses range from 7-9.1 mm with diameters of 11-31 cm and angles of 85-131°. When determinable, shoulder junctures were only round with an angle of 130°. Strap handles are the most common form with lengths ranging from 24.1-41 mm, widths ranging from 17.6-35.3 mm, and thicknesses ranging from 5.5-8.3 mm. An equal amount of handles were attached to the rim and shoulder as were attached to the lip and shoulder. Lip, rim, shoulder, and handle surfaces were smoothed with exception of a burnished and an exfoliated lip. All examined segments were tempered with bivalvian shell with grain sizes between 0.5-5 mm and percent inclusion ranges of 5-20%. Smudging is absent from the Sheffield assemblage and burning is present on only a single vessel segment.

Lip notches are common within the Sheffield assemblage with interior notches being present on all specimen but two. Lip notch thicknesses range from 3.5-6 mm with depths of 0.4-1.6 mm. Interior chevrons are the most common rim decoration type. Line thicknesses range from 2.25-5.6 mm and depths range from 0.2-2 mm. Rectilinear shoulder lines oriented in a horizontal or oblique fashion are the most common form at Sheffield. Shoulder line thicknesses range from 2.25-5.6 mm and depths range from 0.2-2 mm. Intaglio is absent from the Sheffield sample. A single case of vertical lines on a handle was recorded from Sheffield with a thickness of 2.20 mm and a depth of 0.3 mm. Round and ovular punctates are common applied in both a direct or gradual manner. Punctate thicknesses range from 4-4.8 mm with depths of 0.5-1.3 mm.

The Sheffield and Red Wing assemblages differ mostly in terms of orifice diameter, rim form, rim thickness, rim length, rim attachment, interior neck shape, neck thickness, handle form, lip decoration location, line intaglio, grain size, smudging, and burning. Similar to the Center Creek assemblage, Sheffield vessels have a smaller range of orifice diameters; Red Wing has more large vessels. Although everted rims are the prevalent form in both the Red Wing and Sheffield samples, only a single case of each a vertical and curved rim was identified from the Sheffield assemblage. Sheffield rims are on average thinner and shorter than those from Red Wing. Attached rims are entirely absent from the Sheffield sample compared to the few attached rims from Red Wing sites. Interior necks are more commonly round and the range of neck thickness is less variable within the Sheffield sample than Red Wing. Handles are more commonly loop shaped in Red Wing as opposed to strap shaped at Sheffield. Lip decoration is predominantly located on the interior surface of Sheffield pottery whereas notches are more common on the superior aspect of Red Wing vessels. Line intaglio and smudging is absent from Sheffield pottery, but is frequent among Red Wing site assemblages, especially those from multi-component sites. The range of grain size is slightly larger and burning is not common among Sheffield pottery.

Table 6.72: List of Differences in Morphological and Decorative Attributes between Red Wing, Center Creek, and Sheffield Pottery

	Morphological Attributes		*Decorative Attributes*	
Compared Locations	Scale Measurements	Nominal Measurements	Scale Measurements	Nominal Measurements
Red Wing: Center Creek	Orifice diameter, temper grain size, percent temper, lip thickness, rim thickness, rim length, rim angle, handle length, handle width, handle thickness	Lip form, rim form, interior neck form, exterior neck form, handle form	Rim decoration thickness, shoulder line thickness, shoulder line depth	Lip decoration location
Red Wing: Sheffield	Orifice diameter, temper grain size, rim thickness, rim length, neck thickness	Rim form, rim attachment method, interior neck shape, handle form	Lip decoration location, line intaglio	Punctate depth

Overall, the descriptive statistic results support the assertion that Red Wing, Center Creek, and Sheffield site pottery are more different than previously reported and the original typologies created in the mid-20th century are in need of revision, given newly excavated material and additionally considered attributes. These results would benefit from further measurements of morphological and decorative features from vessels and segments from the Armstrong and Double sites in Red Wing as well as several sites from the Willow Creek locality, near the Center Creek locality along the Blue Earth River, and the La Crosse locality, south of the Red Wing region, along the Mississippi River. Chapter Seven takes these statistical results from each location and runs them through multiple multivariate tests to determine the relationship among variables and discretion of typological clustering within a large assemblage.

Chapter Seven: Results II: Multivariate Analysis

"Statistical hypothesis testing is merely one formulation of the more general procedure operative in science. In archaeology, the ideas subject to evaluation are our ideas about how and why the archaeological record is structured as it is." (VanPool and Leonard 2011:97).

Background

Multivariate analysis is a powerful tool in archeology. It allows researchers to statistically evaluate the relationships among variables within a data set. It is not enough to simply outline the results of recorded data of pottery attributes. One must also explore the relationships between morphological and decorative features to better immerse one's research into the realm of stylistic behavior and understand the ways in which people made pottery in a similar or different fashion within and between sites, localities, and or regions. Multivariate analysis is used in this research to determine the covariance among aspects of vessel form and decoration within and between regions in southern Minnesota and western Wisconsin. It is also used to determine whether typologies can be created by comparing the frequency or values of multiple variables. Chapter Six outlined the descriptive statistics concerning ratio and nominal data collected for this research, this chapter will now compare the relationships among the scale and nominal data using correlation and numerical taxonomy. Both methods were computed using IBM SPSS.

Correlation

Correlation is a useful statistical technique to explore the relationships among variables. It measures the degree to which variables are linearly related to one another. It can be used to answer questions such as, 'is there a strong relationship among neck, shoulder, and rim angles or does the value of rim length vary independent from vessel size?' This multivariate method is similar to linear regression, which also explores the linear relationship among variables, yet it does not assume there is a causal connection between an independent variable, measured without error, and a dependent variable (VanPool and Leonard 2011: 221). Correlation is specifically used for ratio data when the researcher is unsure whether one variable has a direct influence on the values of another.

There are three main methods of correlation analysis: Pearson's, Spearman's, and Kendall's coefficients (Hauke and Kossowski 2011). Each technique measures correlation in slightly different manners, such as by rank or specific comparative value, which can be tailored to different research questions. The Pearson's "product-moment" Correlation Coefficient technique is used in this research to analyze the relationship between lengths, widths, thicknesses, angles, and diameters. Originally described by the British statistician Karl Pearson in 1896, it compares the linear relationship between to variables and gives a specific value (r) between -1 and 1 (Pearson 1896). A value above zero displays a positive correlation (Figure 7.1) between the two attributes. Positive correlation states that as one variable increases in value, so does the other. Correlation values below zero display a negative correlation (Figure 7.2), which states that as a particular value increases the other decreases. A value of zero represents no correlation (Figure 7.3) between the two attributes. An r value of 1 or -1 indicates a positive or negative linear relationship between the variables.

A post hoc analysis of the correlation among ratio data was also conducted, which provided a p-value, similar to the ANOVA and t-tests. This subsequent analysis tested whether the r value produced within the Pearson's Correlation Coefficient method was sufficiently dissimilar from zero to indicate significant correlation. Only associations with a p-value at or below the threshold of 0.05 were considered to be significantly correlated, meaning it is not likely that the correlation is the result of random variation. Tables containing all of the Pearson's Correlation Coefficient values for every ratio data attribute from the Red Wing region, Center Creek locality, and Sheffield site are located in Appendix III.

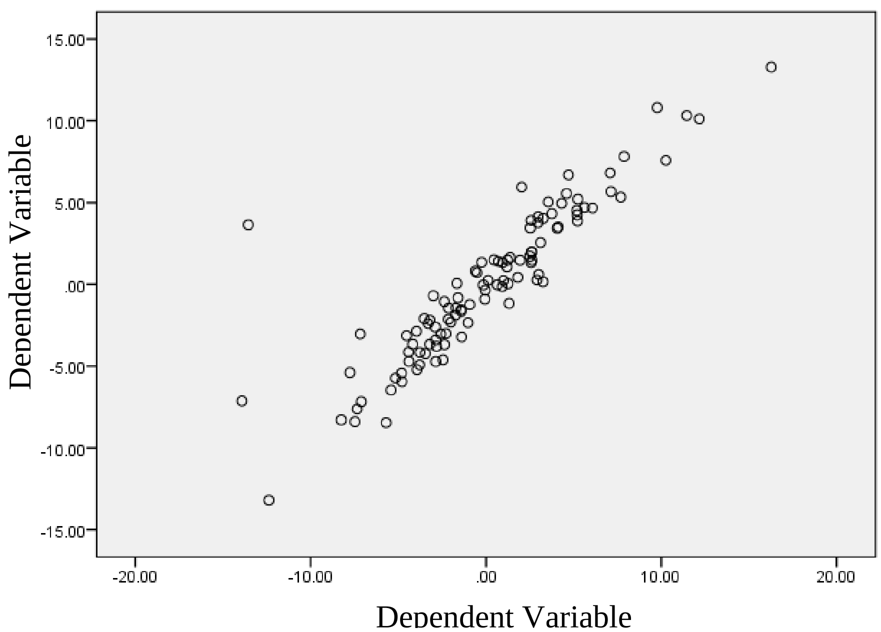

Figure 7.1: Example of Positive Correlation within the Pearson's Correlation Coefficient.

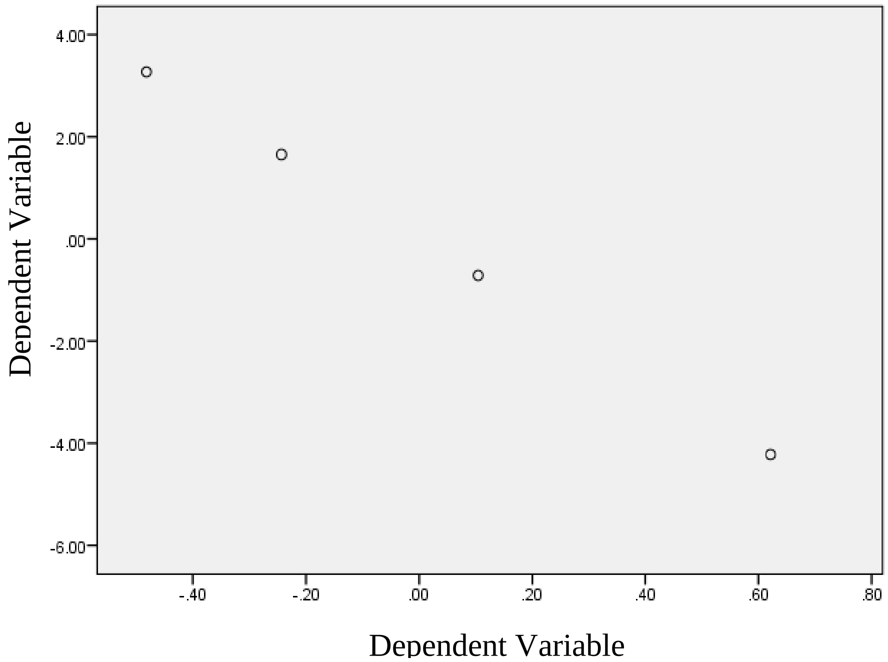

Figure 7.2: Example of Negative Correlation within the Pearson's Correlation Coefficient.

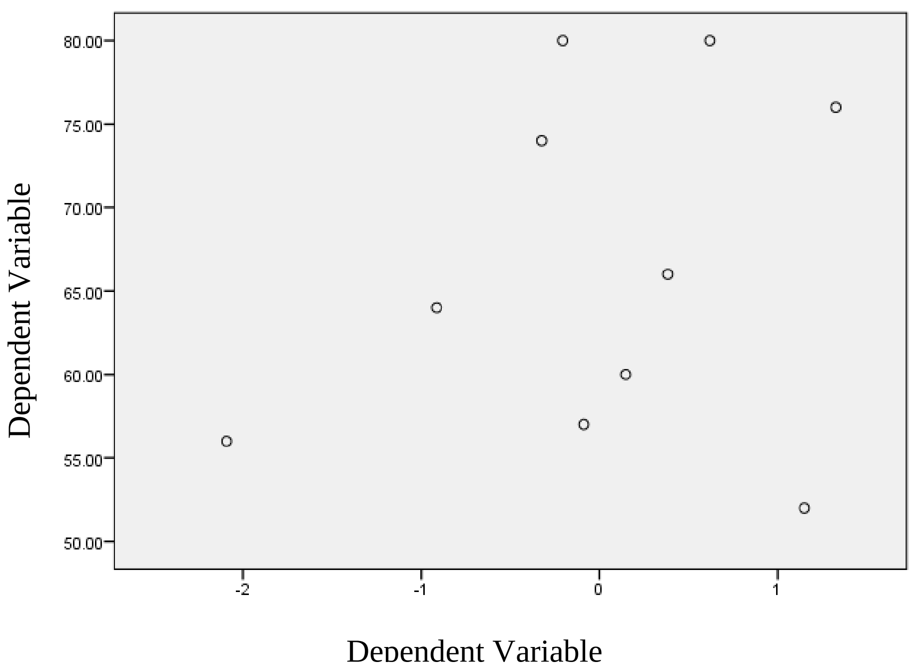

Figure 7.3: Example of No Correlation within the Pearson's Correlation Coefficient.

Red Wing.

Overall, there is a tendency for larger vessels to have thicker lip, rim, neck, and shoulder walls, longer rims, and larger handles. That is, there are positive correlations (with p-values below 0.05) between orifice diameter and rim, neck, and shoulder thicknesses, rim length, and neck diameter as well as handle length, thickness, and width. There are correlations that can be expected *a priori* concerning practical aspects of vessel production, such as vessel size and wall thickness. Larger vessels functionally will have thicker walls for structural stability. Even though the correlation registered with a 95% confidence between vessel size and wall thickness, it is not necessarily a correlation that lends itself to typological classification. Holley (n.d.) previously hinted to the strong positive correlation between orifice diameter and rim length for Oneota vessels from the Red Wing region, yet there are several other attributes, whose values are linearly related to the size of vessel opening. A positive correlation exists between rim angle, neck angle, and shoulder angle. As rims become more vertical, neck angles will likely be more obtuse and shoulders will be more round. For decoration there are significant positive trends between vessel wall thickness and lip decoration thickness, shoulder line thickness and depth, punctate depth, and handle decoration thickness and depth. Indicating that vessels with thicker walls, i.e., larger vessels, will likely have thicker and deeper lip notches, shoulder decoration, and handle decoration than smaller vessels.

Center Creek.

Similar to the Red Wing region, as Center Creek vessels increase in size, their rims increase in length, walls generally become thicker, neck diameters increase, and decoration widens and deepens. Dissimilar to Red Wing specimens, as Center Creek vessel size increases, shoulders become more round. The correlation value among Red Wing vessels between orifice diameter and shoulder angle is negative. The opposite is true of the Center Creek sample. Unlike the Red Wing correlation, only handle width is significantly linked to the increase in vessel size. That is, larger vessels tend to have wider handles but not necessarily thicker or longer handles. Concerning decoration, there are positive correlations among punctate thickness and depth as well as line thickness and depth, which correlate with overall vessel size.

Sheffield.

The general positive correlation between vessel size and wall thickness, neck diameter, and rim length as well as handle length and width is reflected in the Sheffield sample. Similar to the Center Creek sample and opposite to the Red Wing assemblage, Sheffield handles tend to be thinner in larger vessels than they are in smaller vessels. Several attributes only have a single measurable data entry for the Sheffield sample and were thus taken out of the correlation. These features include rim decoration thickness and depth, punctate thickness and depth, handle decoration thickness and depth, and shoulder angle. More excavated material is needed to fill in the gaps in this sample's multivariate data.

The most dynamic catalyst for linear relationships among ratio data seems to be vessel size. Oneota vessels from the Red Wing, Center Creek, and Sheffield locations show positive relationships between the size of orifice opening and several aspects of wall thickness, decoration thickness, and decoration depth. Although the results of this correlation do not lend themselves to apparent typological divisions in the ratio data for vessel form and decoration, they do display some variation of vessel production between Red Wing and Center Creek as well as Red Wing and Sheffield. Larger vessels produced within the Red Wing region tend to have longer, wider, and thicker handles whereas larger vessels from Center Creek and Sheffield tend to have wider but not longer and thicker handles. This correlation reflects the differences in prevalent handle forms and the choices potters make after initial vessel formation to mold a certain type of adhered features for suspending the vessel. Loop handles are the dominant handle type recorded on vessels from the Red Wing region. They are generally circular in cross-section and thus larger handles will be larger in length, width, and thickness. Strap handles are the most common form of handle within the Center Creek and Sheffield samples, they are more ovate in cross-section and thus tend to be wider than they are thicker or longer.

Numerical Taxonomy

For comparing nominal data, such as rim, lip, neck, shoulder, and handle forms or the presence or absence of particular decorative elements and motifs on a multivariate level, archeologists can utilize numerical taxonomy. Numerical taxonomy is a classificatory method in which researchers can compare the co-occurrence of nominal attributes. For archeology, it allows archeologists to use statistics to "[extract] information of cultural significance from archaeological data" (Spaulding 1953: 305). The mid-century archeologist Albert Spaulding introduced the notion of numerical taxonomy to the field of archeology, specifically the use of chi-square tests, to make typological sorting more replicable and reliable. By using statistical methods to determine typological boundaries, the traditional (and difficult to replicate) technique of sorting artifacts into piles based on size, color, shape, etc. and confirmation of these typologies based on an archeologists "expertise" in a particular field is no longer needed. Although archeologists are extremely adept at noticing distinct and minute differences in artifact morphology and decoration based on recognition and experience, it is not enough to demonstrate testable typological variation. The simple form of numerical taxonomy is to record the frequencies of co-occurring variables on an artifact. Archeologists can use the chi-square test to evaluate the strength of association among such co-occurring frequencies quantitatively (Spaulding 1953; VanPool and Leonard 2011). Table 7.1 and 7.2 display ideal examples of no association and perfect association respectively between two nominally recorded variables. The results shown within these two tables are not actual results observed within this study.

Table 7.1: Ideal Example of No Association between Two Variables within the Numerical Taxonomy

		Exterior Neck Shape		
		Constricting	*Expanding*	*Total*
Interior Neck Shape	*Round*	25	25	50
	Sharp	25	25	50
	Total	50	50	100

Table 7.2: Ideal Example of Perfect Association between Two Variables within the Numerical Taxonomy

		Exterior Neck Shape		
		Constricting	*Expanding*	*Total*
Interior Neck Shape	*Round*	50	-	50
	Sharp	-	50	50
	Total	50	50	100

Using chi-square tests within the numerical taxonomy allow researchers to answer important typological questions, such as ‘is there a significant association between sharp interior neck shapes and expanding exterior neck shapes?’ by using statistical measures. For pottery, numerical taxonomy can record the number of segments which have a particular type of rim form and lip form or interior and exterior neck shape and provide a probability score to determine whether such frequencies are the result of random variability or significant statistical variation. The chi-square test compares the count of observed frequencies within an archeological sample with the statistically expected frequencies of the original population. Expected frequencies are calculated by taking a column total, multiplying it with a row total, and dividing it by the grand total (VanPool and Leonard 2011). Chi-square tests can be calculated in the Crosstabs function in SPSS or by using the “chitest” formula in Excel. Both methods result in a probability value (p-value), similar to ANOVA and t-tests, in which significant statistical variation is recognized, with at least 95% confidence, below the threshold of 0.05.

Below are descriptive results of chi-square tests that are below the p-value of 0.05 as well as interesting frequency results, which display one attribute being more associated with another. Attributes with significant chi-square results were examined in terms of frequency of observed variables to determine exactly which morphological and decorative traits were associated with each other. Tables of significant nominal data relationship are located in Appendix III as well as chi-square test results displaying p-values for comparing all nominal attributes of vessel form and decoration from specimens within the Red Wing, Center Creek, and Sheffield samples.

Overall, several nominal attributes were not included in the numerical taxonomy because they are characteristics that most Oneota vessels within the upper Midwest share. Within the Red Wing, Center Creek, and Sheffield assessments, temper type, lip tab presence, shoulder form, and all surface treatments were not incorporated. Although these are important morphological and decorative features to have in pottery multivariate analyses, they are not meaningfully relevant within these samples in terms of determining clustered instances of particular formal and or decorative traits.

Red Wing.

Although orifice shape can be difficult to discern with vessel segments, there are a few correlations between this attribute and some morphological and decorative features. For lip and rim decoration, interior lip notching, interior rim arcs and oblique lines are only associated with vessels with round orifice shapes; superior lip notches and interior rim chevrons are associated with both round and ovular shaped orifices. Ovular orifices are more associated with constricting and expanding exterior neck shapes than parallel. In addition, round orifices co-occur more with parallel necks than constricting or expanding ones.

As an interesting way to look at vessel size in relation to nominal morphological and decorative traits, orifice diameter was split into four ranges from which co-occurrence could be better discerned. As described in Chapter Six, small vessels have an orifice diameter of 9-19 cm, medium sized vessels between 20 and 29 cm, large vessels between 30 and 39 cm, and lastly extremely large vessels have a diameter above 40 cm. Small vessels commonly have shell temper grain sizes of 0.5-1 mm, medium and large vessels frequently have grain sizes between 0.5 and 2 mm, and extremely large vessels have larger grain sizes between 0.5-4 mm. Pointed lips are only found on specimens with orifice diameters between 20 and 29 cm. Small vessels are more associated with round interior necks than sharp. Medium to very large vessels more commonly have sharp interior necks than round. All handles recorded were from vessels segments with small and medium size orifice diameters. Either large or very large vessels were made without handles, or these segments were parts of the vessel in which handles were not located.

Concerning decoration and vessel size, interior notching was recorded on small and medium size vessels; superior notches were applied to the lips of small to large size vessel. Extremely large vessels have no lip decoration. Interior chevrons are only associated with orifice diameters between 30 and 39 cm. Ovate, steeply applied punctates are more common on small vessels and gradually applied round punctates are more frequently on medium size vessels. Strong intaglio is found more on vessels with an orifice diameter of 9-19 cm and 30-39 cm. Weak intaglio is prevalent in medium size vessels.

The grain range of 0.5-1 mm is more frequently associated with round necks, which is also more common with smaller orifice diameters. Sharp necks were associated with all other grain ranges. Parallel exterior neck shapes are more linked with the grain ranges of 0.5-1 mm and 0.5-2 mm whereas expanding exterior neck forms are more common in larger grain size ranges such as 0.5-3 mm and 0.5-4 mm.

Certain lip forms are associated with particular rim decorations and punctate orientation as well as rim and neck forms. Interior lines and interior arcs are only found on vessel segments that also have round lips. Interior chevrons are also commonly associated with round lips and flat lips. Segments with beveled interior, beveled exterior, or pointed lips are not associated with rim decoration. Although the chi-square results show a low probability of statistically significant variation between lip and rim form, by examining the observed frequencies it is apparent that curved rims are only associated with round lips, and pointed lips are only associated with everted rims. Beveled interior and pointed lips are more linked with round interior necks than sharp necks. Conversely, vessels with beveled exterior, round, or flat lips more commonly have sharp necks. Parallel and constricting exterior neck shapes are associated, in differing amounts, with all lip forms, but vessels with round and flat lips more often have expanding exterior neck shapes than parallel or constricting. There are no instances in which a specimen has a pointed or beveled interior lip and expanding exterior neck. Lastly, directly or gradually applied punctates are only seen on specimens with round or flat lips. Steeply applied punctates were recorded on vessels with round or beveled interior lips.

Interesting associations exist between certain types of rim forms and rim decoration, neck shapes, punctate forms, and punctate application orientation. Interior rim decoration is overwhelmingly associated with everted rims. Interior chevrons, interior arcs, and interior lines are found on rims with an everted form. As discussed within the Correlation section of this chapter, although certain relationships may seem like a functional correlation more than a stylistics association, vertical rims in addition to everted rims within the Center Creek sample were commonly decorated along the interior surface whereas vertical rims within the Red Wing assemblage are overwhelmingly undecorated. Only a single instance of an interior line was recorded on a rim with vertical orientation. There is no evidence for an association between curved rims and rim decoration. Curved and vertical rim forms are more commonly associated with round interior necks than sharp. Conversely, everted rims are more associated with sharp necks than round. Expanding necks are more frequently correlated with everted rims than curved or vertical. Curved and vertical rims are more commonly linked with parallel exterior necks than everted. Constricting necks are only recorded with everted rims. Curved rims are only associated with round punctates. Everted rims are more correlated with round punctates applied in a direct orientation. Differentially, vertical rims are more associated with ovate punctates applied in a steep or gradual fashion.

There is a relationship between particular interior and exterior neck shapes. Although there seems to be some variation with these attributes by which all exterior neck forms are somewhat correlated with all interior neck shapes, round interior necks are more commonly associated with parallel exterior necks and sharp necks are more commonly identified with expanding exterior neck forms. In addition, loop and strap handles are only recorded on vessels and segments having either expanding or parallel interior neck shapes; no association between constricting necks and the presence of handles was observed.

Certain decorative aspects have a significant probability of purposeful association. Steeply applied punctates are ovate; no instances of steeply applied round punctates were recorded. Additionally, punctates applied in a direct fashion are only round in form. Gradual punctate application was recorded on specimens with round or ovate punctates, but this application was more frequently identified with ovate punctate forms. It seems that the manner in which someone applied a decorative impression into the vessel exterior had an effect upon the overall shape of the punctate. Vessel segments that have curvilinear lines only, have no recorded presence of punctates. Weak intaglio is only associated with steeply applied punctates. Strongly impressed intaglio is correlated with all methods of punctate application.

Chi-square results from the Red Wing sample display a significant amount of variation within the assemblage's morphological and decorative attributes – a trait one would expect in an aggregation center in which regional peoples are coming into the area bringing their stylistic behavior and influences with them. Yet, three general clusters form around certain traits. The first group includes vessels with everted rims, sharp interior necks, expanding or parallel exterior necks, interior rim decoration, round or flat lips, superior lip notches, curvilinear and rectilinear shoulder decoration, strong intaglio, round and directly applied punctates, loop or strap handles, and smudged surfaces. The second group includes vessels with vertical rims, round lips, round interior necks, parallel exterior necks, no lip or rim decoration, ovate and gradually or steeply applied punctates, and loop handles. The last group of vessels have curved rims, round lips, no lip or rim decoration, round interior necks, parallel exterior necks, strap handles, and no intaglio. These clusters are not perfect separations; some morphological and decorative traits are found on more than one rim form, but they can give a general idea as to where some relations exist between certain types of form and design.

Center Creek.

Again, orifice shape is a difficult attribute to identify with smaller segments of an original vessel. Only a single case of an ovular shaped orifice was identified in this sample, thus there are not enough ovular shaped specimen to include in a nominal data comparison with other attributes. For orifice diameter, all lip form variants are present in small to large sized vessels. Yet small and medium vessels tend to have more round lips; beveled interior lips are dominant in the group of vessels with an orifice diameter of 30-39 cm. Exterior and superior lip notches are only present on small to medium size vessels and interior notches are only present on large vessels. Rim decoration variation is common among medium size vessels. Segments with exterior lines, interior and exterior lines, interior chevrons and horizontal lines, and interior only lines are associated with the 20-29 cm orifice diameter range. Rim decoration recorded on small and large vessels only included interior chevrons. Small vessels from the Center Creek locality more commonly have round interior neck shapes, as opposed to medium and large vessels, which more commonly have sharp interior necks. Interestingly, handles were only recorded on small or medium sized vessels. Similar to the Red Wing sample's chi-square results, smudging is more commonly present when burning is absent and vice versa. Significant statistical differences between rim attachment method and neck shape indicate that attached rims only have sharp interior necks and more commonly constricting exterior neck shapes. Round and sharp interior necks as well as parallel and expanding exterior necks are present with drawn up rims.

For additional decoration correlations, loop handles are not associated with any specific rim decoration. Oppositely, strap handles are present on segments with exterior lines and interior chevrons. Elongated and ovate shoulder punctates were only applied in a gradual fashion whereas round and irregular punctates were applied directly. No steep punctate application was recorded for Center Creek segments. Lastly, segments with attached rims only have round or irregularly shaped punctates. Ovate and elongated punctates are present on vessels with rims drawn up from the same paste material as the shoulder and neck.

In addition to the morphological and decorative traits eliminated from this multivariate analysis of nominal data, there is not enough data concerning orifice shape and handle decoration type to create meaningful typological separations with other vessel attributes. Compared to the Red Wing sample, there is less internal variation among morphological and decorative traits. The clustered occurrence of certain formal and decorative attribute types with particular rim forms is not apparent in this sample.

Sheffield.

Little variety exists within the Sheffield sample. This may be caused by the smaller sample size or caused by the purposeful uniformity in vessel decoration and morphology at the site. Concerning grain size, there are some interesting correlations with neck shape, punctate application, and handle attachment. Segments with sharp interior necks have temper diameters ranging from 0.5-2 mm to 0.5-4 mm. Round necked specimens have grain sizes ranging from 0.5-1 mm to 0.5-5 mm. Punctates are present on vessels with smaller grain sizes (between 0.5-2 mm) no punctates are present on segments with inclusion diameters ranging from 0.5-3 mm to 0.5-5 mm. Lastly, handles attached to the exterior lip and shoulder seem to only have grain sizes of 0.5-2 mm.

Handles attached to the rim and shoulder ranged between 0.5-2 mm and 0.5-3 mm. Specimens with grain diameters ranging from 0.5-1 mm, 0.5-4 mm, and 0.5-5 mm, did not have handles.

In contrast to both the Red Wing and Center Creek samples, orifice diameter does not seem to be significantly correlated to any particular morphological or decorative traits. Since there are only single examples of sharp interior necks, exterior lip notches, shoulders with curvilinear and rectilinear line forms, beveled interior, beveled exterior and flat lips as well as curved and everted rims, results involving lip and rim form variation do no provide meaningful information towards the purposeful differences in vessel formation and decoration in association with other pottery attributes.

Orifice shape, rim attachment method, rim decoration type, intaglio, and smudging were not included in the chi-square assessment due to their absence on most Sheffield segments. There is very little intra-site variation concerning rim form at Sheffield. Everted rims dominate the pottery assemblage with only single cases of curved and vertical rims. The everted rims from Sheffield have orifice diameters between 10 and 39 cm (mostly medium size vessels) with round lips, interior lip notches, drawn up rim attachments, round and parallel neck forms, predominantly rectilinear lines, no intaglio, round directly applied as well as ovate and gradually applied punctates, and strap handles.

Summary

By applying a multivariate perspective to statistical analyses of pottery morphology and decoration, a new realm of information is apparent concerning the relationship between certain attributes recorded numerically or nominally. This research has employed two multivariate methods; however, there are many other statistical approaches such as factor/principle component analysis, two-way ANOVA, nested ANOVA, and linear regression that can be applied in future research of the Red Wing, Sheffield, and Center Creek assemblages.

Correlation worked well in this analysis because it compares the linear relationship among numerically recorded variables without assuming that one directly influences the value of another. Through the correlation, it is apparent that there is a variable that has an influence on several others: vessel size. Larger vessels within the Red Wing sample tend to have wider orifices, thicker vessel walls, and larger handles than smaller vessels. Also, smaller vessels tend to have more vertical rims, obtuse necks, and rounded shoulders. Different from the Red Wing sample, larger Center Creek vessels tended to have rounder shoulders and thinner handles. Different from the Red Wing assemblage and similar to Center Creek, as vessels increase in size within the Sheffield sample, handles decrease in thickness.

For nominal data, a numerical taxonomy of the frequency of co-occurring morphological and or decorative traits provided information concerning internal variation within each sample. By comparing the observed frequencies with the expected frequencies, chi-square tests were able to distinguish statistically between trait pairings that were more likely the result of random variability and those that were likely not due to chance alone. One of the most important results of the chi-square analyses was the identification of three larger associations (see Chapters Eight and Nine) within the numerical taxonomy data for the Red Wing region between particular rim forms and certain aspects of vessel morphology and decoration. No such connection was discovered in the Sheffield or Center Creek data. The associations between morphological and decorative attributes identified within the numerical taxonomy are further discussed in the Chapter Eight of this research.

Chapter Eight: Discussion

"The history of any people is a continuous cycle of events and processes that are determinate of a particular instance in time. Yet the image of past societies comes to us as hundreds of pieces, which we as archaeologists organize in classification schemes of empirical structure"
(Benn 1995: 127).

Background

The ways in which people in the past formed and decorated their pottery reflect the norms, traditions, identity, interaction, and feedback expressed within their communities. Since archeologists cannot contact the people whom they study, they utilize particular research methods and theoretical frameworks to infer conclusions about the humans they research through cultural remains. By viewing detailed measurements of vessel morphology and decoration through the framework of typological classification and stylistic behavior, detailed structures can outline different techniques of pottery manufacturing, which are supported through empirical, quantifiable data. Concerning the subject of this research, there are more differences between Oneota pottery made, utilized, and ultimately disposed in the Upper Mississippi, Blue Earth, and St. Croix River valleys than previously thought. These variations reflect separate communities that, although they share broad cultural traits, make their pottery differently based on local traditions of vessel form and design. This chapter contextualizes the descriptive statistics and multivariate results of the past two chapters and offers suggestions for new regional typologies based on these recently acquired data. Also within the chapter are frequency results and a discussion of common motifs from the Red Wing region, Center Creek locality, and Sheffield site.

The Oneota Tradition

Oneota is an identity term that has been used in decades of archeological research to describe a particular type of village organization, horticultural pattern, and pottery style that reflects a regionally-related group of people during the late pre-contact, sharing a similar type of cultural behavior. Broadly, the archeological remains of Oneota groups reflect large villages with little to no sociopolitical hierarchy, local cultivation of domesticated plants such as maize, beans, and squash, large storage/refuse pits, triangular unnotched projectile points, and shell-tempered globular vessels with flaring rims, round shoulders, and decoration of trailed or incised lines, punctates, and frequent lip notches (Keyes 1927; Griffin 1937; Wilford 1955; Dobbs 1984b; Benn 1989; Henning 1995; Schirmer 2002; Fleming 2009). During the late pre-contact, Oneota groups resided in parts of modern-day Wisconsin, Illinois, Minnesota, Iowa, and Missouri. These groups were most likely ancestral to Ioway, Oto, Winnebago, Ho Chunk, and Missouri tribes (Dobbs 1984b) and shared a broad linguistic pattern derived from the Chiwere Siouan language group (Griffin 1937; Schirmer 2016). Taxonomically, it is a cultural tradition with many regional and local horizons and phases. Phases and horizons not only separate Oneota components into distinct sections of time and space but also often reflect stylistic differences in house construction and burial patterns as well as pottery formation and design.

The emergence of Oneota-like sites and artifacts around AD 900-1000 has been a source of controversy within Midwestern archeology for over half a century. Two fields of thought have existed concerning Oneota origins. The first suggests that Oneota components formed from Mississippian people, culturally tied to Cahokia, migrating north and interacting with local Late Woodland groups (Griffin 1943; Wilford 1955; Griffin 1960; Hall 1962; Stoltman 1986). This theory identifies the Oneota tradition as an Upper Mississippian manifestation of culture behavior originating from the complex sociopolitical behavior occurring in the American Bottom. Under this viewpoint, the presence of vessels in Red Wing with rolled rims, angular shoulders, and scroll motifs was an indication of Mississippian influence and adaptation of the Ramey Incised and Powell Plain types within Cakokia's Sterling phase. Although these morphological and decorative traits are present within Mississippian style pottery, they are not an exact indicator of Mississippian identity. These attributes are also present within other contemporary and earlier ceramic complexes in Iowa, North Dakota, South Dakota, and Wisconsin. The second perspective states that Oneota components emerged *in situ* from local Late Woodland groups contemporary to the emergence of the Mississippian tradition (Gibbon and Dobbs 1991; Overstreet 1995; Holley n.d.). This theory supports a much older date for Oneota pottery in Red Wing, closer to the start of the twelfth century. Current radiocarbon dates and recent research concerning Oneota components suggest that Oneota emergence was co-occurring with Mississippian emergence, not a result of it (Schirmer 2016; Schirmer n.d.). The earliest known Oneota sites are located within eastern Wisconsin and date to around AD 950 (Overstreet 1995).

This is not to say that Mississippian and Oneota people were entirely separate. There are Mississippian sites in Wisconsin, such as Trempealeau and Aztalan, and along the Mississippi River valley south of the Red Wing region and La Crosse locality. As co-occurring cultural traditions within the Midwest, communication between Oneota and

Mississippian groups would have occurred. As an aggregation center (Fleming 2009), Red Wing would have been a contact point among many regional groups, and local people would likely have developed their own particular ways for forming and decorating pottery. As more comparative data are collected concerning Mississippian and Oneota components, archaeologists look towards analyzing how cultural information and objects may have been shared within and between these broad traditions, not strictly Mississippian influence on local groups.

Red Wing, Center Creek, and Sheffield

These three locations are all situated within the modern-day boundaries of Minnesota and western Wisconsin. They all are located within river valleys. The Red Wing region is comprised of more than a dozen villages with Oneota components along the Upper Mississippi River, Cannon River, Hay Creek, and Spring Creek valleys. Many of these sites have adjoining mounds or mound groups, which hug the site boundaries. The region has some of the largest and most densely occupied sites of the northern Midwest during the eleventh to fourteenth centuries (Fleming 2009: 228). Two Oneota phases have been defined for this region: the Bartron phase (AD 1150-1300) (Holley n.d.; Schirmer 2016; Henning and Schirmer n.d.) and the Spring Creek phase (AD 1300-1420) (Schirmer 2017; Henning and Schirmer n.d.). From the results of the current research, these two Red Wing phases do not seem to significantly differ stylistically concerning pottery. They do, however, vary in terms of site organization and habitation location (Schirmer 2017). Three large villages are located within the Center Creek locality. A single phase has been assigned to this locality: the Blue Earth phase (AD 1300-1430)

(Dobbs 1984b; Schirmer 2016). The Blue Earth phase also comprises sites within the Willow Creek locality (Dobbs and Shane 1982; Dobbs 1984b), also located along the Blue Earth River. The Sheffield site is situated within the St. Croix River valley and is currently the only known Oneota village in that regional area. The Sheffield site dates to around AD 1295-1425 (Fleming and Koncur 2015).

Concerning the ways in which people formed and decorated their vessels, the Red Wing region, Center Creek locality, and Sheffield site are stylistically separate from each other. Fifty-two percent of the ANOVA tests for scale data measured on vessels from each location resulted in a p-value below 0.05 – the chosen threshold for suggesting samples are not from the same original population. When comparing each location to each other using t-tests, 42% of the results for ratio data between Red Wing and Center Creek vessel segments and 18% of the numerical measurements between Red Wing and Sheffield specimen differ with statistical significance. Internally, significant variation within the Red Wing region comprises 14% of attributes measuring thicknesses, diameters, angles, widths, or lengths. These locations also vary considering the presence or absence of nominally measured data, such as lip, rim, and neck form as well as the existence of particular decorative elements.

As stated in the Chapter Six, differences between Red Wing and Center Creek pottery lie within the orifice diameter, lip form, lip thickness, rim form, rim angle, rim thickness, rim length, neck angle, handle form, handle length, handle width, handle thickness, percent temper, and temper size attributes. These are the morphological features in which ANOVA and t-tests showed noteworthy statistical scores. Although

Red Wing and Center Creek both have small vessel orifices, the range of diameter is larger among Red Wing (9-50 cm) pottery than Center Creek (9-40 cm). Thinner, beveled lips are more present within the Center Creek assemblage than the Red Wing sample, especially beveled exterior lip forms. The ratio between vertical and everted rims for Center Creek pottery is slightly more equal (9:34) than that of Red Wing (21:101); that is, Red Wing vessels more often have everted rims. Curved rims are present within both assemblages, but they are more common at Red Wing. Red Wing rims are thicker and longer than Center Creek rims. This coincides with the presence of larger vessels at Red Wing sites than Vosburg and Humphrey. Neck angles among Center Creek vessels have a narrower range than Red Wing vessels. Strap handles are more typical of vessels from Center Creek sites whereas loop handles are the representative form for Red Wing pottery. Also, the ranges for handle length, width, and thickness is tighter within the Center Creek assemblage than the Red Wing. Lastly, concerning morphology, the grain size for shell temper among Center Creek vessels and segments, in addition to the range for percent inclusions, is wider than that within the Red Wing sample. When forming vessels, potters added more crushed shell as a tempering agent to their clay in the Center Creek locality than the Red Wing region. This may indicate differences in molecular reaction within the clay during the firing process resulting from chemical variations of different clay sources.

Decoratively, Red Wing and Center Creek pottery differ greatly. Although lips are commonly notched on vessels from both assemblages, notches are typically placed along the interior or exterior lip of Center Creek vessels whereas they are mostly pressed into the superior surface of Red Wing pottery. Decorated rims from the Center Creek locality typically have trailed or incised horizontal lines along the exterior surface or interior chevrons with bordering rows of horizontal lines. Interior chevrons are also common within the Red Wing assemblages, as are oblique lines, yet without horizontal lines drawn on the exterior or interior surfaces. Lastly, shoulder decoration is very different. Although chevrons and punctate borders are common within the design elements of each sample, the ways in which these motifs are organized is distinctly local (see the discussion on motifs below for more information).

Differences between pottery recovered from the Sheffield and Red Wing locations exist in terms of orifice diameter, rim form, rim attachment, rim thickness, rim length, interior neck shape, neck thickness, handle form, intaglio, temper grain size, smudging, and burning. Again, these are the morphological measurements between the assemblages that were identified as having significant statistical variation within the ANOVA and t-tests. The range of identified orifice diameters for Sheffield segments (12-34 cm) is narrower than Red Wing. To coincide with smaller vessels size, Sheffield rims are also on average shorter and thinner. Everted rims are the dominant form among Sheffield vessels. Different from the Center Creek and Red Wing samples, only a single case of a vertical rim was recorded among Sheffield pottery. Attached rims were not recorded on any vessels segments currently recovered from the Sheffield site, as opposed to the 17 attached rims documented from Red Wing sites. The two locations also differ in terms of interior neck shapes: round necks are most frequent in Sheffield pottery whereas sharp necks are more common for Red Wing. Similar to the Center Creek locality, strap handles are more common within the Sheffield sample than the Red Wing sample. Lastly, smudging, burning, and line intaglio, present upon many Red Wing vessels, is distinctly absent from Sheffield pottery.

There are attributes that the three locations share, such as temper type, shoulder form, surface treatment, and orifice shape. With the exception of a mix-tempered vessel from the Silvernale site, all Oneota segments measured for this research from the three locations have shell tempering. Potters could have acquired material for this type of temper locally from the river valleys present in each location. Red Wing, Center Creek, and Sheffield vessels overwhelmingly have smoothed surfaces. This displays a common choice potters made to completely eradicate any evidence of paddling or coiling from vessel formation. Some burnished, brushed, and smoothed-over cordmarked surfaces do exist on vessels from the Red Wing region but these cases are abnormal for this particular pottery style. Also, round orifices and shoulders are commonly shared morphological traits among these locations. Stylistically, the ways in which vessels made in the Red Wing region, Center Creek locality, and Sheffield site are similar reflect the ways in which nearly all Oneota pottery is similar, revealing a commonality of choices made by late pre-contact people symbolic of their shared cultural tradition throughout the Midwest. Intercommunication is apparent. These locations were more or less contemporaneously occupied by people who shared broad traditions, which included basic vessels formation and choice of decorative elements. What is left in the description of pottery from each region is the discussion of motifs.

Table 8.1: General Results for Morphological and Decorative Attributes from the Three Research Locations

Attributes	*Red Wing*	*Center Creek*	*Sheffield*
Orifice Shape	Round; Ovate	Round	Round
Orifice Diameter	9-50 cm	9-40 cm	12-34 cm
Temper Type	Shell	Shell	Shell
Grain Size	0.5-3 mm	0.5-2 mm	0.5-2 mm
Percent Inclusion	5-20%	5-25%	5-20%
Lip Form	Round; Flat	Round; Beveled Ex.	Round
Lip Thickness	2.6-8.5 mm	2.5-7 mm	2.9-6.1 mm
Lip S.T.	Smooth	Smooth	Smooth
Rim Form	Everted; Vertical; Curved	Everted; Vertical	Everted
Rim Thickness	3.4-10.8 mm	4.4-10.5 mm	5.2-9.5 mm
Rim Length	15.4-65.6 mm	14.1-53.9 mm	21.4-51 mm
Rim Attachment	Drawn up; Attached	Drawn up; Attached	Drawn up
Rim Angle	34-86°	49-87°	60-81°
Rim S.T.	Smooth	Smooth	Smooth
Interior Neck Form	Sharp; Round	Sharp; Round	Round
Exterior Neck Form	Parallel; Expanding	Parallel; Expanding	Parallel
Neck Thickness	4.3-15.8 mm	5-15.6 mm	7-9.1 mm
Neck Diameter	10-48.8 cm	7.3-40 cm	11-31 cm
Neck Angle	76-142°	78-114°	85-131°
Shoulder Form	Round	Round	Round
Shoulder Thickness	3.5-10.3 mm	4-12.3 mm	3.7-7.1 mm
Shoulder Angle	120-149°	118-140°	130°
Shoulder S.T.	Smooth	Smooth	Smooth
Handle Form	Loop	Strap; Loop	Strap
Handle Attachment	Rim/Shoulder	Rim/Shoulder	Lip/Shoulder
Handle Length	21.5-53 mm	24-44.9 mm	24.1-41 mm
Handle Width	8.95-37.5 mm	14-52.3 mm	17.6-35.3 mm
Handle Thickness	8.5-23.4 mm	6-15.7 mm	5.5-8.3 mm
Handle S.T.	Smooth	Smooth	Smooth
Smudging	Present	Present	Absent
Burning	Present	Present	Absent
Lip Decoration	Sup. Notch	Int. Notch	Int. Notch
Lip Dec. Thickness	2-6.1 mm	1.8-6.4 mm	3.5-6 mm
Lip Dec. Depth	0.5-2.2 mm	0.2-1.9 mm	0.4-1.6 mm
Rim Decoration	Interior Chevrons	Interior Chevrons	-
Rim Dec. Thickness	1.5-7.7 mm	1.4-4.3 mm	2.3-5.6 mm
Rim Dec. Depth	0.4-1.6 mm	0.2-1.6 mm	0.3-1.1 mm
Punctate Form	Round; Ovate	Round; Ovate	Ovate
Punctate Orientation	Direct; Gradual	Direct; Gradual	Gradual
Punctate Thickness	1.6-5.9 mm	0.7-5.2 mm	4-4.8 mm
Punctate Depth	0.5-2.5 mm	0.2-2.5 mm	0.5-1.3 mm
Line Form	Rectilinear; Curvilinear	Rectilinear	Rectilinear
Line Thickness	1.7-6.7 mm	0.8-4.5 mm	2.3-6.5 mm
Line Depth	0.1-2.2 mm	0.2-2 mm	0.2-2 mm
Intaglio	Strong	Weak	-
Handle Decoration	Vertical Lines	Vertical Lines	-
Handle Dec. Thickness	3-7 mm	1.7-3.2 mm	2.2 mm
Handle Dec. Depth	0.8-2.2 mm	0.2-1.7 mm	0.3 mm

Motifs

It is rare for Oneota pottery from the Red Wing region, Center Creek locality, and Sheffield site to not be decorated. When forming and decorating their vessels, potters made discrete choices concerning deign and the use as well as subdivision of space (Shepard 1985[1954]: 266). The most common location for decorative motifs on Oneota vessels is the shoulder. Shoulders on globular Oneota jars are the broadest plane of the vessel; they are the locations which can draw significant attention and are thus where the most decoration is located.

