CULTURAL DIFFERENCES OR ARCHAEOLOGICAL CONSTRUCTS: AN ASSESSMENT OF PROJECTILE POINT VARIABILITY FROM LATE MIDDLE PREHISTORIC SITES ON THE NORTHWEST GREAT PLAINS

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Abstract

In Great Plains archaeology, differences in projectile point morphologies are used to define typological groups, which are subsequently inferred to reflect unique cultural groups. The goal of this project was to investigate the variability between projectile points dating to the Late Middle Prehistoric period (2,500 – 1,300 BP) since some researchers associate these cultural remains with one group (Besant phase) while others separate them into Outlook, Besant, and Sonota phases/complexes. Metric and non-metric attributes of projectile points from six single component sites, Fincastle, One-Eleven, Happy Valley, Muhlbach, Fitzgerald, and Ruby, were statistically examined. The results showed that basal attributes remain relatively constant, while blade aspects vary greatly. Since the base of a point is considered more typologically indicative than the blade, which is connected to functional aspects, it was concluded that, based on the projectile points, these represent one typological group.

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CHAPTER 1: Introduction

Introduction

Differences in projectile point morphologies are commonly interpreted as being indicative of distinctive prehistoric cultural groups that lived on the Northwest Great Plains. Typological classification based on the frequent occurrence of interrelated artifact attributes is one way of classifying archaeological data and is a means of creating reproducible artifact groups or types. Typological analyses have been dominant in archaeological thought and are still used to help archaeologists create order out of considerable amounts of data, in an effort to identify ancient groups of people. Typology is utilized in order to facilitate an understanding of the archaeological record and is a means of identifying past cultural groups, geographically and temporally. However, it should be noted that directly connecting typological groups of artifacts with ancient societies is no longer an acceptable practice because artifacts do not necessarily equate to specific cultural groups.

In Great Plains archaeology, projectile points provide the basis for identifying typological groups. Since these artifacts are often made from stone, they survive in the archaeological record. Furthermore, they exhibit changes in shape, style, and technology. Typological groups are based on the morphological similarities and the differences between numerous projectile point attributes. These attributes may be reflective of culturally significant preferences; however, each attribute serves a functional purpose, and thus, these aspects are not necessarily mutually exclusive.

It has been suggested that the more culturally indicative attributes are located on the basal portion of the points, while attributes that are functional in nature tend to be found on the blade section of the projectile (Fawcett 1980; Zeier 1983; Charlin and González-José 2012). However, it is unclear as to which attributes reflect stylistic elements and which are functional (Binford 1972; Sackett 1977, 1982, 1985; Wiessner 1983, 1985). Functional attributes are typically associated with the form of the point. The projectile point's form, or shape, must allow it to be launched, reach its target, and penetrate it. For example, a pointed tip is preferred in order to affectively pierce the hide of the prey animal. Stylistic, or culturally significant, traits are typically associated with decoration. Although they may be functional as well, stylistic traits are seen in aspects of the point which vary while maintaining the same overall function. Those associated with the atlatl weapon, for example, served the same purpose and were used the same way, but there are also detectable stylistic differences on the projectiles. For instance, the notches of a point are required to haft it to the shaft or foreshaft, but the character of this element, whether side, corner, or corner/side-notched, can vary. However, style and function are complicated concepts and are simply statuses given to attribute patterns. It is the processes responsible for the patterns of variation seen in the attributes that should be identified and explored.

There are several factors that can affect the final form and style of a projectile point. One such factor is retouch, often observed on the blade portion of the projectile point. Retouching alters the original form of the tool, while extending is use-life. Rather than discarding a dull or broken projectile point, these tools were often reworked (retouched). There are other factors that can influence the blade, including raw material use and initial manufacturing processes. Alternatively, the basal attributes are thought to be better representations of typologically significant aspects since these are less likely to be altered because they are preserved by the haft element. Thus, certain projectile attributes, although functional, may display typologically significant information, while others are reflective of solely functional traits. The challenge is determining which, and eliminating other factors that may also play a role in the form and style of these artifacts.

The manufacturers of the projectile points made clear and decisive choices in their crafting of points, but these artifacts were not static, and alterations occurred throughout the use-life of the artifacts, from the initial manufacturing to the final discard. These alterations, including the original manufacturing variations, as well as reuse, can influence the form of an artifact before it enters the archaeological record. Archaeologists may have created typological groupings that are too rigid, and do not allow for the variation that can be expected within one particular morphological form. Alternatively, different points connected with distinct cultural groups may exist in typological groups that are too broadly inclusive.

Research Objectives and Overview

The goal of this study was to investigate the variability between projectile point assemblages identified as belonging to the Outlook, Besant, and Sonota phases/complexes, that date to the Late Middle Prehistoric period (2,500 – 1,300 BP). These typological groups have been separated on the basis of minute differences between the point forms, as well as on the presence or absence of other archaeological materials. Several researchers (Johnson 1970:55; Syms 1977:92; Hughes 1981:124; Duke 1996:247; Cloutier 2004:22) have noted that the projectile points connected to the Besant phase are highly variable. This problem is further complicated by the fact that there does not appear to be any concrete definitions for Outlook, Sandy Creek, Besant, and Sonota projectile points: it appears that these separations are subjective. The debate surrounding which aspects characterize each of these typological groups continues to this day.

There have been few in-depth studies conducted on these projectile point types in order to assess the variation between and within these typological forms. Both Syms (1977:92) and Reeves (1983:12) agree that a statistical analysis of intra-phase variation of Besant projectile points would be beneficial and should be conducted. Through the identification of differences and/or similarities between the attributes of these projectile points, it may be possible to determine if the differences are culturally significant or the result of other factors. From these results a more comprehensive understanding of this time period can be attained and information regarding the choices of the prehistoric people realized.

In this study, an examination of projectile points, utilizing continuous, nominal, and ordinal attributes, was carried out in order to assess the variation between assemblages classified as Outlook, Besant, and Sonota. The working hypothesis was that if the projectile points are culturally indicative there should be clear and distinctive differences in the projectile point attributes between these three typological groups. However, it was assumed that within these typological groups, particular attributes would remain relatively constant because the points served the same function. The main question was whether the differences between some of the projectile point attributes represented cultural aspects, or were reflective of other factors, such as retouch and reworking.

Projectile point assemblages from six single component bison kill sites located on the Northwest Great Plains, the Fincastle, the One-Eleven, the Happy Valley, the Muhlbach, the Fitzgerald, and the Ruby sites, were selected for analysis. The variability within an assemblage, as well as between these site assemblages was statistically examined. The specific attributes of the projectile points that varied, in addition to those that remained constant, were identified. Possible explanations of these results are presented herein.

Chapter 2 – Typological Considerations on the Northwest Plains

In this chapter, the typological classification of artifacts, or the use of typology, is discussed. Typological classification, although useful, may not in truth be representative of actual separations of morphological types. That is, in reality not every minute difference between projectile point forms equates to a separate typological group. There are a number of factors that can impact projectile point attributes and cause variability within a single typological group. These factors include functional differences, intra-group social variability, trade, inter-community relationships, cultural values, personal preferences, skill level, culturally transmittable variability, raw material type, and reuse and retouch. The point attributes that characterize four of the Late Middle Prehistoric period types found on the north-western Plains, the Outlook complex, the Sandy Creek complex, the Besant phase, and the Sonota complex, are described in this chapter.

Chapter 3 – Projectile Point Attributes

This chapter presents the methodology used in this study. Since attributes, and combinations of attributes, are used to distinguish different projectile point typological groups, it was necessary to begin by describing each attribute in detail. In addition, the cultural and functional significance of each attribute is explained since some attributes may be more culturally significant than others, and other attributes more indicative of function. The attributes selected for analysis, and the methods of measurement and classification are outlined. Numerical (interval/ratio), nominal, and ordinal attributes of the blade, base, and overall portion of the projectile points were examined.

Chapter 4 – Site Descriptions

Chapter 4 provides a brief overview of the six sites from which the projectile points included in this study were excavated. The projectile point assemblages from the Fincastle, the One-Eleven, the Happy Valley Kill, the Muhlbach, the Fitzgerald, and the Ruby sites offered sizable data sets to examine. These sites were selected for analysis because they 1) were located on the Northwest Plains; 2) were radiocarbon dated and date to the Late Middle Prehistoric period; 3) are the same type of site, that is, they are all bison kill sites; 4) were classified as Besant, Outlook, or Sonota sites by the original excavators; and 5) are considered to be single occupation events based on the radiocarbon dates and stratigraphic evidence. Single component sites are thought to represent a single population at a particular moment in time, making these types of sites ideal candidates to study variability within and between site assemblages, as well as typological classification.

Chapter 5 – Review of Applicable Statistical Tests

A variety of statistical techniques were used to examine these projectile point collections, including Pearson’s *r* Product-Moment Correlation Coefficient, Point-

Biserial Correlation, crosstabulation, chi-square test, independent-samples t-test, Analysis of Variance (ANOVA), Scheffé and Tukey HSD post hoc tests, cluster analysis, and principal components analysis. These tests were chosen based on their applicability and what the results denoted, as well as their comparability to research done by previous scholars. The overarching aim was to identify significant similarities and differences in the projectile attributes, both from within and between, each of the six site assemblages using the statistical methods listed above. An overview of each method and their potential application to this study are presented in this chapter.

Chapter 6 – Statistical Results and Interpretation

Numerous statistical tests were used in order to determine the variability of projectile point attributes both within a single site assemblage, and between the six site collections. The results from each of the statistical tests conducted in this study are recorded in Chapter 6. Based on this raw data there is undoubtedly variability in the originally assigned Besant, Outlook, and Sonota assemblages. However, a number of similarities were noted within each site assemblage, as well as overall consistencies across the six site collections. These findings are discussed in detail and are interpreted in the context of the Late Middle Prehistoric period on the Northwest Plains.

Chapter 7 – Conclusion

The final chapter ties the statistical results to the working hypothesis: That the variability between Besant, Outlook, and Sonota projectile point assemblages does not reflect typologically significant differences. Through this research, a number of projectile point attributes were identified as being as culturally significant, or at the very least

constant between Besant, Outlook, and Sonota types, while others appear to be solely functional in nature. Moreover, many were noted as being altered through reuse and retouch activities. The relationship between the attributes and these typological groups is discussed. The findings of this research confirmed that the majority of the projectile point variation in Besant, Outlook, and Sonota assemblages is detectable mainly on the blade portion of the projectile points, while the basal attributes remained relatively consistent across the three types. This result suggests that the ‘morphological’ differences between the projectile points assigned to these groups are, in fact, representative of functional differences. This means that these typological groups are actually archaeological constructs. The limitations of this study are also discussed, along with some future research suggestions with regard to projectile point attributes and their significance.

CHAPTER 2: Typological Considerations on the Northwest Plains

Introduction

The typological classification of artifacts is a worthwhile endeavor for many archaeologists. Grouping artifacts, such as projectile points, on the basis of differences in shape, style, and technology, can be beneficial for simplifying vast amounts of data, as well as easing communication between researchers. However, morphological variability in projectile points is caused by a number of factors, and these differences may not necessarily be reflective of a separate typological group. A brief overview of typology will be provided, along with the assumptions made, and the issues that may arise from those assumptions. How typology is utilized on the Northwest Plains, and what types of processes can produce variability will be reviewed. Finally, the specific projectile point attributes that are used to separate several Late Middle Prehistoric period types found on the Northwest Plains, the Outlook complex, Sandy Creek complex, Besant phase, and Sonota complex, will be described.

Typology on the Plains

Archaeologists spend a considerable amount of time and effort typologically classifying projectile points in the hope of identifying prehistoric societies. Though directly linking typological groups of artifacts with ancient people is no longer considered acceptable (Knecht 1997:6), it is still used to help archaeologists understand the archaeological record. Typology refers to the intuitive and objective creation of reproducible artifact groups, or types, that are based on recurring sets of correlated attributes (Rosen 1997:25). It is also a means of defining archaeological groups at a particular moment in time in space.