In this research, vessel decoration is divided into four interrelated categories: elements, motifs, compound motifs, and themes. Elements are discrete decorative units, such as oblique lines, vertical lines, or punctates. Common Oneota line elements include arcs, meandering lines, hachured lines, and zig-zag lines. Motifs are combinations of decorative elements, such as chevrons, nested arcs, punctate borders, line panels, trios, or curtains. Elements and motifs are incorporated to create an overall design with communicative meaning. Motifs, which are combined with other motifs to generate additional meaning are termed compound motifs. The birdtail is an example of a compound motif. Nested chevrons or arcs, punctate borders, and oblique lines are combined to form an abstract image of a large bird's tail, often interpreted as a symbol of the Thunderer. Motifs, elements, and compound motifs, when structured in a particular way, can convey certain ideological or social themes. For additional definitions of motifs, elements, and themes see Appendix I. Each element, motif, and compound motif type is recorded in terms of presence on vessel segments from each site. Percentages of frequencies are not given because a single vessel segment can have multiple types of elements, motifs, and compound motifs.

Red Wing.

Many vessel segments from the Red Wing region are too incomplete to discern the presence or absence of motifs. Particular elements, such as horizontal or oblique lines were commonly recorded. These elements may have been part of chevrons or birdtails as in Figure 8.1 but without more of the shoulder it is impossible to tell. For the vessel segments with recognizable motifs, the most common form identified on Oneota pottery from the Red Wing region is the chevron (Chev.). Overall, chevrons are an integral part of recognizing vessels from the Oneota tradition and are present in most Oneota decorative patterns throughout the Midwest. The chevrons from Red Wing are often nested, hachured, and or bordered by a row of punctates (P.B.). They are identified in association with other motifs, such as arcs, curtains, trios, and duos. Arcs are basic decorative elements, but on Red Wing Oneota vessels they are often combined with other elements to make nested arc and hachured arc motifs. Arcs are present at all Red Wing sites with the exception of Burnside School. The meandering line (M.L.) and zig-zag line (Z.Z.) are other common elements, which are transformed into motifs with the addition of hachured lines and punctate borders.

Figure 8.1: Segment from the Adams (47PI12) site with oblique lines below the exterior neck, which may have been the superior aspect of a birdtail motif from the SMM collection (Catalog # A2005:19:1062).

Trios are bands of three oblique lines interpreted as “filler” in-between more symbolic motifs and compound motifs (Holley n.d.: 33). Trios are common among Red Wing motifs and are occasionally associated with punctate borders and hachured lines. Trios are present on segments from the Bartron, Adams, Bryan, and Energy Park sites. A shoulder sherd from the 2015 McClelland excavation also contains a trio motifs with a punctate border. Duos are similar to trios, yet they unsurprisingly have bands of two oblique lines instead of three. Duos are present on vessels from the Bryan and McClelland sites. Curtains (Holley n.d.) are also present on Red Wing vessels. A curtain motif contains a band of vertical lines perpendicular to a band of horizontal lines (Figure 8.2). Curtains are present on segments from the McClelland, Silvernale, and Energy Park sites. A large shoulder sherd from Adams also displays a curtain motif. Line panels (L.P.) are additionally present on Red Wing vessels and mostly consist of oblique, horizontal, and or vertical bands most likely used as filler or ways to separate space. Although not present on any vessel segments measured for this research, spiral/sun/star motifs were recorded on shoulder sherds from the Adams site (Figure 8.3).

(a) (b)

Figure 8.2: Segments from the Red Wing region with curtain motifs. (a) From the Adams (47PI12) site within the SMM collection (Catalog # A2005:20:354); (b) From the Silvernale (21GD03) site within the MHS collection.

Figure 8.3: Sherds from the Red Wing region with spiral/sun/star motifs from the Adams site (47PI12) within the SMM collection (Catalog # A2005:19:1078 and A2005:19:604).

Table 8.2: Results for the Presence of Elements, Motifs, and Compound Motifs on Vessel Segments from the Red Wing Region

Site Name	*Arc*	*M.L*	*Z.Z.*	*Chev*	*P.B.*	*Curt.*	*L.P.*	*Duo*	*Trio*	*Birdtail*
Bartron	2	-	-	7	1	-	-	-	3	3
Adams	1	1	-	4	1	-	2	-	1	1
Burnside School	-	-	-	2	1	-	-	-	-	-
McClelland	1	1	-	3	2	1	-	1	-	1
Silvernale	1	2	-	1	1	1	1	-	-	-
Mero	1	1	1	2	1	-	1	-	-	-
Bryan	1	2	-	5	3	1	-	1	2	1
Energy Park	1	-	-	1	-	-	-	-	1	-
Total	8	7	1	25	10	3	4	2	7	6

Compound motifs for the Red Wing region primarily consists of the birdtail. The birdtail is a combination of nested chevrons or arcs and punctate borders within two sets of oblique lines. Within Oneota iconography, the birdtail is interpreted as an abstract representation of a Thunderbird or Thunderer. The Thunderer is a common theme/character in Winnebago, Ho Chunk, Dakota, and Iowa folklore and iconography (Bergen 1896; Meeker 1901; Radin 1909; Skinner 1925; Gilmore 1926; Benn 1989). Examples of Red Wing birdtail motif are displayed in Figure 8.4. The Link Vessel also from the Red Wing region, is an interesting specimen on which the whole Thunderbird is represented (Figure 8.5). The McClelland Vessel also displays a unique representation of the Thunderbird. Although only half of the upper vessel survived the archeological record, the typical Red Wing birdtail motif is flanked by two bird wings with duo and curtain motif fillers (Figure 8.6). A similar example of a bird wing is present on a vessel segment from the Bartron site. Birdtails were recorded on segments from the Bartron, Adams, McClelland, and Bryan sites. Incomplete shoulder sherds from the Mero, McClelland, Bryan, and Burnside School sites also show birdtail motifs.

Figure 8.4: Examples of the birdtail motif on pottery from the Red Wing region. (a) Segment from Bartron (21GD02) within the MHS collection. (b) Shoulder sherd from Burnside School (21GD159) within the SMM collection (Catalog # A2006:4:1564).

Figure 8.5: Thunderbird motifs on the Link Vessel from the Bryan (21GD04) site. In between the two Thunderbirds is a serpent motif. Figure from Benn (1989).

Figure 8.6: McClelland Vessel with the birdtail motif and two birdwings flanked by a curtain and duo motif. Photo curtsey of MSU, Mankato Archaeology Lab. Photo taken by Cory Nowak.

Decorative themes on pottery vessels represent the distinctive ways in which motifs, compound motifs, and elements are organized within particular types. Fleming (2009) proposed a "mother-motif" common among Red Wing vessels, termed the Cross-in-Circle (Figure 8.7). Fleming's description of a "mother-motif" correlates with this thesis' definition of a theme. "At its simplest, the cross-in-circle design has been interpreted as relating to the four cardinal directions and the quadripartite, four-cornered cosmos that is pervasive in all American Indian symbolism" (Fleming 2009: 284). The motifs, which create the four corners could include birdtails, chevrons, curtains, and or nested arcs. Fleming suggests that vessel decoration should be viewed from above as well as from the side to better understand the non-verbal communication aspect of style, which can be interpreted from different viewpoints. Red Wing pottery can also be understood through themes of Upperworld and Lowerworld cosmology (Benn 1989; Fleming 2009) The Upperworld is tied to creatures and phenomena of the sky. Motifs such as the birdtail, Thunderer, and sun/star motifs are representative of this realm. The Lowerworld characterizes the earth's surface, and is interpreted through the presence of water or serpent motifs. Meandering lines, especially with vertical hachures, have been viewed as water symbols (Figure 8.8) (personal conversation with Ronald Schirmer 2016). Water symbols are present at the Bartron, Adams, McClelland, Silvernale, Bryan, and Mero sites.

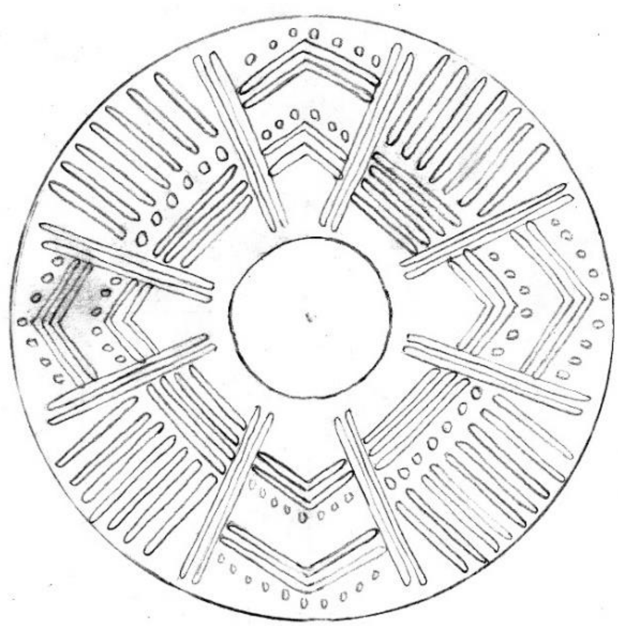

Figure 8.7: Cross-in-Circle theme symbolic of vessel design from the Red Wing region with birdtails as the four corners and curtain motifs as filler.

Figure 8.8: Water motif on large shoulder sherds recovered from the 2015 excavation at the McClelland Site (21GD258). Photo curtesy of the MSU, Mankato Archaeology Lab. Photo by Cory Nowak.

No two Red Wing vessels bear the exact same decoration. Each is a unique combination of commonly shared motifs and elements within the region, such as chevrons, punctate borders, duos, trios, arcs, meandering lines, curtains, and birdtails. There does not seem to be any evidence to suggest motif differences between Bartron and Spring Creek phase sites or between pure Oneota and multi-component sites. There is, however, significant difference in the stylistic choices made by potters living in the Red Wing region as opposed to the Center Creek locality and Sheffield site.

Center Creek.

Pottery from the Red Wing region and Center Creek locality share similar elements and motifs but differ greatly in overall decorative profile. Like Red Wing pottery, chevrons and punctate borders are common motifs upon Center Creek vessel shoulders, yet they are overwhelmingly associated in panel form, separated by four vertical lines. These vertical line panels act as axis points on which chevrons alternate from regular to inverted form. Figure 8.9 shows this common combination of nested chevrons, punctate borders, and line panels on Center Creek vessels. Another common motif specific to Center Creek decoration is the line border. Line borders (L.B.) are short trailed or incised lines drawn below the exterior neck (Figure 8.10). They are often paneled by sets of vertical or oblique lines. Wilford (1955) referred to these borders as line fringes, typical of Blue Earth style pottery. Curtains, duos, and trios are present motifs within the Center Creek assemblage but are less common than within the Red Wing sample. Quatros, which are oblique bands of four lines, are more representative of the Center Creek sample. Concentric circles (C.C.) are present on two segments from the Vosburg site. Concentric circles are referred in other literature as bulls-eye, sun, or star motifs (Holley n.d.).

Figure 8.9: Typical Center Creek locality motifs of chevrons, punctate borders, and line panels. (a), (d) Segment from the Vosburg (21FA02) site within the MHS collection; (b), (c), (e) Segment from the Humphrey (21FA01) site within the MHS collection.

Figure 8.10: Vessel segments with line borders below the exterior neck. (a), Segment from the

Vosburg site within the MHS collection; (b), (c) Segments from the Humphrey (21FA01) site within the MHS collection; (d) Segment from the Vosburg (21FA02) site within the MSU collection.

Birdtails are not a typical compound motif in Center Creek pottery. A unique vessel segment from the 2012-2013 excavation at Vosburg displays an abstract image of a Thunderer, unsurprisingly this vessel has been named the Thunderer Vessel (Figure 8.11). This vessel does not fit in morphologically or decoratively with other vessels from the Center Creek locality. Its profile is related more in form to Holley's (n.d.) defined Link style vessels, present at multi-component Red Wing sites. Decoratively, the presence of a lip tab and abstract Thunderer image is also similar to Link style pottery.

Figure 8.11: Thunderer Vessel from the Vosburg (21FA02) site within the MSU collection, recovered during the 2012-2013 excavation.

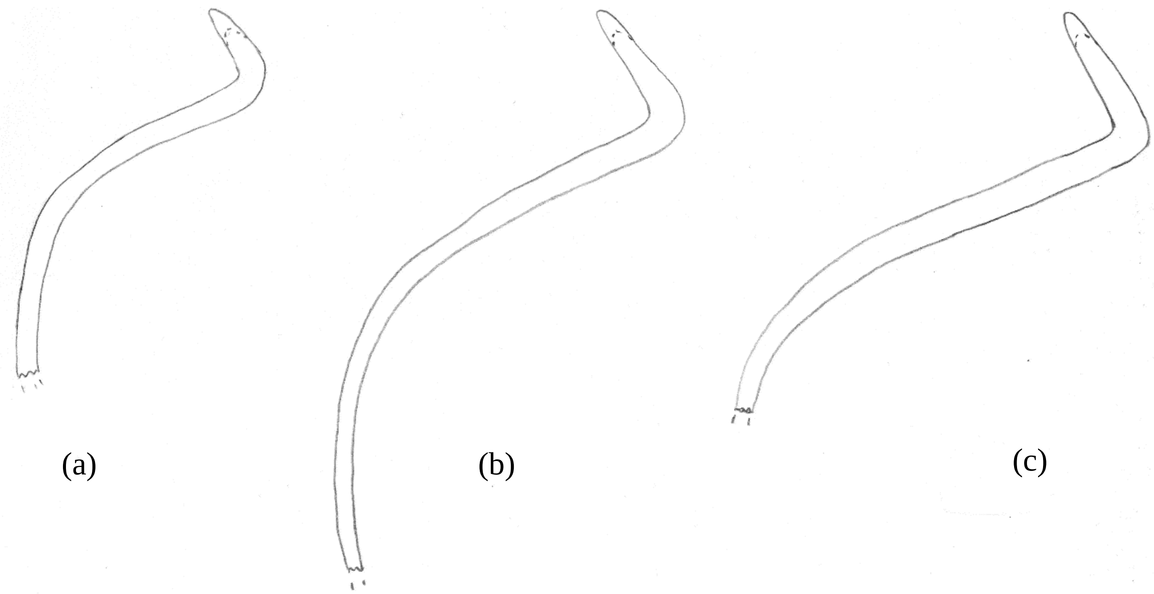

Figure 8.12: Link style vessel profiles. (a) Thunderer Vessel profile from Vosburg (21FA02); (b) Vessel profile from Energy Park (21GD158); (c) Vessel profile from Energy Park (21GD158).

Table 8.3: Results for the Presence of Elements, Motifs, and Compound Motifs on Vessel Segments from the Center Creek Locality and Sheffield Site

Site Name	*Arc*	*Chev*	*P.B.*	*P. Fill*	*Curt.*	*L.P.*	*L.B*	*Duo*	*Trio*	*Quatro*	*C.C.*	*Birdtail*
Vosburg	-	8	16	1	3	14	4	1	-	2	2	-
Humphrey	-	5	12	-	-	14	5	-	1	1	-	-
Total	-	13	28	1	3	28	9	1	1	3	2	-
Sheffield	1	1	3	-	-	1	-	-	-	-	-	1

Sheffield.

Over 50% of segments in the current Sheffield site assemblage are too incomplete to discern any recognizable motifs. Motifs that were recorded include nested arcs, nested chevrons, punctate borders, and line panels. The particular way that line panels and nested chevrons are ordered on one Sheffield vessel is reminiscent of Perrot Punctate (Hall 1962; Fleming 2014; Fleming and Koncur 2015). Perrot Punctate is a defined type for several localities in Wisconsin. What is needed is parallel data concerning Perrot Punctate vessels to discern quantitative morphological and decorative similarities between Hall's defined type and the Sheffield segment assemblage. This Sheffield vessel is also reminiscent of design patterns on Orr and Correctionville phase Oneota vessels recovered from northern Iowa (Wedel 1959; Benn 1989). A single vessel from Sheffield contains a birdtail motif. Instead of chevrons with punctate borders, common in the Red Wing region, this motif is comprised of several nested, inverted arcs with a border of punctates above and below. Future excavations of the Sheffield site may produce more segments from which a better understanding of Sheffield motifs can be assessed.

Types and Style

To recap the theoretical context of this thesis, one way in which archeologists can outline identity and behavior concerning vessel manufacturing is to classify artifacts into structured types. Types are quantifiable classifications researchers create in order to understand artifact patterning. Their existence represents empirical similarities and differences among classes of artifacts, and allows archeologists to infer cultural relationships within and between sites, localities, and or regions. However, types are not set in stone. They, like any other framework, are subject to confirmation, refinement, and or refutation with the addition of new data, theoretical perspectives, and or methods of data evaluation. The types created more than half a century ago concerning Red Wing, Blue Earth, and Sheffield pottery are no longer applicable in today's archeological community – decades of newly excavated material and more detailed quantifiable measurements suggest typological separations, where they in the past were not divided.

The pottery recovered from these locations was in desperate need of a new perspective using multivariate statistics and more recent advances in statistical programing, beyond the use of punch cards.

The regulation or distinction of types across temporal and spatial landscapes provides a foundation for the detection of style. Style in archeology is first a manner of doing something specific to a time and place (Sacket 1977) and second, a method of non-verbal communication (Wobst 1977; Weissner 1983) in which people within and between groups utilize and interpret symbols as identifying features of particular cultural categories. It reflects the choices people make on a daily basis, often subconsciously, within a cultural setting that represent the ways of thinking, feeling, and or acting (Hodder 1990) in their community and reflect meaningful traditions, norms, and emblems iconic of a particular group identity. For Oneota pottery, the repetition of chevrons or punctate borders is a recognizable, shared symbol connecting people between and within regions and localities. The variation of location of these symbols on vessels and the abstract way they are depicted or combined with other symbols can indicate unique, local expression of shared ideas and symbolism. For example, bird symbolism is common within the decorative complex of late pre-contact pottery. This bird symbolism is inferred to be tied to the Upperworld cosmology (Gilmore 1926; Benn 1989; Fleming 2009) and in particular to depictions of the Thunderer. Thunderer and birdtail motifs have been recorded on vessels, ornamentation, and rock art from several sites in Minnesota, Iowa, Wisconsin, Illinois, and Missouri (Benn 1989). The Thunderer has been represented in oral tradition within Chiwere Siouan speaking groups (Bergen 1896; Meeker 1901; Radin

1909; Skinner 1925). As mentioned previously, it appears commonly on Oneota pottery, but in varying depictions using decorative elements and motifs, such as oblique lines, chevrons, arcs, punctate borders, and hachures. These variations of a shared cultural figure/phenomenon represent stylistic expression, which differs between each localized community. Within each local group, people are sharing ideas as to how vessels should be formed and how images should be depicted. These cultural norms have been molded through generations of formulated traditions as well as verbal and non-verbal communication.

Often when creating typologies, archeologists may not view them as a reflection of their own understanding of stylistic choices. Typologies do not perfectly reflect the actual behaviors of past people but instead are archeologist's best inferences using contemporary methods and theoretical frameworks. The typologies that currently exist for Oneota pottery within Minnesota do not reflect observable patterns in the existing archeological record. Past Oneota types for the three research locations within this study were formulated from a few attributes, mostly assessed through visual recognition, of small rim sherds without a full outline of vessel morphology and decoration for each type. When creating types in an assessment of style, all aspects of vessel production, morphology, and decoration should be considered. Meaningful types cannot be created based solely on the presence or absence of decorative motifs.

Past Oneota Typologies in Minnesota

Overall, past typologies assigned during the 20th century to the Red Wing region, Center Creek locality, and Sheffield site are minimalistic in terms of quantitative and qualitative parameters. Although these typologies are mentioned in Chapter Three and Four of this research, they are recapped here to reassess the past definitions of Red Wing, Center Creek, and Sheffield pottery in association with newly acquired data recorded in Chapters Six and Seven. All of the previously formed typologies discussed below contained no reference to data from Spring Creek sites since this area was not intensively investigated until the late 1990s. Although more recently excavated than Bartron phase sites, data from the Burnside School, Sell, McClelland, and Horse sites need to be included in a more holistic definition of Red Wing pottery.

Red Wing.

Most typological analysis done concerning any Oneota pottery in Minnesota has focused on the Red Wing region, but even here there has not been a significant amount of analytical work. Classificatory descriptions for Red Wing pottery began with Lloyd Wilford. Wilford viewed Red Wing as being deeply connected to the Blue Earth region – as part of the Blue Earth focus, which encompassed most Oneota sites in southern and eastern Minnesota (Wilford 1955). He defined Oneota pottery from the Red Wing region as having shell temper, round shoulders, high everted rims, loop handles, and shoulder decoration of rectilinear lines, chevrons, and punctates (Wilford 1955: 140). No quantitative attributes were given for his original classification and Wilford offered no typological divisions for southern Minnesota pottery. His description is consistent with the attributes recorded for this research, but his vague definition is also in alignment with most Oneota pottery from the entire Midwest. A posthumous publication of Wilford's 1955 and 1957 excavation reports of the Bryan site identifies Oneota pottery in Red Wing as belonging to the Cannon Incised type (Wilford 1984). Wilford describes Cannon Incised pottery as having round or pointed lips, high rims, and necks which meet the body at a 90 degree angle. Charles Stortroen (1956, 1984) proposed five major and four minor pottery types for the region after assessing rims and segments excavated from the Bryan site. Stortroen identified his Type D as being part of the region's Oneota component. Type D and Minor Type 3 pottery have straight and high rims, sharp necks, and loop handles as well as decoration on the lip, interior rim, and exterior shoulder of chevrons, inverted chevrons, and punctates. Like Wilford, Stortroen provides no quantitative parameters in his definition concerning what "high rim" actually means and any thicknesses or angles of vessel morphology.

Hurley's 1978 analysis of the Armstrong site offers some divisions in terms of types within the region. He proposed three types: Armstrong Chevron, Armstrong Plain, and Armstrong Trailed, which varied morphologically and decoratively. Within Hurley's typological framework, Armstrong Chevron vessels have orifice diameters between 30 and 34 cm, superior lip notches, lip thicknesses of 4-7 mm, interior rim chevrons, rim thicknesses of 8-14 mm, rim lengths of 49-70 cm, and chevron decoration on the exterior shoulder. Armstrong Plain vessels have no rim or lip decoration, orifice diameters of 26 cm, beveled exterior lips, smooth or burnished surfaces, lip thicknesses ranging from 3-6 mm, rim thicknesses of 8-13 mm, and rim lengths of 15-59 mm. Lastly his Armstrong Trailed definition includes vessels with orifice diameters between 23 and 40 cm, no lip or rim decoration, lip thicknesses of 3-5 mm, rim thicknesses of 5-12 mm, rim lengths ranging from 28-66 mm, and chevron decoration on the exterior shoulder. These classifications were made without the input of data from other Oneota sites surrounding Armstrong.

Similar to Wilford, Gibbon (1979) also grouped Red Wing and Blue Earth pottery (with the addition of Sheffield) together. Gibbon used a cluster analysis to identify type-groups throughout southern Minnesota, regardless of regional location (see Chapter Three for a table of his measured attributes). Due to the amount of varieties in Gibbon's results, a synopsis of his conclusions is located in Appendix V. Vessels from the Red Wing region fit into four of the five composite types he created. Pottery within his Bartron Composite is split into two type-varieties: Variety 7 and Vermillion Variety. Two sherds from the Bartron and Bryan site fit Variety 7. The Vermillion Variety contains six sherds from the Bryan, Bartron, Vosburg, and Humphrey sites. Red Wing vessels of the Bryan composite fit into the Goodhue Variety, Variety 6, Pepin Variety, and Spring Creek Variety. The Goodhue Variety, Cannon Variety, and Variety 6 Gibbon associate with the Silvernale component and Wilford's defined Silvernale Rolled Rim, Silvernale Thick Rim, and Bryan Short Rim (Wilford 1984). The Pepin and Spring Creek Varieties he attributes to an Oneota component. The Pepin Variety includes 19 sherds from the Bryan, Silvernale, Bartron, Vosburg, and Humphrey sites. The Spring Creek Variety contains nine rims and segments from the Bryan, Bartron, Vosburg, and Humphrey sites. No Spring Creek sites are included in the actual Spring Creek Variety. Gibbon also incorporates Red Wing pottery in his Blue Earth Composite, specifically the Prairie Island Variety and Variety 16. The Prairie Island Variety contains 11 sherds from the Bryan, Bartron, and Silvernale sites and Variety 16 includes three sherds from the

Humphrey and Bartron sites. Lastly, the Harliss and St. Croix Varieties of Gibbon's Sheffield Composite contain pottery from Red Wing sites – ten sherds within the Harliss Variety from the Bartron, Humphrey, Vosburg, and Sheffield sites as well as 62 sherds within the St. Croix Variety from the Bartron, Humphrey, and Sheffield sites. Clearly, Gibbon took a "splitting" approach in his analysis.

Rodell (1997) identified Oneota vessels in the Red Wing region as being part of an "unmodified rim" class. In this publication, he states that Wilford's Cannon Incised, Stortroen's Type D, Hurley's Armstrong Chevron and Armstrong Plan, and Hall's Perrot Punctate all fall under this unmodified category. Unmodified rims have orifice diameters ranging from 3.6-36.3 cm, mostly round lips ranging from 1.8-9 mm with occasional notches, smooth surfaces, rim thicknesses ranging from 3.1-17.2 mm and length of 3.3-64.4 mm, interior and exterior rim decoration ranging from 1.4-6.3 mm thick and 0.2-2.2 mm deep, neck diameter of 3.5-31.6 cm, round and angular shoulders, with rectilinear and curvilinear decoration ranging from 0.15-8 mm thick and 0.1-2 mm deep.

These 20th century typologies were defined using mostly small rim sherds with very few morphological and decorative features as well as little attention to specifying parameters, for example concerning what "high" and "short" mean. The Pearson's Correlation coefficient results from this thesis shows a strong, positive relationship between rim length (height) and orifice diameter. Essentially, larger vessels have longer/higher rims and shorter rims are the result of a smaller vessel size. Rim length is not a reliable indicator of stylistic separation but instead is more important in the comparison of stylistic attributes on small, medium, and large vessels. In addition, many of these typologies were based more on visual recognition, which is subject to change depending upon the archeologist, than on detailed measurement of morphological and decorative attributes. Overall, there are two extremes concerning past typological definitions of Red Wing pottery. On one side there is Wilford's overly vague Cannon Incised, and on the other is Gibbon's hyper division of types into more than a dozen varieties with sometimes 2-3 rims for an example. Both use mostly rim sherds to define their classifications of Red Wing pottery, which as stated before does not provide a representative example of the original vessel's morphology or decoration. Also, both archeologists' typologies cross regions of southern Minnesota to reaffirm the assertion that pottery from the Blue Earth and Upper Mississippi River valleys are part of the same focus/phase – that is, they affirm the consequent. With additional excavation, artifact analysis, and radiocarbon dating, it is apparent that, although related in terms of being part of a larger Oneota regional communication system of behavioral practices and somewhat contemporary, they are indeed locally distinct in terms of space, site organization, artifact components, feature formation, and pottery style.

Holley (n.d.) identified the Oneota component in Red Wing as falling within the Bartron phase, which stylistically evolved from the earlier Silvernale phase and transient Link phase. Given recent radiocarbon dating, this current thesis research views Bartron phase as at least partly contemporaneous with, and not derived from Silvernale and Link pottery. Holley's definition of Bartron phase vessels include high, everted rims, sharp necks, and round shoulders. Lip notches, rectilinear lines, and loop handles are also common attributes to this pottery. In his research, Holley perceives these groups through a modal frame, not a typological perspective (Holley n.d.: 12), and thus does not offer any pottery types within the defined Bartron phase. Holley's proposed Link phase also contains many Oneota like decorative features on vessels with short rims and lip tabs. This research views Link pottery as a style, not a phase, with lip tabs, morphological traits indicated in Table 8.4, shoulder decoration with Oneota and or Silvernale motifs, weak line intaglio, and smudged surfaces.

Table 8.4: Morphological Attributes for Link Style Pottery

Attributes	*Diameter*	*Thickness*	*Length*	*Width*	*Angle*	*Form*
Orifice	26-30 cm	-	-	-	-	Oval and Round
Tab	-	2.5-4.1 mm	4.3-7.8 mm	25.7-34 mm	-	-
Lip	-	2.5-4.1 mm	-	-	-	-
Rim	-	5.4-7.2 mm	14.9-27.1 mm	-	52-63°	Everted
Neck	23-27 cm	5.4-7.8 mm	-	-	94-106°	Round
Shoulder	-	5.3-7.7 mm	-	-	132°	Round

Center Creek.

Along with the Red Wing region, the Center Creek locality was grouped under the Blue Earth focus/phase originally publicized by Wilford (1955). According to Wilford, Blue Earth pottery, specifically from the Blue Earth River Valley, is shell-tempered with short everted rims, round shoulders, wide strap handles, and shoulder decoration of line panels, chevrons, and punctate borders. Again, Wilford's definition for this region is minimal and vague with no quantitative information concerning vessel morphology and decoration. What is most striking about Wilford's definition of Blue Earth pottery is his description of motifs: "…the upper body is divided into panels by vertical bands of parallel lines and the panels are spanned by chevrons which point up and down respectively in alternate panels. Chevrons are commonly bordered by a row of punctates…" (Wilford 1955:140-141). This overall thematic outline, as mentioned above in the Motif section, is not present on vessels from the Red Wing region.

In Gibbon's 1979 research, he, like Wilford, emphasized the similarity between Red Wing, Blue Earth, and Sheffield pottery. Pottery from the Center Creek locality fit into all six of his composites. In addition to the presence of Blue Earth pottery in the Vermillion, Pepin, 6, and Spring Creek Varieties of the Bartron and Bryan Composites, Center Creek segments are included in the St. Peter, Buffalo Slough, Winnebago, 14, and 16 Varieties of the Blue Earth Composite, the Harliss and St Croix Varieties of the Sheffield Composite, the Center Creek Variety and Variety 19 of the Humphrey Composite, and Variety 20 of the Vosburg Composite. With the exception of the St. Peter and St. Croix Varieties, all other type variants have eleven or fewer rims within their group.

In modification of Gibbon's composite varieties, Dobbs proposed a broad pottery type, Blue Earth Trailed, to the phase (Dobbs 1984b: 103). Blue Earth Trailed jars have globular vessel shapes, orifice diameters of 10-30 cm, smoothed surfaces, round lips that are 1-7 mm thick with lip notches, straight everted rims that are 2-13 mm thick and 6-54 mm long with interior trailed lines, sharp (86%) necks, round shoulders that are 2-12 mm thick with trailed lines and punctates, and strap (70%) handles that are 30 mm long at maximum with occasional vertical trailed lines. Common shoulder motifs are line panels, chevrons, punctate borders, and concentric circles. Line thicknesses range from 0.5-5 mm.

Sheffield.

Wilford (1961) first defined Sheffield pottery as being shell-tempered, globular shaped jars with occasional pointed lips, interior lip notching, everted rims, sharp and round necks, smooth surfaces, and shoulder decoration of chevrons with punctate borders. Strap handles predominate with thicknesses ranging from 6-11 mm and widths of 17.5-31.5 mm. Wilford noted that handles were usually attached by rivets on the inferior end and melding at the superior juncture. Typical of Wilford's mid-century style of defining pottery, few quantitative parameters of morphology and decoration are provided to truly explain pottery from the Sheffield site.

In his 1973 publication of the Sheffield site, Gibbon provided a more detailed outline of Wilford's conclusions stating that interior lip notches on Sheffield pottery ranged from 4-7 mm in thickness, rim length ranges from 10-69 mm, exterior neck shapes were either parallel or constricting, and shoulder line decoration ranged from 0.1-4.5 mm in thickness. In his broad 1979 study of the Bartron, Bryan, Silvernale, Vosburg, Humphrey, and Sheffield assemblages, Gibbon attributes pottery from the Sheffield site to Variety 6 of the Bryan Composite, the St. Peter Variety of the Blue Earth Composite, the Harliss, Marine, and St. Croix Varieties of the Sheffield Composite, and Variety 20 of the Vosburg Composite. A more recent study of the Sheffield site associated its pottery with the Perrot Punctate Type: Inner Lip Variety (Fleming 2014; Fleming and Koncur 2015) of the Brice Prairie phase located around La Crosse, Wisconsin.

Once created and used repeatedly in decades of archeological literature, types are not easy to refute; they become prevalent in the minds of researchers and today, archeologists are stuck with outdated terms that do not reflect patterns within past cultural behavior or currently recorded data. Even after years of excavation and research within Red Wing, Center Creek, and Sheffield, archeologists are still left with questions concerning how to actually define pottery from these three locations and how people living in these locations were connected through interactions or broader cultural relationships. This research seeks to reevaluate the typological classifications previously created to lump or unnecessarily split pottery within and between the Red Wing region, Center Creek locality, and Sheffield site.

Typological Proposals

Suggestions for valid pottery types must include the unique methods of forming and decorating vessels that reflect meaningful stylistic behavior and actual patterns in the recorded data. Overwhelmingly, the data documented for this research support the assertion that pottery production during the late pre-contact within the Upper Mississippi, Blue Earth, and St. Croix River valleys was locally distinctive to each area. Although culturally tied within a general identity archeologists call the Oneota tradition, people were making pottery differently in each location based on norms and information shared within each community.

Red Wing.

"Red Wing is just weird" (personal conversation with Ronald Schirmer 2017). Unlike the other Oneota manifestations within this study, Red Wing pottery does not easily conform to rules of consistent decoration; every vessel is unique in its design pattern, i.e., its overall decorative outline. According to the chi-square results from the numerical taxonomy, 20% of nominally recorded data from Red Wing vessels vary in a statistically significant way. This is considerably more than the 11% variation within Center Creek and the 5% variation among Sheffield specimens. The data recovered from Red Wing Oneota vessels suggests very little internal patterning concerning design profile. Thus, the reasoning behind creating other Oneota typological divisions founded on decorative patterns, such as Midway Incised, Koskonong Bold, Perrot Punctate, or Allamakee Trailed (Hall 1962; Boszhardt 1994; Holtz-Leith 2006; Kotwasinski 2011) cannot be applied to the Red Wing region. The variation in Red Wing Oneota pottery supports its existence as an aggregation center; the interaction between local and regional people coming into Red Wing from other locations in southern Minnesota and western Wisconsin yields Red Wing pottery characteristics that do not reflect solid outlines of internal consistency, which result in standardized typologies.

From the numerical taxonomy, a few clusters within the Red Wing nominal data are apparent. First, two groups of vessels or segments can be noticed in the data: those with curved rims and those with straight rims. These two groups are here termed Red Wing Curved Rim and Red Wing Straight Rim. The separation of rim forms displays discrete choices made by potters to bend the rim in an outward, curved fashion or to flatten it.

<u>Red Wing Curved Rim:</u>

To date, curved rims were only recovered from multi-component sites within the Red Wing region. They typically have round orifices, temper diameters between 0.5-1 mm and 0.5-3 mm, round lips, drawn up rims, round interior necks, and parallel exterior necks. A single specimen displayed a strap handle attached at the lip and shoulder. Decoratively, round punctates applied directly, curvilinear and or rectilinear lines, and motifs of nested arcs and punctate borders are common. Elements such as incomplete rectilinear oblique lines were also recorded on curved rims. No lip or rim decoration or intaglio or smudging is present upon curved rim pottery.

Table 8.5: Typical Morphological Attributes for Red Wing Curved Rim

Attributes	*Diameter*	*Thickness*	*Length*	*Width*	*Angle*	*Form*	*Attachment*
Orifice	15-30 cm	-	-	-	-	Round	-
Temper	0.5-3 mm	5-10%	-	-	-	Shell	-
Lip	-	2.7-5.7 mm	-	-	-	Round	-
Rim	-	5.9-9.1 mm	18.9-44 mm	-	52-75°	Curved	Drawn up
Neck	13.5-28.5 cm	6.1-10.5 mm	-	-	100-124°	INT: Round EXT: Parallel	-
Shoulder	-	4.9-9.5 mm	-	-	-	Round	-
Handle	-	11.6 mm	38.9 mm	26 mm	-	Strap	Lip/Shoulder
S.T.	-		-	-	-	Smooth	-
Smudging	-	-	-	-	-	-	-
Burning	-	-	-	-	-	-	-

Table 8.6: Typical Decorative Attributes for Red Wing Curved Rim

Attributes	*Thickness*	*Depth*	*Form*	*Application*
Lip	-	-	-	-
Rim	-	-	-	-
Punctate	-	-	Round	Direct
Line	3.5-5 mm	1-1.5 mm	Curvilinear; Rectilinear	-
Handle	5.1 mm	1.4 mm	Vertical Lines	-
Motifs	-	-	Nested Arc; Punctate Border	-

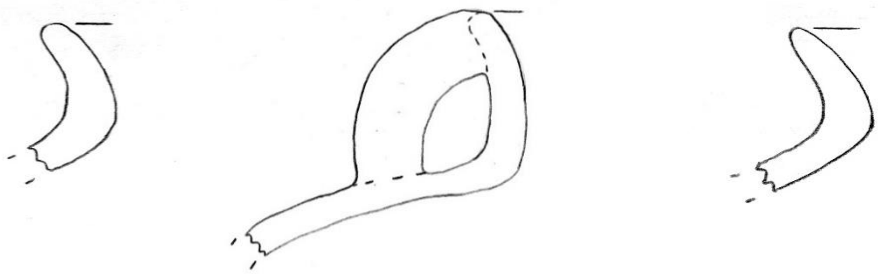

Figure 8.13: Profiles of Typical Red Wing Curved Rim vessels.

Red Wing Straight Rim:

Straight rims were recovered from both multi-component and pure Oneota sites. Morphologically, straight rims have round or ovate orifices, grain size ranges between 0.5-1 and 0.5-4 mm, all varieties of lip form, drawn up or attached rims, sharp and round interior necks, parallel, expanding, or constricting necks, and loop or strap handles attached at the lip and shoulder, rim and shoulder, or just the shoulder. Decoratively, all forms of lip notching and interior rim decoration are present among straight rims, as well as rectilinear and curvilinear lines with strong or weak intaglio, round or ovate punctates that were applied in a direct, gradual, or steep fashion, and vertical lines drawn upon handle exteriors. Smudging and burning is present upon vessels with straight rims and motifs or motif/element combinations of chevrons, punctate borders, arcs, meandering lines, zig-zags, line panels, hachures, duos, and trios are present upon the shoulders of vessels with straight rims.

Within the Red Wing Straight Rim type, some clusters within the nominal data can be discerned by rim angle and form. These clusters are identified by the statistically significant chi-square results concerning rim form and rim decoration, interior neck shape, exterior neck shape, punctate form, and punctate orientation. There are also many lines of variation among certain exterior neck forms and orifice shape, grain size, lip form, and rim attachment. In addition, particular punctate form and orientation as well as line form shows noteworthy statistical variation with intaglio and handle form, attachment and decoration. These clusters are defined in this research as the Vertical Rim, Everted Rim, and Strongly Everted Rim varieties. There is definable variation within the Red Wing Oneota assemblage among these type-variants but they are not perfect divisions of stylistic behavior indicative of an actual type.

Vertical Rim Variety.

Red Wing pottery with vertical rims and rim angles above 75° more often were recorded with round orifices, temper sizes between 0.5-1 mm and 0.5-3 mm, round lips, drawn up rims, round or sharp interior necks, parallel exterior necks, and loop handles attached at the rim and shoulder. Decoratively, vertical rims tend to not have lip, rim, and handle decoration; shoulder decoration includes more often rectilinear lines with strong intaglio and ovate punctates applied in a gradual or steep fashion.

Table 8.7: Typical Morphological Attributes for Red Wing Straight Rim: Vertical Rim Variety

Attributes	*Diameter*	*Thickness*	*Length*	*Width*	*Angle*	*Form*	*Attachment*
Orifice	12.5-50 cm	-	-	-	-	Round	-
Temper	0.5-3 mm	5-20%	-	-	-	Shell	-
Lip	-	3-5.9 mm	-	-	-	Round	-
Rim	-	5.1-10.6 mm	15.4-64.3 mm	-	76-86°	Vertical	Drawn up
Neck	12.48-8 cm	6-14.3 mm	-	-	89-142°	INT: Round; Sharp EXT: Parallel	-
Shoulder	-	4-9 mm	-	-	120-133°	Round	-
Handle	-	13.4-23.4 mm	34.5-46.7 mm	12.5-23.4 mm	-	Loop	Rim/Shoulder
S.T.	-	-	-	-	-	Smooth	-
Smudging	-	-	-	-	-	Present	-
Burning	-	-	-	-	-	-	-

Table 8.8: Typical Decorative Attributes for Red Wing Straight Rim: Vertical Rim Variety

Attributes	*Thickness*	*Depth*	*Form*	*Application*
Lip	-	-	-	-
Rim	-	-	-	-
Punctate	3-4.5 mm	1-2.5 mm	Ovate	Gradual; Steep
Line	2.5-6.7 mm	0.3-2.2 mm	Rectilinear	Strong Intaglio
Handle	-	-	-	-
Motifs	-	-	Chevrons; Punctate Borders	-

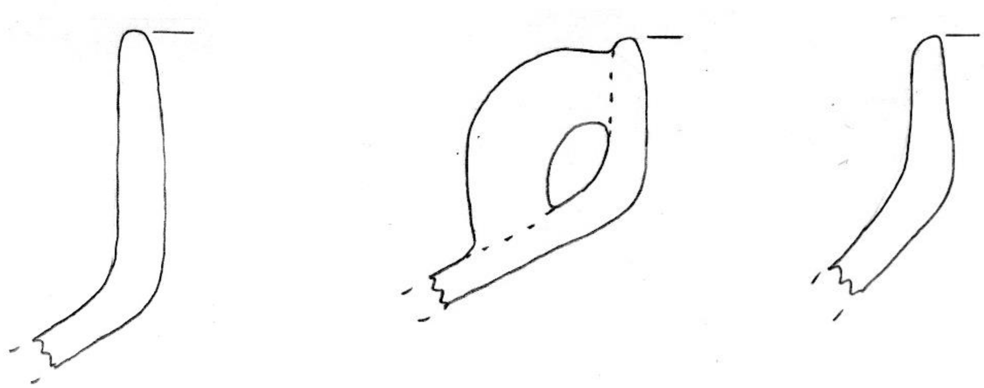

Figure 8.14: Profiles of Typical Red Wing Straight Rim: Vertical Rim Variety vessels.

Everted Rim Variety.

Vessels with everted rims, especially those with a rim angle between 75-60°, tend to have morphological features of round or ovate orifices, temper gran sizes between 0.5-1 mm and 0.5-4 mm, round, flat or beveled exterior lips, drawn up or attached rims, sharp interior necks, parallel or expanding exterior necks, and loop or strap handles attached at either the rim and shoulder or lip and shoulder. Decoratively, these vessels often have superior lip notching, interior rim decoration (especially chevrons), round punctates that are directly or gradually applied, rectilinear lines, strong intaglio, vertical lines on handles, birdtail motifs, and smudging.

Table 8.9: Typical Morphological Attributes for Red Wing Straight Rim: Everted Rim Variety

Attributes	*Diameter*	*Thickness*	*Length*	*Width*	*Angle*	*Form*	*Attachment*
Orifice	9-36 cm	-	-	-	-	Round; Ovate	-
Temper	0.5-4 mm	5-20%	-	-	-	Shell	-
Lip	-	2.6-8.5 mm	-	-	-	Round; Flat; Beveled Ex.	-
Rim	-	3.7-10.8 mm	16.4-65.6 mm	-	60-75°	Everted	Drawn up; Attached
Neck	10-32.5 cm	4.9-15.8 mm	-	-	85-130°	INT: Sharp EXT: Parallel; Expanding	-
Shoulder	-	3.6-10.3 mm	-	-	128-139°	Round	-
Handle	-	3-22.8 mm	29.1-53 mm	9-37.5 mm	-	Loop; Strap	Lip/Shoulder; Rim/Shoulder
S.T.	-	-	-	-	-	Smooth	-
Smudging	-	-	-	-	-	Present	-
Burning	-	-	-	-	-	Present	-

Table 8.10: Typical Decorative Attributes for Red Wing Straight Rim: Everted Rim Variety

Attributes	*Thickness*	*Depth*	*Form*	*Application*
Lip	2.3-5.1 mm	0.6-1.1 mm	Sup. Notch	-
Rim	4-7.7 mm	0.5-1.5 mm	Int. Chevrons; Int. Lines	-
Punctate	1.6-5 mm	0.5-2 mm	Round	Direct; Gradual
Line	1.7-6.2 mm	0.4-1.9 mm	Rectilinear; Curvilinear	Strong Intaglio
Handle	3-7 mm	0.8-2.2 mm	Vertical Lines	-
Motifs	-	-	Chevron; Punctate Border; Birdtail; Trio; Curtain; Nested Arc	-

Figure 8.15: Profiles of Typical Red Wing Straight Rim: Everted Rim Variety vessels.

Strongly Everted Rim Variety.

Vessels with everted rims and rim angles below 60° tend to have round orifices, temper diameters between 0.5-1 mm and 0.5-3 mm, round or flat lips, drawn up rims, sharp or round interior necks, expanding exterior necks, and loop handles attached to the rim and shoulder. Decoration for these more heavily everted rims include interior lip notches, no chevron interior rim decoration, rectilinear lines on the exterior shoulder, weak intaglio, and no handle decoration.

Table 8.11: Typical Morphological Attributes for Red Wing Straight Rim: Strongly Everted Rim Variety

Attributes	*Diameter*	*Thickness*	*Length*	*Width*	*Angle*	*Form*	*Attachment*
Orifice	12-35 cm	-	-	-	-	Round	-
Temper	0.5-4 mm	5-20%	-	-	-	Shell	-
Lip	-	3-7.4 mm	-	-	-	Round; Flat	-
Rim	-	4.8-10.5 mm	26-32.7 mm	-	34-59°	Everted	Drawn up
Neck	10-29 cm	4.3-13.4 mm	-	-	76-131°	INT: Sharp; Round EXT: Expanding	-
Shoulder	-	3.5-9.3 mm	-	-	121.5-149°	Round	-
Handle	-	8.7-15.6 mm	20.5-44.3 mm	9-18.8 mm	-	Loop	Rim/Shoulder
S.T.	-	-	-	-	-	Smooth	-
Smudging	-	-	-	-	-	Present	-
Burning	-	-	-	-	-	Absent	-

Table 8.12: Typical Decorative Attributes for Red Wing Straight Rim: Strongly Everted Rim Variety

Attributes	*Thickness*	*Depth*	*Form*	*Application*
Lip	3.5-5.1 mm	0.5-1.4 mm	Int. Notch	-
Rim	1.5-5.5 mm	0.8-1.6 mm	Int. Lines	-
Punctate	2-5.9 mm	0.5-0.9 mm	Round; Ovate	Direct; Gradual
Line	1.8-6.5 mm	0.3-2.1 mm	Rectilinear	Weak Intaglio
Handle	-	-	-	-
Motifs	-	-	Chevron; Punctate Border	-

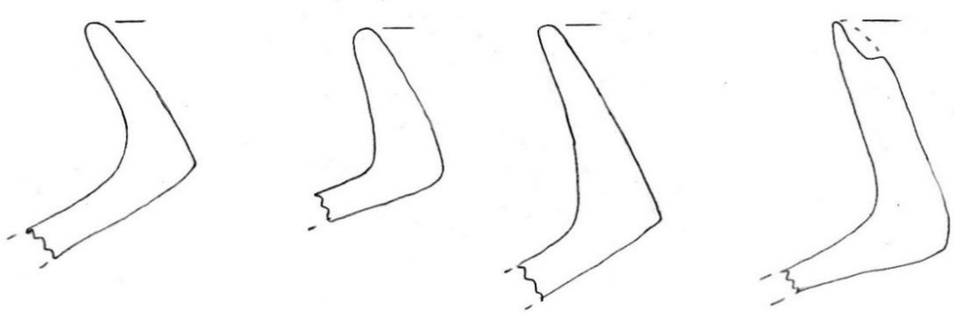

Figure 8.16: Profiles of Typical Red Wing Straight Rim: Strongly Everted Rim Variety vessels.

Center Creek.

Several vessels within this locality have the same design profile: a paneled design in which vertical lines separate nested hachured chevrons with punctate borders and inverted nested chevrons with punctate borders. Unlike Oneota pottery from the Red Wing region, there is little statistical evidence from the chi-square tests to cluster type variants by rim form. Within the current assemblage from the Vosburg and Humphrey sites, only a single curved rim exists, which is not enough to suggest any classificatory variation. Also, several decorative attributes, such as lip notching, rim decoration, and paneled compound motifs, as well as morphological traits, such as lip form, interior neck form, and exterior neck form, are represented commonly on vessels with both everted and vertical rims. The only known typology recorded for the Center Creek locality is Blue Earth Trailed (Dobbs 1984b). When creating this type, Dobbs hinted to the inclusion of pottery from Bartron and Sheffield into this classification (Dobbs 1984b: 103). The results of the current research suggest retention of this single type for Center Creek pottery but with a few modifications – pottery from Red Wing and Sheffield is no longer included in this type and more attributes and recently excavated material is incorporated to provide more than a basic definition. In addition, the application of trailed as well as incised lines is common upon Blue Earth style vessels. Thus, a more accurate name for the pottery type within the Center Creek locality is Blue Earth Trailed/Incised.

<u>Blue Earth Trailed/Incised.</u>

Within the aspect of form, Blue Earth Trailed/Incised vessels commonly have round orifices, round or beveled exterior lips, everted or vertical rims, drawn up or attached rims, sharp or round/parallel or expanding necks, round shoulders, and strap handles attached to the rim and shoulder. Smudging is common on vessel surfaces but burning is not. The most recognizable design pattern for Blue Earth Trailed/Incised pottery is the paneled chevron compound motif discussed within the Motif section of this chapter. This design pattern is similar to that of Hall's (1962) Perrot Punctate but without horizontal line bands within the vertical line panels, fewer nested chevrons, and fewer lines within each panel. Additional research for Blue Earth Trailed/Incised pottery should be conducted to provide comparative data from other localities within the Blue Earth region, such as the Willow Creek locality and other smaller villages located along the river valley

Table 8.13: Typical Morphological Attributes for Blue Earth Trailed/Incised

Attributes	*Diameter*	*Thickness*	*Length*	*Width*	*Angle*	*Form*	*Attachment*
Orifice	9-40 cm	-	-	-	-	Round	-
Temper	0.5-2 mm	5-25%	-	-	-	Shell	-
Lip	-	2.5-7 mm	-	-	-	Round; Beveled Ex.	-
Rim	-	4.4-10.5 mm	14.1-53.9 mm	-	49-87°	Everted; Vertical	Drawn up; Attached
Neck	7.3-40 cm	5-15.6 mm	-	-	78-114°	INT: Sharp; Round EXT: Parallel; Expanding	-
Shoulder	-	4-12.3 mm	-	-	118-140°	Round	-
Handle	-	6-15.7 mm	24-44.9 mm	14-52.3 mm	-	Strap; Loop	Rim/Shoulder
S.T.	-	-	-	-	-	Present	-
Smudging	-	-	-	-	-	Present	-
Burning	-	-	-	-	-	-	-

Table 8.14: Typical Decorative Attributes for Blue Earth Trailed/Incised

Attributes	*Thickness*	*Depth*	*Form*	*Application*
Lip	1.8-6.4 mm	0.2-1.9 mm	Int. Notch; Ext. Notch	-
Rim	1.4-4.3 mm	0.2-1.6 mm	Int. Chevron with Horizontal Line	-
Punctate	0.7-5.2 mm	0.2-2.5 mm	Round; Ovate	Direct; Gradual
Line	0.8-4.5 mm	0.2-2 mm	Rectilinear	Weak Intaglio
Handle	1.7-3.2 mm	0.2-1.7 mm	Vertical Line	-
Motifs	-	-	Line Panel; Chevron; Punctate Border	-

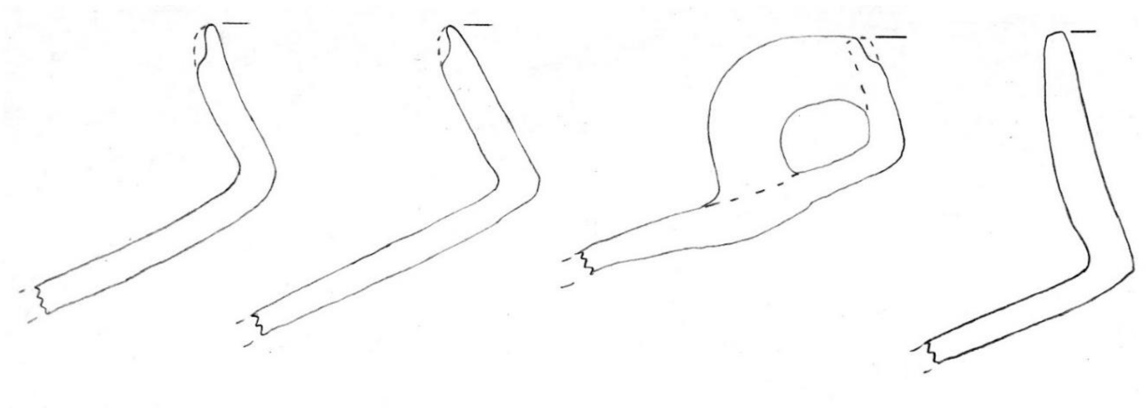

Figure 8.17: Profiles of Typical Blue Earth Trailed/Incised vessels.

Sheffield.

Comparatively within the southern Minnesota complex of Oneota manifestations, Sheffield is unique and varies very little internally. Only 12 vessels segments were available for measuring for this research and truly, additional excavated material is needed to better suggest typological divisions within Sheffield pottery. In addition, comparative data is greatly needed from pottery made within other regional locales across the St. Croix and Mississippi River, such as within the La Crosse locality. Like the Center Creek locality, only a single curved rim was recorded from the Sheffield site, which is not a sufficiently large sample size to distinguish a separate type. In addition, a single vertical rim was identified; the common rim form for Sheffield pottery is everted. Sheffield vessels typically have round orifices, round lips, drawn up rims, round or sharp/parallel necks, round shoulders, and strap handles attached to the lip and shoulder or rim and shoulder. Decoratively, Sheffield pottery is recognized by the presence of interior lip notches. Many segments did not contain enough of the exterior shoulder to detect decoration. For those larger segments, chevrons and punctate borders were the most common forms of motifs.

Table 8.15: Typical Morphological Attributes for Sheffield Pottery

Attributes	*Diameter*	*Thickness*	*Length*	*Width*	*Angle*	*Form*	*Attachment*
Orifice	12-34 cm	-	-	-	-	Round	-
Temper	0.5-2 mm	5-20%	-	-	-	Shell	-
Lip	-	2.9-6.1 mm	-	-	-	Round	-
Rim	-	5.2-9.5 mm	21.4-51 mm	-	60-73°	Everted	Drawn up
Neck	11-31 cm	7-9.1 mm	-	-	85-131°	INT: Round; Sharp EXT: Parallel	-
Shoulder	-	3.7-7.1 mm	-	-	130°	Round	-
Handle	-	5.5-8.3 mm	24.1-41 mm	17.6-35.3 mm	-	Strap	Lip/Shoulder
S.T.	-	-	-	-	-	Smooth	-
Smudging	-	-	-	-	-	Absent	-
Burning	-	-	-	-	-	Absent	-

Table 8.16: Typical Decorative Attributes for Sheffield Pottery

Attributes	*Thickness*	*Depth*	*Form*	*Application*
Lip	3.5-6 mm	0.4-1.6 mm	Int. Notch	-
Rim	-	-	-	-
Punctate	4-4.8 mm	0.5-1.3 mm	Ovate	Gradual
Line	2.3-6.5 mm	0.2-2 mm	Rectilinear	-
Handle	-	-	-	-
Motifs	-	-	Line Panel; Chevron; Punctate Border; Birdtail	-

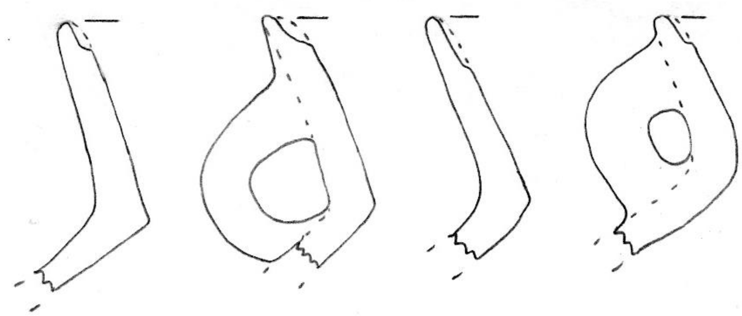

Figure 8.18: Profiles of Typical Sheffield vessels.

Summary

The variation among the Red Wing, Center Creek, and Sheffield assemblages demonstrates that people from each of these three location are following different sets of practices that are outlined by regional boundaries. Within the Red Wing region and Center Creek locality, information seems to be fluid between sites concerning the ways in which people formed and decorated vessels. The repetition of certain types of decoration and decorative patterns on several vessels, such as the paneled design in Blue Earth Trailed/Incised pottery, outlines norms of behavior reinforced by the feedback within the community. The identity of the people living within the Blue Earth River valley and the communication they shared within their community is in part outlined through the repetition of such design patterns. In Red Wing, the norm of vessel decoration was to combine multiple different elements, motifs, and compound motifs to create unique vessels. The identity of Red Wing is represented through this variation deriving from the multiple points of intracommunity contact within an aggregation center. Although locally unique, these three locations do share a broad identity of large villages, horticultural practices, and little perceived sociopolitical organization recognizable as Oneota behavioral characteristics. Concerning pottery, they share a general similarity in the manufacturing of large globular shell-tempered vessels and decorative patterns hinting to themes of Upperworld and Lowerworld characters and phenomena.

Chapter Nine: Conclusion and Further Research

"…it is very unusual for an archaeological story to truly
have a beginning or an end" (Fleming 2009: 3).

This quote perfectly describes the nature of this thesis. This study is another branch on the tree of archeological thought concerning the late pre-contact period in southern Minnesota and is a branch from which further analytical branches surely will develop. As more excavation occurs and data acquired, as well as analytical methods and theoretical frameworks applied to the study of cultural material, archeologists' comprehension of behavior and human interaction within and between the Upper Mississippi, Blue Earth, and St. Croix River valleys will mature into an ever more holistic perspective.

This research has sought to re-envision the ways in which archeologists define pottery types. It is a small step in a larger movement to look at style from a more holistic aspect of pottery morphology and decoration. Instead of defining a pottery sequence based on small rim sherds with no view into the actual form and design of the original vessel, an approach which uses several measurable attributes of morphology and decoration from vessel segments, with at least a part of the lip, rim, neck, and shoulder, provides researchers with a better understanding into how people from a region, locality, or site distinctly made their vessels based on stylistic principles and communication within their social group. In addition, this research pushes for the use of multivariate statistical methods to quantitatively determine the distinct ways in which particular attributes relate. This study utilizes correlation for ratio data and numerical taxonomy for nominal data. By using quantitative methods to define pottery style instead of clusters that are created ad hoc by mostly visual recognition, archeologists can create typological divisions that are both testable and refutable given additional excavation, statistical methods, and comparative collections.

This research has also reevaluated the deep typological connection of Oneota pottery recovered from the Blue Earth, Upper Mississippi, and St. Croix River valleys so emphasized in over half a century of past archeological literature. This study concludes that these three hubs of human behavior and interaction are not only distinct in their geographical location but also in their vessel formation and decoration. Although similar in the broad pottery attributes that identify a site as having a component representative of the Oneota tradition, each location is a product of local processes concerning the norms and traditions of how exactly to form and decorate each vessel.

In addition, the variation within each community is internally distinctive. For example, the norms for decorating Oneota pots in Red Wing lean towards unique motif combinations for each vessel. Within the Center Creek locality, the acceptable range for individual vessel decoration is more confined; several vessels and segments display the same decorative pattern of chevron motifs paneled by bands of four vertical lines. Statistically significant chi-square tests from the nominal data (with an alpha of 0.05 or less), which display distinct, purposeful variation encompassed 11% of the Center Creek sample. The results from this research lean towards a similar restricted nature in Sheffield pottery, but additional excavation of vessel segments will better illuminate the decorative patterns present within the site's assemblage. Significant chi-square results encompassed 5% of the Sheffield sample. The nominal data from Red Wing pottery, on the other hand, displayed a 20% distinguishing variation within the chi-square results. Red Wing is also distinctive in its morphological variation of rim forms. Enough examples of internal variation recognized as distinctive choices between curving the vessel rim or straightening it is apparent within the region's sample. Further excavation of Red Wing Oneota pottery and future statistical analyses will either refute or reaffirm the variation interpreted from these data within Oneota component straight rims into vertical, everted, and strongly everted type variants.

Red Wing's variation, unseen within the Center Creek and Sheffield assemblages, hints to its history and function as an aggregation center in which regional groups migrate into the area at certain intervals within a temporal sequence. These incoming groups bring with them their own distinct ways of thinking, feeling, and acting in particular social settings. With this intercommunication comes a wider variation of behavioral norms, artifact styles, and personal identities than at other contemporary and more socially and geographically secluded sites, regions, and localities within the upper Midwest.

The typological suggestions derived from this research outline the variation seen within Red Wing pottery. This thesis has taken an approach that is more descriptive and exclusive than Wilford's vague definition of Cannon Incised and more broad than Gibbon's sequence of several composites and type varieties. As described here and summarized in Appendix III (Tables III.162-164), the Red Wing Curved Rim type includes small to medium size vessels with shell tempering ranging from 0.5-3 mm in diameter and encompasses 5-10% of the vessel paste. Thicknesses of the lip (2.7-5.7

mm), rim (5.9-9.1 mm), neck (6.1-10.5 mm), and shoulder (4.9-9.5 mm) walls as well as the rim length (1.9-44 mm) all correlate with small to medium size vessels, as recognized from the Pearson's Correlation Coefficient results in Chapter Seven. Round lips, round/parallel necks, and round shoulders are representative of this curved rim type. Angle ranges for the rim are 52-75°and for the neck are 100-124°. A single example of a handle for this type is a strap handle attached to the lip and shoulder with a length of 38.9 mm, a width of 26 mm, and a thickness of 11.6 mm.

Decoratively, recorded motifs for the Red Wing Curved Rim type include nested chevrons and punctate borders. Elements, such as rectilinear, oblique lines were recorded but their inclusion into an actual motif is indeterminable. Rectilinear and curvilinear line thicknesses rage from 3.5-5 mm and depths range from 1-1.5 mm. Punctates for this type are round and directly applied. Decoration on the single strap handle within this type consists of vertical lines that are 5.1 mm thick and 1.4 mm deep. This type contains a small amount of specimens and is wanting in further excavation to hone in or broaden its morphological and decorative definition.

The other outlined type suggested for this region is Red Wing Straight Rim. A significant amount of variation concerning rim, lip, and neck form is present within this typology thus type variants are proposed, which divide Red Wing Straight Rim into Vertical, Everted, and Strongly Everted varieties. These varieties are supported by statistically significant chi-square results within the Red Wing data suggesting noteworthy variation among certain rim forms and certain interior and exterior neck forms, rim decoration, punctate form, and punctate orientation. With certain forms of the exterior neck come statistically significant scores correlated with orifice shape, grain size, lip form, and rim attachment method. Certain punctate forms have a statistically significant relationship with line forms, intaglio, handle forms, handle attachment location, and handle decoration.

From these significant scores comes a Vertical Rim Variety that has shell temper, round orifices, round lips, round or sharp/parallel necks, round shoulders, loop handles and an absence of attached rims as well as lip, rim, and handle decoration. Grain sizes for the shell temper range from 0.5-3 mm and encompass 5-20% of the paste. Vessels of the Vertical Rim Variety vary in size from small to very large vessels with large ranges of lip (3-5.9 mm), rim (5.1-10.6 mm), neck (6-14.3 mm), and shoulder (4-9 mm) walls as well as rim length (15.4-64.3 mm). Angles for the rim range from 79-86°, neck range from 89-142°, and shoulder range from 120-133°. Loop handles were attached commonly at the rim and shoulder and are 34.5-46.7 mm long, 12.5-23.4 mm wide, and 13.4-23.4 mm thick. Decorative elements on the shoulder consist of rectilinear lines and punctates. Punctates are overwhelmingly ovate, applied either gradually or steeply, 3-4.5 mm thick, and 1-2.5 mm deep. Lines were often applied with a strong intaglio, are 2.5-6.7 mm thick, and 0.3-2.2 mm deep. Varieties of chevron motifs and punctate borders are common within the Vertical Rim Variety. Smudging is present upon Vertical Rim Variety vessels yet burning is interestingly absent.

Vessels of the Everted Rim Variety have round or ovate orifices, shell temper, round, flat, or beveled exterior lips, attached or drawn up rims, sharp/parallel or expanding necks, round shoulders, and loop or strap handles. Small, medium, and large vessels are included within the Everted Rim Variety with ranges of lip (2.6-8.5 mm), rim (3.7-10.8 mm), neck (4.9-15.8 mm), and shoulder (3.6-10.3 mm) wall thicknesses as well as rim lengths (16.4-65.6 mm) that correlate with small to large size vessels. Angle ranges for rims, necks, and shoulders are 60-75°, 85-130°, and 128-139° correspondingly. Grain sizes of the shell-tempering range from 0.5-4 mm and incorporate 5-20% of the vessel paste. Loop or strap handles were attached to either the lip and shoulder or rim and shoulder and are 29.1-53 mm long, 9-37.5 mm wide, and 3-22.8 mm thick. Handle decoration is common within this variety and consists of vertical lines ranging from 3-7 mm in thickness and 0.8-2.2 mm in depth. Concerning the rest of the vessel decoration, superior lip notches, interior rim chevrons and oblique lines, and rectilinear and curvilinear shoulder lines are common. Notches range in thickness from 2.3-5.1 mm and in depth from 0.6-1.1 mm. Interior rim decoration thicknesses range from 4-7.7 mm and depths range from 0.5-1.5 mm. Shoulder lines range in thickness from 1.7-6.2 mm and in depth from 0.4-1.9 mm. Round punctates are representative of the Everted Rim Variety and were usually directly applied, 1.6-5 mm thick, and 0.5-2 mm deep. Strong intaglio and smudging is also common within this variety. Common motifs for the Everted Rim Variety include variations of chevrons, punctate borders, nested arcs, and birdtails. Burning is another common attribute to this type-variant.

Lastly, the Strongly Everted Rim Variety outlines some deviance in attributes of everted rims with lower rim angles from everted rims with higher rim angles. Round orifices, round or flat lips, drawn up rims, sharp or round/expanding necks, round shoulders, and loop handles are the common morphological features of this variety. Shell tempering ranges from 0.5-4 mm and encompasses 5-20% of the manufacturing paste. Small to large vessel sizes correspond to the ranges of lip (3-7.4 mm), rim (4.8-10.5 mm), neck (4.3-13.4 mm), and shoulder (3.5-9.3 mm) wall thicknesses as well as rim lengths (26-32.7 mm). These ranges are generally tighter than the Everted Rim Variety. Rim angles range from 34-59°, neck angles range from 76-131°, and shoulder angles range from 121.5-149°. The loop handles for this variety were attached to the rim and shoulder, are 20.5-44.3 mm in length, 9-18.8 mm in width, and 8.7-15.6 mm in thickness. Handle decoration is not indicative of this type-variant. Decoration is common on the interior lip, interior rim, and exterior shoulder. Interior lip notches range from 3.5-5.1 mm in thickness and 0.5-1.4 mm in depth. Interior rim decoration of oblique lines range in thickness from 1.5-5.5 mm and in depth from 0.8-1.6 mm. Rectilinear shoulder lines, with weak intaglio, and punctates are commonly formed into chevron and punctate border motifs. Punctates are either round or ovate in form and applied in either a direct or gradual fashion. The ranges for punctate thickness and depth are 2-5.9 mm and 0.5-0.9 mm. Smudging is present within the Strongly Everted Rim Variety; burning is absent.

Unlike the Red Wing assemblage, pottery from the Center Creek locality does not show statistically significant internal variation concerning particular morphological forms. Instead, only a single type is proposed in this thesis, which somewhat correlations with past albeit vague definitions (Wilford 1955; Gibbon 1978; Dobbs 1984b): Blue Earth Trailed/Incised. Morphologically, Blue Earth Trailed/Incised vessels typically have round orifices, round or beveled exterior lips, everted or vertical rims that are more commonly drawn up than attached, sharp or round/parallel or expanding necks, round shoulders, and strap or loop handles attached to the exterior rim and shoulder. Shell tempering ranges in diameter from 0.5-2 mm and encompasses 5-25% of the vessel paste. Small to very large vessels are representative of this type with correlating ranges in lip (2.5-7 mm), rim (4.4-10.5 mm), neck (5-15.6 mm), and shoulder (4-12.3 mm) wall thicknesses as well as rim lengths ranging from 14.1-53.9 mm. Angles for rims, necks, and shoulders range from 49-87°, 78-114°, and 118-140° correspondingly. Handles range in length from 24-44.9 mm, in width from 14-52.3 mm, and in thickness from 6-15.7 mm. Smudging is common among Blue Earth Trailed/Incised pottery, however burning is not. Lip notching, interior rim, exterior shoulder, and exterior handle decoration is common. Lip notches range in thickness from 1.8-6.4 mm and in depth from 0.2-1.9 mm. Interior chevrons with bands of horizontal lines are the most common motif for rim decoration with line thicknesses between 1.4 and 4.3 mm and depths between 0.2 and 1.6 mm. Punctates are either round or ovate applied in a direct or gradual fashion. A single instance of each elongated and irregular punctates was recorded on segments from this type. Punctate thicknesses range from 0.8-4.5 mm and depths range from 0.2-2.5 mm. Lines were often applied with weak intaglio and are 0.8-4.5 mm thick and 0.2-2 mm deep on the shoulder and 1.7-3.2 mm thick and 0.2-1.7 mm deep on the handle. Common shoulder motifs for Blue Earth Trailed/Incised include line panels, chevron variations, punctate borders, and concentric circles or swirls.

Morphologically, Sheffield pottery is shell-tempered with round orifices, round lips, everted rims that are drawn up, round or sharp/parallel necks, round shoulders and strap handles. Shell temper grain sizes range from 0.5-2 mm in diameter and incorporate

5-20% of the clay body. Small, medium, and large vessels ranging in diameter from 12-34 cm. Lip (2.9-6.1 mm), rim (5.2-9.1 mm), neck (7-9.1 mm), and shoulder (3.7-7.1 mm) wall are on average thinner than vessels from the Red Wing and Center Creek samples. The range for rim length (21.4-51 mm) is also smaller than the other two comparative assemblages. The strap handles were attached to the exterior lip and shoulder or rim and shoulder surfaces and range in length from 24.1-41 mm, in width from 17.6-35.3 mm, and in thickness from 5.5-8.3 mm. Smudging and burning are noticeably absent from the Sheffield vessel collection. Decoratively, Sheffield pottery is overwhelmingly notched on the interior lip. Lip notches are 3.5-6 mm thick and 0.4-1.6 mm deep. Only one example of rim decoration displayed several horizontal exterior lines. When apparent, shoulder decoration included rectilinear lines and punctates. Line thicknesses range from 2.3-6.5 mm and line depths range from 0.5-1.3 mm. Punctates are 2.3-6.5 mm thick and 0.2-2 mm deep. Recorded motifs include line panels, chevrons, punctate borders, and a birdtail. More data from Sheffield is needed beyond 12 vessels segments to infer reliable typological divisions within the sample.

The conclusions and typological suggestions derived from this research require additional measured data from other Oneota sites within the Red Wing and Blue Earth regions and additional specimen acquired from future excavations at Sheffield. Yet, these new suggestions are outlined using as many morphological and decorative measurements as possible as well as descriptive and multivariate statistical methods, which should be done for all proposed vessel typologies. This research utilized only two multivariate methods to analyze ratio and nominal data, other clustering methods for determining variation within vessel form and decoration should and hopefully will be applied in future research to confirm or refute these suggestions. These types, like all artifact classifications, are not set in stone.

Further Research

As in all scientific inquires, more research is needed. Additional excavations at the sites within the Upper Mississippi, Blue Earth, and St. Croix River valleys may further clarify the stylistic expressions within and between these locations. Internally for Red Wing, still very little is known concerning some villages and hamlets along the Cannon River and within the Spring and Hay Creek River valleys. In addition, measurable and comparable data from the Armstrong and Double sites in Wisconsin is needed to determine how exactly these two sites within the Red Wing region relate to Bartron and Spring Creek phase Oneota sites.

This research focused on all available vessel segments from public institutions, such as Minnesota State University, Mankato, the Science Museum of Minnesota, and the Minnesota Historical Society. Red Wing vessels from the Goodhue County Historical Society, Wisconsin State Historical Society and Blue Earth vessels from the Blue Earth County Historical Society and Faribault County Historical Society need to be measured and added to these data. Also, further cataloging of collections from sites such as Vosburg, Sell, and Silvernale, at the Minnesota State University, Mankato and Science Museum of Minnesota will hopefully provide more segments and measurable data for the testing of these proposed pottery types.

There are many questions that still need to be answered concerning Oneota pottery in southern Minnesota and western Wisconsin. How exactly do the Oneota components within the Center Creek locality relate to other localities, such as Willow Creek, within the Blue Earth region? How does Willow Creek relate to the Red Wing region and Sheffield site? How exactly do the Oneota components within the Blue Earth region, Red Wing region, and Sheffield site compare to other contemporary Oneota components in the Midwest? What is further needed is comparable data recorded from other Oneota regions and localities as well as phases, such as the Ogechie phase in central and western Minnesota, Correctionville and Orr phases in Iowa, Brice Prairie phase in western Wisconsin, and the Bold Counselor phase in central Illinois, to better understand how Oneota manifestations throughout the Midwest relate to each other in terms of detailed morphological and decorative attributes.

Concerning pottery made, used, deposited, and ultimately recovered from the Upper Mississippi, Blue Earth, and St. Croix River valleys, each location is locally unique in the stylistic behavior of vessel manufacture and decoration. The definitions of Oneota pottery created in the 1950's and unfortunately preserved throughout the 20th century were severely outdated concerning the current archeological record and grossly vague regarding aspects of vessel morphology and design. This research, again, is just a small step for archeological kind towards defining typologies that are outlined using as many attributes as measurably possible and empirical quantitative and qualitative data to support such types. It is a push towards more testable ways to examine stylistic behavior that can be compared within and between sites, localities, and regions of the Oneota tradition.

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Appendix I: Glossary

Apical- The most superior aspect of a vessel or applique to a vessel. On pottery vessels this term is applicable to lips and tabs. (Minnesota Archeology Integrated Database (MAID) 2017)

Artifact- An object made or modified by a human.

Base- Most inferior part of a vessel. Some vessels simply have rounded bases, others have well defined bases, which act somewhat as a platform.

Body- Morphological location of a vessel below the shoulder and above the base.

Brushed- A term used to denote any surface treatment exhibiting multiple shallow striation and/or smears, generally applied in a unidirectional manner (MAID 2017).

Burnished- Surface treatment exhibiting a smooth and slightly polished surface (MAID 2017).

Ceramic- Term used for vessels made of high fired clay. Ceramics are usually fired above 1200° Celsius (Sinopoli 1991).

Chevron Motif- Motif made of oblique lines, which meet to form an upside-down "V" or regular "V" shape (inverted chevron).

Compound Motif- Decorative unit comprised of multiple motifs (MAID 2017). The birdtail is an example of a compound motif.

Cordmarked- Surface treatment exhibiting impressions or markings resultant from cordage being applied to the vessel (MAID 2017).

Corner Point- Term used to describe vessel contour. It is the point on a vessel where the morphology abruptly changes, such as at the constriction of the neck (Shepard 1985[1954]).

Curtain Motif- Parallel horizontal lines perpendicular to parallel vertical lines (Holley n.d.).

Curvilinear- Decorative lines that exhibit curves or arcs in the application (MAID 2017).

Decoration- A formal expression of style deliberately placed on a vessel's exterior, interior, or apical surface (MAID 2017).

Diagnostic- Distinguishable properties of an artifact that may have cultural, temporal, or spatial significance. Diagnostic features individually possess attributes or properties from which anthropologically significant data can be reasonably inferred (MAID 2017).

Duo Motif- Band of two oblique lines, often used as filler between other motifs.

Element- Discrete decorative unit, such as an oblique line or vertical hachure. Many repeated elements can be in a single motif (MAID 2017).

End Point- Term used to describe vessel contour. It is the point on a vessel in which the morphology abruptly ends, such as the lip and base/foot (Shepard 1985[1954]).

Everted- Rim form that display an outward deviation from the vessel’s interior vertical axis (MAID 2017).

Excavation Unit- A square or rectangular unit of space within a subsurface archeological investigation.

Exterior- The outer-facing wall of a vessel.

Feature- Element of an archeological site that cannot be removed in its entirety. Refuse/storage pits and structures are common feature forms.

Folded Rim- A term used to identify a rim modification in which the lip of a vessel has been folded to the exterior or interior and attached to the surface of the vessel (MAID 2017).

Hachure- Vertical lines extending down from a horizontal or oblique motif, such as a hachured scroll or hachured chevron.

Handle- Nodes of clay added to a vessels exterior after it is initially formed for particular uses, such as suspension, carrying, pouring, etc. Not all vessels have handles.

In situ- Latin phrase meaning “in place.” In archaeology, *in situ* is used to describe the original placement in which an artifact or feature is found within an archeological context.

Incised Line- Scribed decoration, which is applied after a vessel has been dried to a “leather hard” consistency. These lines are deep and narrow and often exhibit a v-shaped trench profile (Anfinson 1979; MAID 2017).

Intaglio- A consequential decoration that is a protrusion or mirror-image of a decoration applied to the opposite wall of a vessel. Intaglio is generally associated with thin-walled vessels, exhibiting exterior trailed line decorations (MAID 2017).

Interior- The inner-facing wall of a vessel.

Inflection Point- Term used to describe a strong change in vessel curvature, often recorded at the shoulder juncture (Shepard 1985[1954]).

Leather-hard State- Manufacturing stage in which newly formed vessels are set aside to dry before firing. Decoration is done within the stage of leather-hardening (Sinopoli 1991).

Line Panel- Section of vertical and/or oblique parallel lines (Wilford 1955: 141). Panels can sometimes have up to 7 or 8 parallel lines.

Lip- The most superior aspect of a vessel.

Loop Handle- Handle type that is circular in cross-section.

Lug- A knob shapped applique often attached to a vessel wall or handle.

Meandering Line- Horizontal curvilinear line, which is often continuous around the vessel shoulder. Meandering lines can be rounded, more angular or scalloped.

Midden- An above ground refuse heap. Middens are classified as features.

Motif- Continuous or discrete designs, comprised of decorative elements. They are highly diagnostic within pottery decoration, and can vary substantially cultural and temporally (MAID 2017).

Morphology- The shape or form of a vessel. A vessel can have several different parts, which make up its entire morphology.

Neck- Constricted part of a vessel that is directly below the lip and directly above the shoulder (MAID 2017).

Neck Juncture- Point of the vessel where the rim transitions into the shoulder.

Nested Motif- A stacked version of common pottery motifs, such as nested chevrons or arches.

Paste- Mixture of a clay raw material with temper.

Plow Zone- Surface and subsurface disruption caused by agricultural activity (MAID 2017).

Polished- Glossy surface treatment produced by rubbing of a fine-grained object, such as a rock on the vessel surface.

Pottery- Term for vessels made of fired clay. Pottery is usually fired below 1200-1300° Celsius (Sinopoli 1991; MAID 2017).

Pre-contact- Time period before indigenous North American groups were in contact with European groups (before c.1650). This period is marked archeologically in the Midwest by an absence of metal (except copper), glass, and ceramic artifacts. “Prehistoric” is a synonym for this term. The “late pre-contact” refers to the time period around AD 900-1650.

Punctate- Decoration produced by the application of an object vertically into the wall of a vessel (Anfinson 1979; Gibbon: 2008). This type of decoration is often circular or ovate.

Orifice diameter- Measurable opening of a pottery vessel at the superior aspects of the rim (MAID 2017).

Quatro Motif- Band of four oblique lines often used as filler between other motifs.

Radii Chart- Polar coordinate grid with predetermined arc widths used to determine orifice and neck diameter as well as percent of rim present.

Rectilinear- Decorative line that has no arc; a line scribed into a vessel with little to no deviation from a straight line (MAID 2017).

Rim- Area of a vessel, which lies directly above the neck, extending to the apical lip margin (MAID 2017).

Rolled Rim- A rim modification, which is characterized by an interior or exterior rolling or curling of the superior aspect of the rim. This produces a bulbous protrusion of the lip (MAID 2017). Rolled rims are representative of Silvernale phase vessels.

Scroll Motif- Design motif consisting of connected swirls. Scrolls are occasionally interlocking. Distinctive of Silvernale phase pottery.

Sherd- A fragment derived from a pottery vessel (MAID 2017).

Shoulder Juncture- The point at which a vessel is at its widest where the shoulder transforms into the body.

Smooth- Surface treatment exhibiting signs of smoothing or otherwise a lack of surface treatment which, in effect, has left a plain surface on the exterior vessel (MAID 2017).

Strap Handle- Handle type that is wider than it is longer and more flat in cross-section (MAID 2017).

Surface Treatments- Surface characteristics produced through the formation of the vessel and or any finishing processes that modify the appearance and texture of the vessel walls (Sinopoli 1991).

Tab- A thin horizontal or oblique protrusions of the rim/lip, which may have served as handles, pot rests, or decorative features (MAID 2016). Not all vessels have tabs.

Temper- Inclusions intentionally added to clay prior to the modeling and firing process of pottery. The addition of temper within clay will result in less cracking during the drying and firing process and will improved resistance to thermal shock (Shepard 1985[1954]).

Theme- Characteristic was in which elements, motifs, and compound motifs are incorporated within the design profile of certain pottery types or styles (MAID 2017).

Thunderbird or Birdtail Motif- Combination of oblique lines, chevrons, and punctates to create an abstract image of either a bird image or bird tail.

Trailed Line- Decoration produced through the dragging of a tool over the surface of a wet and pliable vessel wall. Trailed lines are usually wide, shallow, and appear roughly U-shaped in profile often with slight bulging along the borders of lines or interior intaglio, resultant from the displacement of clay (MAID 2017).

Trio Motif- Band of three oblique lines, often used as filler between other motifs (Holley n.d.).

Vertical- Rim form that displays no deviation from the rim's vertical axis (MAID 2017).

Vessel Segment- Portion of a vessel that include a significant portion of the entire vessels morphology. Vessel segments have a least a representation of a vessel's lip, rim, neck, and shoulder.