Typological classification has been a priority in archaeology, but the methods in which these typologies are realized has been debated. Phillips and Willey (1953:616) recounted the James A. Ford and Albert C. Spaulding debate regarding whether archaeological types were “designed” to suit the needs of the investigator, or were “discovered”, implying that the cultural segmentation was inherent in the data. According to O’Brien and Leonard (2001:6) this debate centered on the reality of the archaeological types. In his argument, Spaulding (1953; 1954) supported discovered artifact types, while Ford (1954) stated that the types were not “real” but were imposed on continuous data by the researcher. The key to Spaulding’s argument was his use of statistical methods, particularly the chi-square test. Ford (1954) deemed that the degree of cultural variation differs widely from one culture to another, from one time period to another, and from one aspect of culture to another. Ford (1954:391) thought that Spaulding’s statistical analyses only revealed the relative degree to which people conformed to their established ceramic styles at one place at one time. He went on to state that artifact attributes that look significant at one site may differ from the seemingly important attributes at another site with a different date and geographical position (Ford 1954:391).

In either case, the archaeologist must determine which characteristics are important in the delineation of typological groups. The characteristics that archaeologists have deemed as important may not have been significant to the individual(s) or group(s) who crafted the artifacts. Thus, typologies may be representative of culturally significant attributes, or they could be an archaeologist’s way of sorting through and classifying huge amounts of data. This debate remains relevant and discussed today (Dibble 1991; Andrefsky 1997; O'Brien and Leonard 2001; Odell 2001).

Projectile points collected from sites on the north-western Great Plains are an important source of archaeological information. Ceramics were not widely used on the Plains due to the nomadic lifestyle, and, hence, most typological sequences employ projectile points (Beck 1998:21). Reher and Frison (1980:98) also stated that the "portable technology of a grassland adaptation lacks the frequent ceramics and other diagnostic items of more complex technologies". Helgason (1987:22) noted that due to the lack of permanent prehistoric dwellings, artwork, and other evidence, projectiles are the basis of the archaeological record in Alberta. In many instances, these are also the only artifacts that survive to the present day. For these reasons, projectile point morphology has assumed a great interpretative role in Plains archaeology.

Since projectile point technology, shape, and style changes over time, a broad sequence of typological groups can be generated based on the variations that have been identified in time and space. For example, in North America, the earliest technology, produced in the Early Prehistoric period (11,200 – 7,500 BP), was the spear, while the throwing spear, atlatl, appeared in the Middle Prehistoric period (7,500 – 1,300). Finally, in the Late Prehistoric period (1,300 – 250 BP), the bow and arrow was used. Not only did the technology change, the size and shapes of these points changed, resulting in a number of various shapes and styles of points used within each technologically defined period. Typological groups are developed by archaeologists based on these variations.

The detailed cataloguing of projectile points and the subsequent use of statistical techniques are utilized to understand the cultural context of these artifacts. Knecht

(1997:7) stated that “morphological analyses of projectile points are designed to statistically delineate any patterning in metric and geometric variables”. These patterns are important because they are used to typologically classify the artifacts, an initial step towards a more detailed analysis.

Typological classification cannot be used in isolation, however, as there are a number of problems with this sort of organization. Flenniken and Wilke (1989:150-151) identified 12 assumptions often made in regards to typology: 1) points were made based on fixed mental templates and these forms are recognized as types; 2) points were manufactured, used, and discarded without modification during their use-life; 3) typological point forms emerged, were popular for a time, and then subsequently disappeared; 4) different point forms were popular at different times; 5) the age of a particular type can be determined through the independent analysis of a number of sites that display this same point type; 6) morphologically distinct projectile point types can be equated to typological types; 7) typological charts can be made to classify points from sites based on the basal sections since this is the location of the most diagnostic attributes on a point; 8) the resulting typology will provide a general sequence of artifact forms from within a specific area; 9) once points were manufactured, point forms were static and did not undergo change on the basal portion where the most typologically significant attributes are located; 10) if a site is found containing projectile points and cannot be dated by another method, for instance, a surface lithic scatter, then projectiles may be used to provide a gross estimation of the age of the site; 11) once dart points are assigned to a particular time period, if they are found in deposits that are older or younger than that inferred age they are generally thought to be out of context; 12) point typologies at multi-component, stratified sites are used to create a chronological framework.

Several of these assumptions can be detrimental since they can lead to erroneous interpretations. For example, numerous researchers (Dibble 1987; Towner and Warburton 1990; Odell 2001; Buchanan et al. 2007) have found that tools were often used more than once and were frequently modified, retouched, and recycled during their use-life. Zeier (1983:24) found that the recycling of tools did occur at Plains sites, often at sites where multiple activities occurred or where "expediency dictated the alteration of the artifacts at hand". Another instance of where these assumptions are detrimental is the development of typological groups based on morphologically distinct projectile point types. Besant phase points have been identified as highly variable (Johnson 1970:55; Syms 1977:92; Duke 1996:247), and there is considerable debate about which morphological traits characterize this type.

Although typological systems can be helpful to understand broad human choices, there are other possible explanations for the variability in projectile points. Not every observable difference between the projectile points is reflective of a separate typological group. A number of potential causes for the initial variability in projectile point forms have been identified (Greaves 1982; Wiessner 1983; Duke 1991; Larick 1991; Griffin 1997). These reasons may be related to function, intra-group social variability, trade, inter-community relationships, cultural values, personal preferences, skill level and culturally transmittable variability, and raw material type.

Many ethnographic studies have documented practical explanations for the variability visible in a projectile point assemblage, such as the study conducted by Griffin

(1997:281). He found that a hunter's choice of arrow was linked to the prey species, prey size, the condition of the animal, the environmental conditions, and the availability of prey (Griffin 1997:281). Other studies, for instance Larick's (1991:300) study in Kenya, have found that spear morphology varied across regions, and within each cohort of the group. Projectile points were also often exchanged between groups of people, as well as individuals. Wiessner (1983:261) commented that arrows were often traded between individual hunters and occasionally from partners as far as 100 km away. Warburton and Duke (1995:217) noted that projectiles were exchanged as gifts, often from a father to a son as a symbol of "the physical embodiment of a man's life and successes". Large, inter-community gatherings could also lead to the diffusion of ideas, raw material, and the exchange of projectile points themselves.

On the Plains, one of the most archaeologically visible examples of group interaction occurred at communal bison hunts, such as the site of Head-Smashed-In Buffalo Jump, where at least 100 people worked together in order to make the hunt successful (Duke 1991:60). These interactions were important not only for subsistence, but also for safety, social, and cultural reasons, which included ceremonies, feasting, and celebrations (Verbicky-Todd 1984; Brink 2008).

It has also been found that certain groups of people may have valued particular types of stone over others, and used certain stone types for specific tool types. Hjermstad (1996:103) stated that certain types of stone may have had ideological significance to the prehistoric people that used them. In addition, Wissler and Duvall (1908:112-116) recorded two Blackfoot stories in which the colour of the arrow points was important. In the first, a white-tipped stone arrow was needed to kill a powerful bison bull, while in the second a yellow-painted arrow was required to kill a medicine-man (Wissler and Duvall 1908:112-116).

Individual variation, creativity, and personal preferences may also be factors that influenced projectile point morphology. In past societies, knowledge was passed down from generation to generation. For example, a grandfather would teach his grandson the art of crafting projectile points and manufacturing them a certain way with particular attributes. This culturally transmittable variation contributed to the creation of every individual artifact (Gunn 1975:36). Another factor that can have an impact on projectile point variability is the raw material from which a projectile point was crafted (Greaves 1982:108; Nelson 1997:377; Kooyman 2000:91). Rosen (1997:25) noted that amorphous and microcrystalline materials were used more often for projectile points since they are harder and sharper than other raw materials. These factors can have a significant influence on the initial morphology of projectile points. However, archaeologists rarely consider these factors during the creation of typological groups, even though these can cause variability within a single component site projectile point assemblage that has not been altered through reuse and retouch. The aforementioned factors can influence the attributes on each individual projectile point and it is these attributes, and combinations of attributes that are used to typologically classify artifacts.

Scholars have questioned which artifact attributes reflect stylistic elements and which are primarily functional in nature (Binford 1972; Sackett 1977, 1982, 1985; Wiessner 1983, 1985). In regards to projectile points, retouch may be functional, for example, because dull tools would be resharpened and reworked, whereas culturally significant stylistic aspects, often interpreted as being seen on the unaltered basal portions, are seen to better reflect cultural choice. However, this separation of style versus function is problematic, and it has been suggested that a “pluralistic approach to the explanation of artifact variability” should be adopted (Cunningham 2003:24). Archaeologists will find both “style” and “function” apparent within the attributes of artifacts (Cunningham 2003:27). In the 1980s, Sackett (1977; 1982; 1985) and Wiessner (1983; 1985) argued over the definitions and the variables which defined the style and function of an artifact, including projectile points. Based on her studies of the Kalahari hunter-gatherers in South Africa, Wiessner (1983:257-258) identified two types of style: emblemic style and assertive style. She defined emblemic style as the formal variation that transmitted information about conscious group affiliation or identity (Wiessner 1983:257). She saw assertive style as the personally-based formal variation that carried information that supported an individual’s identity (Wiessner 1983:258). She attempted to show that three linguistic groups made use of both emblemic and assertive styles in their manufacture of projectile points (Wiessner 1983). Sackett (1985), however, argued against her conclusions and advocated for what he termed isochrestic style, which he referred to as the choices an individual made between different variants that were functionally equivalent. He claimed that the decisions made by individuals were shaped by their cultural traditions and that a craftsman would make choices in both functional and decorative aspects (Sackett 1982; 1985). Sackett (1985:158) stated that “isochrestic choice permeates all aspects of social and cultural life” either consciously or unconsciously. He argued that traits Wiessner identified as stylistic were in fact functional and Wiessner thus ignored the functional constraints placed on the artifacts, such as the point size and barbs (Sackett 1985:157). The terms style and function may in fact be problematic concepts and their utility as such may not be worthwhile; however, the factors that cause variability, within stylistic and/or functional attributes should be examined.

Particular projectile point attributes and certain combinations of these attributes are typically considered to be representative of separate and distinctive typological groups. However, there is no agreement on which attributes are more useful to defining these groups (Andrefsky 2005:185). In many areas of the world, projectile point typologies and temporal sequences of projectile point types have been created based on differences in size and shape (Flenniken and Wilke 1989; Nelson 1997; Charlin and González-José 2012). As Andrefsky (1997:136) has pointed out, artifacts are frequently "pigeonholed into a certain type and the identification of that type becomes more important than understanding the processes responsible for creating the artifact's shape". Artifacts become indicators of time and space, and understanding the causes for variation becomes less important. The identification of what typological group an artifact belongs to seems to take precedence over attempting to determine why there is variability within a single projectile point assemblage.

Odell (2001:83) put forth the question "Do types reflect the achievement of formal mental templates in the minds of prehistoric tool makers, or are they the end result of a process of use and sharpening throughout the complex use-life of a tool?" This discussion between typological groups versus curation has been ongoing for many decades, a noteworthy example of which is the one between Francois Bordes and Harold Dibble. Bordes was an advocate of types, whereas Dibble supported the argument that tools became dulled and when retouched were altered to form a different tool type.

Bordes published an artifact taxonomy based on Middle Paleolithic side scrapers from France (Bordes 1953). Bordes and de Sonneville-Bordes (1970:72) claimed that differences in the style of artifacts were reflective of differences in cultural groups. Dibble (1987:109) questioned the assumption that types represent functional or stylistic types, and instead asked whether or not these differences reflect “stages along a continuum of edge reduction”. Using scrapers from three different sites in France and Iran, he determined that the scraper types that Bordes had recognized could represent different stages of utilization and reduction (Dibble 1987:115). Dibble (1987:116) stated that the variation seen in Middle Paleolithic scrapers was due to the amount of reduction that occurred.