Appendix II: Vessel Segment Profiles

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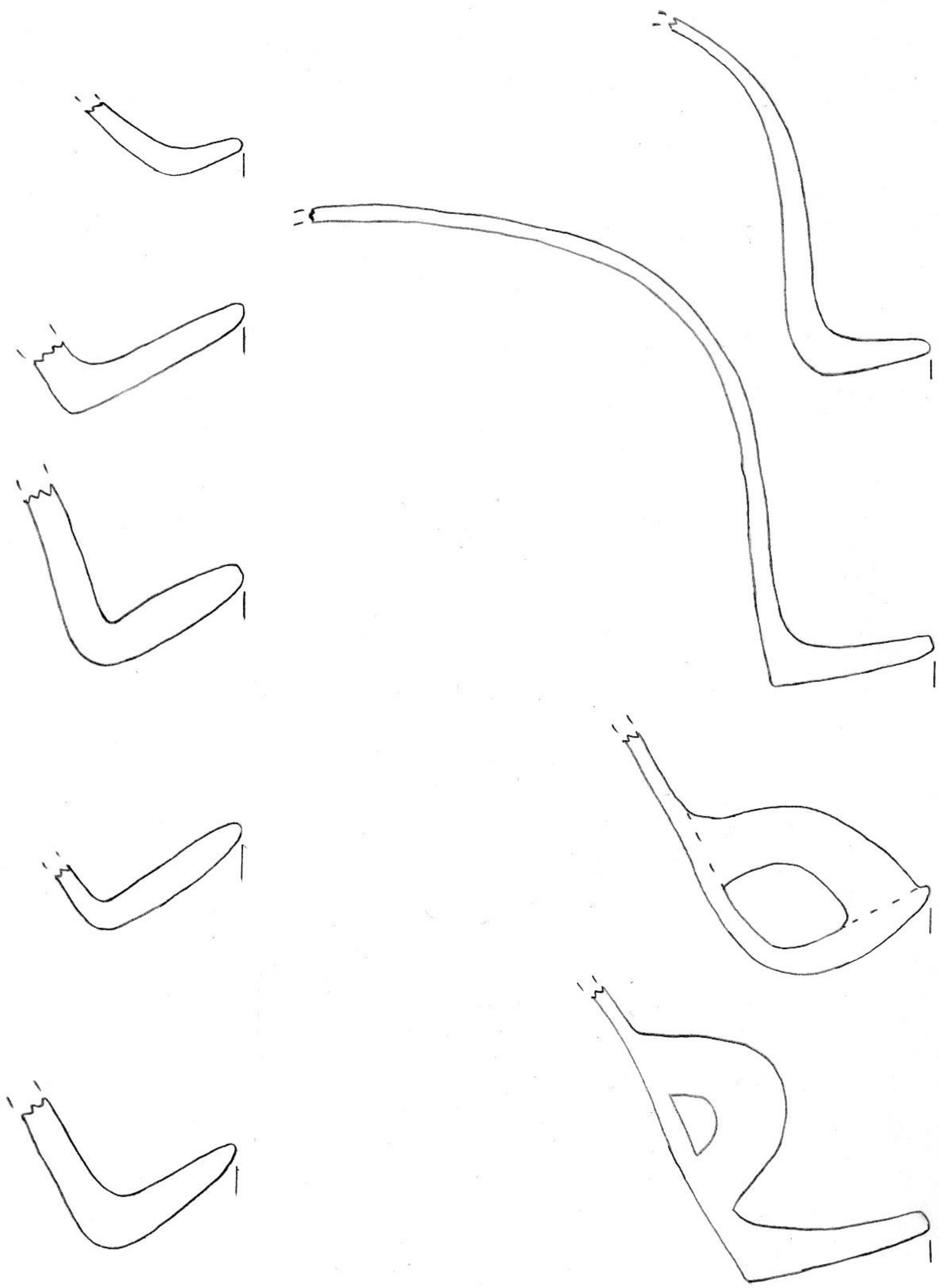

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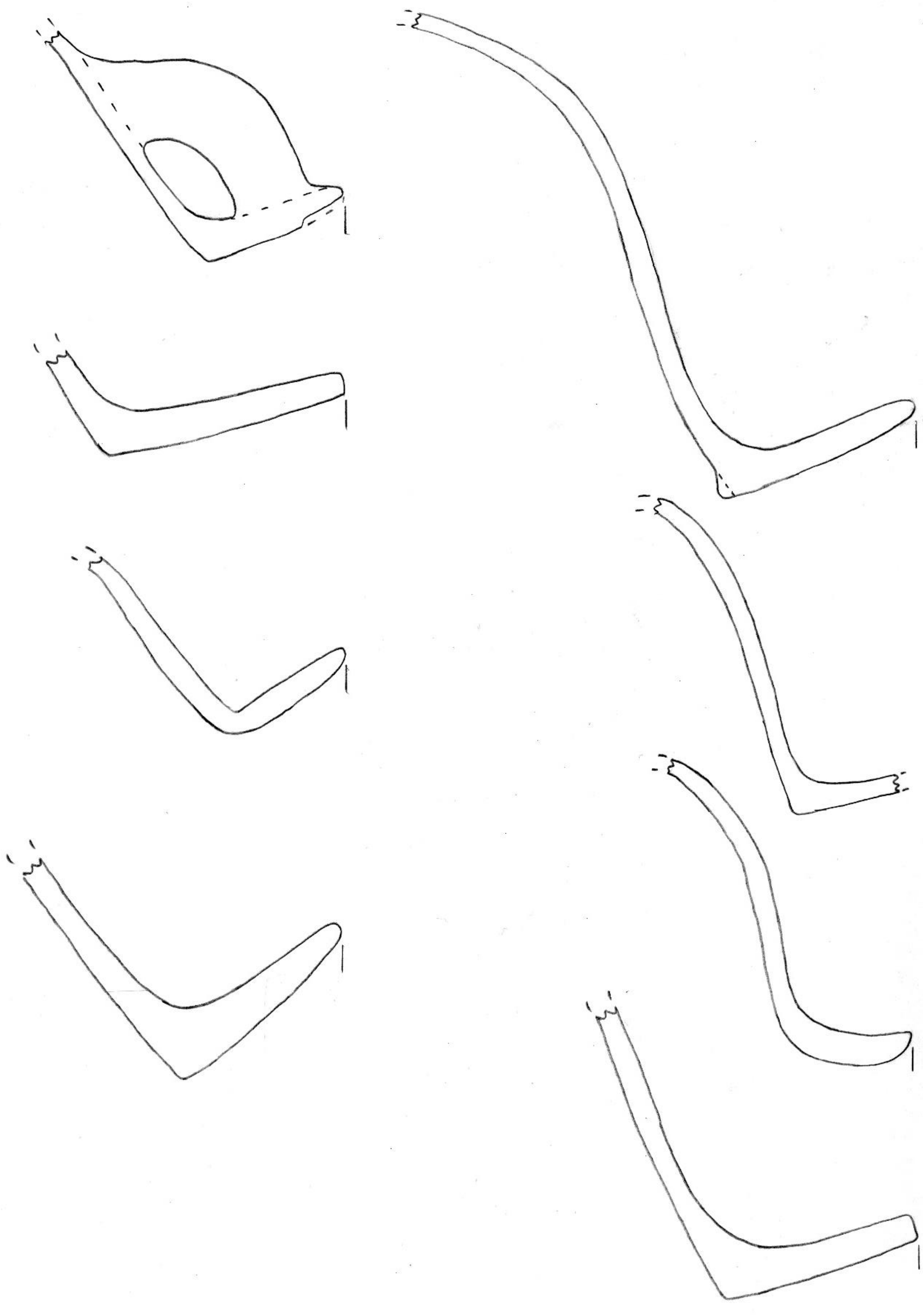

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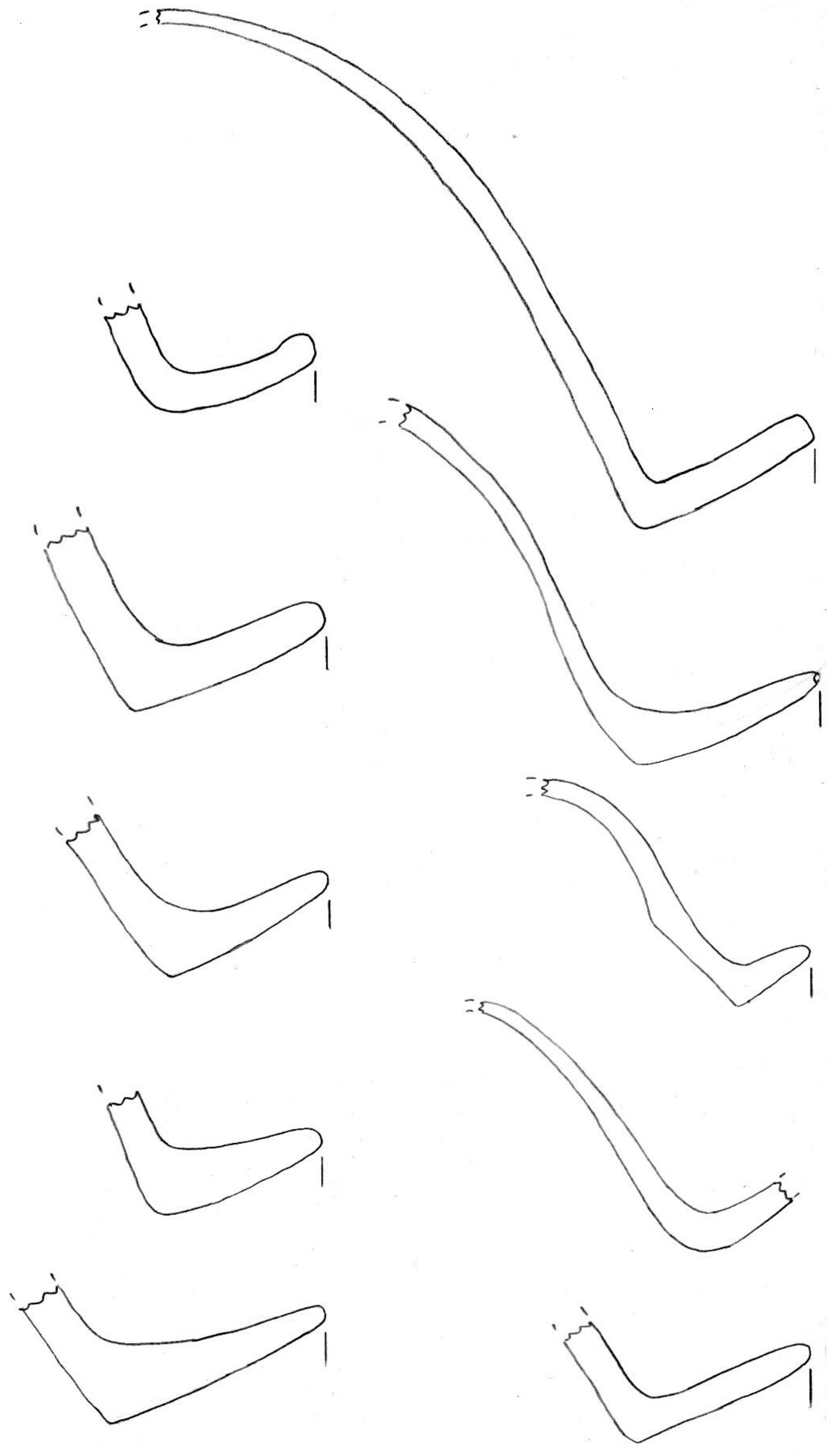

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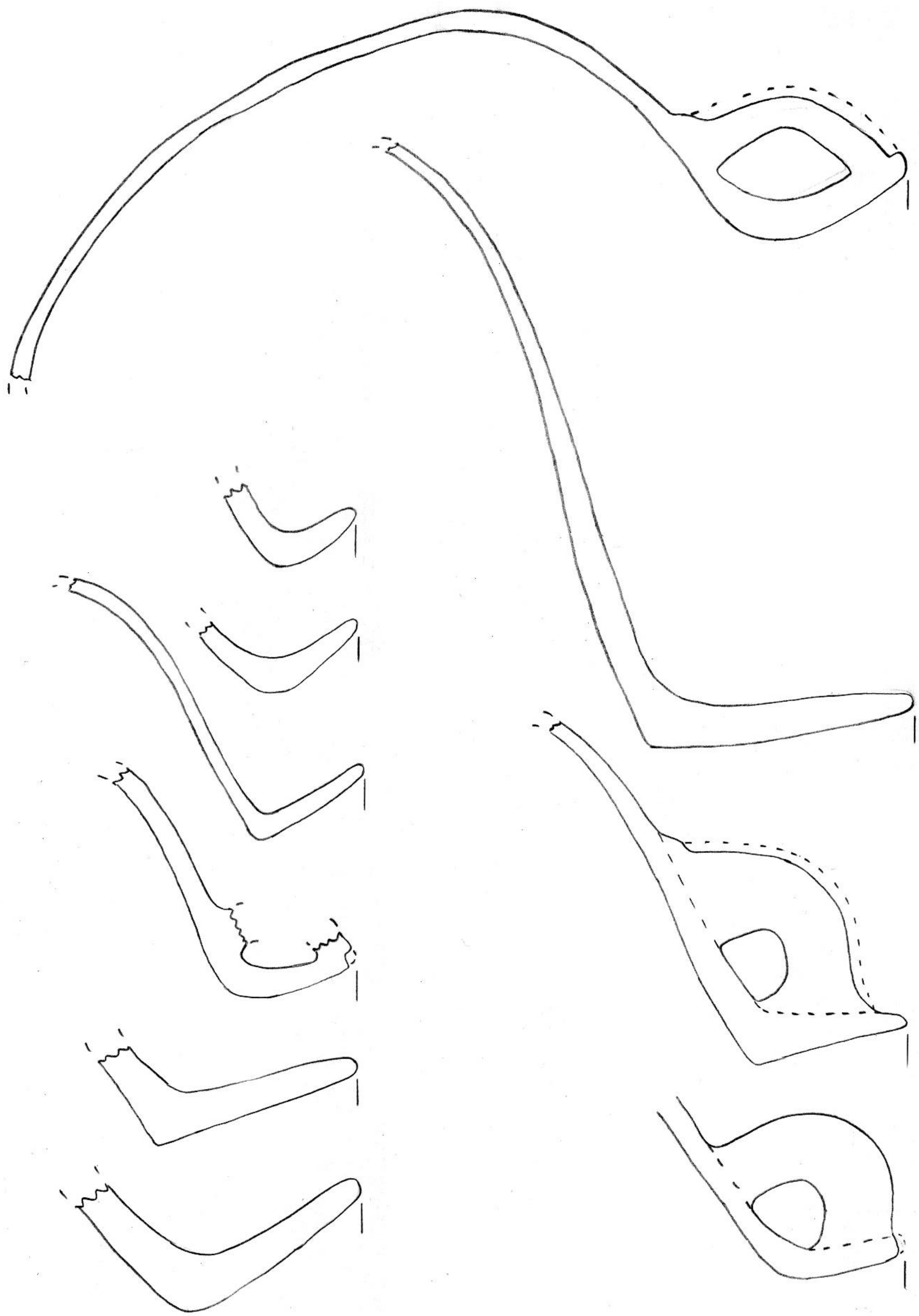

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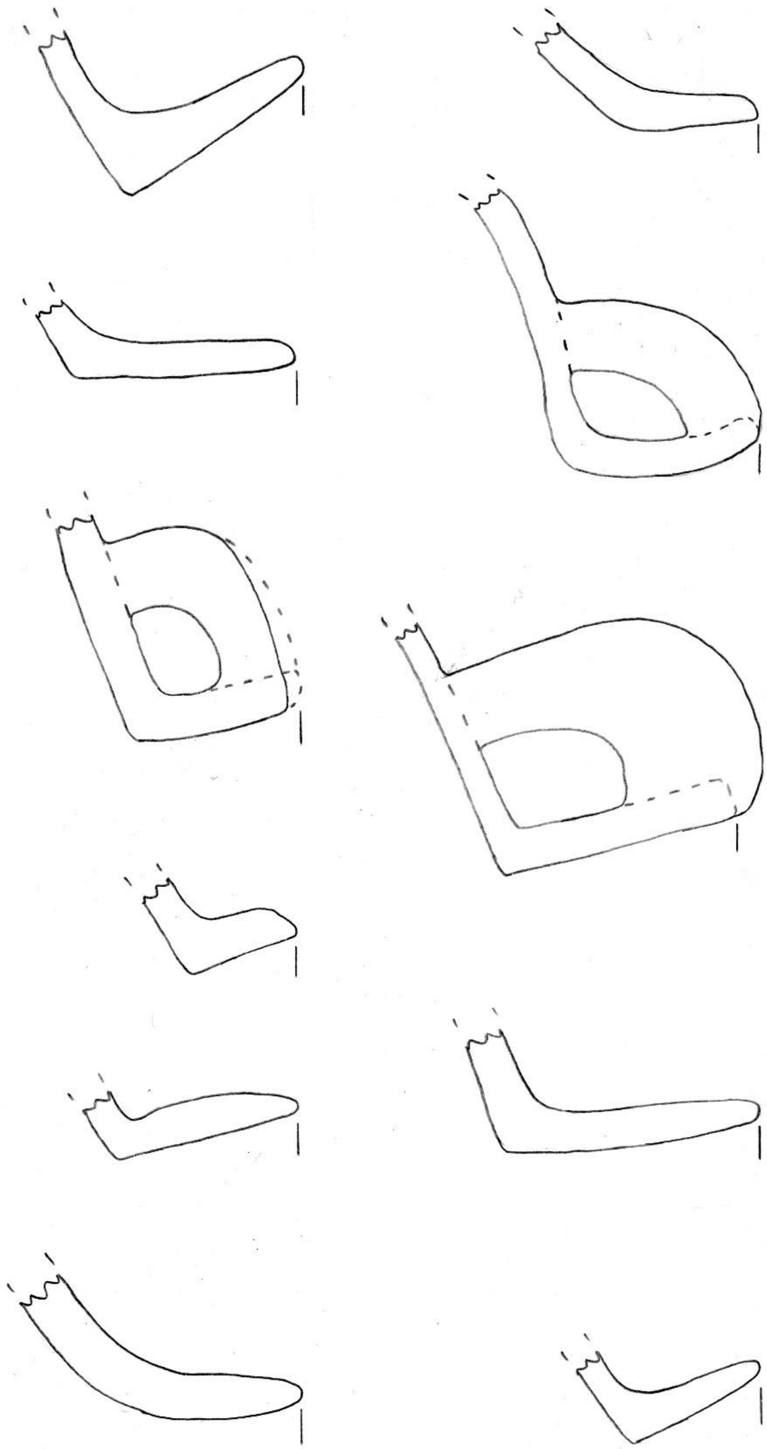

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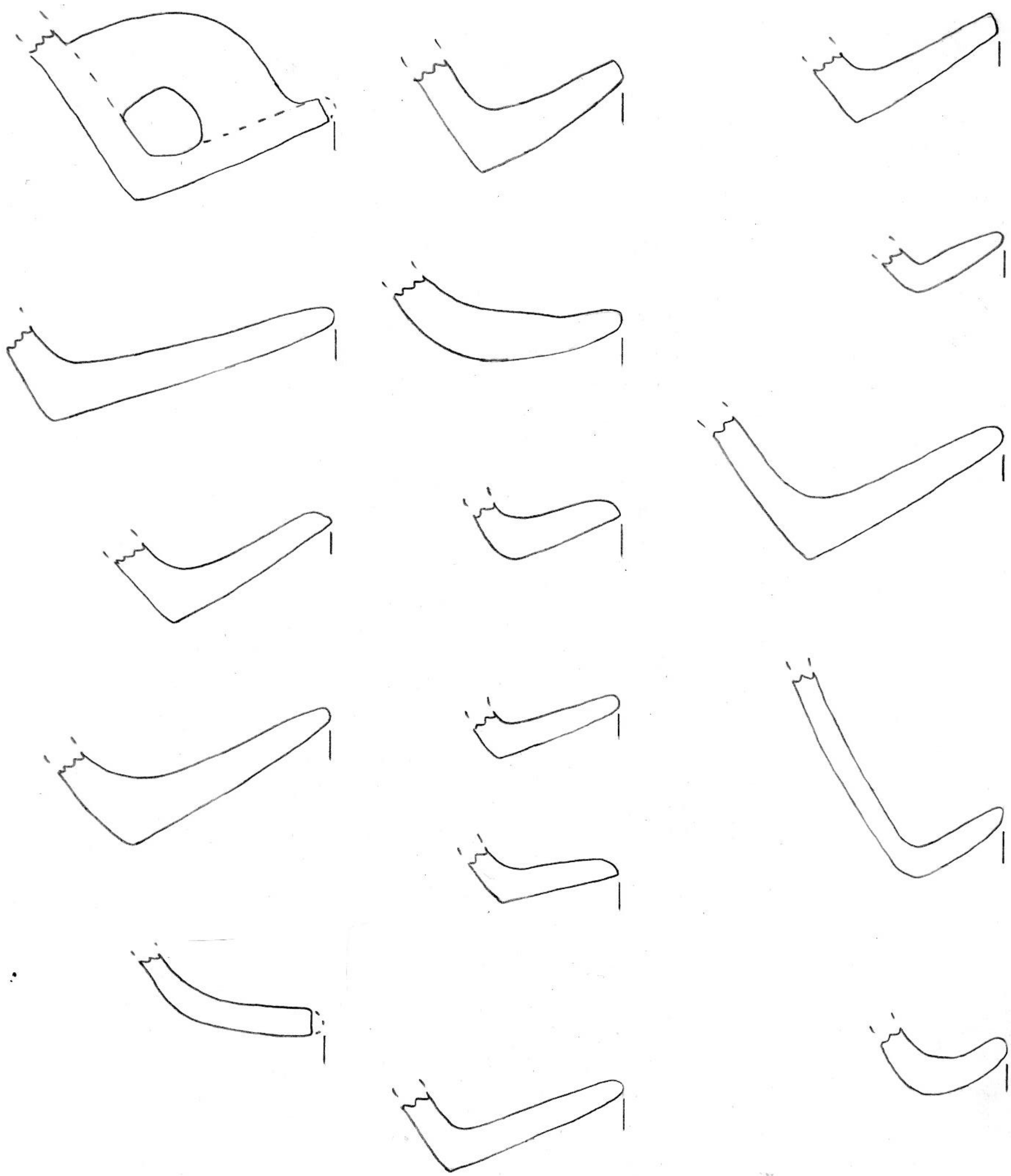

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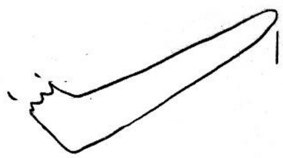

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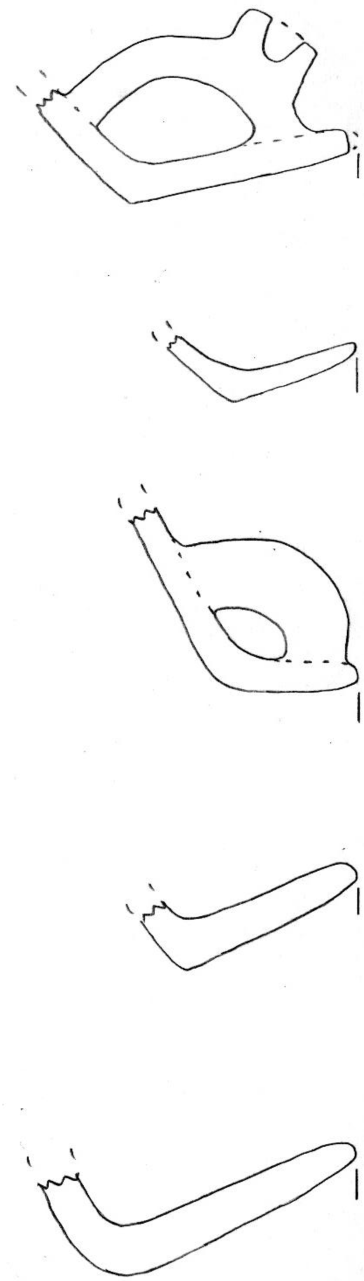

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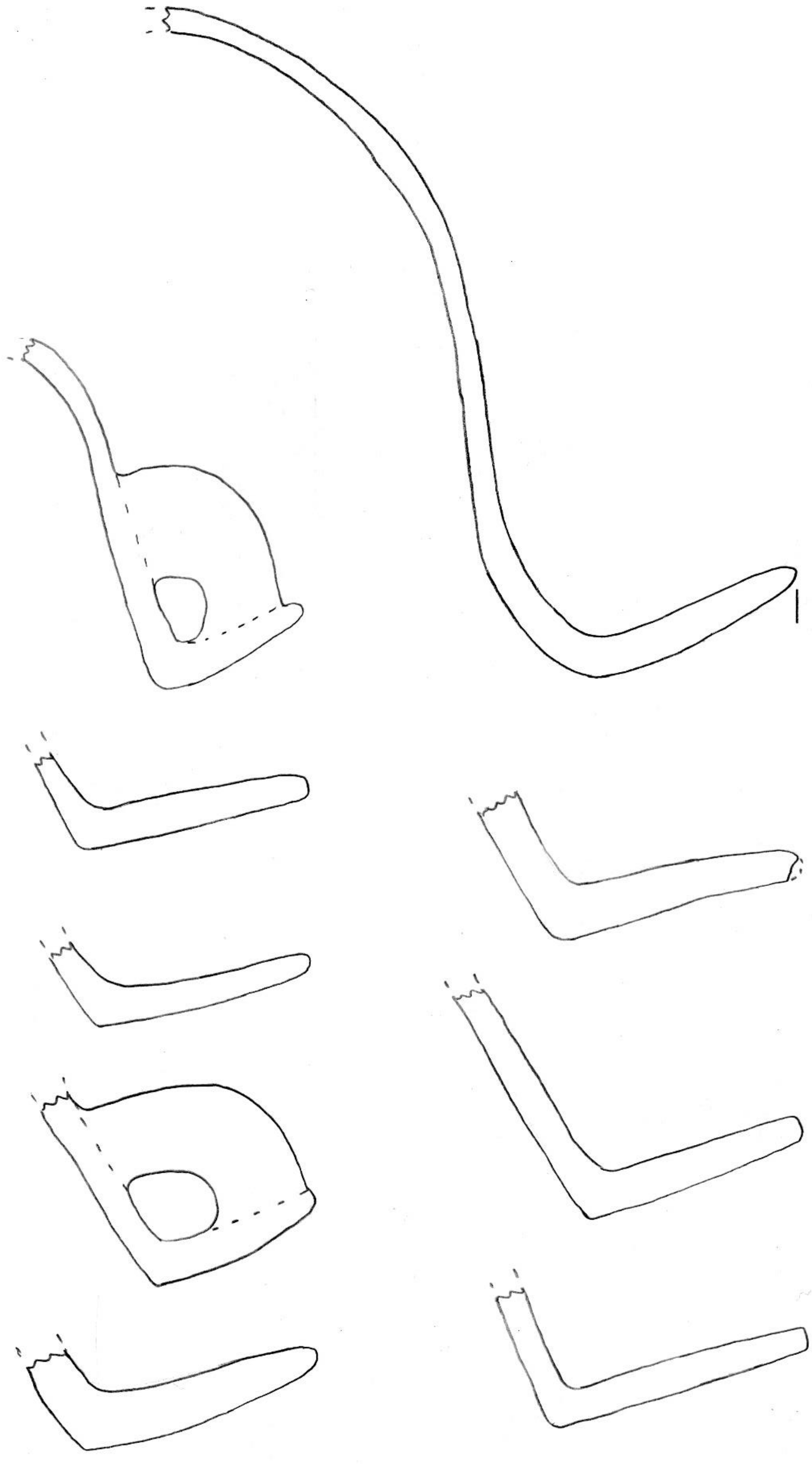

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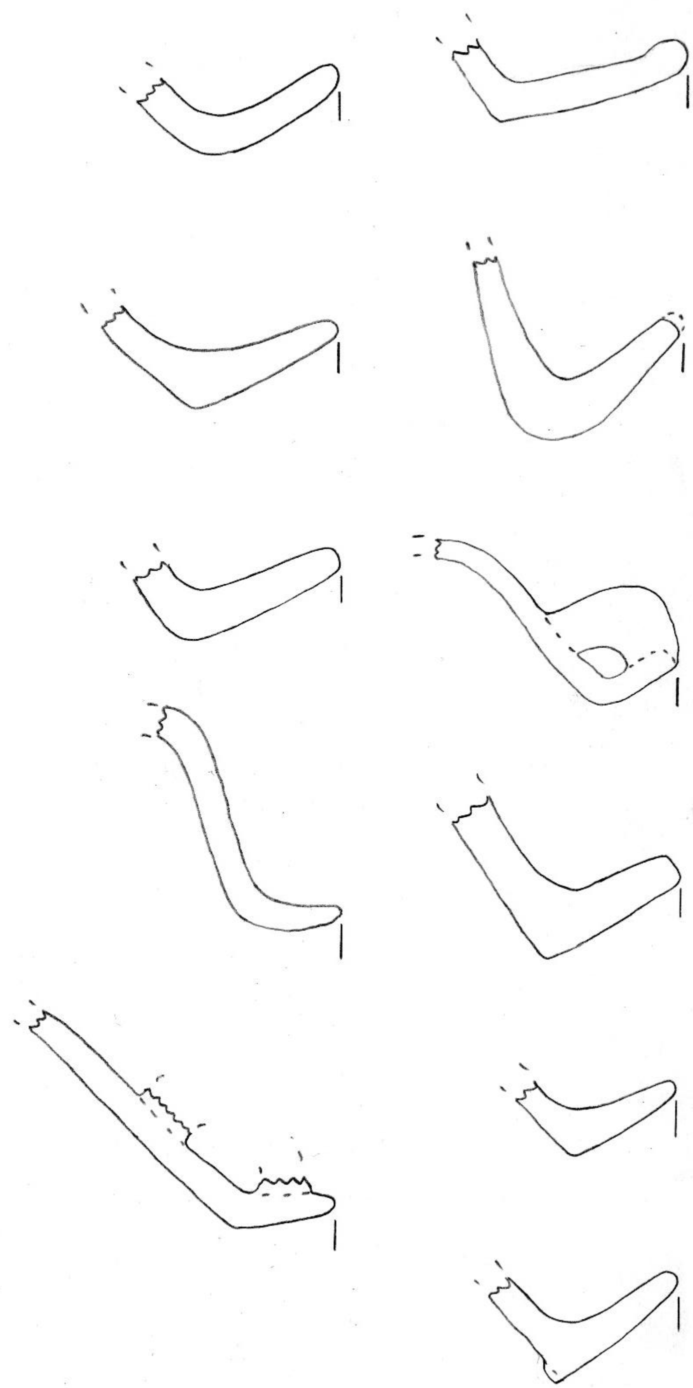

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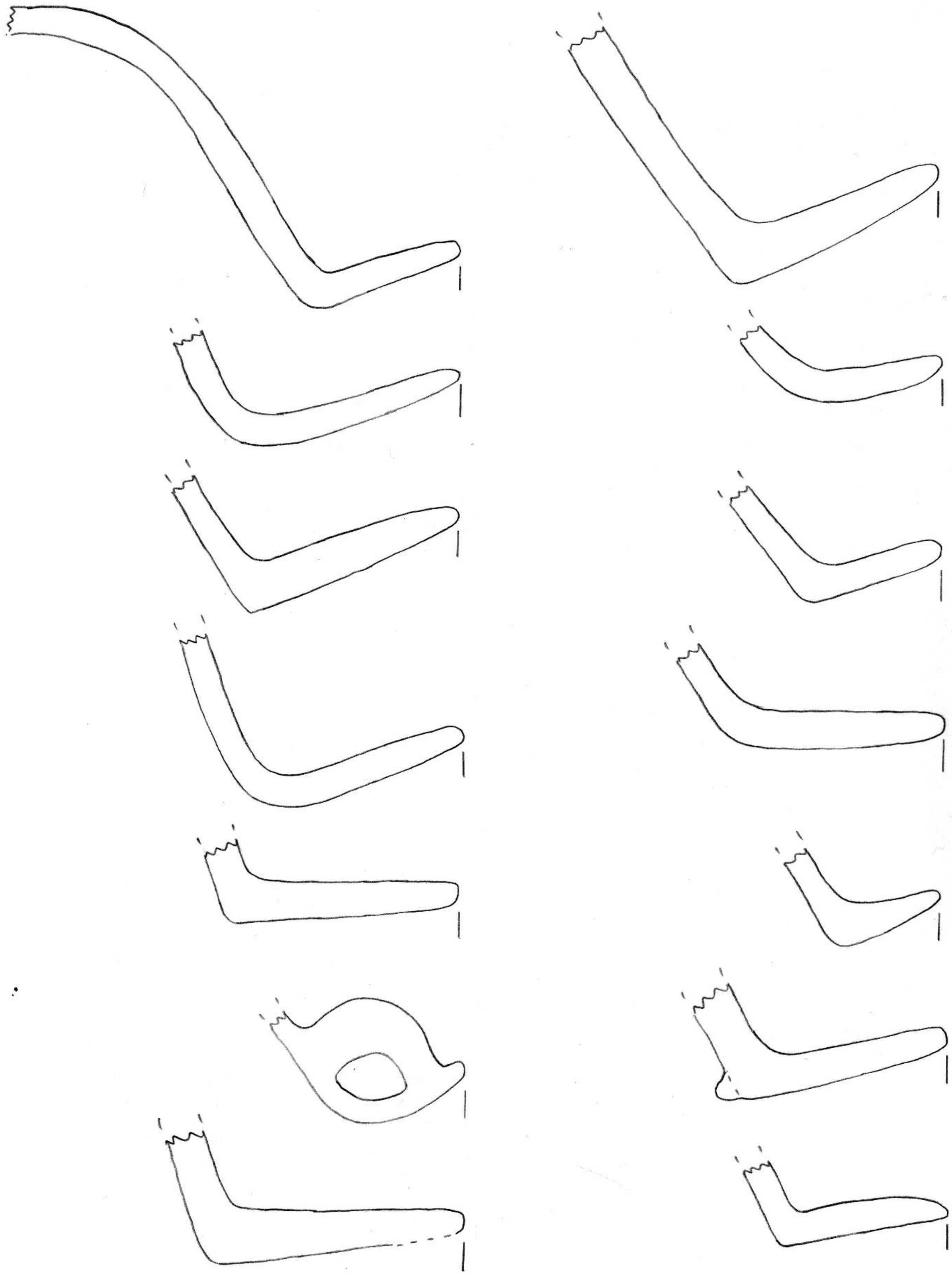

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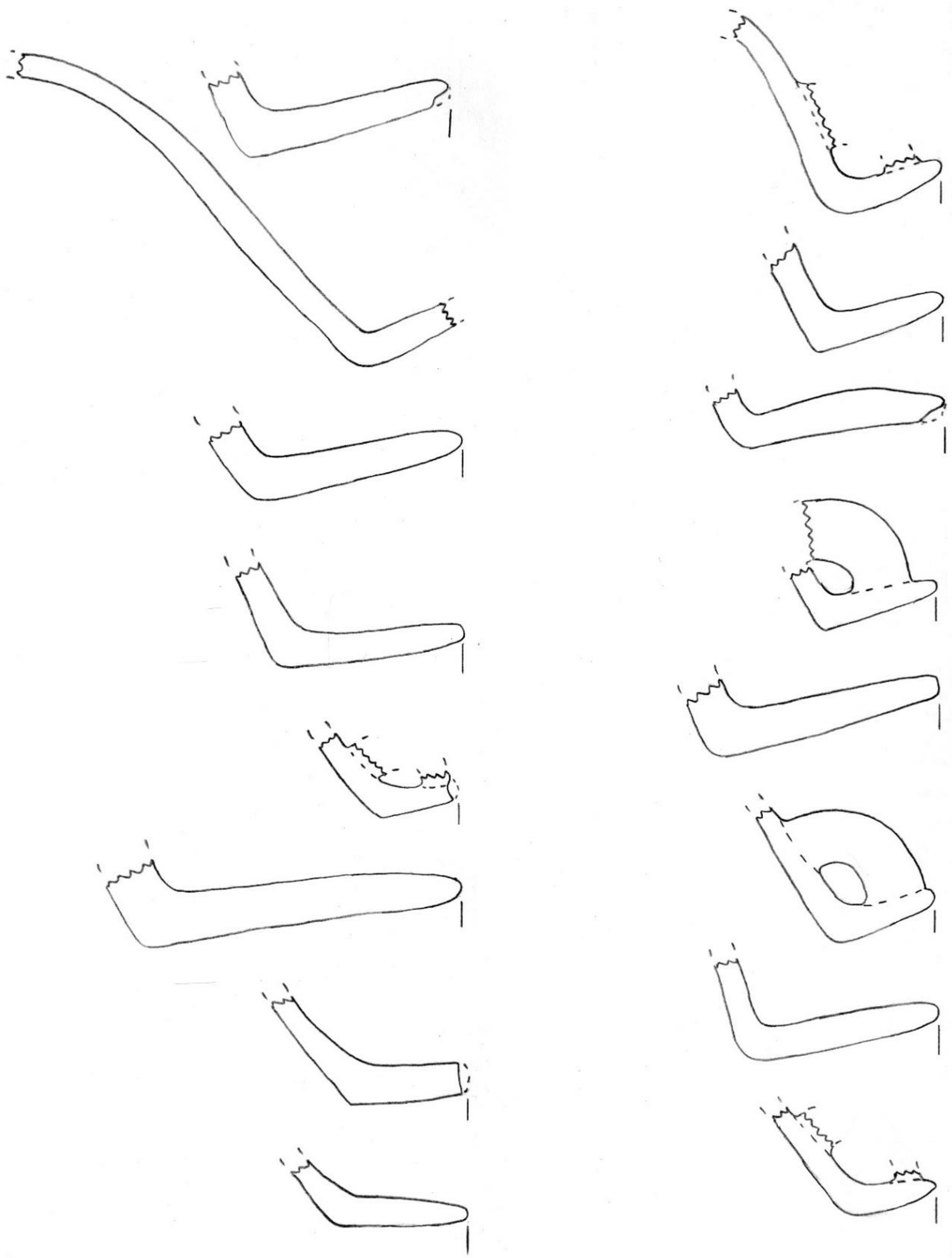

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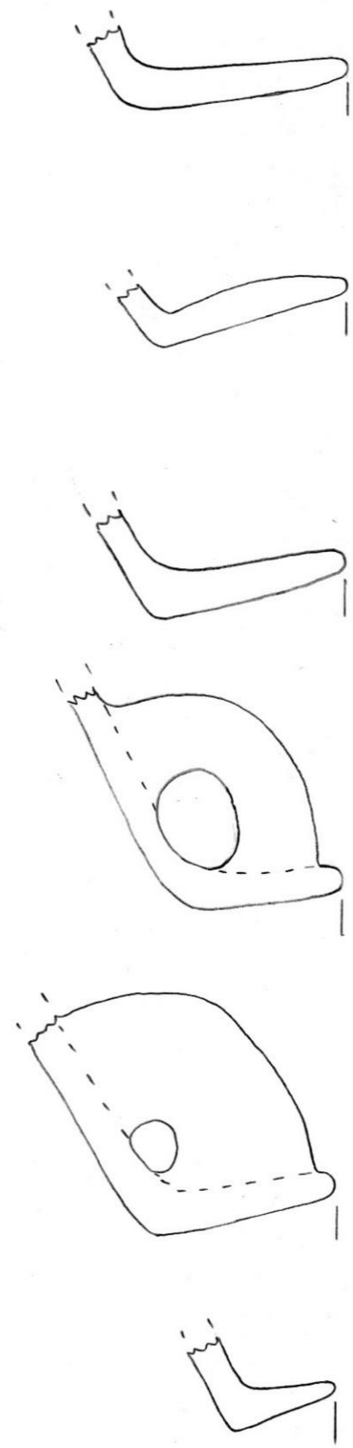

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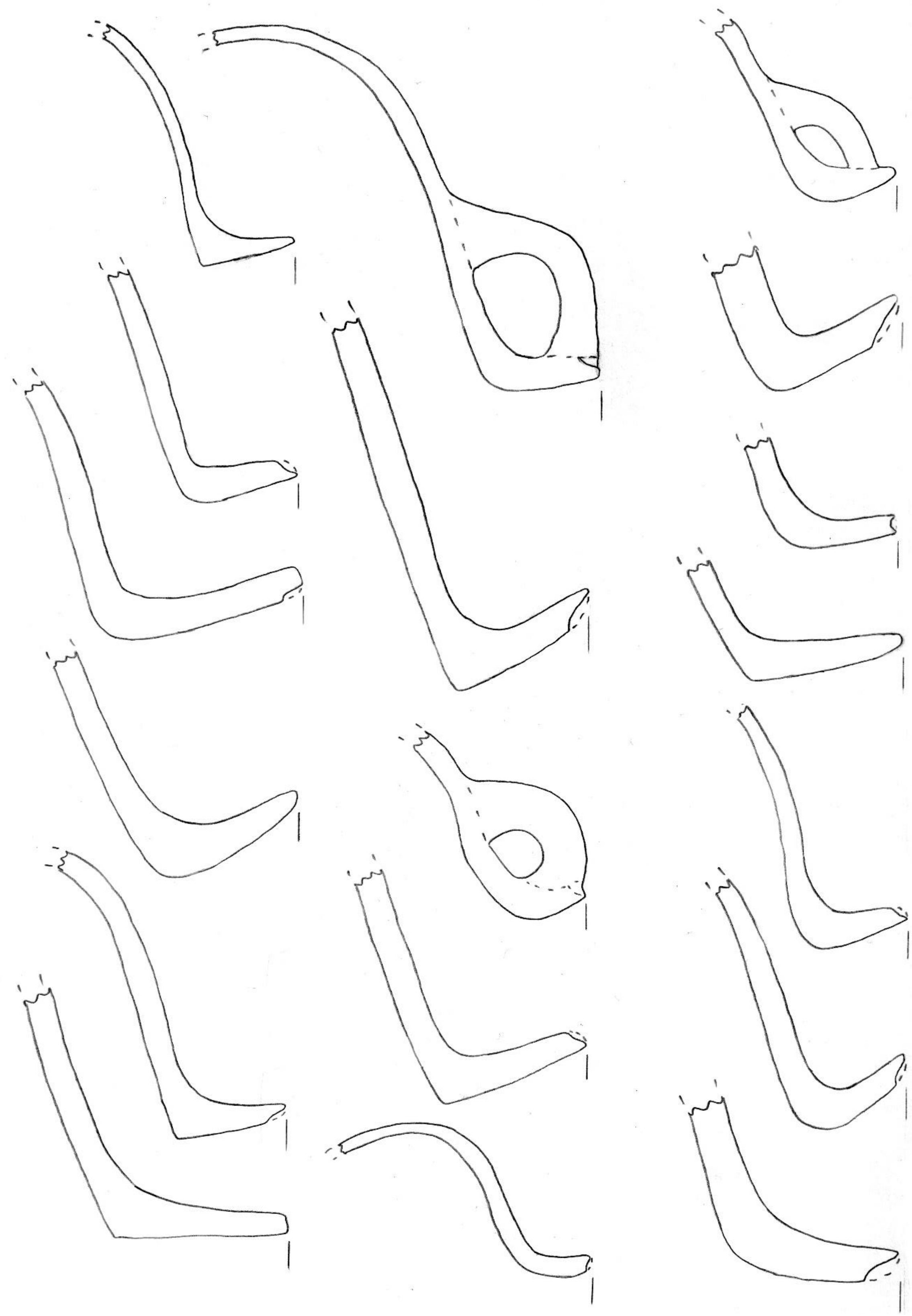

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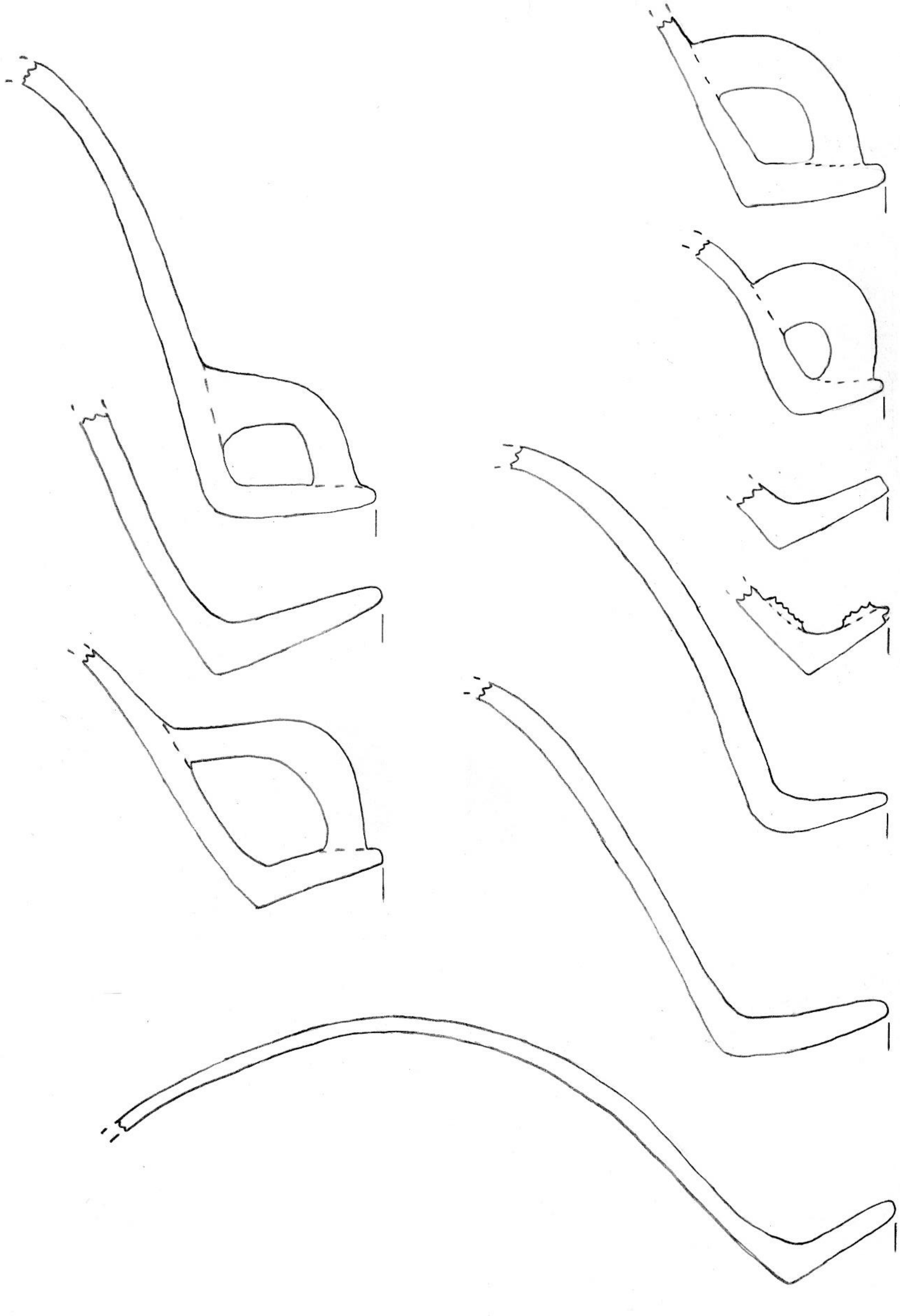

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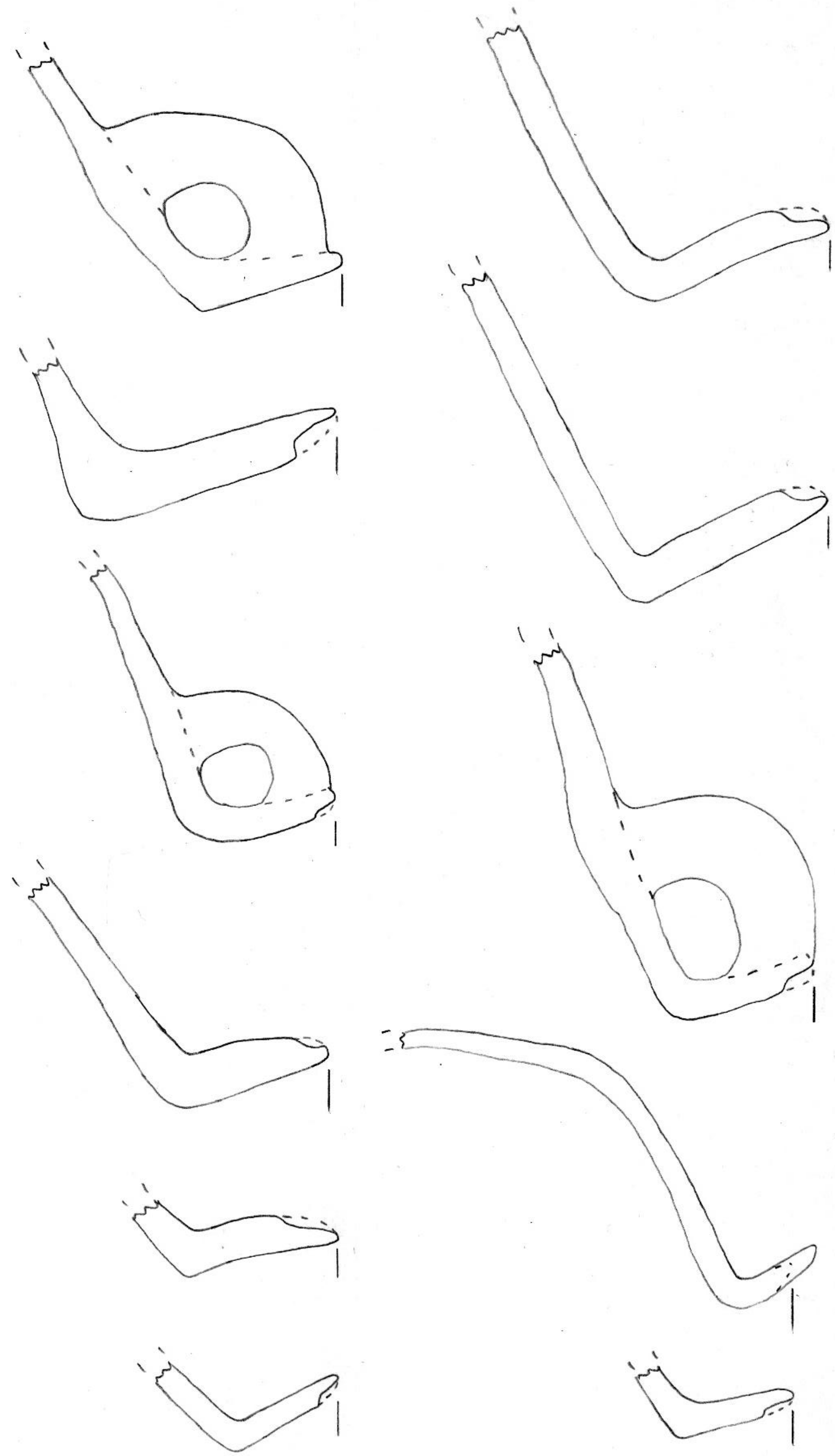

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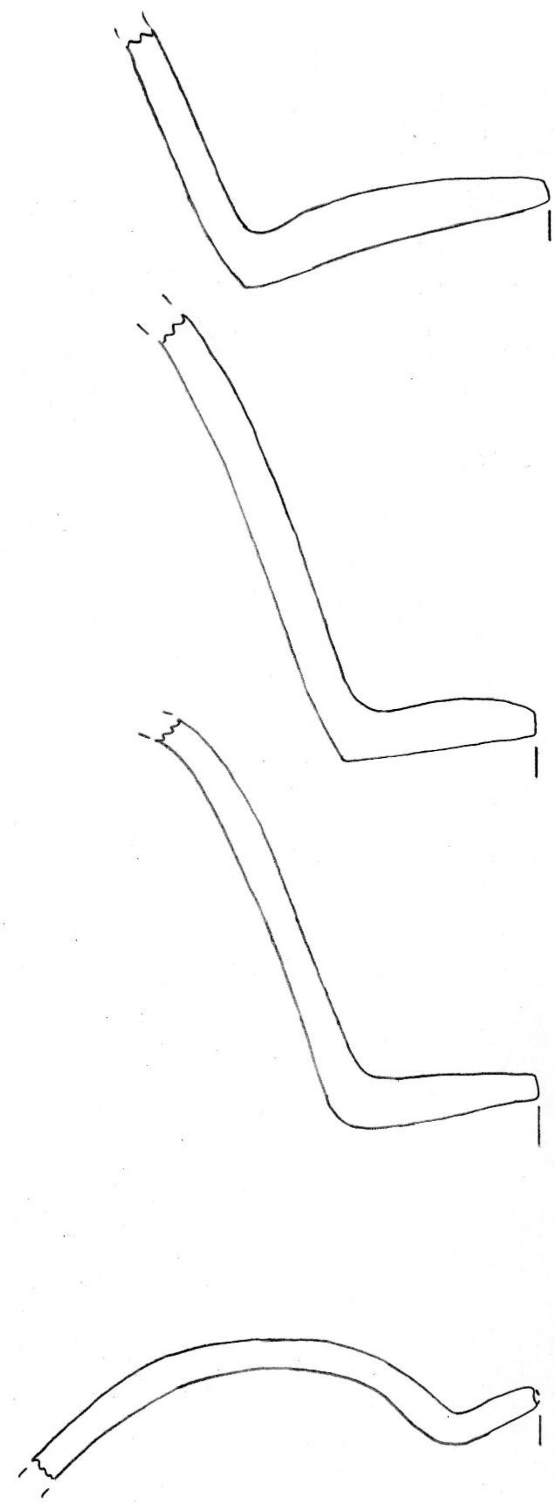

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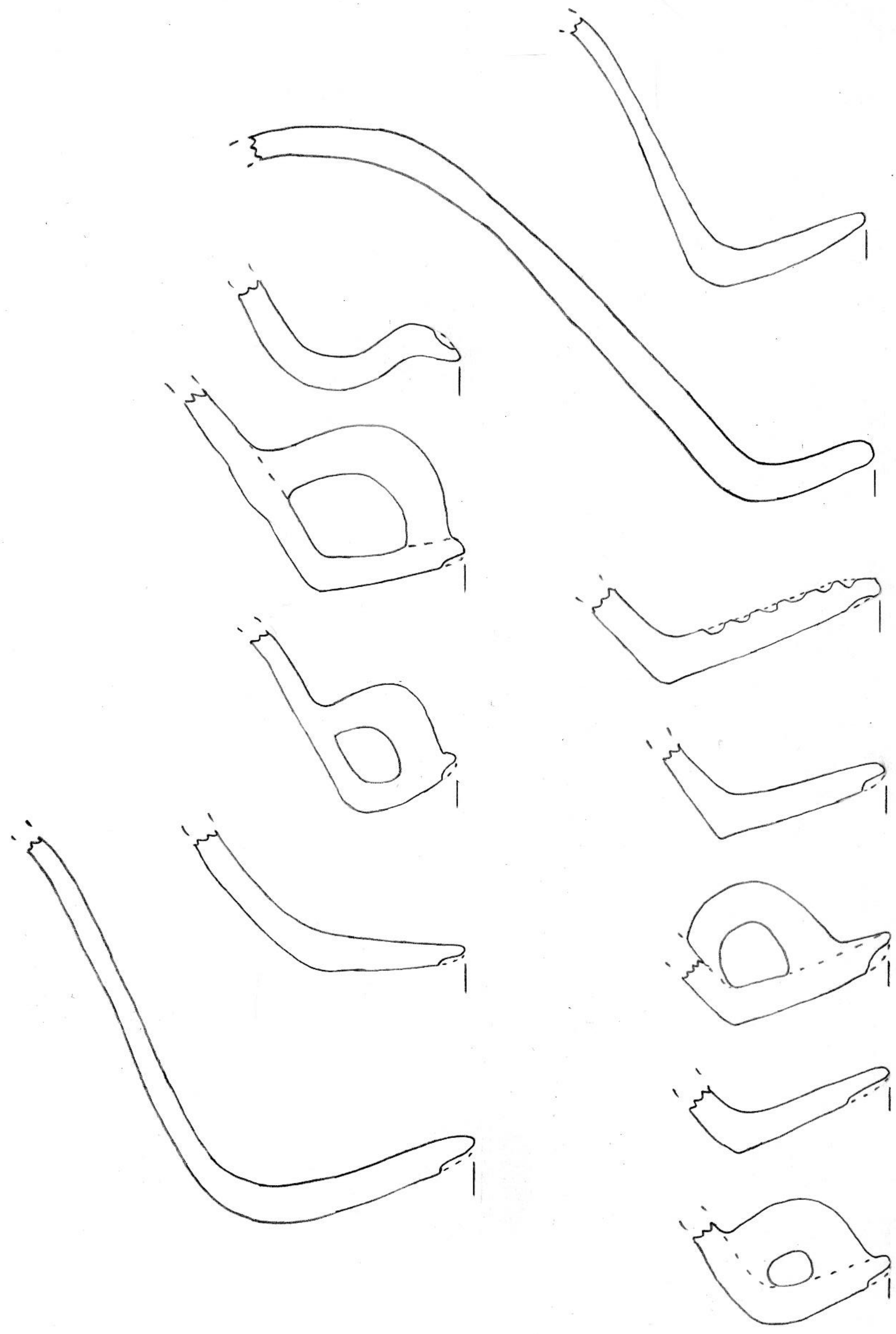

Appendix III: Additional Tables

Chapter Six Data Tables

Table III.1: Orifice Shape Results for sites within the Red Wing Region

	Frequency				*Percent*			
Site Name	*Round*	*Oval*	*Indeterminate*	*Total*	*Round*	*Oval*	*Indeterminate*	*Total*
Bartron	16	1	-	17	94.1	5.9	-	100
Adams	33	-	5	38	86.8	-	13.2	100
Burnside School	5	-	-	5	100	-	-	100
McClelland	4	3	1	8	50	37.5	12.5	100
Sell	-	-	1	1	-	-	1	100
Silvernale	12	-	-	12	100	-	-	100
Mero	10	-	-	10	100	-	-	100
Bryan	9	1	-	10	90	10	-	100
Energy Park	27	-	-	27	100	-	-	100
Total	116	5	7	128	90.63	3.9	5.47	100

Table III.2: Orifice Shape Results for sites within the Center Creek Locality and Sheffield

	Frequency				*Percent*			
Site Name	*Round*	*Oval*	*Indeterminate*	*Total*	*Round*	*Oval*	*Indeterminate*	*Total*
Vosburg	22	1	2	25	88	4	8	100
Humphrey	19	-	-	17	100	-	-	100
Total	41	1	2	44	93.18	2.27	4.55	100
Sheffield	11	-	1	12	91.7	-	8.3	100

Table III.3: Lip Tab Results from sites within the Center Creek Locality and Sheffield

	Frequency			*Percent*		
Site Name	*Present*	*Absent*	*Total*	*Present*	*Absent*	*Total*
Vosburg	1	24	24	4	96	100
Humphrey	-	19	19	-	100	100
Total	1	43	44	2.27	97.73	100
Sheffield	-	12	12	-	100	100

Table III.4: Shoulder Form Results for sites within the Red Wing Region

	Frequency				*Percent*			
Site Name	*Round*	*Sharp*	*Ind.*	*Total*	*Round*	*Sharp*	*Ind.*	*Total*
Bartron	6	-	11	17	35.3	-	64.7	100
Adams	3	-	35	38	7.9	-	92.1	100
Burnside School	-	-	5	5	-	-	100	100
McClelland	1	-	7	8	87.5	-	12.5	100
Sell	-	-	1	1	-	-	100	100
Silvernale	4	-	8	12	33.4	-	66.6	100
Mero	2	-	8	10	20	-	80	100
Bryan	5	-	5	10	50	-	50	100
Energy Park	1	-	26	27	3.7	-	96.3	100
Total	22	-	106	128	17.19	-	82.81	100

Table III.5: Shoulder Form Results for sites within the Center Creek Locality and Sheffield

	Frequency				*Percent*			
Site Name	*Round*	*Sharp*	*Ind.*	*Total*	*Round*	*Sharp*	*Ind.*	*Total*
Vosburg	7	-	18	25	28	-	72	100
Humphrey	8	-	11	19	42.1	-	57.9	100
Total	15	-	29	44	34.1	-	65.9	100
Sheffield	3	-	9	12	25	-	75	100

Table III.6: Temper Type Results for sites within the Red Wing Region

	Frequency			*Percent*		
Site Name	*Shell*	*Shell and Grit*	*Total*	*Shell*	*Shell and Grit*	*Total*
Bartron	17	-	17	100	-	100
Adams	38	-	38	100	-	100
Burnside School	5	-	5	100	-	100
McClelland	8	-	8	100	-	100
Sell	1	-	1	100	-	100
Silvernale	11	1	12	91.7	8.3	100
Mero	10	-	10	100	-	100
Bryan	10	-	10	100	-	100
Energy Park	27	-	27	100	-	100
Total	127	1	128	99.22	0.78	100

Table III.7: Temper Type Results for sites within the Center Creek Locality and Sheffield

	Frequency			*Percent*		
Site Name	Shell	Shell and Grit	Total	Shell	Shell and Grit	Total
Vosburg	25	-	25	100	-	100
Humphrey	18	-	17	100	-	100
Total	44	-	44	100	-	100
Sheffield	12	-	12	100	-	100

Table III.8: Surface Treatment Results for the Lip, Rim, and Shoulder for sites within the Center Creek Locality and Sheffield

Lip	*Frequency*						*Percent*					
Site Name	*Sm*	*S.O*	*Bur*	*Bru*	*Ex*	*Total*	*Sm*	*S.O*	*Bur*	*Bru*	*Ex*	*Total*
Vosburg	24	-	1	-	-	25	96	-	4	-	-	100
Humphrey	19	-	-	-	-	19	100	-	0	-	-	100
Total	43	-	1	-	-	44	97.73	-	2.27	-	-	100
Sheffield	10	-	1	-	1	12	83.4	-	8.3	-	8.3	100
Rim												
Vosburg	25	-	-	-	-	25	100	-	-	-	-	100
Humphrey	19	-	-	-	-	19	100	-	-	-	-	100
Total	44	-	-	-		44	100	-	-	-	-	100
Sheffield	12	-	-	-	-	12	100	-	-	-	-	100
Shoulder												
Vosburg	25	-	-	-	-	25	100	-	-	-	-	100
Humphrey	19	-	-	-	-	19	100	-	-	-	-	100
Total	44	-	-	-	-	12	100	-	-	-	-	100
Sheffield	12	-	-	-	-	12	100	-	-	-	-	100

Table III.9: Surface Treatment Results for the Lip, Rim, and Shoulder for sites within the Red Wing Region

Lip	*Frequency*						*Percent*					
Site Name	*Sm*	*S. O*	*Bur*	*Bru*	*Ex*	*Total*	*Sm*	*S. O*	*Bur*	*Bru*	*Ex*	*Total*
Bartron	15	-	-	-	2	17	88.2	-	-	-	11.8	100
Adams	36	-	1	-	1	38	94.7	-	2.6	-	2.6	100
Burnside School	5	-	-	-	-	5	100	-	-	-	0	100
McClelland	8	-	-	-	-	8	100	-	-	-	0	100
Sell	-	-	-	-	1	1	-	-	-	-	100	100
Silvernale	11	-	-	-	1	12	91.7	-	-	-	8.3	100
Mero	10	-	-	-	-	10	100	-	-	-	0	100
Bryan	10	-	-	-	-	10	100	-	-	-	0	100
Energy Park	27	-	-	-	-	27	100	-	-	-	0	100
Total	122	-	1	-	5	128	95.31	-	0.78	-	3.91	100
Rim												
Bartron	16	-	-	-	1	17	94.1	-	-	-	5.9	100
Adams	36	1	1	-	-	38	94.7	2.6	2.6	-	-	100
Burnside School	5	-	-	-	-	5	100	-	-	-	-	100
McClelland	7	-	-	-	1	8	87.5	-	-	-	12.5	100
Sell	-	-	-	-	1	1	-	-	-	-	100	100
Silvernale	11	-	-	1	-	12	91.7	-	-	8.3	-	100
Mero	10	-	-	-	-	10	100	-	-	-	-	100
Bryan	10	-	-	-	-	10	100	-	-	-	-	100
Energy Park	24	1	1	-	1	27	88.9	3.7	3.7	-	3.7	100
Total	119	2	2	1	4	128	92.97	1.56	1.56	0.78	3.13	100
Shoulder												
Bartron	16	-	-	-	1	17	94.1	-	-	-	5.9	100
Adams	37	-	1	-	-	38	97.4	-	2.6	-	-	100
Burnside School	5	-	-	-	-	5	100	-	-	-	-	100
McClelland	6	-	-	-	2	8	75	-	-	-	25	100
Sell	-	-	-	-	1	1	-	-	-	-	100	100
Silvernale	12	-	-	-	-	12	100	-	-	-	-	100
Mero	10	-	-	-	-	10	100	-	-	-	-	100
Bryan	10	-	-	-	-	10	100	-	-	-	-	100
Energy Park	27	-	-	-	-	27	100	-	-	-	-	100
Total	123	-	1	-	4	128	96.09	-	0.78	-	3.13	100

Table III.10: Shoulder Line Orientation Results for Sites within the Red Wing Region.

	Site Name	B.	A.	B.S.	McC.	Sell	S.	M	Bry.	E.P.	Total
Frequency	*A*	3	12	2	3	1	4	5	-	17	47
	H	1	12	1	3	-	1	-	2	2	22
	O	7	11	1	1	-	3	2	5	6	36
	H/V	-	1	-	-	-	3	-	-	-	4
	H/O	1	-	1	-	-	-	-	-	-	2
	V/O	4	2	-	-	-	1	2	2	-	11
	H/V/O	1	-	-	1	-	-	1	1	-	4
	Ind.	-	-	-	-	-	-	-	-	2	2
	Total	17	38	5	8	1	12	10	10	27	128
Percent	*A*	24	32	40	38	100	33	60	10	63	36.7
	H	5.9	31.6	20	37.5	-	8.3	-	20	7.4	17.2
	O	41	29	20	13	-	25	20	50	22	28.1
	H/V	-	3	-	-	-	25	-	-	-	3.1
	H/O	5.9	-	20	-	-	-	-	-	-	1.6
	V/O	24	5.3	-	-	-	8.3	20	20	-	8.6
	H/V/O	5.9	-	-	13	-	-	10	10	-	3.1
	Ind.	-	-	-	-	-	-	-	-	7.4	1.6
	Total	100	100	100	100	100	100	100	100	100	100

Table III.11: Line Thickness Results (mm) on the Rim, Shoulder, and Handle for Sites within the Red Wing Region

Rim	*N*	*Min*	*Max*	*Mean*	*Sum*	*V*	*SD*
Bartron	1	1.50	1.50	1.50	1.50	-	-
Adams	2	1.80	7.70	4.75	9.50	4.17	17.41
Burnside School	3	2.30	5.50	3.80	11.40	1.61	2.59
McClelland	3	3.40	4.56	4.14	12.43	0.65	0.42
Bryan	3	3.50	5.10	4.20	12.60	0.82	0.67
Energy Park	2	2.75	3.25	3	6	0.35	0.13
Total	14	1.50	7.70	3.82	53.43	2.62	1.62
Shoulder							
Bartron	13	1.75	5	3.73	48.50	0.98	0.99
Adams	24	1.70	6.55	3.64	87.30	1.78	1.33
Burnside School	3	3.90	4.20	4.07	12.20	0.02	0.15
McClelland	5	1.97	4.26	3.57	17.84	1.01	1.00
Silvernale	8	2.76	6.51	4.67	37.32	1.49	1.22
Mero	4	3	6.70	4.45	17.80	2.50	1.58
Bryan	8	2	5	3.70	29.60	0.95	0.98
Energy Park	8	2.60	5	4.01	32.10	0.53	0.73
Total	73	1.70	6.70	3.87	282.66	1.31	1.14
Handle							
Burnside School	1	3	3	3	3		
Bryan	2	3.50	7	5.25	10.50	2.47	6.13
Energy Park	2	5.10	6.10	5.60	11.20	0.71	0.50
Total	5	3	7	4.94	24.70	1.69	2.86

Table III.12: Line Depth Results (mm) on the Rim, Shoulder, and Handle for Sites within the Red Wing Region

Rim	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Bartron	1	1.50	1.50	1.50	-	-	-
Adams	2	0.35	1.50	0.93	1.85	0.81	0.66
Burnside School	3	0.75	1.60	1.05	3.15	0.48	0.23
McClelland	3	0.80	1.35	1.16	3.48	0.31	0.10
Bryan	3	0.50	1.20	0.82	2.45	0.35	0.13
Energy Park	2	0.50	0.85	0.68	1.35	0.25	0.06
Total	14	0.35	1.60	0.98	13.78	0.42	0.18
Shoulder							
Bartron	12	0.10	2.00	0.60	1.20	0.60	1.79
Adams	25	0.30	2.15	0.50	1.04	0.54	1.54
Burnside School	3	1.30	1.90	0.31	1.63	1.33	1.94
McClelland	5	0.60	1.70	0.44	0.98	0.54	1.41
Silvernale	8	0.60	2.06	0.45	1.21	0.76	1.66
Mero	4	0.25	0.90	0.28	0.59	0.31	0.87
Bryan	8	0.25	1.80	0.50	0.98	0.47	1.48
Energy Park	10	0.30	1.90	0.58	1.09	0.51	1.67
Total	75	0.10	2.15	1.08	80.79	0.52	0.27
Handle							
Burnside School	1	0.80	0.80	0.80	0.80		
Bryan	2	1	2.00	1.50	3.00	0.71	0.50
Energy Park	2	1.40	2.20	1.80	3.60	0.57	0.32
Total	5	0.80	2.20	1.48	7.40	0.61	0.37

Table III.13: Shoulder Line Orientation Results for Sites within the Center Creek Locality and Sheffield

	Site Name	*Vosburg*	*Humphrey*	*Total*	*Sheffield*
	A	3	1	4	3
	H	3	-	3	4
	O	1	1	2	-
Frequency	H/V	7	6	13	2
	H/O	1	1	2	-
	V/O	2	5	7	1
	H/V/O	5	5	10	1
	Ind.	3	-	3	-
	Total	25	19	44	12
	A	12	5.3	9.1	25
	H	12	-	6.8	33.3
	O	4	5.3	4.6	8.3
Percent	H/V	28	31.6	29.5	16.7
	H/O	4	5.3	4.6	-
	V/O	8	31.5	15.9	8.3
	H/V/O	20	26.3	22.7	8.3
	Ind.	12	-	6.8	-
	Total	100	100	100	100

Table III.14: Line Thickness Results (mm) on the Rim, Shoulder, and Handle for Sites within the Center Creek Locality and Sheffield

Rim	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Vosburg	11	1.40	4.30	2.75	30.30	0.87	0.76
Humphrey	5	2.20	3.50	2.66	13.30	0.49	0.24
Total	16	1.40	4.30	2.73	43.60	0.76	0.58
Sheffield	2	2.25	5.60	3.93	7.85	2.37	5.61
Shoulder							
Vosburg	22	1	4.35	3.05	67.10	0.56	0.75
Humphrey	18	0.80	4.50	2.51	45.20	1.38	1.17
Total	40	0.80	4.50	2.81	112.30	0.99	0.98
Sheffield	9	2.25	5.60	3.43	30.90	0.94	0.97
Handle							
Vosburg	3	2.20	3.20	8.50	2.83	0.55	0.30
Humphrey	4	1.70	3	9.20	2.30	0.57	0.33
Total	7	1.70	3.20	2.53	17.70	0.59	0.35
Sheffield	1	2.20	2.20	2.20	2.20	-	-

Table III.15: Line Depth Results (mm) on the Rim, Shoulder, and Handle for Sites within the Center Creek Locality and Sheffield

Rim	*N*	*Min*	*Max*	*Mean*	*Sum*	*SD*	*V*
Vosburg	11	0.20	1.60	0.72	7.90	0.43	0.19
Humphrey	5	0.30	1	0.68	3.40	0.31	0.10
Total	16	0.20	1.60	0.71	11.30	0.39	0.15
Sheffield	2	0.25	1.10	0.68	1.35	0.60	0.36
Shoulder							
Vosburg	22	0.20	1.50	0.73	16	0.14	0.38
Humphrey	18	0.20	2	0.77	13.80	0.25	0.50
Total	40	0.20	2	0.75	29.80	0.43	0.19
Sheffield	9	0.20	2	0.84	7.55	0.29	0.54
Handle							
Vosburg	3	0.20	1	1.80	0.60	0.40	0.16
Humphrey	4	0.50	1.70	4.20	1.05	0.49	0.24
Total	7	0.20	1.70	0.86	6	0.48	0.23
Sheffield	1	0.30	0.30	0.30	0.30	-	-

Chapter Six T-test and ANOVA Results

Table III.16: T-test Results for Scale Data Attributes

Attributes	*P-value*			
	Multi-component vs. Pure Oneota	Bartron Phase vs. Spring Creek	Red Wing vs. Center Creek	Red Wing vs. Sheffield
Orifice Diameter	0.83	0.40	0.06	0.67
Percent Inclusion	0.00	0.01	0.00	0.56
Lip Thickness	0.61	0.86	0.00	0.73
Lip Decoration Thickness	0.53	0.44	0.33	0.28
Lip Decoration Depth	0.04	0.02	0.07	0.66
Rim Thickness	0.78	0.83	0.31	0.17
Rim Length	0.00	0.01	0.00	0.84
Rim Decoration Thickness	0.85	0.38	0.03	0.96
Rim Decoration Depth	0.10	0.34	0.07	0.60
Rim Angle	0.01	0.25	0.30	0.78
Neck Angle	0.44	0.80	0.00	0.89
Neck Diameter	0.99	0.46	0.12	0.84
Neck Thickness	0.97	0.06	0.85	0.01
Shoulder Angle	0.76	-	0.52	-
Shoulder Thickness	0.52	0.43	0.09	0.05
Punctate Thickness	0.09	0.62	0.04	0.79
Punctate Depth	0.20	0.75	0.09	0.05
Line Thickness	0.72	0.42	0.00	0.24
Line Depth	0.46	0.46	0.00	0.24
Handle Length	0.82	0.98	0.03	0.11
Handle Width	0.21	0.87	0.29	0.21
Handle Thickness	0.38	0.98	0.01	0.00

Table III.17: ANOVA Results for Orifice Diameter for sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Sites	622.09	7	88.87	1.74	0.11	2.10
Within Sites	5269.28	103	51.16			
Total	5891.37	110				

Table III.18: ANOVA Results for Orifice Diameter the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	203.83	2	101.91	1.86	0.16	3.78
Within Groups	8148.88	149	54.69			
Total	8352.70	151				

Table III.19: ANOVA Results for Lip Thickness for sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	14.86	8	1.86	1.64	0.12	2.31
Within Groups	128.11	113	1.13			
Total	142.96	121				

Table III.20: ANOVA Results for Lip Thickness from the Red Wing Region, Center Creek Locality, and Sheffield Site

Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	10.16	2	5.08	4.74	0.01	3.77
Within Groups	180	168	1.07			
Total	190.16	170				

Table III.21: ANOVA Results for Rim Thickness for sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	27.92	8	3.49	1.49	0.17	2.30
Within Groups	279.17	119	2.35			
Total	307.09	127				

<u>Table III.22:</u> ANOVA Results for Rim Length for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	2521.59	8	315.20	3.08	0.00	2.30
Within Groups	11783.17	115	102.46			
Total	14304.76	123				

<u>Table III.23:</u> ANOVA Results for Rim Angle for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	2065.32	8	258.16	3.06	0.00	2.30
Within Groups	9885.96	117	84.50			
Total	11951.28	125				

<u>Table III.24:</u> Rim Thickness Results from the Red Wing Region, Center Creek Locality, and Sheffield site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	5.53	2	2.77	1.28	0.28	3.77
Within Groups	376.90	175	2.15			
Total	382.44	177				

<u>Table III.25:</u> ANOVA Results for Rim Length for the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	995.92	2	497.96	4.83	0.01	3.77
Within Groups	17645.31	171	103.19			
Total	18641.23	173				

Table III.26: ANOVA Results for Rim Angle for the Red Wing Region, Center Creek Locality, and Sheffield site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	88.24	2	44.12	0.49	0.61	3.77
Within Groups	15295.40	171	89.45			
Total	15383.63	173				

Table III.27: ANOVA Results for Neck Thickness for sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	53.97	8	6.75	1.25	0.28	2.30
Within Groups	641.97	119	5.39			
Total	695.94	127				

Table III.28: ANOVA Results for Neck Diameter for sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	374.71	7	53.53	1.09	0.38	2.42
Within Groups	4972.56	101	49.23			
Total	5347.27	108				

Table III.29: ANOVA Results for Neck Angle for sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	3254.47	8	406.81	3.47	0.00	2.30
Within Groups	13605.73	116	117.29			
Total	16860.20	124				

Table III.30: ANOVA Results for Neck Thickness for the Red Wing Region, Center Creek Locality, and Sheffield site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	3.27	2	1.64	0.34	0.71	3.77
Within Groups	835.23	174	4.80			
Total	838.51	176				

Table III.31: ANOVA Results for Neck Diameter for the Red Wing Region, Center Creek Locality, and Sheffield site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	147.89	2	73.94	1.47	0.23	3.06
Within Groups	7665.37	152	50.43			
Total	7813.26	154				

Table III.32: ANOVA Results for Neck Angle for the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	SS	DF	MS	F	P-value	F Crit
Between Groups	1352.37	2	676.18	5.43	0.01	3.77
Within Groups	21189.15	170	124.64			
Total	22541.52	172				

Table III.33: ANOVA Results for Shoulder Thickness for site within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	14.42	8	1.80	0.82	0.59	2.30
Within Groups	256.58	117	2.19			
Total	271.00	125				

<u>Table III.34:</u> ANOVA Results for Shoulder Thickness for the Red Wing Region, Center Creek Locality, and Sheffield site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	10.42	2	5.21	2.28	0.11	3.77
Within Groups	395.62	173	2.29			
Total	406.04	175				

<u>Table III.35:</u> ANOVA Results for Handle Length for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	513.97	7	73.42	1.44	0.28	2.91
Within Groups	612.76	12	51.06			
Total	1126.72	19				

<u>Table III.36:</u> ANOVA Results for Shoulder Angle for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	381.11	3	127.04	3.18	0.09	4.35
Within Groups	279.3	7	39.9			
Total	660.41	10				

<u>Table III.37:</u> ANOVA Results for Shoulder Thickness for site within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	14.42	8	1.80	0.82	0.59	2.30
Within Groups	256.58	117	2.19			
Total	271.00	125				

Table III.38: ANOVA Results for Shoulder Angle for the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	19.01	2	9.50	0.11	0.89	3.89
Within Groups	994.23	12	82.85			
Total	1013.23	14				

Table III.39: ANOVA Results for Shoulder Thickness for the Red Wing Region, Center Creek Locality, and Sheffield site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	10.42	2	5.21	2.28	0.11	3.77
Within Groups	395.62	173	2.29			
Total	406.04	175				

Table III.40: ANOVA Results for Handle Length for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	513.97	7	73.42	1.44	0.28	2.91
Within Groups	612.76	12	51.06			
Total	1126.72	19				

Table III.41: ANOVA Results for Handle Width for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	642.93	7	91.85	1.91	0.16	3.01
Within Groups	529.83	11	48.17			
Total	1172.76	18				

Table III.42: ANOVA Results for Handle Thickness for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	83.27	7	11.90	0.43	0.87	2.91
Within Groups	334.56	12	27.88			
Total	417.83	19				

Table III.43: ANOVA Results for Handle Width for the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	243.07	2	121.54	1.19	0.32	3.32
Within Groups	3060.53	30	102.02			
Total	3303.6	32				

Table III.44: ANOVA Results for Handle Length for the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	817.70	2	408.85	5.26	0.01	3.33
Within Groups	2255.06	29	77.76			
Total	3072.76	31				

Table III.45: ANOVA Results for Handle Thickness for the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	148.32	2	74.16	4.44	0.02	3.33
Within Groups	484.79	29	16.72			
Total	633.10	31				

<u>Table III.46:</u> ANOVA Results for Lip Notch Thickness for sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	3.72	6	0.62	0.60	0.73	2.85
Within Groups	14.52	14	1.037			
Total	18.25	20				

<u>Table III.47:</u> ANOVA Results for Percent Inclusion for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	1209.69	8	151.21	11.88	0.00	2.30
Within Groups	1463.49	115	12.73			
Total	2673.19	123				

<u>Table III.48:</u> ANOVA Results for Percent Inclusion for the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	224.35	2	112.17	5.57	0.00	3.77
Within Groups	3445.91	171	20.15			
Total	3670.26	173				

<u>Table III.49:</u> ANOVA Results for Lip Notch Depth for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	2.034	6	0.34	1.81	0.17	2.85
Within Groups	2.63	14	0.19			
Total	4.67	20				

Table III.50: ANOVA Results for Lip Notch Thickness for the Red Wing Region, Center Creek Locality, and Sheffield site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	6.89	2	3.44	1.81	0.17	3.16
Within Groups	108.64	57	911.			
Total	115.53	59				

Table III.51: ANOVA Results for Lip Notch Depth for the Red Wing Region, Center Creek Locality, and Sheffield site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	0.67	2	0.33	1.94	0.15	3.16
Within Groups	9.77	57	0.17			
Total	10.43	59				

Table III.52: ANOVA Results for Rim Decoration Line Thickness for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	0.65	5	0.13	0.64	0.67	3.69
Within Groups	1.62	8	0.20			
Total	2.28	13				

Table III.53: ANOVA Results for Shoulder Decoration Line Thickness for sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	8.92	7	1.27	0.97	0.46	2.49
Within Groups	85.06	65	1.31			
Total	93.97	72				

Table III.54: ANOVA Results for Handle Decoration Line Thickness for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	4.83	2	2.41	0.73	0.58	19
Within Groups	6.63	2	3.31			
Total	11.45	4				

Table III.55: ANOVA Results for Rim Decoration Line Depth for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	0.65	5	0.13	0.64	0.67	3.69
Within Groups	1.62	8	0.20			
Total	2.28	13				

Table III.56: ANOVA Results for Shoulder Decoration Line Depth from Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	8.92	7	1.27	0.97	0.46	2.49
Within Groups	85.06	65	1.31			
Total	93.97	72				

Table III.57: ANOVA Results for Handle Decoration Line Depth for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	0.67	2	0.33	0.81	0.55	19
Within Groups	0.82	2	0.41			
Total	1.49	4				

Table III.58: ANOVA Results for Rim Decoration Line Thickness for the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	13.35	2	6.68	4.31	0.02	3.37
Within Groups	40.30	26	1.55			
Total	53.66	28				

Table III.59: ANOVA Results for Rim Decoration Depth for the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	0.65	5	0.13	0.64	0.67	3.69
Within Groups	1.62	8	0.20			
Total	2.28	13				

Table III.60: ANOVA Results for Shoulder Decoration Line Thickness for the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	31.58	2	15.79	13.58	0.00	3.81
Within Groups	132.50	114	1.16			
Total	164.08	116				

Table III.61: ANOVA Results for Shoulder Decoration Line Depth for the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	3.25	2.00	1.63	6.88	0.00	3.81
Within Groups	27.42	116.00	0.24			
Total	30.67	118.00				

Table III.62: ANOVA Results for Punctate Thickness for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	12.86	5	2.57	1.73	0.26	4.39
Within Groups	8.94	6	1.49			
Total	21.80	11				

Table III.63: ANOVA Results for Punctate Depth for Sites within the Red Wing Region

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	0.85	5	0.17	0.30	0.89	5.05
Within Groups	2.80	5	0.56			
Total	3.64	10				

Table III.64: ANOVA Results for Punctate Thickness for Sites within the Red Wing Region, Center Creek Locality, and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	17.37	2	8.68	3.84	0.03	3.22
Within Groups	94.96	42	2.26			
Total	112.33	44				

Table III.65: ANOVA Results for Punctate Depth for Sites within the Red Wing Region, Center Creek Locality and Sheffield Site

ANOVA						
Source of Variation	*SS*	*DF*	*MS*	*F*	*P-value*	*F Crit*
Between Groups	6.40	2	3.20	3.75	0.03	3.20
Within Groups	39.28	46	0.85			
Total	45.68	48				

Chapter Seven Tables

Pearson's Correlation Coefficient Results

Table III.66: Pearson's Correlation Coefficient Results for Scale Attributes Recorded on Vessels from the Red Wing Region (1 of 3) (*p-values below 0.05)

Attributes	*Orifice Diameter*	*Lip Thickness*	*Lip Dec. Thickness*	*Lip Dec. Depth*	*Rim Thickness*	*Rim Length*	*Rim Dec. Thickness*
Orifice Diameter	1	0.40*	0.39	-0.07	0.60*	0.76*	0.20
Lip Thickness	0.40*	1	0.61*	0.28	0.43*	0.25*	0.54
Lip Dec. Thickness	0.40	0.61*	1	0.42	0.38	0.20	0.16
Lip Dec. Depth	-0.07	0.28	0.42	1	-0.06	-0.21	0.81
Rim Thickness	0.6*	0.43*	0.38	-0.06	1	0.53*	0.29
Rim Length	0.76*	0.25*	0.20	-0.21	0.53*	1	0.39
Rim Decoration Thickness	0.20	0.54	0.16	0.81	0.29	0.39	1
Rim Dec. Depth	0.60	0.56	0.38	0.18	0.49	0.53	0.56*
Rim Angle	0.16	0.04	-0.22	0.05	0.04	0.17	0.40
Neck Angle	-0.16	-0.07	-0.06	-0.04	-0.07	-0.28*	-0.10
Neck Thickness	0.51*	0.26*	0.20	-0.15	0.63*	0.46*	0.06
Neck Diameter	0.95*	0.39*	0.43	0.01	0.56*	0.68*	0.71*
Shoulder Angle	-0.13	0.20	-	-	0.19	0.31	-
Shoulder Thickness	0.42*	0.32*	0.47*	0.20	0.51*	0.30*	0.12
Punctate Thickness	0.31	0.06	0.75	0.56	0.12	0.36	-
Punctate Depth	0.75*	-0.07	0.43	0.19	0.60*	0.74*	-
Line Thickness	-0.03	0.29*	0.33	0.42	0.11	-0.21	0.72*
Line Depth	0.12	0.14	0.13	-0.15	0.13	0.13	0.12
Handle Length	0.73*	0.21	-0.04	0.11	0.72*	0.71*	0.59
Handle Width	0.60*	0.38	0.28	0.26	0.49*	0.57*	0.27
Handle Thickness	0.30	0.40	-0.30	-0.28	0.31	0.38	-0.69
Handle Dec. Thickness	-0.81	0.52	0.41	0.94	0.62	-0.21	1*
Handle Decoration Depth	-0.54	0.65	0.70	1*	0.81	-0.43	1*

Table III.67: Pearson's Correlation Coefficient Results for Scale Attributes Recorded on Vessels from the Red Wing Region (2 of 3) (*p-values below 0.05)

Attributes (CONT)	*Rim Dec. Depth*	*Rim Angle*	*Neck Angle*	*Neck Thickness*	*Neck Diameter*	*Shoulder Angle*	*Shoulder Thickness*	*Punctate Thickness*
Orifice Diameter	0.60	0.16	-0.16	0.51*	0.95*	-0.13	0.42*	0.31
Lip Thickness	0.56	0.04	-0.09	0.26*	0.39*	0.20	0.31*	0.06
Lip Dec. Thickness	0.38	-0.22	-0.06	0.20	0.43	-	0.47*	0.75
Lip Dec. Depth	0.18	0.05	-0.04	-0.15	0.01	-	0.20	0.56
Rim Thickness	0.49	0.04	-0.07	0.63*	0.56*	0.19	0.51*	0.12
Rim Length	0.53	0.17	-0.28*	0.46*	0.68*	0.31	0.29*	0.36
Rim Dec. Thickness	0.56*	0.40	-0.10	0.06	0.71*	-	-0.12	-
Rim Dec. Depth	1	-0.11	-0.32	0.30	0.19	-	0.25	-
Rim Angle	-0.11	1	0.43	-0.02	0.30*	-0.25	0.03	-0.07
Neck Angle	-0.32	0.43*	1	-0.24*	-0.03	0.67*	-0.12	0.23
Neck Thickness	0.30	-0.02	-0.24*	1	0.45*	-0.26	0.69*	0.18
Neck Diameter	0.19	0.30*	-0.03	0.45*	1	-0.51	0.37*	-0.09
Shoulder Angle	-	-0.25	0.67*	-0.26	-0.18	1	0.25	0.33
Shoulder Thickness	0.25	0.03	-0.12	0.69*	0.37*	0.25	1	-0.10
Punctate Thickness	-	-0.07	0.23	0.18	0.33	-0.26	-0.10	1
Punctate Depth	-	0.45	-0.40	0.76*	0.69*	-0.19	0.42	0.45
Line Thickness	0.12	-0.02	0.23	-0.02	0.05	0.08	-0.13	0.89*
Line Depth	0.49	-0.16	-0.14	0.29*	0.06	0.38	0.21	0.11
Handle Length	0.92*	0.18	-0.21	0.62	0.55*	-	0.50*	-0.99
Handle Width	-0.04	0.32	0.04	0.23	0.60*	-	0.48*	-0.85
Handle Thickness	-0.65	0.17	0.11	0.34	0.26	-	0.23	-0.49
Handle Decoration Thickness	1*	-0.87	-0.73	-0.33	-0.76	-	0.23	-
Handle Decoration Depth	1*	-0.74	-0.71	-0.19	-0.44	-	0.51	-

Table III.68: Pearson's Correlation Coefficient Results for Scale Attributes Recorded on Vessels from the Red Wing Region (3 of 3) (*p-values below 0.05)

Attributes (CONT)	*Punctate Depth*	*Line Thickness*	*Line Depth*	*Handle Length*	*Handle Width*	*Handle Thickness*	*Handle Dec. Thickness*	*Handle Dec. Depth*
Orifice Diameter	0.75*	-0.03	0.12	0.73*	0.60*	0.30	-0.81	-0.54
Lip Thickness	-0.07	0.29*	0.14	0.21	0.38	0.40	0.52	0.65
Lip Dec. Thickness	0.43	0.33	0.13	-0.04	0.28	-0.30	0.41	0.70
Lip Dec. Depth	0.19	0.42	-0.15	0.11	0.26	-0.28	0.94	1.00
Rim Thickness	0.60*	0.11	0.13	0.72*	0.49*	0.31	0.62	0.81
Rim Length	0.74*	-0.21	0.13	0.71*	0.57*	0.38	-0.21	-0.43
Rim Dec. Thickness	-	0.72*	0.12	0.59	0.27	-0.69	1*	1*
Rim Dec. Depth	-	0.12	0.49	0.92*	-0.04	-0.65	1*	1*
Rim Angle	0.45	-0.02	-0.16	0.18	0.32	0.17	-0.87	-0.74
Neck Angle	-0.40	0.23	-0.14	-0.21	0.04	0.11	-0.73	-0.71
Neck Thickness	0.75*	-0.02	0.29*	0.51*	0.23	0.34	-0.33	-0.19
Neck Diameter	0.69*	0.05	0.06	0.55*	0.60*	0.26	-0.76	-0.44
Shoulder Angle	-0.19	0.08	0.38	-	-	-	-	-
Shoulder Thickness	0.42	-0.13	0.21	0.50*	0.48*	0.23	0.23	0.51
Punctate Thickness	0.45	0.89*	0.11	-0.99	-0.85	-0.49	-	-
Punctate Depth	1	0.45	0.42	0.99	0.96	0.72	-	-
Line Thickness	0.45	1	0.35*	0.48	0.31	0.19	0.42	0.36
Line Depth	0.42	0.35*	1	0.21	0.06	0.22	0.40	0.04
Handle Length	0.99	0.48	0.20	1	0.59*	0.52*	0.04	-0.05
Handle Width	0.96	0.48	0.06	0.59*	1	0.36	-0.75	-0.50
Handle Thickness	0.72	0.19	0.22	0.52*	0.36	1	-0.30	-0.14
Handle Dec. Thickness	-	0.42	0.40	0.04	-0.74	-0.30	1	0.94*
Handle Dec. Depth	-	0.36	0.04	-0.05	-0.50	-0.14	0.94*	1

Table III.69: Pearson's Correlation Coefficient Results for Scale Attributes Recorded on Vessels from the Center Creek Locality (1 of 3) (*p-values below 0.05)

Attributes	*Orifice Diameter*	*Lip Thickness*	*Lip Dec. Thickness*	*Lip Dec. Depth*	*Rim Thickness*	*Rim Length*	*Rim Dec. Thickness*
Orifice Diameter	1	0.36*	0.43*	0.26	0.59*	0.87*	0.18
Lip Thickness	0.36*	1	0.50*	-0.03	0.52*	0.44*	0.39
Lip Dec. Thickness	0.43*	0.50*	1	0.18	0.39*	0.61*	-0.09
Lip Dec. Depth	0.26	-0.03	0.18	1	0.21	0.24	0.28
Rim Thickness	0.59*	0.52*	0.39*	0.21	1	0.64*	0.22
Rim Length	0.87*	0.44*	0.61*	0.24	0.64*	1	0.28
Rim Dec. Thickness	0.18	0.39	-0.09	0.28	0.22	0.28	1
Rim Dec. Depth	-0.07	0.28	0.12	0.07	.576*	-0.04	0.50*
Rim Angle	0.01	0.29	-0.09	-0.07	0.05	-0.02	0.20
Neck Angle	0.14	0.17	-0.06	-0.45*	0.10	0.00	0.40
Neck Thickness	0.73*	0.34*	0.33	0.36*	0.74*	0.67*	0.32
Neck Diameter	0.96*	0.34*	0.40	0.12	0.62*	0.83*	0.19
Shoulder Angle	1*	1*	-	-	1*	1*	-
Shoulder Thickness	0.46*	0.35*	0.22	0.33	0.50*	0.37*	-0.09
Punctate Thickness	0.42*	0.09	0.31	-0.08	0.23	0.28	0.22
Punctate Depth	0.23	0.08	-0.20	0.06	-0.03	0.09	0.14
Line Thickness	0.47*	0.28	0.46*	-0.31	0.14	0.43*	0.38
Line Depth	0.49*	0.10	0.43*	-0.02	0.13	0.39*	0.18
Handle Length	0.66	-0.09	-0.48	-0.23	0.27	0.62*	0.41
Handle Width	0.83*	0.09	-0.64	-0.30	0.11	0.67*	0.28
Handle Thickness	-0.10	-0.08	0.10	0.12	0.04	0.29	0.10
Handle Dec. Thickness	0.32	0.23	0.79	-0.44	0.41	0.32	-
Handle Dec. Depth	0.24	-0.03	-0.66	0.33	-0.74	-0.26	-

Table III.70: Pearson's Correlation Coefficient Results for Scale Attributes Recorded on Vessels from the Center Creek Locality (2 of 3) (*p-values below 0.05)

Attributes (CONT)	*Rim Dec. Depth*	*Rim Angle*	*Neck Angle*	*Neck Thickness*	*Neck Diameter*	*Shoulder Angle*	*Shoulder Thickness*	*Punctate Thickness*
Orifice Diameter	-0.07	0.01	0.14	0.73*	0.96*	1*	0.46*	0.42*
Lip Thickness	0.28	0.29	0.17	0.34*	0.34*	1*	0.35*	0.09
Lip Dec. Thickness	0.12	-0.09	-0.06	0.33	0.40	-	0.22	0.31
Lip Dec. Depth	0.07	-0.07	-0.45*	.361*	0.12	-	0.33	-0.08
Rim Thickness	0.58*	0.05	0.10	0.74*	0.62*	1*	0.50*	0.23
Rim Length	-0.04	-0.02	0.00	0.66*	0.83*	1*	0.37*	0.28
Rim Dec. Thickness	0.50*	0.20	0.40	0.32	0.19	-	-0.09	0.22
Rim Dec. Depth	1	0.41	0.24	0.27	-0.02	-	-0.05	0.14
Rim Angle	0.41	1	0.41*	-0.13	0.07	-	-0.08	-0.12
Neck Angle	0.24	0.41*	1	-0.12	0.19	-1*	-0.14	0.20
Neck Thickness	0.27	-0.13	-0.12	1	0.71*	1*	0.58*	0.32
Neck Diameter	-0.02	0.07	0.19	0.71*	1	1*	0.46*	0.36
Shoulder Angle	-	-	-1*	1*	1*	1	1*	-1*
Shoulder Thickness	-0.05	-0.08	-0.14	0.58*	0.46*	1*	1	0.06
Punctate Thickness	0.14	-0.12	0.20	0.32	0.36	-1*	0.06	1
Punctate Depth	-0.03	-0.17	-0.18	0.22	0.13	1*	-0.02	0.36*
Line Thickness	0.08	-0.08	0.28	0.16	0.45*	1*	-0.02	0.71*
Line Depth	0.13	0.03	0.26	0.24	0.47*	1*	-0.09	0.53*
Handle Length	-0.99*	0.43	0.40	0.75*	0.7*	-	0.51	0.45
Handle Width	-0.28	0.70*	0.33	0.29	0.85*	-	-0.09	-0.06
Handle Thickness	-0.84	-0.18	0.06	0.57	-0.11	-	0.87*	0.62
Handle Dec. Thickness	-	-0.12	0.69	0.27	0.09	-	0.73	0.76
Handle Dec. Depth	-	0.27	-0.70	-0.10	0.18	-	-0.77*	-0.73