As noted above, variability may be the result of a number of factors acting on the artifact. These also include rejuvenation, resharpening, and curation. Towner and Warburton (1990:311) defined rejuvenation as “the refurbishing of a broken tool into a functionally equivalent tool”. Resharpening has been identified as the retouching of a dull tool to provide a new, sharp cutting edge. Curation refers to the degree of use a tool experienced throughout its use-life, which can include maintenance and transport from site to site (Shott 1989, 1996:267; Kooyman 2000:171; Odell 2001:68). A large number of projectile points display modification, mainly in the form of retouch, and it is likely that these projectiles were used multiple times before final discard. Thus, a projectile point’s typological form can be altered and change throughout its use-life. Flenniken and Raymond (1986), Deaver (1997), and Andrefsky (2005) noted that retouch and maintenance activities are a prevalent cause for the variability seen within projectile point forms. Tools were extensively resharpened to prolong their use-life, to be reworked into other tools, such as drills and borers, and to use raw material more efficiently (Bamforth 2002:72; Macy 2009:302; Kornfeld et al. 2010:190).

The reuse of points was time efficient as well, as noted by Flenniken and Raymond (1986:608), who reported that it took a mean time of forty minutes to manufacture one point, while it only took a mean time of three minutes to rework a broken point into a functional point or tool. Projectile points often broke and their subsequent rejuvenation could change its morphological type (Flenniken and Raymond 1986:608-609). Through their experiments, Flenniken and Raymond (1986:613) found that "potentially one out of every three aboriginal projectile points changed 'temporal types' (morphological types) while still in their prehistoric context due to damage sustained during use as hunting tools". They concluded that there was a high probability for points to change morphological form before entering the archaeological record, thereby contributing to the variability present within a site assemblage. Flenniken and Raymond (1986) demonstrated that projectile point typologies are not always reliable temporal or typological markers. These researchers established that several artifact "types" may be representative of a certain "culture" at any given moment in time due to resharpening and reuse activities (Flenniken and Raymond 1986). They stated that "archaeologists cannot assume that patterns of morphological attributes have clear-cut chronological significance when simple alteration of shape during use-life may change the temporal assignment of that point by thousands of years" (Flenniken and Raymond 1986:609). Therefore, retouch and rejuvenation should not be ignored by archaeologists and should be examined more thoroughly. The use of projectile points for multiple purposes in forager toolkits, such as cutting, butchering, and digging tools, may also have altered the morphological attributes (Ramsay 1991:124; Andrefsky 2005:204; Woods 2009:15).

There are a great number of processes that can lead to the alteration of existing point attributes, which can cause an artifact to be erroneously classified as a separate typological form. Typologies are useful as broad temporal markers on the basis of technology, shape, and stylistic variations; however, the modifications that can occur during the use-life of a projectile point have caused some researchers to doubt the validity of temporal typological sequences (Flenniken and Raymond 1986; Nelson 1997). As Rosen (1997:25) stated, the "legitimacy of a type or a type list is to be found in (1) its reproducibility and (2) its analytic utility". Typologies were created to be groups of reproduced artifacts. If an artifact was not replicated it cannot be labeled as a separate typological group. As well, if during its use-life the artifact was modified, yet still retains many of its original characteristics then it should not be typologically separated. The use of typology should not be abandoned; however, a typology should remain flexible in order to incorporate the variability found within a single morphological group. The Besant phase projectile points have been recognized as highly variable by several researchers (Johnson 1970:55; Syms 1977:92; Hughes 1981:124; Duke 1996:247; Cloutier 2004:22). However, in what respect the points differ, or which particular attributes vary, is rarely discussed in detail. Although typology remains dominant in archaeological thought on the north-western Great Plains, other possible causal processes for the variability in projectile point assemblages of a single "type" are worth investigating.

Current Typological Groups on the Northwest Plains

There are a number of different phases or complexes that have been assigned to the Northwest Plains during the Late Middle Prehistoric period (2,500 – 1,300 BP). In this study, sites labeled as Besant, Outlook, and Sonota were examined. The Sandy Creek type is also discussed here due to the similarities between it and the Besant type. Although the relationships between these groups remains unclear, the material remains, in particular the projectile points, appear very similar (Foreman 2010:9; Bubel in press).

Many scholars (Neuman 1975; Dyck and Morlan 1995; Peck 2011) attributed the Outlook complex, Sandy Creek complex, Besant phase, and Sonota complex to different typological groups based on the slight differences between the projectile point attributes, as well as the presence or absence of other archaeological materials, for instance, burial mounds. It is necessary to identify these proposed differences between projectile points, especially since other researchers (Reeves 1983; Bubel in press) have argued for similarities, and question whether, based on the projectile point attributes, if these typological differences exist, or if they are reflective of a single morphological type.

Outlook

There have been a number of Northwest Great Plains sites dated between 2,800 – 2,500 BP, at which long atlatl points made of Knife River Flint have been uncovered. In many instances these projectiles were labeled as Besant, although these predate the Besant phase by approximately 500 years if the currently accepted temporal range of 2,000 and 1,500 BP is used (Foreman 2010:157; Peck 2011:247). Dyck and Morlan (1995) were the first to define Outlook projectiles based on materials recovered from the Sjovold site in south central Saskatchewan; however, there are variations regarding the characteristic attributes of Outlook projectile points. Dyck and Morlan (1995:425) defined them as a "distinctive straight-based, side-notched type of arrowpoint". They stated that the notches are low on the sides, only 2.0 mm above the base, with a neck width that ranges from 10.6 to 13.1 mm (Dyck and Morlan 1995:433). Alternatively, Peck (2011:247) recognized Outlook projectiles as atlatl points with "slightly elongate, wide-necked, straight-to concave-based points made on Knife River flint with side-notches low on the lateral margins". He also pointed out that Outlook points often look very similar to Sonota projectiles and that without a radiocarbon date the two are very difficult to differentiate (Peck 2011:249). If these points are not distinguishable from one another then perhaps the separation based on the projectile points alone is not justified. Dyck and Morlan (1995:445) considered Outlook to be early manifestation of Besant; however, due to the large temporal gap between Outlook and Besant, Peck (2011:247) believed that Outlook should "stand on its own" until more evidence can be collected.

Sandy Creek

Sandy Creek projectile points appeared approximately 2,450 to 1,950 BP according to Dyck (1983:108). Peck (2011:250) placed the Sandy Creek complex at around 2,500 BP. Sandy Creek projectile points were first identified by Wettlaufer (1955) at the Mortlach site in central Saskatchewan. He described these as being "short, thick, rather misshapen" projectiles (Wettlaufer 1955:52). According to Wettlaufer (1955:52), Sandy Creek projectiles averaged 28.0 mm long and 19.0 mm across the base, which is also the widest part of the point. However, Dyck (1983:108) stated that these points are side-notched, concave-based points with lengths ranging from 35.0 to 55.0 mm. Peck (2011:255) argued that Sandy Creek materials display sufficient amounts of variability, enough to fall under the “range of variability exhibited by Bracken projectile points”. Bracken points are dated between 2,800 and 2,100 BP and are defined as having “wide corner notches and straight shoulders and a convex base that was ground” (Peck 2011:256). Reeves (1983:14) argued that Sandy Creek is a transitional point between Oxbow and Besant, while Dyck and Morlan (1995:405) argued that Sandy Creek should be included within the Besant phase. This is intriguing since it illustrates that there is much variability visible within the projectile point collections. Oxbow, Besant, and Bracken are considered to be unique from one another, yet the Sandy Creek projectiles apparently display characteristics associated with all of them.

Besant

Perhaps the greatest typological disagreements center on the Besant phase. Wettlaufer (1955) was the first scholar to identify Besant side-notched points at the Mortlach site. Traditionally, Besant phase sites have been dated to between 2,000 and 1,500 BP (Reeves 1983; Vickers 1986; Peck 2011). A number of researchers (Johnson 1970; Syms 1977:92; Hughes 1981:124; Duke 1996:247) stated that the Besant atlatl point has a greatly varied shape, which is one possible explanation for the numerous definitions of the Besant projectile point. Wettlaufer (1955:44) defined these projectiles as being short and broad with a slightly concave base and shallow side notches. Dyck (1983:115) noted that the notches are generally twice as broad as they are deep. Forbis (1962:106) defined Besant points as being 25.0 to 37.0 mm in length, although some exceeded 40 mm in length, and were typically 17.0 to 24.0 mm wide. Kooyman (2000:123) identified two variants of Besant points: short and long. He stated that Besant points tend to be between 30.0 and 80.0 mm in length with an internotch distance of 14.0

to 23.0 mm (Kooyman 2000:124). Johnson (1970:56) indicated that Besant points range in length from 22.5 to 75.0 mm with widths from 11.0 to 33.2 mm, the greatest width being just above the notches at the midpoint. However, she also noted that “a number of the short points look as if they might once have been longer points that had been broken and were reworked” (Johnson 1970:58). Syms (1977:92) noted that there appears to be a high correlation between elongated corner-notched forms of Besant points to Knife River Flint, and a low occurrence of Knife River Flint in the small, squat forms. Many researchers (Dyck 1983; Reeves 1983; Kooyman 2000; Bubel et al. 2012) have also recognized that high quality material and workmanship can be seen in many Besant projectile points, even though there are a significant number of points that display less concern for uniformity and symmetry. Zeier (1983) demonstrated that the Besant points recovered from the Antonsen site, a bison kill site with an adjacent campsite located in Montana, have a wide variation of characteristics, which he reasoned was due to the fact that archaeologists find points that are representative of various stages in the life-cycle of a projectile. There does not appear to be a uniform definition as to what characterizes a Besant projectile point, which may be because the points themselves exhibit a great amount of variability. Having said that, they are easily distinguished from the Bracken points that predate them and the Avonlea points that follow them.

Sonota

Sonota sites date to 1,500 – 1,350 BP (Peck 2011:309). Sonota projectile points were first identified by Neuman (1975) based on materials uncovered from the Stelzer (39DW242), Swift Bird (393DW233), Grover Hand (39DW240), Arpan (39DW252), and Boundary mound (32SI1) sites in the Dakotas. Neuman (1975:82) defined Sonota points as being similar to Besant projectiles but more slender with straight basal edges and broad side notches. At the Stelzer site, these points ranged from 25.0 to 67.0 mm long, 19.0 to 26.0 mm wide, 5.0 to 8.0 mm thick, and 2.7 to 8.8 g in weight (Neuman 1975:17-18). Syms (1977:88) stated that the distinctive Sonota projectile points are a “variation of corner-notched projectile points that subsume Besant and Samantha side-notched types”. He also found that a majority of Sonota projectiles are crafted from Knife River Flint (Syms 1977:27). At the Stelzer site, 33 of the 57 points (58%) recovered were made from Knife River Flint (Neuman 1975:17-18; Ramsay 1991:89). Hannus (1994:186) wrote that Sonota points are very similar to Besant and Samantha side-notched forms. Syms (1977:90) found that nearly all Sonota sites rely heavily on Knife River Flint, and that this material is used for more than 80% of the tools recovered, regardless of the distance from the quarries.

Investigating Projectile Point Variability

Clearly, the variability within projectile point assemblages can be the result of a number of different factors. Single component site projectile point assemblages offer the best way to assess the amount of variability present in a past cultural group, although the argument can be made that a single component site could have been occupied by multiple groups at the same time. However, single occupation sites still represent an archaeologist’s best possibility of identifying variation within a single group of people. Other researchers in other regions of the continent have examined projectile point variability within single component sites. For instance, Custer (1989) found that numerous projectile point forms collected from the Hawthorn site in northern Delaware, were in use at a single moment in time, and he noted that this morphological variability could be explained functionally rather than chronologically. He examined tool function and raw material utilization in relation to morphological variability (Custer 1989:149). Many of the tools displayed wear patterns connected with heavy cutting activities and many tools were refurbished within the butchering area (Custer 1989:149). The Fincastle, One-Eleven, Happy Valley Kill, Muhlbach, Fitzgerald, and Ruby sites are all single component bison kill sites that have been radiocarbon dated and in all likelihood represent single occupations.

It is worth investigating which particular projectile point attributes archaeologists consider to be important to typological classifications and to identify the possible causes for variation visible in projectile point attributes. As Reher and Frison (1980:98) stated, although the discussion regarding the reality of morphological "types" may be viewed as counterproductive, the "debate on what is being measured or how to best measure certain phenomena is vital to the continuing development of archaeological thought". It may be that the Late Middle Prehistoric typological groups identified by archaeologists for Northwest Plains sites are too rigid and that the degree of variability identified within the "types" exceeds the variability between the types. Projectile points from six sites were examined in detail, and each attribute is outlined in the following chapter. The attributes were scrutinized in order to study the issue of variability, as well as the factors responsible for each attribute, that is, their functional and/or stylistic significance, was determined.

CHAPTER 3: Projectile Point Attributes

Data Collection

In order to investigate the issue of typological variability in projectile points, points recovered from six single component sites on the north-western Great Plains dating to the Late Middle Prehistoric period, between 2,500 BP and 1,300 BP, were examined. Though datasets exist for the Fitzgerald and Fincastle collections, these sites were reanalyzed in order to ensure as much methodological consistency as possible. The attributes selected for measurement include those commonly recorded, as well as several more (Figure 1). An attribute is defined here as a property of an artifact that cannot be reduced to secondary components (Chivis 2002:40; Hranicky 2011:33). Certain attributes are common to a particular typological group (Chivis 2002:40; Hranicky 2011:33), and are, therefore, used as typological indicators. For instance, Mummy Cave projectile points are characterized by sharp shoulders, square notches, and well defined basal edges (Peck 2011:135). Pelican Lake points are defined as long, corner-notched points with straight blades, barbed shoulders, a thin neck, and a base that is narrower than the blade (Peck 2011; Bubel et al. 2012). Information connected to the attributes, which consists of numerical values and non-metric data were recorded.

In this study the attributes were separated into overall attributes, blade attributes, and basal attributes, with left and right data collected where applicable. Because basal attributes are considered more indicative of typological groupings, and blade attributes have the ability to display evidence of reuse and reworking, these attributes were the main focus of this research. The catalogue/field number, which is the unique number assigned to each projectile point by the site investigator, was recorded for all of the data sets. Many artifacts were complete, but since most specimens were broken the portion of the point present was recorded. Due to the nature of this study, the incomplete portions of projectiles that were examined were body/base or base/body/tip (Figure 2). If specimens were incomplete, measurements of only the complete attributes were taken (Erwin et al. 2005:52). Ten overall attributes were recorded: maximum length, maximum width, maximum thickness, weight, material type, material colour, symmetry, quality of workmanship, transverse section shape, and longitudinal section shape. Blade attributes include tip shape, blade length, blade edge shape, body length, body shape, shoulder width, shoulder shape, use-wear, and retouch in the form of secondary flaking patterns. Fourteen basal attributes were measured and recorded. These were neck width, notch height, notch depth, notch type, notch orientation, notch shape, the presence of notch grinding, stem/haft length, proximal margin height, proximal margin shape, maximum base width, base shape, and the presence of any basal thinning and grinding. Each of these measured attributes are described in greater detail below. It has been noted that many typologies are of limited application since they used vague terms and did not clearly describe the attributes (Binford 1963:195). Thus, all attributes examined in this study are explicitly defined so that this study can be repeated and tested by other researchers. If it was possible to determine the dorsal face of the point, it was examined dorsal face up, ventral face down; left and right portions were assigned accordingly. All metric attributes were measured to the nearest tenth of a millimetre using an electronic digital caliper. Weight was recorded to the nearest hundredth of a gram.

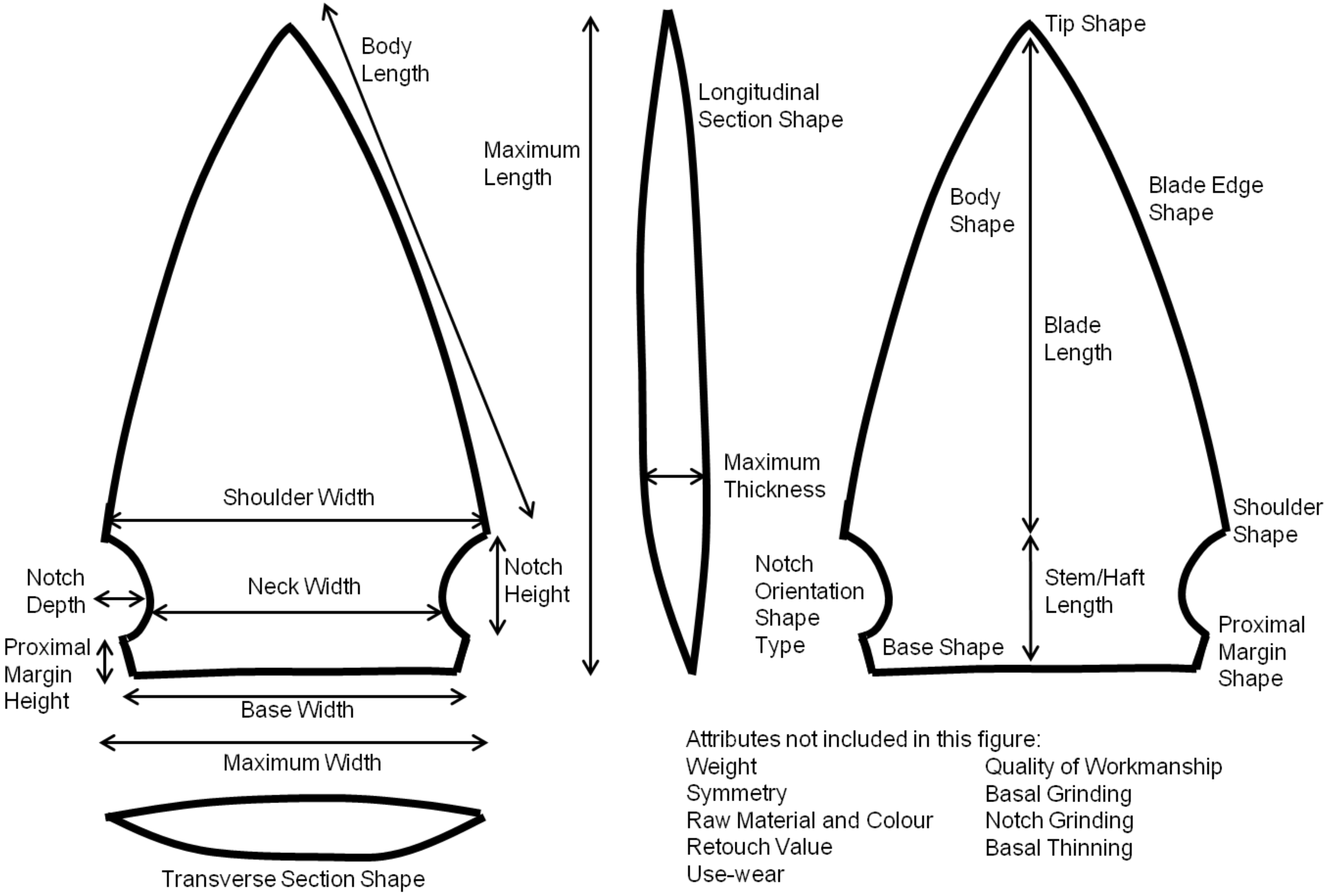

Figure 1: Projectile point attributes measured in this study.

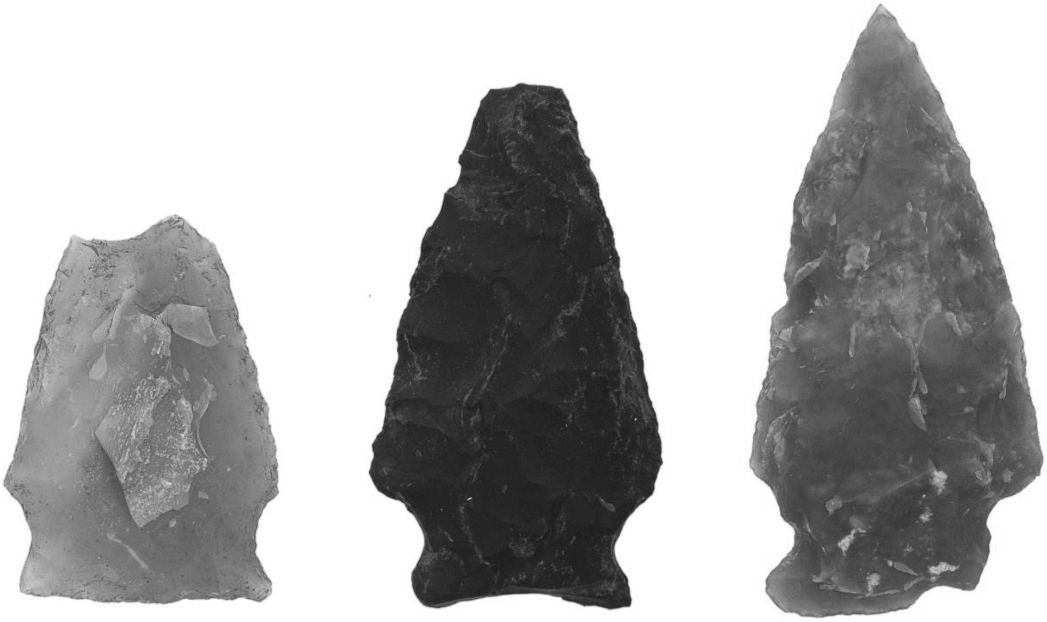

Figure 2: Examples of incomplete projectiles included in this study.

Overall Point Attributes

A number of attributes (Table 1) encompass the entire projectile point including maximum length, width, and thickness, weight, material type, material colour, symmetry, quality of workmanship, transverse section shape, and longitudinal section shape, the first four being the most commonly measured and recorded attributes (Nicholson 1976; Reher and Frison 1980; Hughes 1981, 1998; Flenniken and Raymond 1986; Odell and Cowan 1986; Brink and Dawe 1989; Ramsay 1991; Shortt 1993; Davy and Ramos 1994; Hjermstad 1996; Deaver 1997; Shott 1997; Beck 1998; Peck and Ives 2001; Chivis 2002; Head et al. 2002; Ellis 2004; Erwin et al. 2005; Cheshier and Kelly 2006; Varsakis 2006; Lyman et al. 2008; Sellet et al. 2009). These measurements are also the minimum provincial requirements according to the Heritage Resources Management Branch of Alberta Culture.

Length is defined as the maximum distance from the base or the proximal portion of the point to the tip or distal section of the point; it is the maximum distance that is measured along the longitudinal axis of the point (Binford 1963:219; Krautkramer 2009:52). Maximum width is measured perpendicular to the length. Some researchers (Binford 1963; Thomas 1981; Brink and Dawe 1989; Krautkramer 2009) also included the position of the maximum width within their datasets, as the widest point may be at the base, shoulder, or mid-blade. Both the length and the width are significant since these attributes are related to the seriousness of the inflicted wound, and to the quantity of cutting edge present to cause that wound (Lyman et al. 2008:2,808). However, length can be highly variable due to resharpening, and can be an unstable characteristic (Thomas 1981:15; Greaves 1982:97; Shott 1997:93). Nelson (1997:374) and Hughes (1998) theorized that some projectile points were initially created long in order to facilitate reuse and resharpening, in an attempt to extend their use-life. Variability in width may also be the result of resharpening since it appears that longer, less reduced points also tend to be wider than other points that were reworked (Ellis 2004:221).