Table III.71: Pearson's Correlation Coefficient Results for Scale Attributes Recorded on Vessels from the Center Creek Locality (3 of 3) (*p-values below 0.05)

Attributes (CONT)	*Punctate Depth*	*Line Thickness*	*Line Depth*	*Handle Length*	*Handle Width*	*Handle Thickness*	*Handle Dec. Thickness*	*Handle Dec. Depth*
Orifice Diameter	0.23	0.47*	0.49*	0.66	0.83*	-0.10	0.32	0.24
Lip Thickness	0.08	0.28	0.10	-0.09	0.09	-0.08	0.23	-0.03
Lip Dec. Thickness	-0.20	0.46*	0.43*	-0.48	-0.64	0.10	0.79	-0.66
Lip Dec. Depth	0.06	-0.31	-0.02	-0.23	-0.30	0.12	-0.44	0.33
Rim Thickness	-0.03	0.14	0.13	0.27	0.11	0.04	0.41	-0.74
Rim Length	0.09	0.43*	0.39*	.617*	0.67*	0.29	0.32	-0.26
Rim Dec. Thickness	0.14	0.38	0.18	0.41	0.28	0.10	-1*	-
Rim Dec. Depth	-0.03	0.08	0.13	-0.99*	-0.28	-0.84	1*	-
Rim Angle	-0.17	-0.08	0.03	0.43	0.70*	-0.18	-0.12	0.27
Neck Angle	-0.18	0.28	0.26	0.40	0.33	0.06	0.69	-0.70
Neck Thickness	0.22	0.16	0.24	0.75*	0.29	0.57	0.27	-0.10
Neck Diameter	0.13	0.45*	0.47*	0.70*	0.85*	-0.11	0.09	0.18
Shoulder Angle	1*	1*	1*	-	-	-	-	-
Shoulder Thickness	-0.02	-0.02	-0.09	0.51	-0.09	0.87*	0.73	-0.77*
Punctate Thickness	0.36*	0.71*	0.53*	0.45	-0.06	0.62	0.76	-0.73
Punctate Depth	1	0.29	0.35	0.48	0.16	0.27	0.74	-0.73
Line Thickness	0.29	1	0.62*	0.34	0.10	0.43	0.65	-0.57
Line Depth	0.35	0.62*	1	0.18	0.32	-0.06	0.73	-0.64
Handle Length	0.48	0.34	0.18	1	0.64*	0.54	0.03	0.04
Handle Width	0.16	0.10	0.32	0.64*	1	-0.21	-0.33	0.42
Handle Thickness	0.27	0.43	-0.06	0.54	-0.21	1	0.60	-0.66
Handle Dec. Thickness	0.74	0.65	0.73	0.03	-0.33	0.60	1	-0.64
Handle Dec. Depth	-0.73	-0.57	-0.64	0.04	0.42	-0.66	-0.64	1

Table III.72: Pearson's Correlation Coefficient Results for Scale Attributes Recorded on Vessels from the Sheffield Site (1 of 3) (*p-values below 0.05)

Attributes	*Orifice Diameter*	*Lip Thickness*	*Lip Dec. Thickness*	*Lip Dec. Depth*	*Rim Thickness*	*Rim Length*	*Rim Dec. Thickness*
Orifice Diameter	1	0.84*	0.36	-0.22	0.85*	0.65	-
Lip Thickness	0.84*	1	0.52	-0.11	0.63*	0.35	-
Lip Dec. Thickness	0.36	0.52	1	0.02	0.23	-0.10	-
Lip Dec. Depth	-0.22	-0.11	0.02	1	-0.43	-0.24	-
Rim Thickness	0.85*	0.63*	0.23	-0.43	1	0.64*	-
Rim Length	0.65	0.35	-0.10	-0.24	0.64*	1	-
Rim Decoration Thickness	-	-	-	-	-	-	-
Rim Dec. Depth	-	-	-	-	-	-	-
Rim Angle	-0.07	-0.43	-0.29	0.19	-0.12	-0.01	-
Neck Angle	0.17	0.08	-0.38	0.22	0.17	0.23	-
Neck Thickness	0.30	-0.03	0.26	-0.07*	0.12	0.15	-
Neck Diameter	0.91*	0.79*	0.20	-0.27	0.08*	0.46	-
Shoulder Angle	-	-	-	-	-	-	-
Shoulder Thickness	0.07	-0.04	-0.40	-0.12	0.07	0.31	-
Punctate Thickness	-	-	-	-	-	-	-
Punctate Depth	-	-	-	-	-	-	-
Line Thickness	0.02	0.00	0.09	-0.41	0.34	0.54	-
Line Depth	-0.30	0.11	0.57	0.03	-0.38	-0.40	-
Handle Length	1*	0.31	0.02	-0.10	-0.19	0.67	-
Handle Width	1*	0.67	0.55	0.51	0.05	0.91	-
Handle Thickness	-1*	-0.69	-0.88	-0.97*	-0.34	-0.61	-
Handle Dec. Thickness	-	-	-	-	-	-	-
Handle Decoration Depth	-	-	-	-	-	-	-

Table III.73: Pearson's Correlation Coefficient Results for Scale Attributes Recorded on Vessels from the Sheffield Site (2 of 3) (*p-values below 0.05)

Attributes (CONT)	*Rim Dec. Depth*	*Rim Angle*	*Neck Angle*	*Neck Thickness*	*Neck Diameter*	*Shoulder Angle*	*Shoulder Thickness*	*Punctate Thickness*
Orifice Diameter	-	-0.07	0.17	0.30	0.91*	-	0.07	-
Lip Thickness	-	-0.43	0.08	-0.03	0.79*	-	-0.04	-
Lip Dec. Thickness	-	-0.29	-0.38	0.26	0.20	-	-0.40	-
Lip Dec. Depth	-	0.19	0.22	-0.69*	-0.27	-	-0.12	-
Rim Thickness	-	-0.12	0.17	0.12	0.82*	-	0.07	-
Rim Length	-	-0.01	0.23	0.15	0.46	-	0.31	-
Rim Dec. Thickness	-	-	-	-	-	-	-	-
Rim Dec. Depth	-	-	-	-	-	-	-	-
Rim Angle	-	1	0.38	0.01	-0.04	-	0.42	-
Neck Angle	-	0.38	1	-0.53	0.31	-	0.70*	-
Neck Thickness	-	0.01	-0.53	1	0.20	-	-0.29	-
Neck Diameter	-	-0.04	0.31	0.20	1	-	0.02	-
Shoulder Angle	-					-		-
Shoulder Thickness	-	0.42	0.70*	-0.29	0.02	-	1	-
Punctate Thickness	-	-	-	-	-	-	-	-
Punctate Depth	-	-	-	-	-	-	-	-
Line Thickness	-	-0.36	-0.11	0.00	-0.25	-	0.36	-
Line Depth	-	-0.49	-0.21	-0.03	-0.43	-	0.06	-
Handle Length	-	0.78	0.62	0.15	1*	-	0.96*	-
Handle Width	-	0.25	0.91	-0.38	1*	-	0.58	-
Handle Thickness	-	0.63	-0.67	0.82	-1*	-	0.32	-
Handle Decoration Thickness	-	-	-	-	-	-	-	-
Handle Decoration Depth	-	-	-	-	-	-	-	-

Table III.74: Pearson's Correlation Coefficient Results for Scale Attributes Recorded on Vessels from the Sheffield Site (3 of 3) (*p-values below 0.05)

Attributes (CONT)	*Punctate Depth*	*Line Thickness*	*Line Depth*	*Handle Length*	*Handle Width*	*Handle Thickness*	*Handle Dec. Thickness*	*Handle Dec. Depth*
Orifice Diameter	-	0.02	-0.30	1*	1*	-1*	-	-
Lip Thickness	-	0.00	0.11	0.31	0.67	-0.69	-	-
Lip Dec. Thickness	-	0.09	0.57	0.02	0.55	-0.88	-	-
Lip Dec. Depth	-	-0.41	0.03	-0.10	0.51	-0.97*	-	-
Rim Thickness	-	0.34	-0.38	-0.19	0.05	-0.34	-	-
Rim Length	-	0.54	-0.40	0.67	0.91	-0.61	-	-
Rim Dec. Thickness	-	-	-	-	-	-	-	-
Rim Dec. Depth	-	-	-	-	-	-	-	-
Rim Angle	-	-0.36	-0.49	0.78	0.25	0.63	-	-
Neck Angle	-	-0.11	-0.21	0.62	0.91	-0.67	-	-
Neck Thickness	-	0.00	-0.03	0.15	-0.38	0.82	-	-
Neck Diameter	-	-0.25	-0.43	1*	1*	-1*	-	-
Shoulder Angle	-						-	-
Shoulder Thickness	-	0.36	0.06	0.96*	0.58	0.32	-	-
Punctate Thickness	-	-	-	-	-	-	-	-
Punctate Depth	-	-	-	-	-	-	-	-
Line Thickness	-	1	0.30	-0.41	0.38	-0.99	-	-
Line Depth	-	0.30	1	-0.84	-0.18	-0.77	-	-
Handle Length	-	-0.41	-0.84	1	0.79	0.03	-	-
Handle Width	-	0.38	-0.18	0.79	1	-0.59	-	-
Handle Thickness	-	-0.99	-0.77	0.03	-0.59	1	-	-
Handle Dec. Thickness	-	-	-	-	-	-	-	-
Handle Dec. Depth	-	-	-	-	-	-	-	-

Chi-Square Results for Numerical Taxonomy

Table III.75: Chi-square Test Results for Nominal Data on Vessels from the Red Wing Region (1 of 2)

Attributes	*Orifice Shape*	*Grain Size*	*Orifice Diameter*	*Lip Form*	*Lip Dec.*	*Rim Form*	*Rim Attach. Method*	*Rim Dec.*	*Interior Neck Shape*	*Exterior Neck Shape*
Orifice Shape	-	0.92	1.00	0.00	0.00	0.83	0.15	0.02	0.84	0.03
Gran Size	0.92	-	0.08	0.88	0.91	0.97	0.62	0.93	0.05	0.00
Orifice Diameter	1.00	0.08	-	0.72	0.84	0.80	0.03	0.88	0.01	0.67
Lip Form	0.62	0.88	0.72	-	0.67	0.89	0.57	0.29	0.24	0.00
Lip Dec.	0.00	0.91	0.84	0.67	-	0.67	0.77	0.13	0.46	0.47
Rim Form	0.83	0.97	0.80	0.89	0.67	-	0.85	0.01	0.01	0.03
Rim Attach. Method	0.15	0.61	0.03	0.57	0.77	0.85	-	0.96	0.06	0.00
Rim Dec.	0.02	0.93	0.88	0.29	0.13	0.01	0.96	-	0.56	0.59
Interior Neck Shape	0.84	0.05	0.01	0.24	0.46	0.01	0.06	0.56	-	0.02
Exterior Neck Shape	0.03	0.00	0.67	0.00	0.47	0.03	0.00	0.59	0.02	-
Punctate Form	0.99	0.92	0.01	0.13	0.94	0.00	1.00	0.34	0.47	0.96
Punctate Orientation	0.99	0.56	0.00	0.00	1.00	0.00	0.97	0.03	0.34	1.00
Line Form	0.95	0.97	0.72	0.99	0.38	0.28	0.49	0.71	0.20	0.33
Intaglio	0.89	0.92	0.48	0.39	0.28	0.94	0.08	0.47	0.20	0.81
Handle Form	0.89	0.95	0.01	0.71	0.20	0.83	0.91	0.07	0.37	0.04
Handle Attach. Location	0.78	0.92	0.03	0.31	0.45	0.94	0.96	0.22	0.18	0.16
Handle Dec.	1.00	0.20	0.90	1.00	0.08	1.00	0.86	0.00	0.42	3.15
Smudging	0.90	0.14	0.10	0.70	0.84	0.12	0.71	0.70	0.81	0.19
Burning	0.10	0.83	0.99	0.06	1.00	0.52	0.56	1.00	0.16	0.88

Table III.76: Chi-square Test Results for Nominal Data on Vessels from the Red Wing Region (2 of 2)

Attributes (CONT)	*Punctate Form*	*Punctate Orientation*	*Line Form*	*Intaglio*	*Handle Form*	*Handle Attach. Location*	*Handle Dec.*	*Smudging*	*Burning*
Orifice Shape	0.99	0.99	0.95	0.89	0.89	0.78	1.00	0.90	0.10
Gran Size	0.92	0.56	0.97	0.92	0.95	0.92	0.20	0.14	0.83
Orifice Diameter	0.01	0.00	0.72	0.48	0.01	0.03	0.90	0.10	0.99
Lip Form	0.13	0.00	0.99	0.39	0.71	0.30	1.00	0.70	0.06
Lip Dec.	0.94	1.00	0.38	0.28	0.20	0.45	0.08	0.84	1.00
Rim Form	0.00	0.00	0.28	0.94	0.83	0.94	1.00	0.12	0.52
Rim Attach. Method	1.00	0.97	0.49	0.08	0.91	0.96	0.86	0.71	0.56
Rim Dec.	0.34	0.03	0.71	0.47	0.07	0.22	0.00	0.70	1.00
Interior Neck Shape	0.47	0.34	0.20	0.20	0.37	0.18	0.42	0.81	0.16
Exterior Neck Shape	0.96	1.00	0.33	0.81	0.04	0.16	3.15	0.19	0.88
Punctate Form	-	0.00	0.00	0.08	0.98	0.22	0.00	0.26	0.13
Punctate Orientation	0.00	-	0.00	0.01	0.98	0.06	0.00	0.17	0.01
Line Form	0.00	0.00	-	0.00	0.00	0.00	0.00	0.68	0.00
Intaglio	0.08	0.01	0.00	-	0.98	0.58	0.77	0.52	0.41
Handle Form	0.98	0.98	0.00	0.98	-	0.00	0.00	0.43	0.95
Handle Attach. Location	0.22	0.06	0.00	0.58	0.00	-	0.00	0.45	0.98
Handle Dec.	0.00	0.00	0.00	0.77	0.00	0.00	-	0.85	1.00
Smudging	0.26	0.17	0.68	0.52	0.43	0.45	0.85	-	0.37
Burning	0.13	0.01	0.00	0.41	0.95	0.98	1.00	0.37	-

Table III.77: Chi-square Test Results for Nominal Data on Vessels from the Center Creek Locality (1 of 2)

Attributes	*Orifice Shape*	*Grain Size*	*Orifice Diameter*	*Lip Form*	*Lip Dec.*	*Rim Form*	*Rim Attach. Method*
Orifice Shape		0.50	0.27	0.14	0.77	0.77	0.04
Gran Size	0.50		0.14	0.34	0.77	0.78	0.27
Orifice Diameter	0.27	0.14		0.14	0.24	0.73	0.66
Lip Form	0.14	0.34	0.14		0.00	0.51	0.84
Lip Dec.	0.77	0.77	0.24	0.00		0.18	0.85
Rim Form	0.77	0.78	0.73	0.51	0.18		0.65
Rim Attach. Method	0.04	0.27	0.66	0.84	0.85	0.65	
Rim Dec.	0.33	0.92	0.49	0.85	0.04	0.87	0.91
Interior Neck Shape	0.29	0.03	0.15	0.90	0.28	0.07	0.03
Exterior Neck Shape	0.00	0.56	0.60	0.25	0.15	0.77	0.00
Punctate Form	0.29	0.00	0.28	0.29	0.65	0.00	0.03
Punctate Orientation	0.94	0.61	0.62	0.38	0.80	0.48	0.05
Line Form	1.00	0.00	0.70	0.45	0.34	0.61	0.73
Intaglio	0.97	0.39	0.33	0.93	0.16	0.85	0.85
Handle Form	1.00	0.92	0.13	0.90	0.50	0.09	0.86
Handle Attach. Loc.	1.00	1.00	0.21	0.66	0.07	0.06	0.93
Handle Dec.	1.00	0.96	0.32	0.96	0.29	0.01	0.87
Smudging	0.68	0.68	0.46	0.54	0.17	0.23	0.69
Burning	0.53	0.88	0.36	0.60	0.09	0.09	0.17

Table III.78: Chi-square Test Results for Nominal Data on Vessels from the Center Creek Locality (2 of 2)

Attributes	*Rim Dec.*	*Interior Neck Shape*	*Exterior Neck Shape*	*Punctate Form*	*Punctate Orientation*	*Line Form*
Orifice Shape	0.33	0.29	0.29	0.00	0.94	1.00
Gran Size	0.92	0.03	0.56	0.00	0.61	0.00
Orifice Diameter	0.49	0.15	0.60	0.28	0.62	0.70
Lip Form	0.85	0.90	0.25	0.29	0.38	0.45
Lip Dec.	0.04	0.28	0.15	0.65	0.80	0.34
Rim Form	0.87	0.07	0.77	0.00	0.48	0.61
Rim Attach. Method	0.91	0.03	0.00	0.03	0.05	0.73
Rim Dec.		0.36	0.77	0.81	0.36	0.27
Interior Neck Shape	0.36		0.15	0.56	0.47	0.59
Exterior Neck Shape	0.77	0.15		0.36	0.57	0.36
Punctate Form	0.81	0.56	0.36		0.00	0.07
Punctate Orientation	0.36	0.47	0.57	0.00		0.97
Line Form	0.27	0.59	0.36	0.07	0.97	
Intaglio	0.99	0.70	0.85	0.99	0.92	0.97
Handle Form	0.00	0.09	0.35	0.78	0.21	0.21
Handle Attach. Loc.	0.00	0.13	0.41	0.62	0.37	0.41
Handle Dec.	0.00	0.05	0.37	0.69	0.17	0.11
Smudging	0.25	0.69	0.39	0.48	0.12	0.28
Burning	0.56	0.53	0.22	0.77	0.86	0.48

Table III.79: Chi-square Test Results for Nominal Data on Vessels from the Sheffield Site (1 of 2)

Attributes	*Gran Size*	*Orifice Diameter*	*Lip Form*	*Lip Dec.*	*Rim Form*	*Interior Neck Shape*	*Exterior Neck Shape*	*Punctate Form*
Gran Size		0.15	0.09	0.07	0.37	0.75	0.82	0.14
Orifice Diameter	0.15		0.48	0.14	0.32	0.51	0.64	0.29
Lip Form	0.09	0.48		0.06	0.60	0.30	0.95	0.83
Lip Dec.	0.07	0.14	0.06		0.02	0.67	0.90	0.19
Rim Form	0.37	0.32	0.60	0.02		0.67	0.90	0.79
Interior Neck Shape	0.75	0.51	0.30	0.67	0.67		0.07	0.24
Exterior Neck Shape	0.82	0.64	0.95	0.90	0.90	0.07		0.68
Punctate Form	0.14	0.29	0.83	0.19	0.79	0.24	0.68	
Punctate Orientation	0.03	0.48	0.12	0.38	0.88	0.26	0.78	0.01
Line Form	0.08	0.66	0.58	0.04	0.88	0.26	0.35	0.22
Line Orientation	0.32	0.18	0.55	0.29	0.83	0.16	0.06	0.45
Handle Form	0.71	0.48	0.66	0.88	0.88	0.80	0.76	0.79
Handle Attachment Location	0.57	0.33	0.39	0.88	0.88	0.80	0.76	0.34
Handle Dec.	0.36	0.64	0.01	0.90	0.90	0.90	0.75	0.68
Burning	0.04	0.64	0.01	0.90	0.90	0.90	0.75	0.68

Table III.80: Chi-square Test Results for Nominal Data on Vessels from the Sheffield Site (2 of 2)

Attributes	*Punctate Orientation*	*Line Form*	*Line Orientation*	*Handle Form*	*Handle Attachment Location*	*Handle Dec.*	*Burning*
Gran Size	0.03	0.08	0.32	0.71	0.57	0.36	0.04
Orifice Diameter	0.48	0.66	0.18	0.48	0.33	0.64	0.64
Lip Form	0.12	0.58	0.55	0.66	0.39	0.01	0.01
Lip Dec.	0.38	0.04	0.29	0.88	0.88	0.90	0.90
Rim Form	0.88	0.88	0.83	0.88	0.88	0.90	0.90
Interior Neck Shape	0.26	0.26	0.16	0.80	0.80	0.90	0.90
Exterior Neck Shape	0.78	0.35	0.06	0.76	0.76	0.75	0.75
Punctate Form	0.01	0.22	0.45	0.79	0.34	0.68	0.68
Punctate Orientation		0.10	0.66	0.90	0.51	0.78	0.78
Line Form	0.10		0.06	0.56	0.78	0.78	0.78
Line Orientation	0.66	0.06		0.46	0.38	0.06	0.90
Handle Form	0.90	0.56	0.46		0.00	0.20	0.76
Handle Attachment Location	0.51	0.78	0.38	0.00		0.07	0.76
Handle Dec.	0.78	0.78	0.06	0.20	0.07		0.76
Burning	0.78	0.78	0.90	0.76	0.76		

Numerical Taxonomy Tables for Nominal Comparisons with Significant Chi-Square Results

Table III.81: Co-occurrence of Observed Variable Frequencies for Lip Decoration and Orifice Shape for the Red Wing Region

		Lip Decoration				
		Absent	*Int./Ex. Notch*	*In. Notch*	*Sup. Notch*	*Total*
Orifice Shape	*Ind.*	*5*	*7*	*1*	*-*	*7*
	Oval	*4*	*-*	*-*	*1*	*5*
	Round	*98*	*-*	*5*	*13*	*116*
	Total	*107*	*1*	*6*	*14*	*128*

Table III.82: Co-occurrence of Observed Variable Frequencies for Rim Decoration and Orifice Shape for the Red Wing Region

		Rim Decoration				
		Abs.	*Int. Arc*	*Int. Chevron*	*Int. Line*	*Total*
Orifice Shape	*Ind.*	*5*	*-*	*1*	*1*	*7*
	Oval	*3*	*-*	*2*	*-*	*5*
	Round	*106*	*1*	*4*	*5*	*116*
	Total	*114*	*1*	*7*	*6*	*128*

Table III.83: Co-occurrence of Observed Variable Frequencies for Exterior Neck Shape and Orifice Shape for the Red Wing Region

		Exterior Neck Shape				
		Constricting	*Expanding*	*Indeterminate*	*Parallel*	*Total*
Orifice Shape	*Ind.*	*-*	*1*	*1*	*5*	*7*
	Oval	*2*	*2*	*-*	*1*	*5*
	Round	*9*	*52*	*2*	*53*	*116*
	Total	*11*	*55*	*3*	*59*	*128*

Table III.84: Co-occurrence of Observed Variable Frequencies for Interior Neck Shape and Grain Size for the Red Wing Region

		Interior Neck Shape		
		Round	*Sharp*	*Total*
Grain Size	*0.5*	*-*	*3*	*3*
	0.5-1	*23*	*16*	*39*
	0.5-2	*15*	*32*	*47*
	0.5-3	*10*	*15*	*25*
	0.5-4	*1*	*9*	*10*
	Ind.	*1*	*3*	*4*
	Total	*50*	*78*	*128*

Table III.85: Co-occurrence of Observed Variable Frequencies for Exterior Neck Shape and Grain Size for the Red Wing Region

		Exterior Neck Shape				
		Constricting	*Expanding*	*Indeterminate*	*Parallel*	*Total*
Grain Size	*0.5*	-	*3*	-	-	*3*
	0.5-1	*3*	*14*	-	*22*	*39*
	0.5-2	*6*	*18*	-	*23*	*47*
	0.5-3	*1*	*14*	-	*10*	*25*
	0.5-4	*1*	*6*	-	*3*	*10*
	Ind.	-	-	*3*	*1*	*4*
	Total	*11*	*55*	*3*	*59*	*128*

Table III.86: Co-occurrence of Observed Variable Frequencies for Lip Decoration and Orifice Diameter for the Red Wing Region

		Lip Decoration				
		Abs.	*Int./Ex. Notch*	*In. Notch*	*Sup. Notch*	*Total*
Orifice Diameter	*9-19 cm*	*20*	*1*	*2*	*3*	*26*
	20-29 cm	*48*	-	*3*	*6*	*57*
	30-39 cm	*25*	-	-	*2*	*27*
	40-50 cm	*1*	-	-	-	*1*
	Total	*94*	*1*	*5*	*11*	*111*

Table III.87: Co-occurrence of Observed Variable Frequencies for Rim Decoration and Orifice Diameter for the Red Wing Region

		Rim Decoration				
		Absent	*Interior Arc*	*Interior Chevron*	*Interior Line*	*Total*
Orifice Diameter	*9-19 cm*	*24*	*1*	-	*1*	*26*
	20-29 cm	*54*	-	-	*3*	*57*
	30-39 cm	*23*	-	*3*	*1*	*27*
	40-50 cm	*1*	-	-	-	*1*
	Total	*102*	*1*	*3*	*5*	*111*

Table III.88: Co-occurrence of Observed Variable Frequencies for Interior Neck Shape and Orifice Diameter for the Red Wing Region

		Interior Neck Shape		
		Sharp	*Round*	*Total*
Orifice Diameter	*9-19 cm*	*16*	*10*	*26*
	20-29 cm	*20*	*37*	*57*
	30-39 cm	*7*	*20*	*27*
	40-50 cm	-	*1*	*1*
	Total	*43*	*68*	*111*

Table III.89: Co-occurrence of Observed Variable Frequencies for Punctate Form and Orifice Diameter for the Red Wing Region

		Punctate Form			
		Absent	*Ovate*	*Round*	*Total*
Orifice Diameter	*9-19 cm*	*20*	*4*	*2*	*26*
	20-29 cm	*51*	*2*	*4*	*57*
	30-39 cm	*27*	-	-	*27*
	40-50 cm	-	-	*1*	*1*
	Total	*98*	*6*	*7*	*111*

Table III.90: Co-occurrence of Observed Variable Frequencies for Punctate Orientation and Orifice Diameter for the Red Wing Region

		Punctate Orientation					
		Absent	*Direct*	*Gradual*	*Ind.*	*Steep*	*Total*
Orifice Diameter	*9-19 cm*	*20*	*1*	*2*	*1*	*2*	*26*
	20-29 cm	*51*	*1*	*3*	*1*	*1*	*57*
	30-39 cm	*26*	*1*	-	-	-	*27*
	40-50 cm	-	*1*	-	-	-	*1*
	Total	*97*	*4*	*5*	*2*	*3*	*111*

Table III.91: Co-occurrence of Observed Variable Frequencies for Handle Form and Orifice Diameter for the Red Wing Region

		Handle Form				
		Absent	*Ind.*	*Loop*	*Strap*	*Total*
Orifice Diameter	*9-19 cm*	*17*	*3*	*5*	*1*	*26*
	20-29 cm	*47*	-	*7*	*3*	*57*
	30-39 cm	*27*	-	-	*0*	*27*
	40-50 cm	*1*	-	-	*0*	*1*
	Total	*92*	*3*	*12*	*4*	*111*

Table III.92: Co-occurrence of Observed Variable Frequencies for Handle Attachment and Orifice Diameter for the Red Wing Region

		Handle Attachment				
		Absent	*Lip/Shoulder*	*Rim/Shoulder*	*Shoulder*	*Total*
Orifice Diameter	*9-19 cm*	*17*	*3*	*5*	*1*	*26*
	20-29 cm	*47*	*4*	*5*	*1*	*57*
	30-39 cm	*27*	-	-	-	*27*
	40-50 cm	*1*	-	-	-	*1*
	Total	*92*	*7*	*10*	*2*	*111*

Table III.93: Co-occurrence of Observed Variable Frequencies for Rim Decoration and Lip Form for the Red Wing Region

		Rim Decoration				
		Absent	*Interior Arc*	*Interior Chevron*	*Interior Line*	*Total*
Lip Form	*Beveled Int.*	*3*	-	-	-	*3*
	Beveled Ex.	*10*	-	-	-	*10*
	Flat	*14*	-	*2*	-	*16*
	Ind.	*3*	-	*2*	-	*5*
	Pointed	*3*	-	-	-	*3*
	Round	*81*	*1*	*3*	*6*	*91*
	Total	*114*	*1*	*7*	*6*	*128*

Table III.94: Co-occurrence of Observed Variable Frequencies for Rim Form and Lip Form for the Red Wing Region

		Rim Form			
		Curved	*Everted*	*Vertical*	*Total*
Lip Form	*Beveled Int.*	-	*1*	*2*	*3*
	Beveled Ex.	-	*8*	*2*	*10*
	Flat	-	*15*	*1*	*16*
	Ind.	-	*4*	*1*	*5*
	Pointed	-	*3*	-	*3*
	Round	*6*	*70*	*15*	*91*
	Total	*6*	*101*	*21*	*128*

Table III.95: Co-occurrence of Observed Variable Frequencies for Exterior Neck Shape and Lip Form for the Red Wing Region

		Exterior Neck Shape				
		Constricting	*Expanding*	*Indeterminate*	*Parallel*	*Total*
Lip Form	*Beveled Int.*	*1*	*-*	*-*	*2*	*3*
	Beveled Ex.	*3*	*2*	*-*	*5*	*10*
	Flat	*3*	*8*	*-*	*5*	*16*
	Ind.	*-*	*1*	*-*	*4*	*5*
	Pointed	*1*	*-*	*1*	*1*	*3*
	Round	*3*	*44*	*2*	*42*	*91*
	Total	*11*	*55*	*3*	*59*	*128*

Table III.96: Co-occurrence of Observed Variable Frequencies for Punctate Orientation and Lip Form for the Red Wing Region

		Punctate Orientation					
		Absent	*Direct*	*Gradual*	*Ind.*	*Steep*	*Total*
Lip Form	*Beveled Int.*	*2*	*-*	*-*	*-*	*1*	*3*
	Beveled Ex.	*10*	*-*	*-*	*-*	*-*	*10*
	Flat	*11*	*1*	*4*	*-*	*-*	*16*
	Ind.	*4*	*-*	*-*	*-*	*1*	*5*
	Pointed	*3*	*-*	*-*	*-*	*-*	*3*
	Round	*84*	*3*	*1*	*2*	*1*	*91*
	Total	*114*	*4*	*5*	*2*	*3*	*128*

Table III.97: Co-occurrence of Observed Variable Frequencies for Lip Form and Lip Decoration for the Red Wing Region

		Lip Form						
		Beveled Int.	*Beveled Ex.*	*Flat*	*Ind.*	*Pointed*	*Round*	*Total*
Lip Decoration	*Absent*	*2*	*9*	*12*	*5*	*3*	*76*	*107*
	Int./Ext. Notches	*-*	*-*	*-*	*-*	*-*	*1*	*1*
	Int. Notches	*1*	*-*	*-*	*-*	*-*	*5*	*6*
	Sup. Notches	*-*	*1*	*4*	*-*	*-*	*9*	*14*
	Total	*3*	*10*	*16*	*5*	*3*	*91*	*128*

<u>Table III.98:</u> Co-occurrence of Observed Variable Frequencies for Rim Decoration and Rim Form for the Red Wing Region

		Rim Decoration				
		Absent	*Interior Arc*	*Interior Chevron*	*Interior Line*	*Total*
Rim Form	*Curved*	*6*	-	-	-	*6*
	Everted	*89*	*1*	*6*	*5*	*106*
	Vertical	*19*	-	*1*	*1*	*16*
	Total	*114*	*1*	*7*	*6*	*128*

<u>Table III.99:</u> Co-occurrence of Observed Variable Frequencies for Interior Neck Shape and Rim Form for the Red Wing Region

		Interior Neck Shape		
		Sharp	*Round*	*Total*
Rim Form	*Curved*	*5*	*1*	*6*
	Everted	*35*	*66*	*106*
	Vertical	*10*	*11*	*16*
	Total	*50*	*78*	*128*

<u>Table III.100:</u> Co-occurrence of Observed Variable Frequencies for Exterior Neck Shape and Rim Form for the Red Wing Region

		Exterior Neck Shape				
		Constricting	*Expanding*	*Ind.*	*Parallel*	*Total*
Rim Form	*Curved*	-	*1*	-	*5*	*6*
	Everted	*9*	*47*	*3*	*42*	*106*
	Vertical	*2*	*7*	-	*12*	*16*
	Total	*11*	*55*	*3*	*59*	*128*

<u>Table III.101:</u> Co-occurrence of Observed Variable Frequencies for Punctate Form and Rim Form for the Red Wing Region

		Punctate Form			
		Absent	*Ovate*	*Round*	*Total*
Rim Form	*Curved*	*5*	-	*1*	*6*
	Everted	*92*	*3*	*5*	*106*
	Vertical	*17*	*3*	*1*	*16*
	Total	*114*	*6*	*7*	*128*

<u>Table III.102:</u> Co-occurrence of Observed Variable Frequencies for Punctate Orientation and Rim Form for the Red Wing Region

		Punctate Orientation					
		Absent	*Direct*	*Gradual*	*Ind.*	*Steep*	*Total*
Rim Form	*Curved*	*5*	-	-	*1*	-	*6*
	Everted	*92*	*3*	*2*	*1*	-	*106*
	Vertical	*17*	*1*	*3*	-	*3*	*16*
	Total	*114*	*4*	*5*	*2*	*3*	*128*

<u>Table III.103:</u> Co-occurrence of Observed Variable Frequencies for Lip Decoration and Rim Form for the Red Wing Region

		Lip Decoration				
		Absent	*Int./Ex. Notches*	*Int. Notches*	*Sup. Notches*	*Total*
Rim Form	*Curved*	*6*	-	-	-	*6*
	Everted	*82*	*1*	*5*	*13*	*106*
	Vertical	*19*	-	*1*	*1*	*16*
	Total	*107*	*1*	*6*	*14*	*128*

<u>Table III.104:</u> Co-occurrence of Observed Variable Frequencies for Smudging and Rim Form for the Red Wing Region

		Smudging		
		Absent	*Present*	*Total*
Rim Form	*Curved*	*6*	-	*6*
	Everted	*81*	*20*	*106*
	Vertical	*14*	*7*	*16*
	Total	*101*	*27*	*128*

<u>Table III.105:</u> Co-occurrence of Observed Variable Frequencies for Punctate Orientation and Rim Decoration for the Red Wing Region

		Punctate Orientation					
		Absent	*Direct*	*Gradual*	*Ind.*	*Steep*	*Total*
Rim Decoration	*Absent*	*101*	*3*	*5*	*2*	*3*	*114*
	Interior Arc	-	*1*	-	-	-	*1*
	Interior Chevron	*7*	-	-	-	-	*7*
	Interior Line	*6*	-	-	-	-	*6*
	Total	*114*	*4*	*5*	*2*	*3*	*128*

Table III.106: Co-occurrence of Observed Variable Frequencies for Handle Decoration and Rim Decoration for the Red Wing Region

		Handle Decoration			
		Absent	*Indeterminate*	*Vertical Lines*	*Total*
Rim Decoration	*Absent*	*110*	*1*	*3*	*114*
	Interior Arc	*-*	*-*	*1*	*1*
	Interior Chevron	*7*	*-*	*-*	*7*
	Interior Line	*5*	*-*	*-*	*6*
	Total	*122*	*1*	*4*	*128*

Table III.107: Co-occurrence of Observed Variable Frequencies for Exterior Neck Shape and Interior Neck Shape for the Red Wing Region

		Exterior Neck Shape				
		Constricting	*Expanding*	*Ind.*	*Parallel*	*Total*
Interior Neck Shape	*Sharp*	*6*	*13*	*1*	*30*	*50*
	Round	*5*	*42*	*2*	*29*	*78*
	Total	*11*	*55*	*3*	*59*	*128*

Table III.108: Co-occurrence of Observed Variable Frequencies for Rim Attachment Method and Exterior Neck Shape for the Red Wing Region

		Rim Attachment Method			
		Attached	*Drawn up*	*Indeterminate*	*Total*
Exterior Neck Shape	*Constricting*	*0*	*8*	*3*	*11*
	Expanding	*10*	*44*	*1*	*55*
	Indeterminate	*1*	*1*	*1*	*3*
	Parallel	*6*	*52*	*1*	*59*
	Total	*17*	*105*	*6*	*128*

Table III.109: Co-occurrence of Observed Variable Frequencies for Punctate Orientation and Exterior Neck Shape for the Red Wing Region

		Punctate Orientation					
		Absent	*Direct*	*Gradual*	*Ind.*	*Steep*	*Total*
Exterior Neck Shape	*Constricting*	*11*	*-*	*-*	*-*	*-*	*11*
	Expanding	*49*	*2*	*2*	*1*	*1*	*55*
	Indeterminate	*3*	*-*	*-*	*-*	*-*	*3*
	Parallel	*51*	*2*	*3*	*1*	*2*	*59*
	Total	*114*	*4*	*5*	*2*	*3*	*128*

Table III.110: Co-occurrence of Observed Variable Frequencies for Handle Form and Exterior Neck Shape for the Red Wing Region

		Handle Form				
		Absent	*Indeterminate*	*Loop*	*Strap*	*Total*
Exterior Neck Shape	*Constricting*	*11*	*-*	*-*	*-*	*11*
	Expanding	*45*	*-*	*9*	*1*	*55*
	Indeterminate	*2*	*1*	*-*	*-*	*3*
	Parallel	*45*	*2*	*7*	*5*	*59*
	Total	*103*	*3*	*16*	*6*	*128*

Table III.111: Co-occurrence of Observed Variable Frequencies for Punctate Orientation and Punctate Shape for the Red Wing Region

		Punctate Orientation					
		Absent	*Direct*	*Gradual*	*Ind.*	*Steep*	*Total*
Punctate Form	*Absent*	*114*	*-*	*-*	*-*	*-*	*114*
	Ovate	*-*	*-*	*2*	*1*	*3*	*6*
	Round	*-*	*4*	*3*	*1*	*-*	*8*
	Total	*114*	*4*	*5*	*2*	*3*	*128*

Table III.112: Co-occurrence of Observed Variable Frequencies for Line Form and Punctate Form for the Red Wing Region

		Line Form					
		Absent	*Curvilinear*	*Curv./Rect.*	*Ind.*	*Rectilinear*	*Total*
Punctate Form	*Absent*	*50*	*16*	*3*	*1*	*44*	*114*
	Ovate	*-*	*-*	*2*	*-*	*5*	*7*
	Round	*-*	*-*	*3*	*-*	*4*	*7*
	Total	*50*	*16*	*8*	*1*	*53*	*128*

Table III.113: Co-occurrence of Observed Variable Frequencies for Line Form and Punctate Orientation for the Red Wing Region

		Line Form					
		Absent	*Curvilinear*	*Curv./Rect.*	*Ind.*	*Rectilinear*	*Total*
Punctate Orientation	*Absent*	*50*	*16*	*3*	*1*	*44*	*114*
	Direct	*-*	*-*	*3*	*-*	*1*	*4*
	Gradual	*-*	*-*	*1*	*-*	*4*	*5*
	Ind.	*-*	*-*	*-*	*-*	*2*	*2*
	Steep	*-*	*-*	*1*	*-*	*2*	*3*
	Total	*50*	*16*	*8*	*1*	*53*	*128*

<u>Table III.114:</u> Co-occurrence of Observed Variable Frequencies for Intaglio and Punctate Orientation for the Red Wing Region

		Intaglio			
		Absent	*Strong*	*Weak*	*Total*
Punctate Orientation	*Absent*	*102*	*5*	*7*	*114*
	Direct	*2*	*2*	*-*	*4*
	Gradual	*3*	*2*	*-*	*5*
	Ind.	*2*	*-*	*-*	*2*
	Steep	*1*	*1*	*1*	*3*
	Total	*110*	*10*	*8*	*128*

<u>Table III.115:</u> Co-occurrence of Observed Variable Frequencies for Handle Decoration and Punctate Orientation for the Red Wing Region

		Handle Decoration			
		Absent	*Indeterminate*	*Vertical Lines*	*Total*
Punctate Orientation	*Absent*	*110*	*2*	*2*	*114*
	Direct	*2*	-	*2*	*4*
	Gradual	*5*	-	-	*5*
	Ind.	*2*	-	-	*2*
	Steep	*3*	-	-	*3*
	Total	*112*	*2*	*4*	*128*

<u>Table III.116:</u> Co-occurrence of Observed Variable Frequencies for Burning and Punctate Orientation for the Red Wing Region

		Burning		
		Absent	*Present*	*Total*
Punctate Orientation	*Absent*	*112*	*2*	*114*
	Direct	*4*	-	*4*
	Gradual	*5*	-	*5*
	Ind.	*2*	-	*2*
	Steep	*2*	*1*	*3*
	Total	*125*	*3*	*128*

Table III.117: Co-occurrence of Observed Variable Frequencies for Intaglio and Line Form for the Red Wing Region

		Intaglio			
		Absent	*Strong*	*Week*	*Total*
Line Form	*Absent*	*50*	-	-	*50*
	Curvilinear	*11*	*3*	*2*	*16*
	Curv./Rect.	*3*	*3*	*2*	*8*
	Indeterminate	*1*	-	-	*1*
	Rectilinear	*45*	*4*	*4*	*53*
	Total	*110*	*10*	*8*	*128*

Table III.118: Co-occurrence of Observed Variable Frequencies for Handle Form and Line Form for the Red Wing Region

		Handle Form				
		Absent	*Indeterminate*	*Loop*	*Strap*	*Total*
Line Form	*Absent*	*45*	*1*	*2*	*2*	*50*
	Curvilinear	*8*	*1*	*6*	*1*	*16*
	Curv./Rect.	*4*	-	*3*	*1*	*8*
	Indeterminate	-	-	*1*	-	*1*
	Rectilinear	*46*	*1*	*4*	*2*	*53*
	Total	*103*	*3*	*16*	*6*	*128*

Table III.119: Co-occurrence of Observed Variable Frequencies for Handle Decoration and Line Form for the Red Wing Region

		Handle Decoration			
		Absent	*Indeterminate*	*Vertical Lines*	*Total*
Line Form	*Absent*	*50*	-	-	*50*
	Curvilinear	*14*	*1*	*1*	*16*
	Curv./Rect.	*5*	*1*	*2*	*8*
	Indeterminate	-	-	*1*	*1*
	Rectilinear	*53*	-	-	*53*
	Total	*122*	*2*	*4*	*128*

Table III.120: Co-occurrence of Observed Variable Frequencies for Handle Attachment Location and Line Form for the Red Wing Region

		Handle Attachment Location				
		Absent	*Lip/Shoulder*	*Rim/Shoulder*	*Shoulder*	*Total*
Line Form	*Absent*	*45*	*2*	*3*	*-*	*50*
	Curvilinear	*8*	*1*	*5*	*2*	*16*
	Curv./Rect.	*4*	*3*	*1*	*-*	*8*
	Indeterminate	*-*	*1*	*-*	*-*	*1*
	Rectilinear	*46*	*1*	*5*	*1*	*53*
	Total	*103*	*8*	*14*	*3*	*128*

Table III.121: Co-occurrence of Observed Variable Frequencies for Handle Attachment Location and Handle Form for the Red Wing Region

		Handle Attachment Location				
		Absent	*Lip/Shoulder*	*Rim/Shoulder*	*Shoulder*	*Total*
Handle Form	*Absent*	*103*	*-*	*-*	*-*	*103*
	Indeterminate	*-*	*0*	*1*	*1*	*3*
	Loop	*-*	*4*	*10*	*2*	*16*
	Strap	*-*	*3*	*3*	*-*	*6*
	Total	*103*	*8*	*14*	*3*	*128*

Table III.122: Co-occurrence of Observed Variable Frequencies for Handle Decoration and Handle Form for the Red Wing Region

		Handle Decoration			
		Absent	*Indeterminate*	*Vertical Lines*	*Total*
Handle Form	*Absent*	*103*	*-*	*-*	*103*
	Indeterminate	*2*	*1*	*-*	*3*
	Loop	*13*	*1*	*2*	*16*
	Strap	*4*	*-*	*2*	*6*
	Total	*122*	*2*	*4*	*128*

Table III.123: Co-occurrence of Observed Variable Frequencies for Rim Attachment Method and Orifice Shape for the Center Creek Locality

		Rim Attachment Method			
		Attached	*Drawn up*	*Indeterminate*	*Total*
Orifice Shape	*Ind.*	*-*	*2*	*-*	*2*
	Ovular	*1*	*-*	*-*	*1*
	Round	*5*	*36*	*-*	*41*
	Total	*6*	*38*	*-*	*44*

Table III.124: Co-occurrence of Observed Variable Frequencies for Punctate Form and Orifice Shape for the Center Creek Locality

		Punctate Form						
		Absent	*Ovate*	*Round*	*Ovate/ Round*	*Elongated*	*Irregular*	*Total*
Orifice Shape	*Ind.*	*1*	*-*	*1*	*-*	*-*	*-*	*2*
	Ovular	*-*	*-*	*-*	*-*	*-*	*1*	*1*
	Round	*10*	*11*	*18*	*1*	*1*	*-*	*41*
	Total	*11*	*11*	*19*	*1*	*1*	*1*	*44*