Table 1: Overall attributes of projectile points.

Attribute	Definition
Catalogue Number	The unique identifying number assigned to each artifact
Portion	The part of the projectile that is present (Base, Body, Tip, etc.)
Maximum Length	The maximum longitudinal distance from the base to the tip of the projectile
Maximum Width	Maximum measurement that is taken perpendicular to the maximum length
Maximum Thickness	The maximum breadth of the point
Weight	The mass of the artifact
Material Type	Type of stone that the tool is manufactured from
Material Colour	The colour of the raw material that the tool is crafted from
Symmetry	An artifact is symmetrical when the lateral edges are geometrically complementary and asymmetrical when they are not complementary
Quality of Workmanship	Defined as the "degree of workmanship on the projectile point" (Varsakis 2006:126).
Transverse Section Shape	Observed near the midpoint of the blade, perpendicular to the longitudinal axis
Longitudinal Section Shape	Viewed when the point is orientated vertically

Also concerning the maximum width of a projectile, Christenson (1986:117) indicated that a wide point will not penetrate as deeply as a narrow point. It will, however, create a larger wound and thus cause more bleeding. Ellis (2004:224-225) postulated that the raw material could be a factor in determining the thickness of a projectile, since it may be more difficult to create an adequately thin point from low quality material. Differences in thickness may also be associated with various reduction strategies, for instance bifacial reduction may result in thick points, while thin points may be connected to flake reduction (Buchanan et al. 2007:295).

It is important to note that a number of ratios have been calculated by other researchers, most notably the length to width ratio. This ratio is thought to represent the overall shape of the projectile point, where short, wide points will have different values than long, narrow ones (Reher and Frison 1980:110; Fletcher and Lock 2005:7). Reher and Frison (1980:110) noted that a site assemblage with a large length to width index has points that are longer and more slender than a site collection with a smaller index. Odell and Cowan (1986:206) stated that this ratio is important because it is related to the point's ability to penetrate the hide of the animal and its ability to then hit the bone. They go on to state that the greater the probability of penetration, the shorter the use life of that particular tool (Odell and Cowan 1986:206). According to Hughes (1998:388), resharpening can alter the length to width ratio of a projectile point since it reduces the tip length in proportion to the width of the blade. The width to thickness ratio may also be of importance (Reher and Frison 1980:110). Hughes (1998:373) wrote that this ratio can vary and can alter the cross section shape of the point, which also relates to the penetration and durability of dart and arrow projectiles. Other ratios that have been calculated by other researchers include blade length to blade width, notch width to notch depth, blade width to haft width, base width to maximum thickness, and base edge height to notch width (Reher and Frison 1980:111-112; Hughes 1981:68).

The weight of a projectile point is defined as the mass of the artifact, which is usually measured to the nearest tenth of a gram. According to Christenson (1986:115), the weight of a projectile is important to its stability while in flight. He stated that, in general, "a heavier projectile is less subject to the effects of crosswinds than a lighter one" (Christenson 1986:115). Christenson (1986:117) also stated that archers agree that projectile mass is more important to penetration than velocity. Although this study concerns mainly atlatl projectiles, these, like arrows, are a fletched flight projectile. Any reduction in the mass of the projectile, due to resharpening for instance, will cause a loss of penetration force (Christenson 1986:117; Bettinger and Eerkens 1999:233). However, it is possible that projectiles could be designed to allow for modifications in weight when resharpened without significantly varying their stability (Christenson 1986:119). This may be due to fact that the wooden shaft of the projectile retains the majority of the weight, and thus any reduction in the weight of stone point may be negligible.

The raw material type has been recognized by a number of researchers (Greaves 1982; Bamforth 1991; Nelson 1997; Hughes 1998; Head et al. 2002; Cheshier and Kelly 2006; Buchanan et al. 2007) as being an important attribute in the manufacture of projectile point artifacts. Raw material is the type of stone that a lithic projectile point is crafted from. As Nelson (1997:377) noted, the “raw material affects breakage (brittleness and direction of fracture), damage to prey (lethalness), and the amount of time and skill required for manufacture, reworking, and replacement”. Microcrystalline or cryptocrystalline stones, such as cherts, chalcedony, and obsidian, were the preferred materials for use in the manufacture of stone tools (Yohe 2006:41). Good quality lithic material was often scarce and had to be acquired from some distance away (Crabtree 1975), which is the case for Alberta. For this reason, ancient stoneworkers designed their tools to be used repeatedly, and chose stone that was resistant to shock and impact in order to allow for a longer use-life (Crabtree 1975:108). It appears that a fine-grained stone, which has the ability to maintain a sharp cutting edge, was more often preferred over a coarse-grained stone for the manufacture of projectile points (Crabtree 1975:108; Hayden et al. 1996:23; Bamforth 2002:84). Hughes (1998:373) stated that chert is the best material to use because of its compressional and tensile strength combined with its ability to maintain a sharp edge. Chert also has high density values, resiliency value, hardness value, and toughness (Greiser and Sheets 1979:293). Cherts, basalt, and quartzite are materials that have a high compressive strength combined with excellent flaking properties, including homogeneity, isotropy (an even distribution of strength), and a fine grain (Hughes 1998:371-372).

Raw material is important to examine since there may be a connection between the material type and the variation visible in the projectile point assemblages. Raw material, and the subsequent manufacturing techniques used to work that material, can play a role in the final morphological form of a projectile point (Finnigan and Johnson 1984:32; Ramsay 1991:91). The projectile points made from locally available materials, which on the Canadian Plains are generally poorer in quality, tend to be shorter than those made from high quality materials (Finnigan and Johnson 1984:32; Ramsay 1991:91). The colour of the raw material is also considered important since colour changes, typically of red or pink, can be indicative of heat treatment (Kooyman 2000:65). Andrefsky (1997:136) stated that different patterns of stone tool production can emerge depending on the abundance of lithic raw material, and that tool morphologies can be subsequently influenced by the availability of these raw materials. In research conducted by Greaves (1982:108) she did not include raw material type in her study; however, she stated that future research should explore the possible association between raw material type, projectile point morphology, and group affiliation. The raw material that was chosen for use may have been subject to a number of factors, such as the distance to the source of the raw material (quarry), the ability to access the quarry, the lithic exchange networks that were in place at the time (trade), and perhaps the type of site, for instance, a site focused on hide working would have less need for high quality materials (Hughes 1998:373). It has been noted that if the source for a highly sought after raw material type is a great distance away, a greater utilization of those stone types may have occurred (Andrefsky 2006:754). Andrefsky (2006:753) found that foreign materials were curated and reused since in many instances these were favored over the locally available materials. Buchanan et al. (2007:280) also examined the possible correlation between raw material type and point form variability. The authors grouped their sample of points by raw material and conducted tests in order to determine if there were significant differences in form. These researchers found that Late Paleoindian assemblages exhibited no significant differences in form between material types; however, Buchanan et al. (2007:293) did go on to state that a number of materials were represented only in small amounts and were then not included in the study, and that these may have influenced the final form of the projectile artifact. Thus, there may not be a relationship between raw material and variation; however, this has not been tested on Late Middle Prehistoric period assemblages.

In regards to Besant utilization of lithic material, Reeves (1983:96) and Vickers (1994:11) noted that Knife River Flint and Avon chert, from Montana, were commonly used, while the use of Wyoming-derived obsidian was rare. At some Besant sites, the tool assemblage is predominantly made from Knife River Flint, a high quality raw material sourced to North Dakota (Clayton et al. 1970; Clark 1984; Gregg 1987), while other sites appear to have an emphasis on local, poorer quality materials. The Fincastle, Muhlbach, and Fitzgerald projectile point assemblages are dominated by Knife River Flint. There are over twenty quarries located in the Dunn and Mercer counties in North Dakota, which is the primary source for high quality Knife River Flint, although cobbles have been found in other areas in small amounts (Gregg 1987).

Knife River Flint is a type of chert which, due to its uniform, homogeneous, and non-porous nature, is excellent for flint knapping. Usually this stone is dark brown in colour, similar to root beer or coffee, but it can range from light yellowish to almost black in colour (Gregg 1987:367). Generally it does not require heat treatment to improve its flaking qualities; however, if heated to between 225 – 250 °C, Knife River Flint turns very dark brown or dark grayish brown in colour (Clayton et al. 1970:287; Gregg 1987:367; Boras 1991:95).

Another attribute examined was body symmetry (Nicholson 1976:75; Head et al. 2002), which can be symmetrical, asymmetrical, or slightly asymmetrical. As defined by Binford (1963), a point is labeled symmetrical when the lateral edges are geometrically complementary and asymmetrical when they are not complementary. Asymmetry can be an indicator of reworking and reuse, where the point was reworked more heavily on one side than the other (Binford 1963:202; Ramsay 1991). However, reworking can also create a symmetrical point if both edges were reworked. Symmetry could also reflect how the flint-knapper chose to refashion a broken tool (Ramsay 1991:124). Asymmetry can also be the result of secondary uses, such as a point modified into a knife. Binford (1963:202) also suggested that asymmetry could be the result of the material fracturing imperfectly.

The quality of workmanship is another attribute that has been recorded (Varsakis 2006); it may also be labeled as knapping quality (Bubel in press). This refers to the "degree of workmanship on the projectile point" (Varsakis 2006:126), and is based on the judgment of the researcher. Common options for this include high, medium, and poor quality. In this study, quality could be high, medium/high, medium, medium/low and low. High quality points are considered to be skillfully made, significantly shaped, and more or less symmetrical. A moderately well-made and shaped point is considered to be medium in quality. A low quality point displays minimal shaping and effort. The categories of medium/high and medium/low were used when it was determined that the point could not be placed precisely into one of the previous three categories. Yet as Crabtree (1975:109) noted, tools that exhibit inferior workmanship may be the result of a superior flint-knapper who was forced to use a very poor quality stone. There are a number of variables that the original flint-knapper had to take into consideration, including core preparation, striking angle of the hammerstone and the chipping implement itself (Gunn 1975:38-39). Bamforth (1991:310) stated that a flint-knapper's ability to express detail in style in a projectile point could be constrained by the use of a poor quality raw material. It could also indicate that exceptional craftsmanship was not important to the individual who manufactured the projectile point. The use of a coarse material may result in a point that is less symmetrical and less precisely flaked than a projectile crafted from a higher quality, microcrystalline stone (Bamforth 1991:310). Manufacturing errors may also occur more often when using a poorer quality of stone that has more inclusions and micro-fractures. Thus, any evaluation of workmanship should consider both the skill involved to craft such tool and the material from which the tool is manufactured. Pyszczyk (2003:60) also noted that the quality of workmanship of Besant points is related to the raw material, as quartzite points tend not to be well made, while those crafted of Knife River Flint display a high quality of workmanship. It is important to note that amateur, and other less skilled flint-knappers, also contributed to the archaeological record, which may have resulted in workmanship variation within a single component site assemblage (Tehrani and Riede 2008).

Transverse and longitudinal section shapes are often referred to as the cross-sections of the point in the literature (Nelson 1997; Peck and Ives 2001). According to Nelson (1997:377), the cross-section is related to a point's ability to resist breakage and the size of the wound it would inflict. Hughes (1998:385) found that different cross sections were produced depending upon whether the manufacturer was focussed on durability or penetration. A thick, conical cross section improves durability, while a thin, elliptical cross section improves penetration. Hughes (1998) suggested that the projectile points of flight weaponry (atlatls and arrows) were designed to increase the penetration ability of the point. The longitudinal section can be viewed when the point is orientated vertically, while the transverse section should be observed near the midpoint of the blade, perpendicular to the longitudinal axis (Binford 1963; Chivis 2002; Varsakis 2006). In this study, the longitudinal and transverse profiles were classified as biconvex (BI), plano-convex (PLCX), plano-triangular (PLTR), lenticular (LEN), or concave/convex (CCV/CVX) (Figure 3). Biconvex can be identified when both the ventral and the dorsal surfaces curve outward, similar to a lens. Plano-convex can be seen when one side, either the ventral or dorsal is curved outwards while the other is straight. Plano-triangular occurs when one surface of the projectile appears straight while the other is triangularly shaped, due to the straight edges meeting at a point producing an angle. Lenticular is identified when one edge is slightly convex and the other is concave and curves up into the convex edge. Concave/convex refers to a cross section that arcs upwards, and then curves downwards, and vice versa, and thus looks similar to a wave.