Table III.125: Co-occurrence of Observed Variable Frequencies for Exterior Neck Shape and Orifice Shape for the Center Creek Locality

		Exterior Neck Shape			
		Constricting	*Expanding*	*Parallel*	*Total*
Orifice Shape	*Ind.*	*-*	*1*	*1*	*2*
	Ovular	*1*	*-*	*-*	*1*
	Round	*7*	*16*	*18*	*41*
	Total	*8*	*17*	*19*	*44*

Table III.126: Co-occurrence of Observed Variable Frequencies for Interior Neck Shape and Grain Size for the Center Creek Locality

		Interior Neck Shape		
		Round	*Sharp*	*Total*
Grain Size	*0.5-1*	*10*	*5*	*15*
	0.5-2	*4*	*18*	*21*
	0.5-3	*3*	*3*	*6*
	0.5-5	*1*	*-*	*1*
	Total	*18*	*26*	*44*

Table III.127: Co-occurrence of Observed Variable Frequencies for Line Form and Orifice Diameter for the Center Creek Locality

		Line Form				
		Absent	*Curvilinear*	*Curv./Rect.*	*Rectilinear*	*Total*
Orifice Diameter	*0.5-1*	*3*	*-*	*-*	*12*	*15*
	0.5-2	*1*	*-*	*2*	*19*	*22*
	0.5-3	*-*	*-*	*-*	*6*	*6*
	0.5-5	*-*	*-*	*1*	*-*	*1*
	Total	*4*	*-*	*3*	*37*	*44*

<u>Table III.128:</u> Co-occurrence of Observed Variable Frequencies for Punctate Form and Grain Size for the Center Creek Locality

		Punctate Form						
		Absent	*Ovate*	*Round*	*Elongated*	*Irregular*	*Round/ Ovate*	*Total*
Grain Size	*0.5-1*	*3*	*5*	*6*	*1*	*-*	*-*	*15*
	0.5-2	*6*	*5*	*11*	*-*	*-*	*-*	*55*
	0.5-3	*2*	*1*	*2*	*-*	*1*	*-*	*6*
	0.5-5	*-*	*-*	*-*	*-*	*-*	*1*	*1*
	Total	*11*	*11*	*19*	*1*	*1*	*1*	*44*

<u>Table III.129:</u> Co-occurrence of Observed Variable Frequencies for Line Form and Orifice Diameter for the Center Creek Locality

		Line Form			
		Absent	*Curv./Rect.*	*Rectilinear*	*Total*
Orifice Diameter	*9-19 cm*	*2*	*1*	*11*	*14*
	20-29 cm	*1*	*1*	*14*	*16*
	30-39 cm	*-*	*-*	*7*	*7*
	40-50 cm	*-*	*-*	*1*	*1*
	Total	*3*	*2*	*33*	*38*

<u>Table III.130:</u> Co-occurrence of Observed Variable Frequencies for Handle Form and Orifice Diameter for the Center Creek Locality

		Handle Form				
		Absent	*Ind.*	*Loop*	*Strap*	*Total*
Orifice Diameter	*9-19 cm*	*6*	*-*	*5*	*3*	*14*
	20-29 cm	*13*	*2*	*-*	*1*	*16*
	30-39 cm	*7*	*-*	*-*	*-*	*7*
	40-50 cm	*1*	*-*	*-*	*-*	*1*
	Total	*27*	*2*	*5*	*4*	*38*

<u>Table III.131:</u> Co-occurrence of Observed Variable Frequencies for Interior Neck Shape and Orifice Diameter for the Center Creek Locality

		Interior Neck Shape		
		Sharp	*Round*	*Total*
Orifice Diameter	*9-19 cm*	*5*	*9*	*14*
	20-29 cm	*11*	*5*	*16*
	30-39 cm	*5*	*2*	*7*
	40-50 cm	*1*	*-*	*1*
	Total	*22*	*16*	*38*

Table III.132: Co-occurrence of Observed Variable Frequencies for Rim Decoration and Orifice Diameter for the Center Creek Locality

		Rim Decoration					
		Absent	*Exterior Line*	*Int./Ex. Line*	*Interior Chevron*	*Interior Line*	*Total*
Orifice Diameter	*9-19 cm*	*11*	*-*	*-*	*3*	*-*	*14*
	20-29 cm	*8*	*1*	*1*	*2*	*4*	*16*
	30-39 cm	*5*	*-*	*-*	*2*	*-*	*7*
	40-50 cm	*1*	*-*	*-*	*-*	*-*	*1*
	Total	*25*	*1*	*1*	*7*	*4*	*38*

Table III.133: Co-occurrence of Observed Variable Frequencies for Lip Decoration and Orifice Diameter for the Center Creek Locality

		Lip Decoration				
		Absent	*Ext. Notches*	*Int. Notches*	*Sup. Notches*	*Total*
Orifice Diameter	*9-19 cm*	*4*	*3*	*6*	*1*	*14*
	20-29 cm	*5*	*2*	*5*	*4*	*16*
	30-39 cm	*2*	*-*	*5*	*-*	*7*
	40-50 cm	*1*	*-*	*-*	*-*	*1*
	Total	*12*	*5*	*16*	*5*	*38*

Table III.134: Co-occurrence of Observed Variable Frequencies for Lip Form and Lip Decoration for the Center Creek Locality

		Lip Form					
		Beveled Int.	*Beveled Ex.*	*Flat*	*Pointed*	*Round*	*Total*
Lip Decoration	*Absent*	*-*	*1*	*5*	*-*	*8*	*14*
	Int./Ext. Notches	*-*	*6*	*-*	*-*	*-*	*6*
	Int. Notches	*6*	*1*	*2*	*1*	*9*	*19*
	Sup. Notches	*-*	*3*	*1*	*-*	*1*	*5*
	Total	*6*	*11*	*8*	*1*	*18*	*44*

Table III.135: Co-occurrence of Observed Variable Frequencies for Punctate Form and Rim Form for the Center Creek Locality

		Punctate Form						
		Absent	*Ovate*	*Round*	*Ovate/ Round*	*Elongated*	*Irregular*	*Total*
Rim Form	*Curved*	-	-	-	-	1	-	1
	Everted	6	9	12	-	-	1	28
	Vertical	5	2	7	1	-	-	15
	Total	11	11	19	1	1	1	44

Table III.136: Co-occurrence of Observed Variable Frequencies for Handle Decoration and Rim Form for the Center Creek Locality

		Handle Decoration			
		Absent	*Indeterminate*	*Vertical Lines*	*Total*
Rim Form	*Curved*	-	-	1	1
	Everted	26	1	1	28
	Vertical	9	1	5	15
	Total	35	2	7	44

Table III.137: Co-occurrence of Observed Variable Frequencies for Exterior Neck Shape and Rim Attachment Method for the Center Creek Locality

		Exterior Neck Shape				
		Constricting	*Expanding*	*Indeterminate*	*Parallel*	*Total*
Rim Attachment Method	*Attached*	4	1	-	1	6
	Drawn up	4	16	-	18	38
	Ind.	-	-	-	-	-
	Total	8	17	-	19	44

Table III.138: Co-occurrence of Observed Variable Frequencies for Interior Neck Shape and Rim Attachment Method for the Center Creek Locality

		Interior Neck Shape		
		Sharp	*Round*	*Total*
Rim Attachment Method	*Attached*	-	6	6
	Drawn up	18	20	38
	Ind.	-	-	-
	Total	18	26	44

Table III.139: Co-occurrence of Observed Variable Frequencies for Punctate Form and Rim Attachment Method for the Center Creek Locality

		Punctate Form						
		Absent	*Ovate*	*Round*	*Ovate/ Round*	*Elongated*	*Irregular*	*Total*
Rim Attachment Method	*Attached*	-	-	*5*	-	-	*1*	*6*
	Drawn up	*11*	*11*	*14*	*1*	*1*	-	*38*
	Ind.	-	-	-	-	-	-	-
	Total	*11*	*11*	*19*	*1*	*1*	*1*	*44*

Table III.140: Co-occurrence of Observed Variable Frequencies for Punctate Orientation and Rim Attachment Method for the Center Creek Locality

		Punctate Orientation					
		Absent	*Direct*	*Gradual*	*Ind.*	*Steep*	*Total*
Rim Attachment Method	*Attached*	-	*4*	*2*	-	-	*6*
	Drawn up	*11*	*14*	*11*	-	*2*	*38*
	Ind.	-	-	-	-	-	-
	Total	*11*	*18*	*13*	-	*2*	*44*

Table III.141: Co-occurrence of Observed Variable Frequencies for Handle Decoration and Rim Decoration for the Center Creek Locality

		Handle Decoration			
		Absent	*Indeterminate*	*Vertical Lines*	*Total*
Rim Decoration	*Absent*	*23*	-	*5*	*28*
	Exterior Line	*1*	*1*	-	*2*
	Int./Ex. Line	-	*1*	-	*1*
	Interior Chevron	*7*	-	*2*	*9*
	Interior Line	*4*	-	-	*4*
	Total	*35*	*2*	*7*	*44*

Table III.142: Co-occurrence of Observed Variable Frequencies for Handle Form and Rim Decoration for the Center Creek Locality

		Handle Form				
		Absent	*Ind.*	*Loop*	*Strap*	*Total*
Rim Decoration	*Absent*	*21*	-	*5*	*2*	*28*
	Exterior Line	*1*	-	-	*1*	*2*
	Int./Ex. Line	-	*1*	-	-	*1*
	Interior Chevron	*6*	-	-	*3*	*9*
	Interior Line	*4*	-	-	-	*4*
	Total	*32*	*1*	*5*	*6*	*44*

Table III.143: Co-occurrence of Observed Variable Frequencies for Handle Attachment Location and Rim Decoration for the Center Creek Locality

		Handle Attachment Location				
		Absent	*Ind.*	*Lip/Shoulder*	*Rim/Shoulder*	*Total*
Rim Decoration	*Absent*	*21*	-	*3*	*4*	*28*
	Exterior Line	-	*1*	*1*	-	*2*
	Int./Ex. Line	-	*1*	-	-	*1*
	Interior Chevron	*6*	-	-	*3*	*9*
	Interior Line	*4*	-	-	-	*4*
	Total	*31*	*2*	*4*	*7*	*44*

Table III.144: Co-occurrence of Observed Variable Frequencies for Handle Decoration and Interior Neck Shape for the Center Creek Locality

		Handle Decoration			
		Absent	*Indeterminate*	*Vertical Lines*	*Total*
Interior Neck Shape	*Sharp*	*24*	-	*2*	*26*
	Round	*11*	*2*	*5*	*18*
	Total	*35*	*2*	*7*	*44*

Table III.145: Co-occurrence of Observed Variable Frequencies for Punctate Orientation and Punctate Form for the Center Creek Locality

		Punctate Orientation					
		Absent	*Direct*	*Gradual*	*Ind.*	*Steep*	*Total*
Punctate Form	*Absent*	*11*	-	-	-	-	*11*
	Ovate	-	*4*	*5*	-	*2*	*11*
	Round	-	*12*	*7*	-	-	*19*
	Round/Ovate	-	*1*	-	-	-	*1*
	Elongated	-	-	*1*	-	-	*1*
	Irregular	-	*1*	-	-	-	*1*
	Total	*11*	*18*	*13*	-	*2*	*44*

Table III.146: Co-occurrence of Observed Variable Frequencies for Handle Attachment Location and Handle Form for the Center Creek Locality

		Handle Attachment Location				
		Absent	*Ind.*	*Lip/Shoulder*	*Rim/Shoulder*	*Total*
Handle Form	*Absent*	*31*	-	-	-	*31*
	Ind.	-	*2*	-	-	*2*
	Loop	-	-	*2*	*3*	*5*
	Strap	-	-	*2*	*4*	*6*
	Total	*31*	*2*	*2*	*7*	*44*

Table III.147: Co-occurrence of Observed Variable Frequencies for Handle Decoration and Handle Form for the Center Creek Locality

		Handle Decoration			
		Absent	*Indeterminate*	*Vertical Lines*	*Total*
Handle Form	*Absent*	*31*	-	-	*31*
	Indeterminate	-	*2*	-	*2*
	Loop	*2*	-	*3*	*5*
	Strap	*2*	-	*4*	*6*
	Total	*35*	*2*	*7*	*44*

Table III.148: Co-occurrence of Observed Variable Frequencies for Rim Decoration and Punctate Form for the Center Creek Locality

		Rim Decoration					
		Absent	*Exterior Line*	*Int./Ex. Line*	*Interior Chevron*	*Interior Line*	*Total*
Punctate Form	*Absent*	*8*	*-*	*-*	*2*	*1*	*11*
	Ovate	*7*	*2*	*-*	*2*	*-*	*9*
	Round	*11*	*-*	*1*	*4*	*3*	*19*
	Round/Ovate	*-*	*-*	*-*	*1*	*-*	*1*
	Elongated	*1*	*-*	*-*	*-*	*-*	*1*
	Irregular	*1*	*-*	*-*	*-*	*-*	*1*
	Total	*28*	*2*	*1*	*9*	*4*	*44*

Table III.149: Co-occurrence of Observed Variable Frequencies for Interior Neck Shape and Grain Size for the Sheffield Site

		Interior Neck Shape		
		Round	*Sharp*	*Total*
Grain Size	*0.5-1*	*1*	*-*	*1*
	0.5-2	*1*	*-*	*1*
	0.5-3	*3*	*1*	*4*
	0.5-4	*1*	*1*	*2*
	0.5-5	*1*	*1*	*2*
	Ind.	*2*	*-*	*1*
	Total	*9*	*3*	*12*

Table III.150: Co-occurrence of Observed Variable Frequencies for Burning and Grain Size for the Sheffield Site

		Burning		
		Absent	*Present*	*Total*
Grain Size	*0.5-1*	*2*	*-*	*2*
	0.5-2	*1*	*-*	*1*
	0.5-3	*4*	*-*	*4*
	0.5-4	*2*	*-*	*2*
	0.5-5	*2*	*1*	*3*
	Total	*11*	*1*	*12*

Table III.151: Co-occurrence of Observed Variable Frequencies for Punctate Orientation and Grain Size for the Sheffield Site

		Punctate		*Orientation*		
		Absent	*Direct*	*Gradual*	*Ind.*	*Total*
Grain Size	*0.5-1*	-	2	-	-	2
	0.5-2	2	-	1	-	3
	0.5-3	2	1	1	-	4
	0.5-4	2	-	-	-	2
	0.5-5	-	-	-	-	-
	Ind.	-	-	-	1	1
	Total	6	3	2	1	12

Table III.152: Co-occurrence of Observed Variable Frequencies for Punctate Form and Grain Size for the Sheffield Site

		Punctate		*Form*	
		Absent	*Direct*	*Gradual*	*Total*
Grain Size	*0.5-1*	-	1	-	1
	0.5-2	2	1	1	4
	0.5-3	2	-	-	2
	0.5-4	2	-	-	2
	0.5-5	1	-	-	1
	Ind.	-	-	2	2
	Total	7	2	3	12

Table III.153: Co-occurrence of Observed Variable Frequencies for Handle Form and Grain Size for the Sheffield Site

		Handle		*Form*	
		Absent	*Loop*	*Strap*	*Total*
Grain Size	*0.5-1*	1	-	-	1
	0.5-2	1	1	2	4
	0.5-3	1	-	1	1
	0.5-4	2	-	-	2
	0.5-5	1	-	-	1
	Ind.	2	-	-	2
	Total	8	1	3	12

Table III.154: Co-occurrence of Observed Variable Frequencies for Handle Attachment Location and Grain Size for the Sheffield Site

		Handle Attachment Location			
		Absent	*Lip/Shoulder*	*Rim/Shoulder*	*Total*
Grain Size	*0.5-1*	*2*	-	-	*2*
	0.5-2	*1*	*2*	*1*	*2*
	0.5-3	*1*	-	*1*	*2*
	0.5-4	*2*	-	-	*2*
	0.5-5	*1*	-	-	*1*
	Total	*8*	*2*	*2*	*12*

Table III.155: Co-occurrence of Observed Variable Frequencies for Handle Form and Grain Size for the Sheffield Site

		Handle Form			
		Absent	*Loop*	*Strap*	*Total*
Grain Size	*0.5-1*	*1*	-	-	*1*
	0.5-2	*1*	*1*	*2*	*4*
	0.5-3	*1*	-	*1*	*2*
	0.5-4	*2*	-	-	*2*
	0.5-5	*1*	-	-	*1*
	Ind.	*2*	-	-	*2*
	Total	*8*	*1*	*3*	*12*

Table III.156: Co-occurrence of Observed Variable Frequencies for Handle Decoration and Lip Form for the Sheffield Site

		Handle Decoration		
		Absent	*Vertical Lines*	*Total*
Lip Form	*Beveled Int.*	-	*1*	*1*
	Beveled Ex.	*1*	-	*1*
	Flat	*1*	-	*1*
	Round	*9*	-	*9*
	Total	*11*	*1*	*12*

Table III.157: Co-occurrence of Observed Variable Frequencies for Interior Neck Shape and Lip Form for the Sheffield Site

		Interior Neck Shape		
		Absent	*Present*	*Total*
Lip Form	*Beveled Int.*	*1*	*-*	*1*
	Beveled Ex.	*1*	*-*	*1*
	Flat	*-*	*1*	*1*
	Round	*9*	*-*	*9*
	Total	*11*	*1*	*12*

Table III.158: Co-occurrence of Observed Variable Frequencies for Rim Form and Lip Decoration for the Sheffield Site

		Rim Form			
		Curved	*Everted*	*Vertical*	*Total*
Lip Decoration	*Absent*	*-*	*1*	*-*	*1*
	Exterior Notch	*1*	*-*	*-*	*1*
	Interior Notch	*-*	*9*	*1*	*10*
	Total	*1*	*10*	*1*	*12*

Table III.159: Co-occurrence of Observed Variable Frequencies for Line Orientation and Lip Decoration for the Sheffield Site

		Line Orientation				
		Absent	*Curvilienar*	*Curv./Rect.*	*Rectilinear*	*Total*
Lip Decoration	*Absent*	*-*	*-*	*1*	*-*	*1*
	Exterior Notch	*-*	*-*	*-*	*1*	*1*
	Interior Notch	*3*	*2*	*-*	*5*	*10*
	Total	*3*	*2*	*1*	*6*	*12*

Table III.160: Co-occurrence of Observed Variable Frequencies for Punctate Orientation and Punctate Form for the Sheffield Site

		Punctate Orientation			
		Absent	*Direct*	*Gradual*	*Total*
Punctate Form	*Absent*	*7*	*-*	*-*	*7*
	Ovate	*-*	*-*	*2*	*2*
	Round	*-*	*3*	*-*	*3*
	Total	*7*	*3*	*2*	*12*

Table III.161: Co-occurrence of Observed Variable Frequencies for Handle Attachment Location and Handle Form for the Sheffield Site

		Handle Attachment Location			
		Absent	*Lip/Shoulder*	*Rim/Shoulder*	*Total*
Handle Form	*Absent*	*8*	-	-	*8*
	Loop	-	-	*1*	*1*
	Strap	-	*2*	*1*	*3*
	Total	*8*	*2*	*2*	*12*

Chapter Eight Discussion Tables

Table III.162: Observed Frequencies of Nominal Attributes for Typological Suggestions within the Red Wing Region, Center Creek Locality, and Sheffield Site (1 of 3)

Attributes	*Curved Rim*	*Straight Rim*			*Blue Earth Trailed/Incised*	*Sheffield*
Orifice Shape		Everted Rim Variety	Vertical Rim Variety	Strongly Everted Rim Variety		
Round	6	90	20	28	41	11
Ovate	0	5	0	1	1	0
Indeterminate	0	6	1	2	2	1
Total	6	101	21	31	44	12
Grain Size						
0.5	0	3	0	0	0	0
0.5-1	3	29	7	9	15	1
0.5-2	2	36	9	10	22	4
0.5-3	1	20	4	8	6	2
0.5-4	0	9	1	1	0	2
0.5-5	0	0	0		1	1
Ind.	0	4	0	0	0	2
Total	6	101	21	31	44	12
Lip Form						
Beveled In	0	1	2	1	6	1
Beveled Ex	0	8	2	2	11	1
Flat	0	15	1	5	8	1
Ind	0	4	1	2	0	0
Pointed	0	3	0	2	1	0
Round	6	70	15	19	18	9
Total	6	101	21	31	44	12
Lip Decoration						
Absent	6	82	19	27	14	1
Int/Ex Notch	0	1	0	0	0	0
Interior Notch	0	5	1	3	19	11
Exterior Notch	0	0	0		8	0
Superior Notch	0	13	1	1	3	0
Total	6	101	21	31	44	12
Rim Attachment						
Attached	1	13	3	2	6	0
Drawn up	5	83	17	29	38	8
Ind.	0	5	1	0	0	4
Total	6	101	21	31	44	12

Table III.163: Observed Frequencies of Nominal Attributes for Typological Suggestions within the Red Wing Region, Center Creek Locality, and Sheffield Site (2 of 3)

Attributes	*Curved Rim*	*Straight Rim*			*Blue Earth Trailed/Incised*	*Sheffield*
Rim Dec		Everted Rim Variety	Vertical Rim Variety	Strongly Everted Rim Variety		
Absent	6	89	19	27	28	12
Interior Arc	-	1	-	-	-	-
Interior Chevron	-	6	1	1	9	-
Exterior Line	-	-	-		3	2
Interior Line	-	5	1	3	4	-
Total	6	101	21	31	44	12
Interior Neck Shape						
Round	5	35	10	13	18	9
Sharp	1	66	11	18	26	3
Total	6	101	21	31	44	12
Exterior Neck Shape						
Constricting	-	9	2	4	8	-
Expanding	1	47	7	16	17	1
Ind	-	3	-	1		-
Parallel	5	42	12	10	19	11
Total	6	101	21	31	44	12
Punctate Form						
Absent	5	93	17	29	11	7
Ovate	-	3	3	1	12	2
Round	1	5	1	1	19	3
Elongated	-	-	-	-	1	-
Irregular	-	-	-	-	1	-
Total	6	101	21	31	44	12
Punctate Application						
Absent	5	92	17	29	11	7
Direct	-	3	1	1	18	3
Gradual	-	4	1	1	13	2
Ind	1	1	-	-	-	-
Steep	-	1	2	-	2	-
Total	6	101	21	31	44	12
Line Form						
Absent	2	40	8	11	4	3
Curvilienar	2	13	1	6	-	2
Curv/Rec	-	8	-	2	37	1
Ind	-	1	-	-	-	-
Rectilinear	2	39	12	12	3	6
Total	6	101	21	31	44	12

Table III.164: Observed Frequencies of Nominal Attributes for Typological Suggestions within the Red Wing Region, Center Creek Locality, and Sheffield Site (3 of 3)

Attributes	*Curved Rim*	*Straight Rim*			*Blue Earth Trailed/Incised*	*Sheffield*
Handle Form		Everted Rim Variety	Vertical Rim Variety	Strongly Everted Rim Variety		
Absent	5	81	17	24	31	8
Ind	-	2	1	1	2	-
Loop	-	13	3	5	5	1
Strap	1	5	-	1	6	3
Total	6	101	21	31	44	12
Handle Attachment						
Absent	5	81	17	24	31	8
Lip/Shoulder	1	6	1	1	4	2
Rim/Shoulder	-	11	3	4	7	2
Shoulder	-	3	-	2	-	-
Ind	-	-	-		2	-
Total	6	101	21	31	44	12
Handle Decoration						
Absent	5	96	21	30	35	11
Ind	-	2	-	1	2	-
Vertical Lines	1	3	-	-	7	1
Total	6	101	21	31	44	12
Smudging						
Absent	6	81	14	25	26	12
Present	-	20	7	6	18	-
Total	6	101	21	31	44	12
Burning						
Absent	6	98	21	30	29	11
Present	-	3	-	1	15	1
Total	6	101	21	31	44	12

Appendix IV: Data

Data Code:

- Class I: Orifice Shape
  - 0: Indeterminate
  - 1: Round
  - 2: Oval
- Class II: Orifice Diameter (cm)
- Class III: Temper Type
  - 1: Shell
  - 2: Grit
  - 3: Shell and Grit
- Class IV: Grain Size (mm)
  - 1: 0.5
  - 2: 0.5-1
  - 3: 0.5-2
  - 4: 0.5-3
  - 5: 0.5-4
  - 6: 0.5-5
- Class V: Percent Inclusion
  - 5
  - 10
  - 15
  - 20
  - 25
- Class VI: Lip Form
  - 0: Indeterminate
  - 1: Round
  - 2: Flat
  - 3: Beveled Interior
  - 4: Beveled Exterior
  - 5: Pointed
- Class VII: Lip Thickness (mm)
- Class VIII: Lip Tab
  - 0: Absent
  - 1: Present
- Class IX: Lip Surface Treatment
  - 0: Exfoliated
  - 1: Smoothed
  - 2: Smoothed-over Cordmarked
  - 3: Burnished
  - 4: Brushed
- Class X: Lip Decoration Type
  - 0: Absent
  - 1: Interior
  - 2: Superior
  - 3: Exterior
  - 4: Interior and Exterior
- Class XI: Lip Decoration Thickness (mm)
- Class XII: Lip Decoration Depth (mm)
- Class XIII: Rim Form
  - 0: Indeterminate
  - 1: Vertical
  - 2: Everted
  - 3: Curved
- Class XIV: Percent of Rim
- Class XV: Rim Thickness (mm)
- Class XVI: Rim Length (mm)
- Class XVII: Rim Attachment Method
  - 0: Indeterminate
  - 1: Drawn Up
  - 2: Attached
- Class XVIII: Rim Surface Treatment
  - 0: Exfoliated
  - 1: Smoothed
  - 2: Smoothed-over Cordmarked
  - 3: Burnished
  - 4: Brushed
- Class XIX: Rim Decoration Type
  - 0: Absent
  - 1: Interior Chevron
  - 2: Interior Line
  - 3: Exterior Line
  - 4: Interior Arc
  - 5: Interior Chevron and Horizontal Line

    - 6: Interior and Exterior Line
- Class XX: Rim Decoration Thickness (mm)
- Class XXI: Rim Decoration Depth (mm)
- Class XXII: Rim Angle (degrees)
- Class XXIII: Interior Neck Shape
    - 0: Indeterminate
    - 1: Round
    - 2: Sharp
- Class XXIV: Exterior Neck Shape
    - 0: Indeterminate
    - 1: Parallel
    - 2: Expanding
    - 3: Constricting
- Class XXV: Neck Thickness (mm)
- Class XXVI: Neck Diameter (cm)
- Class XXVII: Neck Angle (degrees)
- Class XXVIII: Shoulder Form
    - 0: Indeterminate
    - 1: Round
    - 2: Sharp
- Class XXIX: Shoulder Thickness (mm)
- Class XXX: Shoulder Surface Treatment
    - 0: Exfoliated
    - 1: Smoothed
    - 2: Smoothed-over Cordmarked
    - 3: Burnished
    - 4: Brushed
- Class XXXI: Shoulder Angle (degrees)
- Class XXXII: Punctate Form
    - 0: Absent
    - 1: Round
    - 2: Ovate
    - 3: Elongated
    - 4: Irregular
- Class XXXIII: Punctate Thickness (mm)
- Class XXXIV: Punctate Depth (mm)
- Class XXXV: Punctate Application Orientation
    - 0: Absent
    - 1: Direct
    - 2: Gradual
    - 3: Steep
- Class XXXVI: Line Form
    - 0: Absent
    - 1: Curvilinear
    - 2: Rectilinear
    - 3: Curvilinear and Rectilinear
- Class XXXVII: Line Thickness (mm)
- Class XXXVIII: Line Depth (mm)
- Class XXXIX: Line Orientation
    - 0: Absent
    - 1: Horizontal
    - 2: Vertical
    - 3: Oblique
    - 4: Horizontal and Vertical
    - 5: Horizontal and Oblique
    - 6: Vertical and Oblique
    - 7: Horizontal, Vertical and Oblique
    - 8: Indeterminate
- Class XL: Line Intaglio
    - 0: Absent
    - 1: Weak
    - 2: Strong
- Class XLI: Handle Form
    - 0: Absent
    - 1: Loop
    - 2: Strap
    - 3: Indeterminate
- Class XLII: Handle Attachment Location
    - 0: Absent
    - 1: Lip and Shoulder
    - 2: Rim and Shoulder
    - 3: Shoulder
    - 4: Indeterminate
- Class XLIII: Handle Length (mm)
- Class XLIV: Handle Width (mm)
- Class XLV: Handle Thickness (mm)
- Class XLVI: Handle Surface Treatment
    - 0: Exfoliated
    - 1: Smoothed

- 2: Smoothed-over Cordmarked
- 3: Burnished
- 4: Brushed
- 5: Absent/Indeterminate

- Class XLVII: Handle Decoration Type
  - 0: Absent
  - 1: Vertical Line
  - 2: Vertical Line, Lug, and Punctate
- Class XLVIII: Handle Decoration Thickness (mm)
- Class XLIX: Handle Decoration Depth (mm)
- Class L: Smudging
  - 0: Absent
  - 1: Present
- Class LI: Burning
  - 0: Absent
  - 1: Present

Sites:

- Specimen (SN) 1-38 – Adams (47PI12)
- Specimen 39-55 – Bartron (21GD02)
- Specimen 56-65 – Bryan (21GD04)
- Specimen 66-70 – Burnside School (21GD159)
- Specimen 71-97 – Energy Park (21GD158)
- Specimen 99-105 – McClelland (21GD258)
- Specimen 105-115 – Mero (47PI02 and 47PI93)
- Specimen 116 – Sell (21GD96)
- Specimen 117-128 – Silvernale (21GD03)
- Specimen 129 – Horse (21GD204)
- Specimen 130-155 – Vosburg (21FA02)
- Specimen 156-175 – Humphrey (21FA01)
- Specimen 176-185 – Sheffield (21WA03 and 21WA13)

Data Results for Classes I – XVIII:

SN	*I*	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VII*	*IX*	*X*	*XI*	*XII*	*XIII*	*XIV*	*XV*	*XVI*	*XVII*	*XVIII*
1	1	38	1	4	10	1	5.9	0	1	0	-	-	2	11	8.9	41.7	2	1
2	1	29	1	2	5	1	5.4	0	1	0	-	-	1	6	7.3	30.4	1	1
3	1	27	1	3	10	1	5.2	0	1	0	-	-	2	8	6	32.95	1	1
4	1	35	1	3	10	1	6.5	0	1	0	-	-	1	8	9.3	44.4	1	1
5	1	15	1	3	10	1	4.2	0	1	0	-	-	2	15	7.6	24.3	1	1
6	1	31	1	3	15	1	5.2	0	1	0	-	-	2	8	7.8	47	2	1
7	1	22	1	2	10	1	4.6	0	1	0	-	-	2	8	7.6	33.4	1	1
8	1	34	1	4	15	1	4.2	0	1	0	-	-	2	20	6.6	50.2	1	1
9	1	36	1	4	15	1	3.25	0	1	0	-	-	2	9	8.5	50.5	1	1
10	0	15	1	2	10	1	3.2	0	1	4	3.3	1	2	6	4.7	32.35	1	1
11	1	20	1	3	5	1	4	0	1	0	-	-	2	8	7.6	31.1	1	1
12	0	-	1	-	-	1	4.35	0	1	1	3.8	1	2	-	8.25	43.2	0	1
13	1	20	1	5	15	1	2.6	0	1	0	-	-	2	7	6.1	26.35	1	1
14	1	25	1	2	5	2	4.3	0	1	2	2.8	0.7	2	7	7.7	49	2	1
15	1	30	1	2	15	4	4.1	0	1	0	-	-	2	8	7.1	37.6	1	1
16	1	31	1	2	15	1	3.6	0	1	0	-	-	2	10	7.4	45.1	1	1
17	1	30	1	3	20	1	4.95	0	1	0	-	-	2	12	8.1	48.8	1	1
18	1	15	1	4	15	1	4.4	0	1	1	4.3	1.2	2	12	4.8	26	1	1
19	1	35	1	4	15	0	-	0	1	0	-	-	2	13	10.5	54.3	1	1
20	1	11.5	1	1	5	1	4.9	0	1	0	-	-	2	12	5.7	20	1	1
21	0	26	1	3	5	1	3.1	0	1	0	-	-	2	-	7.15	41.35	2	1
22	1	10	1	2	10	1	3.7	0	1	0	-	-	2	10	5.45	16.4	1	1
23	1	37	1	3	10	1	4.9	0	1	0	-	-	2	5	10.65	64.3	0	1
24	1	25	1	5	10	1	5.7	0	1	1	3.85	1.2	2	6	8.5	45.35	1	1
25	1	30	1	3	10	1	4.5	0	1	0	-	-	2	5	7.1	56.5	1	1
26	1	-	1	3	10	0	-	0	1	0	-	-	2	-	6.9	-	1	1
27	1	30	1	2	10	2	6.5	0	0	2	5.1	0.6	2	6	8.3	45.3	0	1
28	0	-	1	3	5	1	4.2	0	1	0	-	-	2	-	8.65	47.4	1	1
29	1	25	1	4	10	1	3.5	0	1	0	-	-	2	30	6.6	39.3	1	1
30	1	12	1	2	15	2	4.1	0	1	2	2.3	0.75	1	5	5.6	19.2	1	1
31	1	14	1	1	5	2	6.1	0	1	2	3.9	1.12	2	15	8.3	21.9	1	1

SN	I	II	III	IV	V	VI	VII	VII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
32	1	20	1	3	10	1	3.05	0	1	0	-	-	1	12	8.65	25.15	1	2
33	1	25	1	3	10	3	5.25	0	1	0	-	-	2	6	8.75	43.65	1	1
34	1	15	1	4	5	4	3.55	0	3	0	-	-	2	12	5.5	34.25	1	3
35	1	21	1	3	5	1	4.2	0	1	0	-	-	2	12	8.9	36	2	1
36	0	-	1	2	5	1	4.9	0	1	0	-	-	1	-	7.9	29.2	2	1
37	1	20	1	3	15	1	5.3	0	1	0	-	-	2	5	7.65	34.7	1	1
38	1	9	1	1	5	1	4.4	0	1	0	-	-	2	-	4.75	18.25	1	1
39	1	25	1	4	5	1	5.85	0	1	0	-	-	2	5	8.1	27.3	1	1
40	1	13	1	2	5	1	5.75	0	1	0	-	-	2	12	6.6	17.75	1	1
41	1	22	1	2	5	1	5.4	0	1	0	-	-	2	10	7.1	20.6	1	1
42	1	15	1	2	5	1	3.95	0	1	0	-	-	2	15	7.25	15.35	1	1
43	1	20	1	4	5	1	4.55	0	1	0	-	-	2	9	8.05	30.2	1	1
44	1	-	1	2	5	1	4.1	0	1	0	-	-	3	-	6.1	26.3	1	1
45	1	25	1	2	5	1	5.1	0	1	0	-	-	2	6	7.2	31.05	1	1
46	1	20	1	3	5	1	4	0	1	0	-	-	2	5	5.9	23.3	1	1
47	1	30	1	4	5	2	6.65	0	1	0	-	-	2	5	8.5	24.9	2	1
48	1	12	1	3	5	2	3	0	1	0	-	-	2	45	3.4	16.6	1	1
49	2	12	1	4	5	1	3.4	0	1	0	-	-	2	-	5.23	17.4	1	1
50	1	-	1	-	-	1	6.45	0	0	0	-	-	2	-	5.81	36.9	1	0
51	1	30	1	5	10	1	6.25	0	1	0	-	-	2	10	10	37	1	1
52	1	27	1	5	20	4	5	0	1	0	-	-	2	40	7	40	2	1
53	1	21	1	2	10	0	-	0	0	0	-	-	1	15	5.75	-	1	1
54	1	12.5	1	2	10	3	3.15	0	1	0	-	-	1	10	7	24.75	1	1
55	1	35	1	3	10	2	8.5	0	1	0	-	-	2	10	9.5	46	1	1
56	1	19	1	3	10	1	3	0	1	0	-	-	1	13	6	28	1	1
57	1	23	1	2	15	1	4.75	0	1	0	-	-	2	30	8	38.75	1	1
58	1	26	1	3	20	2	4	0	1	0	-	-	1	21	6	34.25	2	1
59	1	24	1	2	10	1	5	0	1	0	-	-	2	12	8	38.5	1	1
60	1	-	1	4	10	1	5.25	0	1	0	-	-	2	-	8	35	1	1
61	1	20	1	4	20	3	3	0	1	1	4	0.74	2	7	6	33.25	1	1
62	1	32	1	3	10	2	6	0	1	0	-	-	2	6	6	50	2	1
63	1	20	1	3	15	1	3.5	0	1	0	-	-	2	16	6.25	27	1	1
64	1	35	1	3	10	1	4.5	0	1	0	-	-	2	20	9.25	43.75	2	1
65	1	28	1	3	15	2	6.5	0	1	0	-	-	2	15	8	40	1	1
66	1	19	1	2	15	1	4.67	0	1	0	-	-	2	25	7.03	16.71	1	1
67	1	19	1	-	-	1	3.65	0	1	0	-	-	2	6	6.15	33.78	1	1

SN	I	II	III	IV	V	VI	VII	VII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
68	1	28	1	-	-	5	7.09	0	1	0	-	-	2	11	10.31	28.85	2	4
69	1	18	1	3	10	0	-	0	0	0	-	-	2	4	5.89	-	1	1
70	1	34	1	5	10	2	7.41	0	1	0	-	-	2	25	8.68	39.79	1	1
71	1	25	1	4	15	1	4.29	0	1	0	-	-	2	13	7.29	38.56	1	1
72	1	22	1	3	20	1	5.45	0	1	0	-	-	2	13	7.2	35.9	1	1
73	1	30	1	5	20	1	3.55	0	1	0	-	-	2	9	9.75	46.3	2	1
74	1	28	1	2	10	1	5.45	0	1	0	-	-	2	13	9.3	34.2	1	1
75	1	25.5	1	3	15	1	4.15	0	1	0	-	-	2	17	10.25	34.15	1	1
76	1	28	3	3	20	1	-	0	1	2	2.75	0.75	2	12	7	35.75	1	1
77	1	30	1	5	15	1	5.45	0	1	0	-	-	2	10	8.7	40.05	2	1
78	1	20	1	2	10	1	2.7	0	1	0	-	-	3	7	5.9	18.9	1	1
79	1	25	1	5	10	1	5	0	1	0	-	-	2	18	6.7	45.4	1	1
80	1	25	1	2	10	1	4.3	0	1	0	-	-	2	5	9.3	48.4	1	1
81	1	18	1	3	15	1	4.95	0	1	2	4	2	2	50	7	37.5	1	1
82	1	21	1	3	15	1	4	0	1	2	3.25	2	2	15	5.25	26	1	1
83	2	20	1	4	10	1	4	0	1	0	-	-	2	15	4.5	28	1	1
84	1	15	1	2	5	1	3.75	0	1	0	-	-	2	12	6	22	1	1
85	1	50	1	5	10	1	4	0	1	0	-	-	1	40	8.5	60	1	1
86	1	-	1	3	10	1	4.5	0	1	2	2	1	2	-	6	34	1	1
87	1	29	1	2	10	1	3	0	1	0	-	-	2	10	7	33	2	1
88	1	20	1	2	10	4	4.2	0	1	0	-	-	2	7	7.1	34.5	1	1
89	1	-	1	3	10	1	5.2	0	1	0	-	-	2	-	9	50.9	1	1
90	1	-	1	3	15	1	5.05	0	1	2	3.7	0.8	2	-	6.1	38.9	1	1
91	1	15	1	2	10	1	4	0	1	1	3.1	0.6	1	11	5.1	22.75	1	1
92	1	15	1	2	5	1	2.7	0	1	0	-	-	2	12	3.7	23.7	1	1
93	1	20	1	3	5	1	5.7	0	1	0	-	-	3	26	6.9	34.1	1	1
94	1	-	1	3	5	1	7	0	1	0	-	-	2	-	6.55	38.9	1	1
95	1	-	1	3	5	1	4.1	0	1	0	-	-	3	-	7.65	44	1	1
96	1	14	1	2	5	1	3.4	0	1	0	-	-	2	14	4.7	24.3	1	1
97	1	24	1	4	5	1	5.7	0	1	0	-	-	2	16	7.65	35.1	1	1
98	1	35	1	2	5	1	4.7	0	1	0	-	-	1	3	6.1	37.4	1	1
99	1	24	1	2	5	1	7.1	0	1	2	6.1	2.2	2	6	8.1	30.55	1	1
100	1	30	1	2	10	4	4.7	N	1	0	-	-	2	5	7.5	21.5	1	1
101	1	20	1	4	10	1	4.5	0	1	2	3.4	1.4	1	5	6.45	24.1	1	0
102	1	25	1	3	5	4	4.9	0	1	0	-	-	2	5	6.75	34.6	0	1
103	1	25	1	2	5	1	4.2	0	1	0	-	-	1	5	9.1	28.8	1	1
104	1	-	1	2	10	4	5.9	0	1	0	-	-	2	-	6.4	25.3	1	1
105	1	20	1	2	5	1	4.5	0	1	0	-	-	2	5	5.7	26.4	1	1
106	1	18	1	2	10	4	4.2	0	1	0	-	-	2	10	6.6	25	1	1
107	1	25	1	3	5	1	4.6	0	1	0	-	-	2	6	6.6	36.2	1	1

SN	I	II	III	IV	V	VI	VII	VII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
108	1	-	1	4	5	1	4.9	0	1	2	3	1	2	-	8.6	45.3	1	1
109	1	20	1	3	10	4	4.6	0	1	0	-	-	1	8	6.9	25.6	1	2
110	1	25	1	4	10	1	4.8	0	1	0	-	-	2	10	10.5	65.6	1	1
111	1	24	1	5	5	4	4.55	0	1	2	3.5	0.5	2	4	8.3	40	1	1
112	1	30	1	3	5	1	4.9	0	1	1	5.1	1.4	2	14	8.9	47.05	1	1
113	1	30	1	2	5	1	4.25	0	1	0	-	-	3	6	9.1	27.4	1	3
114	1	28	1	2	5	2	5.65	0	1	0	-	-	2	8	10	31.85	1	1
115	1	29	1	3	5	1	4.8	0	1	0	-	-	2	10	8.45	43.45	1	1
116	1	28	1	3	5	5	3.85	0	1	0	-	-	2	12	6.45	22.6	1	1
117	1	-	1	3	5	5	4	0	1	0	-	-	2	-	6.95	22.35	1	1
118	1	15	1	4	5	1	4.95	0	1	0	-	-	3	8	7.75	20.2	2	1
119	1	27	1	2	5	2	5.3	0	1	0	-	-	2	11	10.5	32.7	1	1
120	1	29	1	4	10	2	5.49	0	1	0	-	-	1	16	7.38	43.7	1	1
121	1	20	1	4	10	1	4.81	0	1	0	-	-	2	14	5.74	35.56	1	1
122	2	35	1	3	20	2	6.87	0	1	0	-	-	2	15	7.49	46.39	0	0
123	2	35	1	3	15	2	5.17	0	1	0	-	-	2	17	7.58	52.48	1	1
124	2	30	1	3	20	1	5.59	0	1	2	3.95	0.75	2	8	10.81	47.95	2	1
125	1	35	1	4	10	1	5.55	0	1	0	-	-	2	8	10.65	47.75	0	1
126	0	-	1	3	20	0	-	0	1	0	-	-	2	-	5.95	-	1	1
127	1	30	1	4	15	1	4.47	0	1	0	-	-	2	10	5.68	43.7	1	1
128	0	-	1	4	10	1	3.92	0	1	0	-	-	2	-	8.93	42.73	1	0
129	0	-	1	-	-	0		0	0	0	-	-	0	-	8	-	0	0
130	1	23.5	1	3	5	1	3.75	0	1	1	2.8	0.4	2	100	5.4	31.7	1	1
131	1	22.5	1	4	5	1	4.4	0	1	0	-	-	1	15	8.1	24.85	2	1
132	1	20	1	2	10	1	3	0	1	1	3.95	0.2	2	7	5	23.7	1	1
133	0	20	1	2	5	2	4.2	0	1	0	-	-	2	5	7.1	27	1	1
134	1	15	1	3	5	4	4.7	0	1	1	3.2	0.75	1	9	6.05	22.4	1	1
135	0	-	1	3	10	5	3.1	0	1	1	2.2	0.5	2	-	6.5	24.3	1	1
136	1	-	1	3	10	4	4.7	0	1	3	3.3	0.7	2	-	9	29.2	2	1
137	1	18	1	3	5	2	4.15	0	1	0	-	-	2	15	6.3	28.3	1	1
138	2	31	1	4	5	2	4.2	0	1	1	5.1	0.95	2	14	8.8	53.85	2	1
139	1	24	1	3	10	2	5.8	0	1	0	-	-	1	16	7.8	29.1	1	1
140	1	25	1	6	5	2	5.6	0	1	0	-	-	1	17	8	34.3	1	1
141	1	36	1	3	5	3	5.05	0	1	1	5.7	1.6	2	8	10.5	49.82	1	1
142	1	23	1	3	10	4	3.45	0	1	2	5.3	0.63	2	8	7.25	37.2	1	1
143	1	15	1	3	5	1	4	0	1	1	3.8	0.55	2	10	8.9	25.7	1	1
144	1	26	1	3	5	4	4.68	0	1	2	6.35	1.07	2	25	7.5	37.8	2	1
145	1	-	1	3	5	1	3.97	0	1	1	2.82	1.16	2	-	6.27	28.25	1	1
146	1	12	1	2	10	1	4.35	0	1	1	5.7	0.85	2	11	5.55	24.55	1	1
147	1	15	1	3	5	1	4.7	0	1	1	3.2	0.75	2	9	6.05	22.4	1	1
148	1	25	1	2	10	4	4.6	0	1	2	2.65	0.3	2	5	7.95	27.75	1	1
149	1	-	1	2	10	1	2.5	1	1	0	2.95	1.1	2	-	5	14.05	1	1