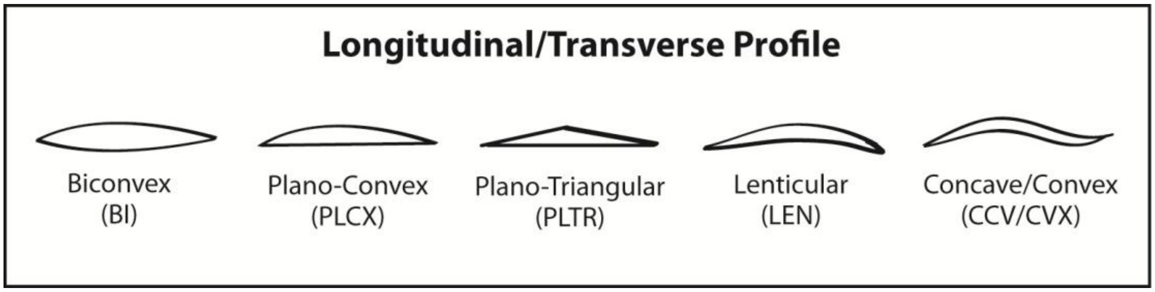

Figure 3: Longitudinal and transverse profile classifications.

Blade Attributes

Blade attributes (Table 2) are important because this is where the majority of the secondary modification would have occurred. The blade attributes are external to the haft and were thus subject to more alterations than the basal portions. It is therefore possible that secondary alterations changed the appearance of the blade portions and are not representative of the original cultural template.

Table 2: Blade attributes of projectile points.

Attribute	Definition
Tip Shape	Formed structure of the distal portion of a projectile
Blade Length	Measured from the tip of the projectile to the distal portion of the two haft or notch elements
Blade Edge Shape	Is specific in that it describes each side of the projectile separately
Body Length	Measured from the tip straight to the left or right shoulder of the point
Body Shape	Overall impression of the shape; more general than Blade Edge Shape
Shoulder Width	Maximum distance perpendicular to the longitudinal axis between the shoulders of the point
Shoulder Shape (left and right)	Shape of the distal point of juncture of the haft element

The tip shape, the formed structure of the distal portion of a projectile, has been recorded by a number of researchers (Hughes 1998; Head et al. 2002). The angle or shape of the tip has been used as a reduction estimator (Charlin and González-José 2012:228). Zeier (1983) and Deaver (1997) measured the tip angle in their examinations of Besant projectile point assemblages. Frison (pers. comm. 2012) stated that a pointed tip was both important and preferred, since the more pointed the tip, the easier the penetration of the bison hide. This is supported by Christenson (1986) who stated that the sharpness of the tip affects the penetration ability of the point. Fawcett (1980:15) found that tip angle, along with thickness, were the main attributes that affected the penetration ability of the projectile. Tip shape may also be related to the projectile point's ability to generate a hole that is substantial enough to allow the shaft of the point to enter the prey with minimal resistance (Hughes 1998:379). Tip shape was classified as either pointed (PT), sharp (SH), blunted (BL), or rounded (RND) (Figure 4). Pointed tips have distal edges that meet to form a distinct acute pike. Sharp is identified where the distal blade edges are not straight but angled. Blunted can be seen when the tip has been purposefully ground down or manufactured to create a dulled, flattened tip. Rounded tips are curved and smoothed. A rounded tip may also be representative of a retouched tip.

Blade length, measured from the tip of the projectile to the distal portion of the two haft or notch elements (Binford 1963; Reher and Frison 1980), was recorded for the complete projectile points. The body length of the projectile was also recorded, measured from the tip straight to the left or right shoulder of the point, or to the end of the distal portion of the notch. Buchanan et al. (2007:283) wrote that the resharpening of hafted points can result in a reduction of the blade dimensions, and thus decrease attributes such as body length and blade length.

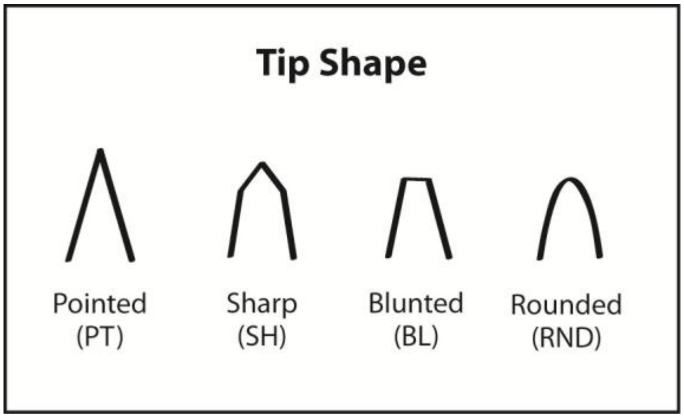

Figure 4: Tip classifications.

The blade edge shape, or blade shape, is closely connected to blade angle (Zeier 1983), as well as the body shape. While the body shape is the overall impression of the shape, blade edge shape is more specific in that it describes each side of the projectile separately. Blade edge shape can be indicative of reworking, since the angles or shape of the blade may be altered during repeated resharpening. Blade edge shape may also be related to the penetration ability of the point. The sharpness of the distal blade edge would affect the size of the opening in the hide, made for the rest of the point and shaft to enter (Frison 1978:338). Ramsay (1991:122) reported that the reworking of the blade can result in concave (incurvate) blade edges. The blade edge shape can be categorized as one of five options: straight (STR), excurvate (EXC), incurvate (INC), excurvate/incurvate (EXC/INC), or recurved (REC) (Figure 5). A straight edge shape is characterized by direct, unfaltering line from the shoulder to the tip. Excurvate can be seen when the blade edge arcs outwards slightly, and allows the point to roll back and forth on a flat surface. An incurvate blade edge shape is characterized by a slight concaveness between the shoulder and the tip. Incurvate/excurvate is visible when the blade expands outwards slightly and then arcs inwards at the tip. A recurved blade edge shape is characterized by a blade with a curve inward, then outward, and then inward again as it reaches the tip. To clarify, it resembles a wave or a bump in the blade.

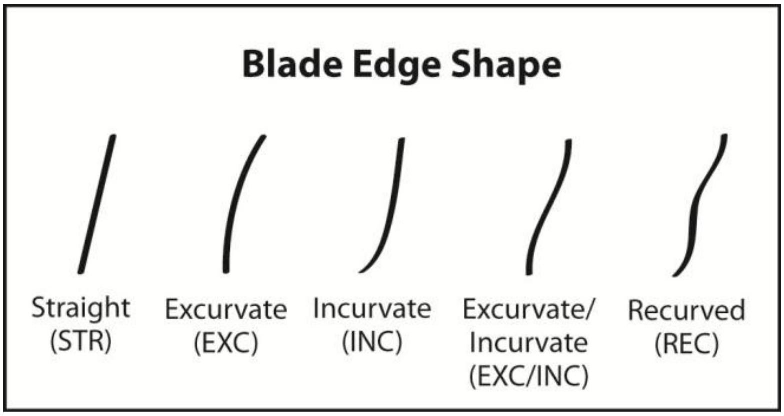

Figure 5: Blade edge shape classifications.

Body shape, also called point shape, lateral edge shape, total form outline, and outline form (Nicholson 1976; Head et al. 2002; Peck and Ives 2001; Erwin et al. 2005; Bubel in press) is defined as the general shape of the blade portion of a projectile point. This can be used to identify patterns of variability in projectile point assemblages (Buchanan et al. 2007:280). Body shape, for instance incurvate on one side and excurvate on the other, may also indicate that points were reworked (Ramsay 1991:112; Chivis 2002:41). Reher and Frison (1980:116) noted that attributes, for instance, blade size and shape, were determined by the size of the target animal, as well as with change in technology size and power, in this case a bow. Ovate (OVT), triangular (TRI), incurvate (INC), incurvate/excurvate (INC/EXC), and recurved (REC) forms were identified in this study (Figure 6). These terms closely follow the body shape terminology. An ovate body shape is characterized by convex edges of the blade meeting at the tip. Triangular is identified when there are straight lines visible between the shoulders and the tip. Incurvate has slightly concave lines between the shoulders and the tip of the projectile. Incurvate/excurvate can be seen when the shoulders of the blade expand outwards in a convex manner, and then these lines arc inwards until they meet at the tip. A recurved body shape is visible when there are a number of slight curves along the blade edges.

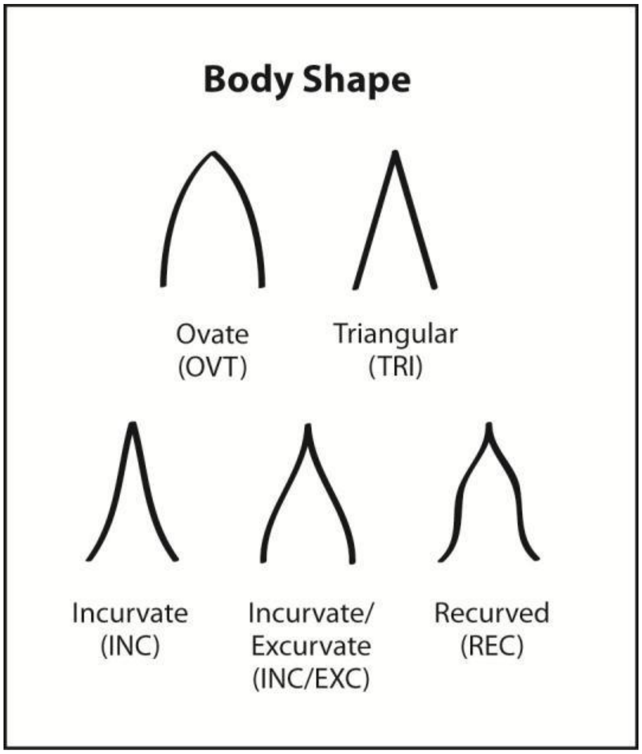

Figure 6: Body shape classifications.

Shoulder width (Nicholson 1976; Brink and Dawe 1989; Hughes 1998; Head et al. 2002; Andrefsky 2005; Lyman et al. 2008), also referred to as blade width when the maximum width is above the shoulders (Reher and Frison 1980; Andrefsky 2005), is the maximum distance perpendicular to the longitudinal axis between the shoulders of the point. Binford (1963:198) described the shoulders as being the distal point of juncture on a projectile point, where points of juncture refers to the point where one element joins with another. Shoulder width, like neck width, can be used to distinguish between arrow and atlatl projectiles (Pyszczyk 2003). Arrow points tend to have shoulder widths smaller than 19 mm and atlatl projectiles have shoulder widths greater than 19 mm (Pyszczyk 2003). Shott (1997:98) also found that arrows tend to have shoulder widths of less than 20 mm and correctly identified arrows 92% of the time using a single-variable analysis.

The shape of the shoulder, which is similar to the shoulder angle (Thomas 1981; Zeier 1983; Flenniken and Raymond 1986; Davy and Ramos 1994), was also examined and recorded in this study. According to Nelson (1997:377) shoulder shape, both left and right, contributes to the recoverability of the point and to the internal damage dealt to the prey. Ramsay (1991:114) found that shoulder shape often differs from one side of Besant points to the other. This could be the result of breakage and subsequent reworking, or it could result from their use as cutting tools. Binford (1963:212) labeled shoulder shape as the distal point of juncture of the haft element. He identified six variants incorporated into this study: rounded/obtuse (RND/OBT), which is categorized by a rounded shoulder where the angle is greater than 95°; rounded/right (RND/RT), which is where the shoulder angle is between 95° and 85°; rounded/acute (RND/ACT), where the shoulder is rounded with an angle of less than 95°; angled/obtuse (ANG/OBT), where the shoulder is more sharp and has an angle of greater than 95°; angled/right (ANG/RT), which has an angle of between 95° and 85° and has an abrupt meeting; angled/acute (ANG/ACT), where the shoulder is sharp and has an angle of less than 95° (Figure 7).

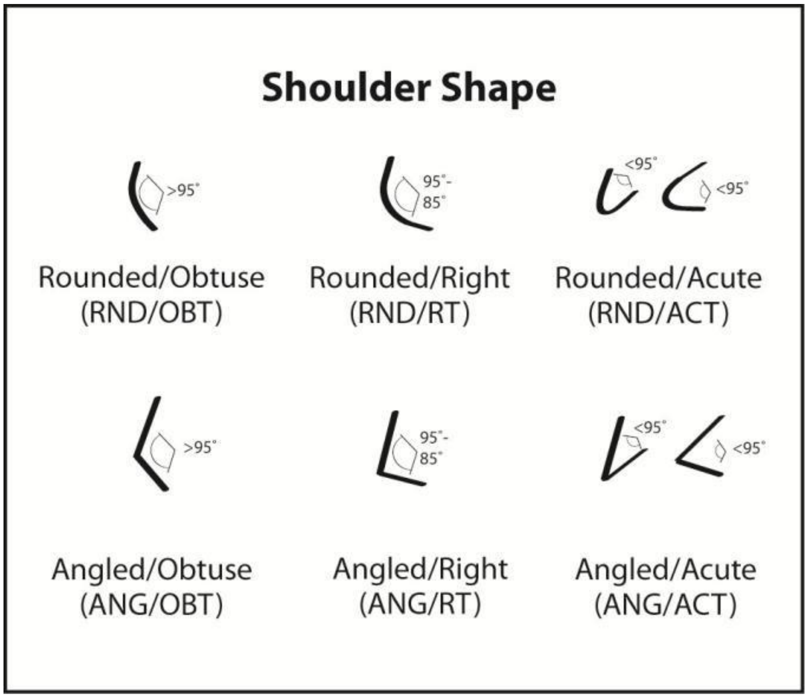

Figure 7: Shoulder shape classifications.

Basal Attributes

Since it is speculated that the basal attributes (Table 3) are more typologically indicative than the blade attributes because projectile points were likely resharpened while remaining hafted, a number of measurements for the base are typically recorded (Fawcett 1980:24). According to Fawcett (1980:30) basal attributes include notch width and depth, neck width, base edge height, base shape, notch angle and others. Buchanan et al. (2007:283) found that in most instances, there was little alteration of the basal measures, which further suggests resharpening while the point was hafted. Odell and

Cowan (1986:204) stated that during the experiments they conducted, every projectile exhibited tip damage while basal damage was not perceived on a majority of the points recovered. Thomas (1981:15) also found that “basal attributes clearly provide the most stable variables for monitoring temporal change in projectile points”. He used basal attributes, particularly basal width and neck width to sort projectile points. Thomas (1981) avoided gross size attributes, such as the weight and length because he considered these to be highly variable. As Macy (2009:310) subsequently noted, the differences in points “could be due to continued reduction and re-use, or could be as simple as stylistic variation, which can be translated into preference”. Since basal attributes appear to display much more culturally significant attributes than does the blade, these should be examined thoroughly in order to extract as much information as currently possible.

Neck width, also called notch width, or haft/stem width, is the distance between the two notches perpendicular to the length. It is generally thought that the neck width is directly related, often the same size or slightly larger, to the diameter of the shaft or foreshaft to which it was once connected (Forbis 1962:87; Christenson 1986:119; Pyszczyk 2003:59). This may suggest that the shafts that were chosen for use as projectile weapons dictated the final width of the point itself. Neck width can be useful when identifying arrow points versus atlatl or dart points as atlatl points often have a neck width greater than 11 mm. Pyszczyk (2003:59) stated that the reason for this is that any narrower and the shaft would be too flexible, which would adversely affect the accuracy and the distance of the launched projectile. On the other hand, if an arrow shaft diameter is greater than 11 mm, the bow required to shoot the arrow would have to be very powerful, the shaft itself would have to be crafted of a very flexible material, or be very long in length to achieve the necessary flexibility, all of which seem impractical alterations (Pyszczyk 2003:59). Hildebrandt and King (2012) have also introduced the Dart-Arrow Index, where the neck width is added to the maximum thickness and this produces a number which can be used to identify atlatl versus arrow points. These researchers found that arrows will have an index number of less than 11.8 mm and atlatl points will have values greater than 11.8 mm (Hildebrandt and King 2012:792).

Table 3: Base attributes of projectile points.

Attribute	Definition
Neck Width	The distance between the two notches perpendicular to the length
Notch Height	Measured from the maximum portion of the base to the maximum extent of the shoulder
Notch Depth	Measured from the internal portion of the notch, the neck edge, to the lateral edge where the shoulder and the basal edge would meet had the notch not been produced
Notch Type	The kind of notch that was produced, classified as side (SID), corner (COR), or corner-side (COR/SID)
Notch Orientation	Direction of the notch, classified as symmetrical (SYM), skewed distally (SKWDST), or skewed proximally (SKWPRX)
Notch Shape	The form of the notch, classified as rounded (RND), angled (ANG), squared (SQ), or rounded/squared (RND/SQ)
Notch Grinding	Smoothing the notch, by abrasion or friction
Stem Length	Measured from the lateral longitudinal edges to the base of the point
Proximal Margin Height	The "lateral distance between the notch and the base" (Forbis 1962:90)
Proximal Margin Shape	The shape of the very proximal edge of the point, which is the connection between the base and the notch
Base Width	The measurement of the base, also called base linear length
Base Shape	Outline of the base, or the shape of the most proximal portion of the projectile point
Basal Thinning	Identified from the small flakes that were removed longitudinally from the proximal portion of the point, which may be unifacial or bifacial
Basal Grinding	Grinding appears as smoothing by abrasion or friction

The dimensions of the notches of projectile points are examined closely by archaeologists as they facilitate the hafting of the point onto the shaft or foreshaft (Andrefsky 2006:744). The notches are the indentations which generally occur very near the proximal portion of the point. Notch height and notch depth were measured and recorded to the nearest tenth of a millimetre. Notch height is here defined as “the distance across the opening of the notch at its mouth” (Forbis 1962:90). The notch height was measured from the maximum portion of the base to the maximum extent of the shoulder. It is, therefore, where the notch begins on the proximal portion of the point to where it terminates in the distal portion. The notch depth was measured from the internal portion of the notch, the neck edge, to the lateral edge where the shoulder and the basal edge would meet had the notch not been produced. Hjermstad (1996:66) stated that the notch height and depth can vary considerably and are offset, which he felt is a diagnostic characteristic of Besant projectile points. He found that a vast majority of the points included in his study had one notch that was long and shallow while the other was short and deep. Although the reason for this is unclear, he hypothesized that it may help stabilize the points if they were used as cutting tools (Hjermstad 1996:66).

Again, since the notches assist in the hafting of the projectile points to the shaft or foreshaft, three shape aspects were analyzed in this study. The notch orientation, also labeled notch opening angle (Nicholson 1976; Thomas 1981; Ramsay 1991; Davy and Ramos 1994) was classified as symmetrical (SYM), skewed distally (SKWDST), or skewed proximally (SKWPRX) (Figure 8). Ramsay (1991:114) stated that a notch was labeled as symmetrical if both sides of the notch are equal. If the “tail” of the notch appeared to be longer in the distal or proximal direction then it was stated to be skewed in the direction that the tail was pointing (Ramsay 1991:115). Notch symmetry may be reflective of the flint-knapper's individual motor habits or it may be functional in design (Ramsay 1991:115).

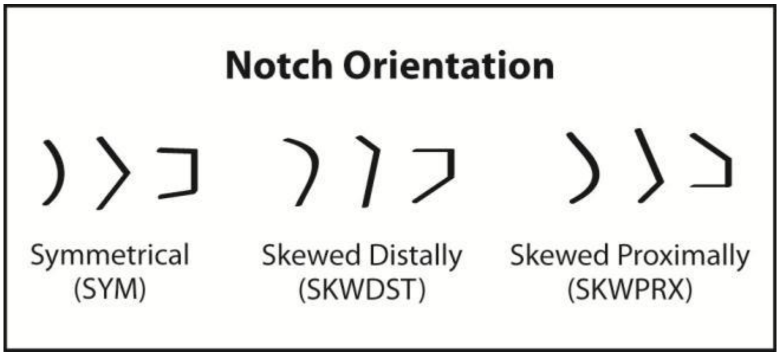

Figure 8: Notch orientation classifications.

Notch type was recorded as corner-notched (COR) where the notches originate in the proximal corners of the point and there are little to no proximal margins, side-notched (SD) where the notches originate on the lateral surfaces of the point, or a combination corner/side-notched (COR/SD) with a small proximal edge still apparent on the point (Figure 9). Notch shape was categorized as rounded (RND), angled (ANG), squared (SQ), or rounded/squared (RND/SQ) (Figure 10). Rounded notches are slightly indented and appear smoothed. Angled notches were crafted by two straight lines that intersect at a sharp angle. Squared notches occur when the notch is deep, and the internal intersections meet at angles of approximately 90°. Rounded/squared notches can be identified when the notch is very deep but lacks defined internal angles. A number of researchers also examined the notches for grinding (Binford 1963; Frison 1971; Ramsay 1991; Head et al. 2002), the presence or absence of which was recorded in this study. Grinding the notch of the projectile would facilitate the hafting process by smoothing the notch and preventing the accidental severing of the sinew or other binding agent. Frison (1971:80-82) found that grinding of the notches (as well as of the bases) would allow for more strength in the bonding of the projectile point to the shaft or foreshaft.

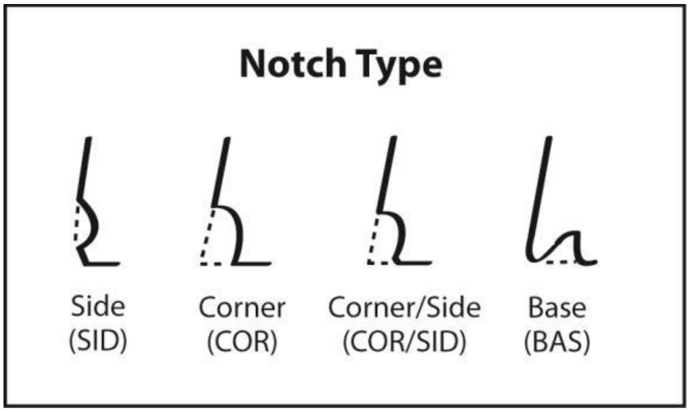

Figure 9: Notch type classifications.

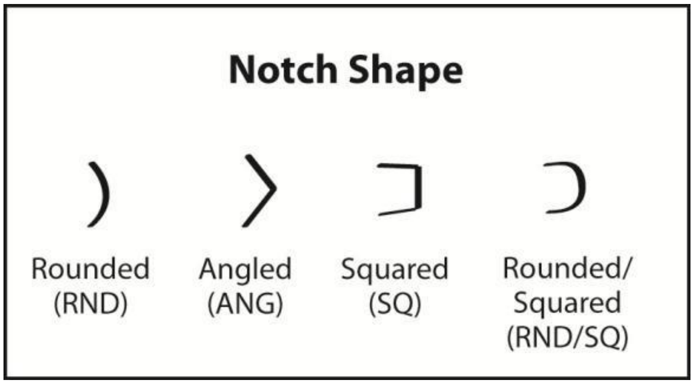

Figure 10: Notch shape classifications.