SN	*I*	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VII*	*IX*	*X*	*XI*	*XII*	*XIII*	*XIV*	*XV*	*XVI*	*XVII*	*XVIII*
150	1	35	1	2	10	1	4	0	1	0	-	-	2	28	8	44.75	1	1
151	1	-	1	3	5	1	4.6	0	1	0	-	-	1	-	7.1	30.9	1	1
152	1	20	1	3	10	1	3.3	0	1	0	-	-	1	10	7.1	28.5	1	1
153	1	20	1	3	5	1	3.8	0	1	1	2.9	0.7	1	25	8.1	29.5	2	1
154	1	13	1	4	5	1	3.4	0	1	0	-	-	2	23	6	20.6	1	1
155	1	14	1	2	5	2	5	0	1	2	4	1	1	12	6	23	1	1
156	1	11	1	2	5	4	3.75	0	1	3	3	0.5	2	22	6.5	19.5	1	1
157	1	15	1	2	10	1	3.5	0	1	0	-	-	1	10	7.5	18	1	1
158	1	30	1	4	10	3	6	0	1	1	4	1	1	7	9.5	38	1	1
159	1	20	1	2	10	3	4	0	1	1	3	1	2	13	7	24	1	1
160	1	30	1	3	5	4	4	0	1	0	-	-	2	8	7	35.5	1	1
161	1	-	1	2	5	3	4	0	1	1	3.5	1	2	-	8	33	1	1
162	1	28	3	4	25	1	4	0	1	2	2.75	0.75	2	12	7	35.75	1	1
163	1	30	1	2	10	2	7	0	1	1	6	0.6	1	10	8	43	1	1
164	1	20	1	2	10	4	3.4	0	1	3	2.1	1	2	12	6	28.1	1	1
165	1	9	1	2	5	3	2.8	0	1	1	1.8	0.5	1	30	4.4	16.75	1	1
166	1	24	1	2	5	4	4.2	0	1	3	2.1	0.7	2	15	7.15	34.4	1	1
167	1	30	1	3	5	3	2.8	0	1	1	3.9	1.5	2	11	7.9	36.75	1	1
168	1	40	1	3	5	2	4.65	0	1	0	-	-	1	6	7.4	39.7	1	1
169	1	20	1	3	5	1	4	0	1	1	2.4	1	2	15	7.6	24	1	1
170	1	18	1	4	10	1	4.6	0	1	0	-	-	2	12	7.7	33.5	1	1
171	1	17	1	3	5	1	3.15	0	1	1	2.9	1.85	1	15	5.5	25.2	2	1
172	1	17	1	3	5	4	3.7	0	1	3	1.8	0.8	1	30	6.7	21.5	1	1
173	1	10	1	2	5	4	4	0	1	3	3	1	2	12	7.5	21	1	1
174	1	30	1	5	20	1	6.1	0	1	1	4.2	1.1	2	10	7.1	40.5	0	1
175	1	-	1	3	15	1	4.5	0	1	1	4	0.9	2	-	7.4	27.5	0	1
176	1	-	1	3	5	1	4.4	0	1	1	3.7	0.65	2	-	6.4	34.5	1	1
177	1	12	1	3	5	1	3.7	0	1	1	3.6	0.8	2	21	6	22.55	1	1
178	1	24.5	1	4	10	1	3.9	0	1	1	3.5	1.45	1	5	6.65	35	0	1
179	1	-	1	2	5	1	-	0	0	0	-	-	2	-	5.5	33.15	1	1
180	1	25	1	6	10	2	4.4	0	1	1	4	0.4	2	6	8.1	51	1	1
181	1	34	1	-	-	1	5.8	0	1	1	5.2	0.8	2	35	9.5	42.7	1	1
182	1	21	1	-	-	1	5.1	0	3	1	6	1.2	2	23	5.9	21.4	1	1
183	0	12	1	5	10	4	2.9	0	1	3	3.9	1.5	2	15	5.2	31.75	1	1
184	1	25	1	3	10	1	4.6	0	1	1	5.6	0.75	2	8	7.1	34.1	1	1
185	1	25	1	4	20	3	5.25	0	1	1	4.7	1.6	2	10	7.2	40.1	0	1

Data Results for Classes XIX - XXXIII

SN	XIX	XX	XXI	XXII	XXIII	XXIV	XXV	XXVI	XXVII	XXVIII	XXIX	XXX	XXXI	XXXII	XXXIII
1	0	-	-	80	2	2	14.3	37	96	0	9	1	-	0	-
2	0	-	-	71	1	1	7.54	27	125	0	6.1	1	-	0	-
3	0	-	-	67	2	1	7.7	25	109	0	4.6	1	-	0	-
4	0	-	-	86	1	1	9.1	34	122	0	7.1	1	-	0	-
5	0	-	-	65	1	2	9	12	93	0	4.9	1	-	0	-
6	0	-	-	73	2	2	11.9	28.5	110	0	10.3	1	-	0	-
7	0	-	-	64	1	1	8	18	106	1	6.6	1	139	0	-
8	0	-	-	70	1	1	6.1	31	102	0	6.8	1	-	0	-
9	0	-	-	65	2	2	10.6	32	97	0	5.75	1	-	0	-
10	0	-	-	60	1	1	6.4	13	95	1	5.65	1	-	0	-
11	0	-	-	65	2	2	9.1	19	98	0	8.2	1	-	0	-
12	0	-	-	61	2	0	8	-	-	0	6.4	1	-	0	-
13	0	-	-	70	2	2	7.6	17	105	0	5.1	1	-	0	-
14	0	-	-	72	2	2	12.25	22.5	95	0	6.8	1	-	0	-
15	0	-	-	79	1	3	8	28.5	102	0	6.7	1	-	0	-
16	0	-	-	70	1	1	8.5	27.5	96	0	6.5	1	-	0	-
17	0	-	-	82	2	1	10.55	29	98	0	6.6	1	-	0	-
18	0	-	-	56	1	1	5.5	14	106	0	5.2	1	-	0	-
19	1	7.7	1.5	78	2	2	12.2	34	101	0	7.7	1	-	0	-
20	0	-	-	64	2	2	8.5	10	95	0	4.4	1	-	0	-
21	0	-	-	74	2	1	8.2	24	90	0	5.8	1	-	0	-
22	0	-	-	73	1	1	6	11	114	0	5	1	-	0	-
23	0	-	-	77	2	1	13.8	35.5	107	0	-	1	-	0	-
24	0	-	-	70	2	2	10.1	22	98	0	7.7	1	-	0	-
25	0	-	-	74	2	1	11.1	26.5	96	0	7.3	1	-	0	-
26	0	-	-	56	1	1	7.7	-	131	1	5.45	1	149	0	-
27	0	-	-	67	1	3	6.95	27	98	0	6	1	-	0	-
28	2	1.8	0.35	-	2	1	9.1	-	104	0	8.35	1	-	0	-
29	0	-	-	76	2	2	9.25	22.5	106	0	7.75	1	-	0	-
30	0	-	-	69	1	1	6.1	11	107	0	5.25	1	-	2	1.6
31	0	-	-	75	2	2	9.4	13	121	0	4.9	1	-	0	-

SN	XIX	XX	XXI	XXII	XXIII	XXIV	XXV	XXVI	XXVII	XXVIII	XXIX	XXX	XXXI	XXXII	XXXIII
32	0	-	-	85	2	2	9.15	19.5	131	0	4.9	1	-	0	-
33	0	-	-	80	2	3	8.6	22.5	109	0	4.45	1	-	0	-
34	0	-	-	72	2	3	5	13	109	0	4.4	3	-	0	-
35	0	-	-	73	2	1	8.7	19	109	0	4.3	1	-	0	-
36	0	-	-	80	1	1	6	-	110	0	6.6	1	-	0	-
37	0	-	-	76	2	2	10.09	18.5	110	0	7.1	1	-	0	-
38	0	-	-	67	2	2	9.9	10	99	0	6.9	1	-	0	-
39	0	-	-	60	1	2	9.15	21.5	100	0	6.4	1	-	0	-
40	0	-	-	72	1	2	5.55	12	104	1	6.1	1	-	0	-
41	0	-	-	64	1	2	7.6	19	130	0	5.4	1	-	0	-
42	0	-	-	77	1	1	7.1	14.5	137	0	5.6	1	-	0	-
43	0	-	-	61	2	2	10	18	119	0	6.3	1	-	0	-
44	0	-	-	61	1	1	6.1	-	108	0	4.85	1	-	0	-
45	0	-	-	51	2	2	11.1	22	90	0	5.2	1	-	0	-
46	0	-	-	62	2	2	7.6	18	114	0	5.7	1	-	0	-
47	0	-	-	57	2	2	10.15	27.5	95	0	8.5	1	-	0	-
48	0	-	-	57	1	1	4.3	11.5	112	1	3.6	1	-	1	5.9
49	0	-	-	64	1	2	5.47	11	113	0	4.1	1	-	0	-
50	0	-	-	60	2	1	11.38	-	96	0	8.65	0	-	0	-
51	0	-	-	56	1	3	12.5	27	104	0	9.25	1	-	0	-
52	0	-	-	66	2	1	9	24	100	1	6.25	1	128	0	-
53	0	-	-	74	2	1	7.5	20	97	1	7	1	134	2	2
54	0	-	-	80	1	1	8	12	112	1	5	1	133	2	4
55	0	-	-	69	2	2	10.75	32.5	99	0	7	1	-	0	-
56	0	-	-	80	1	2	9	12.5	89	1	7	1	126	2	3
57	0	-	-	64	1	1	5	20	90	0	4	1	-	0	-
58	0	-	-	76	2	2	8	25	93	1	4	1	120	2	4
59	0	-	-	56	1	3	5	20.5	94	0	3.5	1	-	0	-
60	0	-	-	53	1	2	11	-	96	0	7.25	1	-	0	-
61	0	-	-	34	1	1	8.5	17.5	102	0	5.25	1	-	0	-
62	0	-	-	72	2	1	8.5	29.5	106	0	5	1	-	0	-
63	0	-	-	50	1	3	6	16.5	93	1	6.5	1	-	0	-
64	2	1.5	1.5	43	2	2	11.5	14	91	0	9	1	-	0	-
65	0	-	-	72	2	2	8	26	105	0	5	1	-	0	-
66	0	-	-	52	2	2	8.08	17	104	1	5.2	1	121.5	0	-
67	0	-	-	57	2	0	9.19	14	-	0	6.72	1	-	0	-

SN	XIX	XX	XXI	XXII	XXIII	XXIV	XXV	XXVI	XXVII	XXVIII	XXIX	XXX	XXXI	XXXII	XXXIII
68	0	-	-	61	1	0	8.5	26	-	0	8.01	1		0	-
69	0	-	-	-	1	1	8.18	15	89	1	6.18	1	135	0	-
70	0	-	-	57	2	1	9.65	29	96	1	6.87	1	132	0	-
71	0	-	-	62	2	1	10.14	20	95	0	5.87	1	-	0	-
72	0	-	-	64	1	1	8.3	20	94	0	8.2	1	-	0	-
73	0	-	-	64	2	2	13.7	26.5	102	0	8.15	1	-	0	-
74	0	-	-	65	1	2	11.2	25	85	0	5.85	1	-	0	-
75	0	-	-	59	2	2	13.35	22.5	95	0	7.65	1	-	0	-
76	0	-	-	63	2	2	9.5	25	92	1	4	1	-	1	4.75
77	0	-	-	61	2	2	15.8	27	91	0	9.35	1	-	0	-
78	0	-	-	52	1	2	6.7	17.5	102	0	5.1	1	-	1	-
79	0	-	-	68	2	2	10.4	22	116	0	6.7	1	-	0	-
80	0	-	-	53	1	2	11.6	21	102	0	8.8	1	-	0	-
81	4	5.1	1.2	60	1	2	7.5	16	99	1	7	1	130	1	5
82	2	4	0.5	69	1	2	6.5	20	95	1	5.25	1	-	0	-
83	0	-	-	52	1	1	5.5	-	89	1	4	1	-	0	-
84	0	-	-	51	1	1	7.25	12.5	96	0	5	1	-	2	2
85	0	-	-	81	2	1	11	48.75	100	1	7	1	-	1	4.5
86	1	3.5	0.75	73	1	1	7	-	109	0	5	1	-	0	-
87	0	-	-	75	2	2	12	27.75	102	1	7	1	-	1	5
88	0	-	-	58	2	1	7.5	17	109	0	4.5	1	-	0	-
89	1	5.5	1.6	61	1	1	9.2	-	100	0	6.05	1	-	0	-
90	1	3.6	0.8	75	2	1	7.4	-	120	0	-	1	-	0	-
91	2	2.3	0.75	83	1	1	8	14.5	115	0	6.1	1	-	0	-
92	0	-	-	65	2	1	4.9	13.5	122.5	0	3.55	1	-	0	-
93	0	-	-	73	1	1	6.1	18.5	101	1	6	1	-	0	-
94	0	-	-	72	2	1	7.6	-	115	0	5.1	1	-	0	-
95	0	-	-	73	2	1	8.8	-	103	0	5.55	1	-	0	-
96	0	-	-	59	2	2	7.4	12	100	0	4.45	1	-	0	-
97	0	-	-	53	2	2	12.55	20.5	92	0	7.15	1	-	0	-
98	0	-	-	83	2	1	6.45	34.5	115	0	5.6	1	-	0	-
99	0	-	-	70	2	2	8.8	24	100	0	7.5	1	-	0	-
100	0	-	-	65	2	2	9.2	29	118	0	7.6	1	-	0	-
101	0	-	-	84	1	1	6.85	19.5	142	0	5.5	1	-	0	-
102	0	-	-	72	2	3	7.5	23.5	104	0	6.9	1	-	0	-
103	0	-	-	82	1	1	9.4	24.5	135	0	8.9	1	-	0	-
104	0	-	-	64	2	1	7.3	-	103	0	6.4	1	-	0	-
105	0	-	-	63	2	1	6.7	18	93	0	4.5	1	-	0	-
106	0	-	-	75	2	1	6.25	17.5	116	0	4.6	1	-	0	-
107	0	-	-	64	2	1	4.9	22	98	0	4.9	1	-	0	-

SN	XIX	XX	XXI	XXII	XXIII	XXIV	XXV	XXVI	XXVII	XXVIII	XXIX	XXX	XXXI	XXXII	XXXIII
108	0	-	-	63	2	1	4.9	-	97	0	4.3	1	-	0	-
109	0	-	-	82	1	1	7.5	19.5	134	0	5.7	1	-	0	-
110	0	-	-	70	2	2	10.75	21.5	106	0	5.95	1	-	0	-
111	0	-	-	57	2	2	9.45	20	103	0	6.35	1	-	0	-
112	2	3.25	0.85	56	2	2	11.15	25	104	0	6.2	1	-	0	-
113	-	-	-	75	1	1	10.5	28.5	124	0	9.45	1	-	0	-
114	0	-	-	55	2	2	11.15	24.5	101	0	7.4	1	-	0	-
115	2	2.75	0.5	56	2	2	11.25	24.5	95	0	5.6	1	-	0	-
116	0	-	-	53	2	1	7.1	25.5	91	0	4.75	1	-	0	-
117	0	-	-	56	1	3	5.5	-	116	0	5.25	1	-	0	-
118	0	-	-	58	1	1	7.7	13.5	100	0	7.2	1	-	0	-
119	0	-	-	51	2	2	11.25	23	95	0	8.25	1	-	0	-
120	0	-	-	67	2	1	8.16	26	100	0	7.11	1	-	1	4.88
121	0	-	-	57	1	2	11.97	10	76	1	8.55	1	-	0	-
122	1	4.6	1.4	75	2	3	8.51	28	103	0	5.65	-	-	0	-
123	1	4.5	1.3	72	2	3	7.77	-	95	0	5.22	-	-	0	-
124	0	-	-	72	2	2	11.54	27.5	107	0	8.1	1	-	0	-
125	0	-	-	68	2	2	11.1	32	102	0	7.45	1	-	0	-
126	1	3.4	0.8	58	2	1	8.25		109	0	4.13	1	-	0	-
127	0	-	-	73	2	1	5.96	28	117	0	4.38	1	-	0	-
128	0	-	-	51	2	2	8.33	-	84	0	4.9	0	-	0	-
129	0	-	-	-	1	2	11	-	101	0	4.5	0	-	0	-
130	2	3.5	0.6	-	2	1	7.7	-	-	1	4.7	1	-	1	2.4
131	2	1.7	0.6	70	2	3	7.7	21	99	1	7	1	-	1	4
132	2	1.4	0.2	53	2	2	7.2	18	104	0	4.9	1	-	1	3.5
133	2	2.3	0.5	57	2	2	10	17.5	105	0	5.5	1	-	0	-
134	0	-	-	73	2	2	6.85	13.5	107	0	6.35	1	-	0	-
135	0	-	-	54	2	1	6.7	-	107	0	4.7	1	-	1	2.6
136	1	4.3	1.6	64	2	3	10.5	-	109	0	6	1	-	1	5.2
137	1	3.8	0.7	68	2	3	8.2	16	106	0	5.4	1	-	0	-
138	0	-	-	71	2	3	9.2	29	100	0	5.15	1	-	4	3.3
139	0	-	-	72	2	3	8.8	15	105	0	8.1	1	-	0	-
140	6	3	0.9	76	1	1	8.8	24	101	0	7.2	1	-	2	2.6
141	0	-	-	66	2	2	15.55	32	89	0	6.95	1	-	2	3.12
142	0	-	-	67	1	3	7.72	20	95	0	7.6	1	-	1	3.4
143	0	-	-	74	2	1	9.05	14	114	0	6.65	1	-	2	3.38
144	0	-	-	60	2	3	8.35	22	99	0	7.35	1	-	1	4.35
145	3	2.9	0.5	67	2	1	9.55	-	90	0	7.93	1	-	2	2.4

SN	XIX	XX	XXI	XXII	XXIII	XXIV	XXV	XXVI	XXVII	XXVIII	XXIX	XXX	XXXI	XXXII	XXXIII
146	0	-	-	73	1	1	7.05	10.5	94	1	5.6	1	-	1	3.55
147	0	-	-	73	2	2	6.85	13.5	107	0	6.35	1	-	0	-
148	0	-	-	75	2	3	8.25	24	111	0	5.2	1	-	0	-
149	0	-	-	-	1	1	5.4	-	-	1	6.25	1	-	1	2.75
150	1	2.6	0.3	59	2	1	10.7	32	100	0	9.1	1	-	1	2.9
151	5	2.6	0.7	82	1	1	7		100	1	5.9	1	-	2	0.7
152	6	2.2	1.4	74	1	2	8.3	18.5	93	1	6.4	1	128	1	2
153	0	-	-	79	2	1	8	19	107	0	6.4	1	-	1	-
154	0	-	-	69	1	2	7.4	12	91	1	6.5	1	-	0	-
155	0	-	-	64	1	1	6	11	94	1	5.75	1	-	2	1
156	5	2.5	0.5	67	1	2	9	10	80	1	6.25	1	-	1	3
157	5	2.5	1	70	1	2	8.5	14	95	0	5.5	1	-	1	1
158	0	-	-	80	1	2	12	29.5	109	0	12.25	1	-	0	-
159	0	-	-	49	1	2	9	17	78	0	7.5	1	-	2	3.5
160	1	3.5	1	68	2	1	9	28.5	108	0	7	1	-	0	-
161	0	-	-	54	2	1	11.5	-	90	0	11	1	-	2	3
162	0	-	-	63	2	1	9.5	25	92	1	4	1	-	1	4.75
163	0	-	-	70	1	1	8.6	28	89	0	7.2	1	-	0	-
164	3	2.6	0.3	69	1	1	6	19	96	0	5.2	1	-	2	2.3
165	0	-	-	74	1	1	4.95	8.5	102	1	4.1	1	118	1	2.3
166	5	2.2	0.6	65	2	2	9.15	21.5	88	0	8.5	1	-	2	2.5
167	0	-	-	51	2	2	11.6	27	83	0	9.1	1	-	1	2.7
168	0	-	-	87	2	2	12.5	40	111	0	8.1	1	-	1	3.7
169	0	-	-	69	2	2	9.1	19	92	1	8.4	1	-	2	2.85
170	0	-	-	59	1	2	11.1	15	87	0	8	1	-	2	2.3
171	0	-	-	75	2	2	7.3	7.3	91	1	5.4	1	-	1	3.4
172	0	-	-	79	1	1	8	16.5	93	1	5.5	1	-	0	-
173	0	-	-	64	1	1	6	11	94	1	5.75	1	-	3	1
174	0	-	-	62	2	1	7.2	27	105	0	5.6	1	-	0	-
175	0	-	-	62	1	1	8.15	-	95	0	5.1	1	-	0	-
176	0	-	-	73	1	1	8	-	113	0	6.8	1	-	1	-
177	0	-	-	63	1	1	7.2	19	108	0	5.1	1	-	2	-
178	3	2.25	0.25	81	1	1	-	25	131	0	6.35	1	-	0	-
179	0	-	-	63	1	1	8.85		89	1	4.85	1	-	2	-
180	3	5.6	1.1	65	1	1	8.35	21.5	113	0	7.05	1	-	0	-
181	0	-	-	69	1	1	7.8	31	101	1	5.3	1	-	1	4.8
182	0	-	-	67	1	1	7.5	19.5	106	1	6.1	1	130	1	4
183	0	-	-	72	1	1	7.2	11	89	0	5.35	1	-	0	-
184	0	-	-	65	2	2	9.1	22.5	85	0	3.7	1	-	0	-
185	0	-	-	60	2	1	7	22.5	120	0	5.4	1	-	0	-

Data Results for Classes XXXIV – LI:

SN	XXXIV	XXXV	XXXVI	XXXVII	XXXVIII	XXXIX	XL	XLI	XLII	XLIII	XLIV	XLV	XLVI	XLVII	XLVIII	XLIX	L	LI
1	-	0	1	6.55	2.15	1	2	0	0	-	-	-	5	0	-	-	1	0
2	-	0	1	5.4	1.5	3	0	0	0	-	-	-	5	0	-	-	1	0
3	-	0	3	2.8	0.4	3	0	0	0	-	-	-	5	0	-	-	0	0
4	-	0	1	5	0.8	1	0	0	0	-	-	-	5	0	-	-	0	0
5	-	0	1	6.15	1.25	3	0	0	0	-	-	-	5	0	-	-	0	0
6	-	0	1	1.9	0.4	3	0	0	0	-	-	-	5	0	-	-	1	0
7	-	0	2	3.6	1.6	6	1	0	0	-	-	-	5	0	-	-	0	0
8	-	0	1	2.4	0.3	1	0	0	0	-	-	-	5	0	-	-	0	0
9	-	0	1	3.5	1.1	1	0	0	0	-	-	-	5	0	-	-	0	0
10	-	0	3	3.5	0.9	6	1	0	0	-	-	-	5	0	-	-	0	0
11	-	0	1	3.6	2.1	1	0	0	0	-	-	-	5	0	-	-	0	0
12	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
13	-	0	1	3.6	0.75	1	0	1	2	-	3.3	3	1	0	-	-	0	0
14	-	0	1	3.2	0.9	3	0	0	0	-	-	-	5	0	-	-	0	0
15	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
16	-	0	1	2.4	1.1	1	0	0	0	-	-	-	5	0	-	-	0	0
17	-	0	1	2.5	1.2	3	0	0	0	-	-	-	5	0	-	-	0	0
18	-	0	2	3.5	0.85	3	0	1	2	25.9	8.95	9.7	1	0	-	-	0	0
19	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
20	-	0	2	2.7	1	3	0	1	2	29.1	11.8	10.3	1	0	-	-	0	0
21	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
22	-	0	0	-	-	0	0	3	1	-	-	-	5	0	-	-	0	0
23	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0
24	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
25	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
26	-	0	1	5.35	1.35	4	1	0	0	-	-	-	5	0	-	-	0	0
27	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
28	-	0	1	1.7	0.4	1	0	0	0	-	-	-	5	0	-	-	0	0
29	-	0	1	3.3	0.4	3	0	0	0	-	-	-	5	0	-	-	0	0
30	0.5	2	1	1.9	0.5	1	0	0	0	-	-	-	5	0	-	-	0	0
31	-	0	1	4.85	1.45	1	0	0	0	-	-	-	5	0	-	-	0	0

SN	XXXIV	XXXV	XXXVI	XXXVII	XXXVIII	XXXIX	XL	XLI	XLII	XLIII	XLIV	XLV	XLVI	XLVII	XLVIII	XLIX	L	LI
32	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
33	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
34	-	0	1	-	-	1	0	0	0	-	-	-	5	0	-	-	0	0
35	-	0	1	3.5	1.2	3	0	0	0	-	-	-	5	0	-	-	0	0
36	-	0	0	-	-	0	0	1	2	41.65	22.65	13.35	1	0	-	-	0	0
37	-	0	1	4.4	1	1	0	1	1	46.7	23.4	23.4	1	0	-	-	0	0
38	-	0	1	-	1.35	3	0	0	0	-	-	-	5	0	-	-	0	0
39	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
40	-	0	1	4.15	0.9	6	0	0	0	-	-	-	5	0	-	-	0	0
41	-	0	1	3	0.5	7	0	0	0	-	-	-	5	0	-	-	1	0
42	-	0	1	6.7	0.25	3	0	3	2	-	-	-	5	0	-	-	0	0
43	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
44	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
45	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
46	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
47	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
48	0.9	2	3	3.95	0.7	6	2	1	1	21.5	9.8	8.65	1	0	-	-	0	0
49	-	0	1	4.25	-	1	0	0	0	-	-	-	5	0	-	-	0	0
50	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
51	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0
52	-	0	1	4.75	1	6	2	0	0	-	-	-	5	0	-	-	0	1
53	1	3	3	2	2	7	0	0	0	-	-	-	5	0	-	-	0	1
54	1	3	1	3.25	0.5	6	2	0	0	-	-	-	5	0	-	-	1	0
55	-	0	2	4.25	2	3	0	0	0	-	-	-	5	0	-	-	1	0
56	2	3	1	3	1	5	1	0	0	-	-	-	5	0	-	-	1	0
57	-	0	1	5	1	6	0	2	2	44	20.5	11	1	0	-	-	0	0
58	1	2	1	3.5	1	6	0	0	0	-	-	-	5	0	-	-	1	0
59	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
60	-	0	1	4.25	1.25	3	0	0	0	-	-	-	5	0	-	-	1	0
61	-	0	1	4.25	2	3	0	2	2	40.4	18.5	14	1	0	-	-	0	0
62	-	0	-	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
63	-	0	1	4.25	1	3	1	0	0	-	-	-	5	0	-	-	1	0
64	-	0	1	1.75	1.5	3	0	0	0	-	-	-	5	0	-	-	0	0
65	-	0	2	4	0.1	3	0	1	3	42	15.5	11	1	0	-	-	0	0
66	-	0	2	5.47	0.78	1	2	1	2	37.78	11.45	11.41	1	0	-	-	0	0
67	-	0	2	5.16	1.17	4	0	3	3	-	-	-	5	0	-	-	0	0

SN	XXXIV	XXXV	XXXVI	XXXVII	XXXVIII	XXXIX	XL	XLI	XLII	XLIII	XLIV	XLV	XLVI	XLVII	XLVIII	XLIX	L	LI
68	-	0	2	5.47	1.33	6	2	0	0	-	-	-	5	0	-	-	0	0
69	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0
70	-	1	3	6.51	2.06	4	2	0	0	-	-	-	5	0	-	-	0	0
71	-	0	2	2.76	1.22	3	0	0	0	-	-	-	5	0	-	-	1	0
72	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0
73	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
74	-	0	1	3.55	0.6	3	0	0	0	-	-	-	5	0	-	-	0	0
75	-	0	1	3.9	1	3	1	0	0	-	-	-	5	0	-	-	1	0
76	2	2	1	4.5	1.5	4	2	0	0	-	-	-	5	0	-	-	1	0
77	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0
78	-	1	1	-	-	1	0	0	0	-	-	-	5	0	-	-	0	0
79	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
80	-	0	1	4.1	1.8	3	0	0	0	-	-	-	5	0	-	-	0	0
81	1.5	1	3	5	1.5	6	2	2	1	49	20	8.5	1	1	7	2	0	0
82	-	0	3	3.75	0.75	3	1	1	1	31	-	-	5	0	-	-	0	0
83	-	0	1	3	0.5	6	0	0	0	-	-	-	5	0	-	-	0	0
84	0.5		1	2	0.25	1	0	0	0	-	-	-	5	0	-	-	0	0
85	2.5	1	1	3	1	3	0	0	0	-	-	-	5	0	-	-	0	0
86	-	0	2	4.25	1	3	0	1	2	41	21.5	14.5	1	0	-	-	0	0
87	1.75	1	3	4.5	1	7	0	1	2	53	31.5	16	1	1	3.5	1	0	0
88	-	0	1	3.9	1.3	1	0	0	0	-	-	-	5	0	-	-	0	0
89	-	0	1	4.2	1.7	3	0	0	0	-	-	-	5	0	-	-	0	0
90	-	0	0	-	-	0	0	2	2	38.9	37.5	9	1	2	3	0.8	0	0
91	-	0	1	4.1	1.9	5	0	1	2	34.5	12.5	-	1	0	-	-	0	0
92	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
93	-	0	2	3.75	0.95	3	0	2	1	38.9	26	11.6	1	1	5.1	1.4	0	0
94	-	0	0	-	-	0	0	2	1	-	18.25	22.8	1	0	-	-	0	0
95	-	0	1	3.95	1.45	3	0	0	0	-	-	-	5	0	-	-	0	0
96	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
97	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0
98	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0
99	-	0	1	4.4	0.7	3	0	1	1	40	33.4	12.9	1	1	6.1	2.2	0	0
100	-	0	1	-	1.9	8	0	0	0	-	-	-	5	0	-	-	0	0
101	-	0	2	3.8	1.4	8	2	0	0	-	-	-	5	0	-	-	0	0
102	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0
103	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0
104	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
105	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
106	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
107	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0

SN	XXXIV	XXXV	XXXVI	XXXVII	XXXVIII	XXXIX	XL	XLI	XLII	XLIII	XLIV	XLV	XLVI	XLVII	XLVIII	XLIX	L	LI
108	-	0	0	-	-	0	0	1	2	44.1	24.5	15.9	1	0	-	-	1	0
109	-	0	1	-	0.3	1	0	0	0	-	-	-	5	0	-	-	0	0
110	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
111	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
112	-	0	2	4.7	1.9	1	0	0	0	-	-	-	5	0	-	-	0	0
113	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
114	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
115	-	0	2	3.9	0.85	3	0	0	0	-	-	-	5	0	-	-	0	0
116	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
117	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
118	-	0	2	5	1.15	3	0	0	0	-	-	-	5	0	-	-	0	0
119	-	0	1	2.6	0.3	3	0	0	0	-	-	-	5	0	-	-	0	0
120	1.2	2	1	4.18	0.8	1	0	0	0	-	-	-	5	0	-	-	0	0
121	-	0	2	3.18	1.7	6	1	1	2	44.32	18.76	14.08	1	0	-	-	0	0
122	-	0	1	4.26	0.73	1	0	0	0	-	-	-	5	0	-	-	0	0
123	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0
124	-	0	1	1.97	0.6	1	0	0	0	-	-	-	5	0	-	-	0	0
125	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
126	-	0	1	4.25	1.05	3	0	1	3	42.03	17.75	15.53	1	0	-	-	1	0
127	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	1	0
128	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	1
129	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	1
130	0.65	1	1	3.5	0.6	7	0	0	0	-	-	-	5	0	-	-	0	0
131	1.2	2	1	2.9	0.35	4	0	0	0	-	-	-	5	0	-	-	1	0
132	1.75	2	1	3.5	1.5	3	1	0	0	-	-	-	5	0	-	-	0	1
133	-	0	1	2.15	0.75	3	0	0	0	-	-	-	5	0	-	-	1	0
134	-	0	1	3.25	0.25	1	0	0	0	-	-	-	5	0	-	-	0	0
135	0.3	1	1	2.9	0.6	3	0	0	0	-	-	-	5	0	-	-	0	0
136	1.15	1	1	3.5	0.7	5	1	0	0	-	-	-	5	0	-	-	0	1
137	-	0	3	3.7	1.2	3	0	2	2	37.8	42.65	7.7	1	0	-	-	1	0
138	0.9	1	1	3.2	0.9	6	0	0	0	-	-	-	5	0	-	-	0	1
139		0	1	2.4	0.5	6	0	0	0	-	-	-	5	0	-	-	1	0
140	1.6	1	3	3.2	0.9	7	0	0	0	-	-	-	5	0	-	-	1	0
141	1.1	1	1	3.4	1.1	2	0	0	0	-	-	-	5	0	-	-	1	0
142	0.3	1	1	3.7	0.55	6	0	0	0	-	-	-	5	0	-	-	1	0
143	0.9	2	0	-	-	0	0	1	2	42.15	23.38	13.1	1	1	2.32	0.25	1	0
144	0.5	1	1	4.35	1.35	7	0	0	0	-	-	-	5	0	-	-	1	0
145	0.5	2	1	2.9	0.45	1	0	2	1	44.85	28.88	15.65	1	0	-	-	1	1
146	0.45	1	0	-	-	0	0	1	2	27.05	19.05	10.15	1	0	-	-	1	0
147	-	0	1	3.25	0.25	1	0	0	0	-	-	-	5	0	-	-	0	0
148	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
149	0.85	1	1	2.8	0.75	5	1	0	0	-	-	-	5	0	-	-	1	0
150	1	1	1	3	0.5	6	0	0	0	-	-	-	5	0	-	-	1	0

SN	XXXIV	XXXV	XXXVI	XXXVII	XXXVIII	XXXIX	XL	XLI	XLII	XLIII	XLIV	XLV	XLVI	XLVII	XLVIII	XLIX	L	LI
151	0.5	2	3	1	0.5	3	0	2	2	36.1	52.3	6.4	1	1	2.2	1	0	1
152	0.7	2	1	2.8	0.7	6	0	3	4	-	-	-	5	0	-	-	0	0
153	0.9	2	1	4	1.4	3	0	2	2	3.5	34.35	9.1	1	1	3.1	0.6	0	1
154	-	0	1	1.7	0.2	3	0	1	2	26.2	15.7	9.5	1	0	-	-	0	0
155	0.5	1	1	2	0.5	5	0	1	1	24	14	8	1	1	3	1	0	1
156	0.5	1	1	2.5	0.5	6	0	0	0	-	-	-	5	0	-	-	1	0
157	0.5	1	1	1	0.5	6	0	2	2	25	21.5	6	1	1	2.5	1	1	0
158	-	0	1	2.5	0.5	3	0	0	0	-	-	-	5	0	-	-	0	1
159	2.5	2	1	3.5	0.5	3	0	0	0	-	-	-	5	0	-	-	0	1
160	-	0	1	4.5	2	5	0	0	0	-	-	-	5	0	-	-	0	0
161	1	2	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
162	2	2	1	4.5	1.5	4	2	0	0	-	-	-	5	0	-	-	0	0
163	-	0	1	4.1	1.3	3	1	0	0	-	-	-	5	0	-	-	0	1
164	0.2	1	1	2.6	0.3	3	0	1	4	-	-	-	5	0	-	-	1	0
165	0.6	2	1	1.4	0.5	3	0	0	0	-	-	-	5	0	-	-	0	0
166	1	1	1	3	0.7	6	0	0	0	-	-	-	5	0	-	-	0	0
167	0.8	1	1	0.8	0.5	5	0	0	0	-	-	-	5	0	-	-	0	1
168	1.2	2	1	3.8	1.5	3	0	0	0	-	-	-	5	0	-	-	0	1
169	1.6	2	1	1.4	1	6	1	0	0	-	-	-	5	0	-	-	1	0
170	1.3	2	1	2.3	0.3	6	0	0	0	-	-	-	5	0	-	-	1	0
171	2.2	1	1	2.1	1	5	0	0	0	-	-	-	5	0	-	-	0	1
172	-	0	1	1.2	0.2	2	0	2	1	40.4	4.03	7.6	1	1	1.7	1.7	0	1
173	0.5	2	1	2	0.5	5	0	1	1	24	14	8	1	1	2	0.5	0	1
174	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
175	-	0	0	-	-	0	0	1	2	24.1	17.6	8.1	1	0	-	-	0	0
176	1.3	1	2	2.9	0.5	1	0	2	1	41	31.8	8.3	1	0	-	-	0	0
177	0.8	2	1	3.15	0.85	1	0	2	1	24.9	20.4	7.6	1	0	-	-	0	0
178	-	0	1	2.25	0.25	3	0	0	0	-	-	-	5	0	-	-	0	0
179	0.8	2	3	2.6	1	5	0	0	0	-	-	-	5	0	-	-	0	0
180	-	0	2	5.6	1.1	1	0	0	0	-	-	-	5	0	-	-	0	1
181	0.5	1	1	3.4	0.2	6	0	0	0	-	-	-	5	0	-	-	0	0
182	0.9	1	1	3.4	2	3	0	0	0	-	-	-	5	0	-	-	0	0
183	-	0	1	4	0.75	1	0	0	0	-	-	-	5	0	-	-	0	0
184	-	0	0	-	-	0	0	0	0	-	-	-	5	0	-	-	0	0
185	-	0	1	3.6	0.9	2	0	2	2	32.1	35.3	5.5	1	1	2.2	0.3	0	0

Appendix V: Gibbon's 1979 Typological Results

Table V.1: Gibbon's (1979) Bartron Composite Varieties

Attributes	*Variety 7*	*Vermillion Variety*
Specimen Number	2	6
Temper Type	Shell	Shell
Lip Form	Round	Round
Lip Thickness	3.5 mm	4.5 mm
Lip Decoration	Notches	
Rim Form	Everted	Everted
Rim Thickness	6.0 mm	7.7 mm
Rim Height	30 mm	33 mm
Rim Decoration	Interior lines	Interior chevrons
Interior Neck Shape	Round, sharp	Sharp
Neck Thickness	-	8.8 mm
Shoulder Thickness	-	4.8 mm
Shoulder Decoration	Curvilinear/ rectilinear lines	Rectilinear lines
Decoration Thickness	Medium	Medium to wide
Motif	Chevrons, scrolls	Chevrons, line panels
Handle Form	-	-
Site Distribution	Bartron, Bryan	Bryan, Bartron, Vosburg, Humphrey

Table V.2: Gibbon's (1979) Bryan Composite Varieties

Attributes	*Goodhue Variety*	*Cannon Variety*	*Pepin Variety*	*Spring Creek Variety*	*Variety 6*
Specimen Number	33	75	19	9	2
Temper Type	Shell	Shell	Shell	Shell	Shell
Lip Form	Round	Round	Round	Round	Round
Lip Thickness	5.4	4.5 mm	3.5 mm	3.9 mm	2.5 mm
Lip Decoration	-	-	-	-	-
Rim Form	Rolled, Everted	Rolled, Everted	Everted	Everted	Everted
Rim Thickness	8.8 mm	7.5 mm	6.0 mm	6.3 mm	4.5 mm
Rim Height	13 mm	17 mm	25.5 mm	18 mm	15 mm
Rim Decoration	-	-	-	Exterior lines, punctates	-
Interior Neck Shape	Round	Round	Round	Round	Round
Neck Thickness	6.4 mm	6.4 mm	6.5 mm	6.8 mm	6.0 mm
Shoulder Thickness	4.9 mm	4.5 mm	4.6 mm	4.4 mm	3.5 mm
Shoulder Decoration	Rectilinear lines	Curvilinear/ rectilinear lines	Rectilinear lines	Rectilinear lines	Rectilinear lines
Decoration Thickness		Medium to wide	Narrow to Medium	Narrow to wide	Narrow
Motif	Chevron	Scroll	Chevron, panel of lines	Chevron, continuous lines	Chevron, panel of straight lines
Handle Form	-	Strap	Strap	Strap, loop	-
Site Distribution	Bryan, Silvernale	Bryan, Silvernale, Bartron	Bryan, Silvernale, Bartron, Vosburg, Humphrey	Bryan, Bartron, Vosburg, Humphrey	Humphrey, Sheffield
Referenced Rim Type	Bryan Short Rim	-	Oneota High Rim	-	Bryan Short Rim

Table V.3: Gibbon's (1979) Blue Earth Composite Varieties

Attributes	*St. Peter Variety*	*Prairie Island Variety*	*Buffalo Slough Variety*	*Variety 14*	*Variety 16*	*Winnebago Variety*
Specimen Number	29	11	6	3	3	5
Temper Type	Shell	Shell	Shell	Shell	Shell	Shell
Lip Form	Round	Round	Round	Round	Round	Round
Lip Thickness	3.7 mm	3.6 mm	3.8 mm	5.0 mm	3.7 mm	3.8 mm
Lip Decoration	Interior notches	-	-	-	-	Notches
Rim Form	Everted	Everted	Everted	Everted	Everted	Everted
Rim Thickness	7.1 mm	6.1 mm	7.3 mm	7.3 mm	7.3 mm	6.6 mm
Rim Height	33 mm	31 mm	28 mm	42 mm	38 mm	31 mm
Rim Decoration	-	-	-	Interior chevrons	Interior chevrons	-
Interior Neck Shape	Round, sharp	Sharp	Round, sharp	Sharp	Sharp	Sharp
Neck Thickness	7.8 mm	8.8 mm	9.0 mm	11.0 mm	11.3 mm	8.4 mm
Shoulder Thickness	4.7 mm	4.5 mm	4.2 mm	6.0 mm	6.0 mm	4.6 mm
Shoulder Decoration	Curvilinear/ rectilinear lines, punctates	Curvilinear/ rectilinear lines, punctates	Rectilinear lines, punctates	Rectilinear lines, punctates	Curvilinear/ rectilinear lines, punctates	Rectilinear lines
Decoration Thickness	Narrow to medium	Narrow to medium	Narrow to medium	Narrow to medium	Medium	Narrow to medium
Motif	Chevron, panel of lines	Chevron	Chevron, panel of lines, perpendicular lines	Chevron, panel of lines	Chevron	Chevron, panel of lines
Handle Form	-	-	-	-	-	-
Site Distribution	Sheffield, Humphrey, Vosburg	Bartron, Bryan, Silvernale	Bartron, Humphrey	Humphrey, Bartron	Vosburg, Humphrey	Humphrey, Vosburg, Bartron, Silvernale

Table V.4: Gibbon's (1979) Sheffield Composite Varieties

Attributes	*Harliss Variety*	*Marine Variety*	*St. Croix Variety*
Specimen Number	10	7	62
Temper Type	Shell	Shell	Shell
Lip Form	Round	Round	Round
Lip Thickness	3.9 mm	3.4 mm	3.1 mm
Lip Decoration	Interior notches	-	-
Rim Form	Everted	Curved	Everted
Rim Thickness	7.0 mm	6.1 mm	7.4 mm
Rim Height	32 mm	25 mm	30 mm
Rim Decoration	-	-	Interior notches
Interior Neck Shape	Round	Round	Round and Sharp
Neck Thickness	7.8 mm	7.0 mm	8.9 mm
Shoulder Thickness	5.0 mm	4.4 mm	4.5 mm
Shoulder Decoration	Rectilinear lines	Punctates	Punctates, Curvilinear/ rectilinear lines
Decoration Thickness	Narrow to medium	-	Narrow to medium
Motif	Line panel	-	Chevron, panel of lines
Handle Form	-	-	-
Site Distribution	Sheffield, Humphrey, Vosburg, Bartron	Sheffield	Sheffield, Humphrey, Bartron

Table V.5: Gibbon's (1979) Humphrey Composite Varieties

Attributes	*Center Creek*	*Variety 19*
Specimen Number	10	2
Temper Type	Shell	Shell
Lip Form	Round	Round
Lip Thickness	3.2 mm	3.5 mm
Lip Decoration	-	Exterior notches
Rim Form	Everted	Curved
Rim Thickness	7.1 mm	7.5 mm
Rim Height	28 mm	-
Rim Decoration	Interior chevrons and horizontal lines, exterior horizontal lines	-
Interior Neck Shape	Round	Round
Neck Thickness	8.3 mm	7.0 mm
Shoulder Thickness	4.3 mm	4.4 mm
Shoulder Decoration	Rectilinear lines	Rectilinear lines
Decoration Thickness	Narrow to medium	Narrow to medium
Motif	Chevrons	-
Handle Form	-	-
Site Distribution	Humphrey, Vosburg	Humphrey, Vosburg

Table V.6: Gibbon's (1979) Vosburg Composite Variety

Attributes	*Variety 20*
Specimen Number	4
Temper Type	Shell
Lip Form	Round
Lip Thickness	3.5 mm
Lip Decoration	Interior notches
Rim Form	Everted
Rim Thickness	8 mm
Rim Height	32 mm
Rim Decoration	Interior oblique lines
Interior Neck Shape	Round
Neck Thickness	10 mm
Shoulder Thickness	3 mm
Shoulder Surface Treatment	Cordmarked
Shoulder Decoration	-
Decoration Thickness	Narrow to medium
Motif	Chevrons
Handle Form	-
Site Distribution	Humphrey, Sheffield, Vosburg