A number of researchers (Reher and Frison 1980; Brink and Dawe 1989; Davy and Ramos 1994; Deaver 1997; Chivis 2002; Andrefsky 2005) separated blade length from stem/haft length in order to detach the two and analyze them as separate entities. As previously stated, the blade was often resharpened or reshaped in use or through accidental breakage, whereas the haft element underwent little alteration (Goodyear 1974; Flenniken and Wilke 1989; Truncer 1990; Andrefsky 1997, 2006). Buchanan et al. (2007:283) wrote that although resharpening can result in a reduction in the blade dimensions, the basal attributes and the thickness attributes remain unaltered. Thus, since the stem, tang, or haft section of the point generally remained in the haft during the resharpening process, the stem length may be more constant, and would then provide a better typological indicator than the length of the blade, which would decrease and change in shape with repeated resharpening. The stem length was measured from the lateral longitudinal edges to the base of the point, also called the tang element (Binford 1963). It should be noted that due to the height variance between the notches of many points, only a rough calculation could be attained and variations can occur. If a line were drawn connecting the maximum shoulder left and right, then the measurement was taken in the center of this imaginary line.

Proximal margin height, also called base height, basal edge height, mean ear height, and proximal-lateral edge height, has been measured by a number of researchers (Forbis 1962; Nicholson 1976; Reher and Frison 1980; Brink and Dawe 1989; Peck and Ives 2001; Cheshier and Kelly 2006). Proximal margin height is defined as the “lateral distance between the notch and the base” (Forbis 1962:90). The height of the proximal margin is dependent on a number of factors including, but not limited to, the height of the notch, the notch type, and whether or not breakage and/or reworking of the proximal margin occurred.

Proximal margin shape, also called basal edge shape, basal tang shape, or the proximal point of juncture shape (Binford 1963; Nicholson 1976; Hughes 1981; Ramsay 1991; Head et al. 2002; Varsakis 2006), is the very proximal edge of the point, which is the connection between the base and the notch. Since this attribute is a part of the basal section of the point it is assumed that it was also subject to less alteration after the initial manufacturing. Nicholson (1976:74-75) examined both the basal edge shape, as well as the basal angle. Peck and Ives (2001:167-172) measured the proximal and distal base angle on points where the “distal base angle is the angle between the lateral margin and the proximal margin of a notch” and the “proximal base angle is the angle between the base or proximal end of a point and the lateral margin”. In this investigation, proximal margin shape was categorized as rounded (RND), angled (ANG), squared (SQ), angled/rounded (ANG/RND), rounded/angled (RND/ANG), rounded/squared (RND/SQ), rounded/basally expanding (RND/EXP), squared/basally constricted (SQ/CON), or squared/basally expanding (SQ/EXP). Rounded, angled, and squared shapes are as the name implies. Angled/rounded is visible when the straight distal portion meets the rounded proximal portion at a distinct angle. Rounded/angled occurs when the distal portion is curved and meets the straight proximal portion at an angle. Rounded/squared can be seen when the edge is very square in shape but lacks sharp angles.
Rounded/basally constricted is visible when the edge lacks sharp angles and narrows towards the proximal portion, whereas rounded/basally expanding occurs when the edge flares outwards at the proximal portion. Squared/basally constricted and squared basally expanding are very similar to their rounded counterparts; however, these categorizations display sharp angular joints (Figure 11).

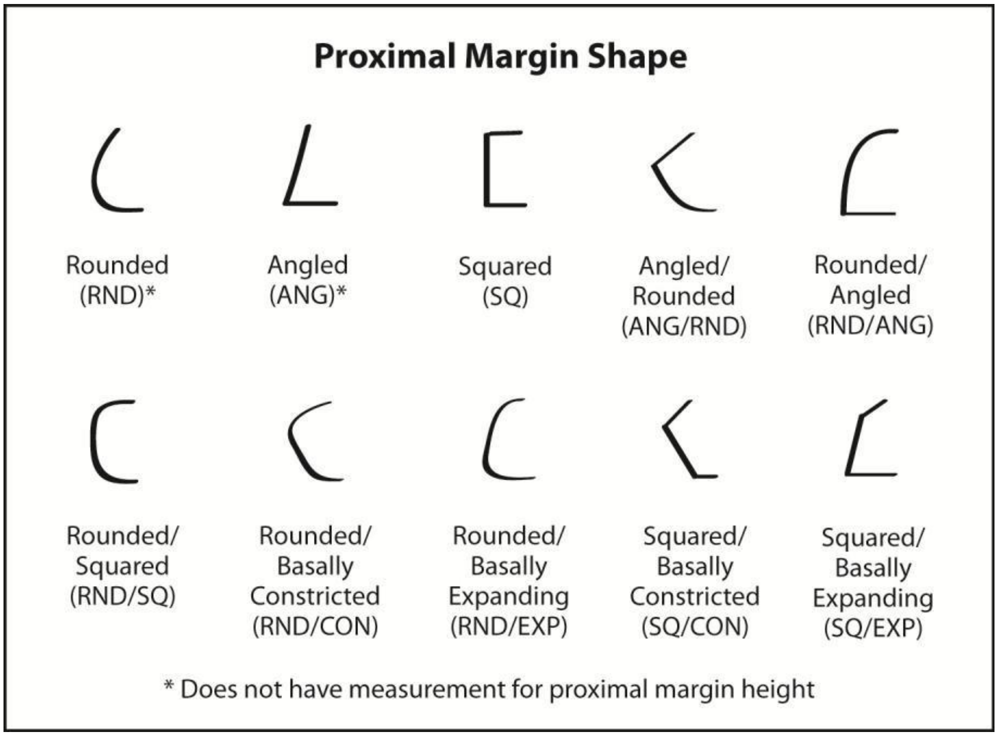

Figure 11: Proximal margin shape classifications.

Maximum base width, also referred to as base linear length, is another commonly recorded attribute (Forbis 1962; Brink and Dawe 1989; Beck 1998; Chivis 2002; Ellis 2004; Cheshier and Kelly 2006; Buchanan et al. 2007). Forbis (1962:87) examined both the base width and the body/blade width, since in most specimens one exceeds the other. This is significant since this ratio can change between projectile points that date to different time periods, and thus may be representative of different typological groups. Regarding base width, Ellis (2004:223) wrote that “basal width often varies less than other characteristics probably due to setting in a haft. Thus, they are more standardized and less subject to reshaping than length and perhaps width. If so, the differences between certain assemblages are due to more fundamental reasons than simply reshaping”. Bettinger and Eerkens (1999:233) reached the same conclusions. The maximum base width is measured at the very proximal portion of the projectile point, perpendicular to the longitudinal axis and records the maximum extent of the basal portion of the point.

The base shape, also called base form, basal edge shape, or proximal segment outline (Forbis 1962; Binford 1963; Nicholson 1976; Reher and Frison 1980; Hughes 1981; Peck and Ives 2001; Head et al. 2002) refers to the outline of the base, or the shape of the most proximal portion of the projectile point. Since this is an attribute of the basal portion of the point, it is unlikely that it would undergo any secondary alteration after initial manufacture. Base shape is also an attribute that is commonly used in the definitions of typological groups. According to Peck and Ives (2001:167), the basal edge shape may be convex, concave, straight, spurred, notched, or irregular. The frequencies of these shapes can vary from time period to time period as well as between geographic areas. Binford (1963:207-208) described eight variants of base shape: straight, subconvex, convex, subconcave, concave, triangulo-concave, bivectoral, and trivectoral, though only straight (STR), concave (CCV), convex (CVX), or concave/convex (CCV/CVX) were used for this study because they are the most widely used and understood by researchers. A straight base is apparent when the two terminal ends of the base are joined directly by a straight line, a concave base curves upwards toward the distal portion of the point, a convex base arcs downwards, and a concave/convex occurs when the base curves upwards but before reaching the other edge of the base arcs downwards (Figure 12).

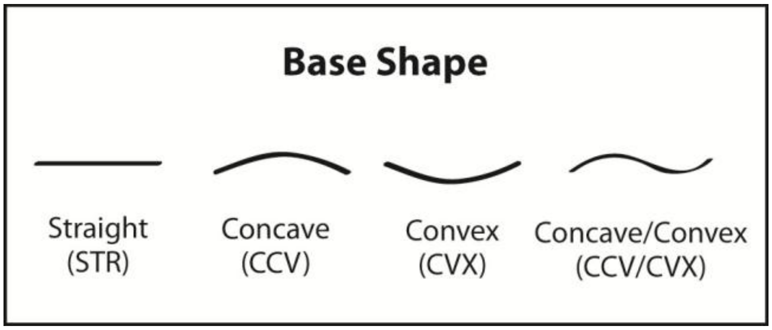

Figure 12: Base shape classifcations.

Modifications to the basal section of projectile points have been noted. Nicholson (1976) described a number of modifications to the base that included thinning on the ventral and/or dorsal surfaces, and grinding. Additionally, Ramsay (1991:118) stated that usually more than one modification could be identified on the base of the projectiles points she examined in her study. She explained that the bases of the points could be retouched by flaking or thinning, dulling or crushing and basal grinding, both light and heavy amounts (Ramsay 1991:118). It has been theorized that stem grinding served two functional purposes: to reduce the possibility of splitting the shaft or fracturing the point and to reduce the risk of the point cutting the binding material during the hafting process (Christenson 1986). Andrefsky (2006:745) also stated that grinding or dulling on the point facilitated the wrap or lashing. He theorized that basal grinding on hafted bifaces may be the product of wear that resulted while the point is in the haft element (Andrefsky 2005:183-184). Zeier (1983:21) noted that basal thinning is an attribute that is commonly associated with the Besant phase. In this study, the occurrence of any basal thinning and grinding was recorded as either present or absent. Basal thinning was noted by the small flakes that were removed longitudinally from the proximal portion of the point, which may be unifacial or bifacial. Grinding appears as smoothing by abrasion or friction.

Reworking

The non-hafted point attributes can be altered through repeated use and resharpening. A number of researchers (Dibble 1987; Towner and Warburton 1990; Buchanan et al. 2007) have noted that the resharpening and rejuvenation of tools has occurred throughout prehistory. These strategies involved retouching the tool in order to maintain an acute sharp edge or the functional aspect of it, and minimize the waste of raw material (Hayden et al. 1996:21). Retouch, or resharpening, occurs when the utilized edges of the tool are refreshed to provide a new cutting edge with no considerable alteration in the shape or function of the artifact (Hayden 1982; Ellis 2004). Rejuvenation can involve the extensive modification of a broken tool, but the function of the tool remains the same (Towner and Warburton 1990; Ellis 2004). Retouch is significant due to the connection with secondary use. It has been noted by several researchers (Hughes 1981:128; Keeley 1982; Towner and Warburton 1990:314), that the resharpening or rejuvenation of an existing point is more energy efficient and time-wise cost effective that crafting a completely new projectile. The rejuvenation of projectiles may occur at sites where there are lithic material shortages, which can include constraints arising from scheduling, material acquisition, group movements, exchange networks, geological or logistical reasons (Bamforth 1986; Towner and Warburton 1990:318; Hughes 1998).

Through the examination of the overlapping flake scars on the body of the point, resharpening flaking patterns can be identified (Binford 1963; Peck and Ives 2001; Buchanan et al. 2007). Flaking patterns can be separated into primary flake scars that correlate to the initial shaping of the blank into the desired shape and secondary flake scars that “originate along the lateral edge and tend to obscure the points of origin of primary flake scars” (Binford 1963:205). Flakes and the corresponding flake scars can provide information about the type of tool being crafted, the type of tool used to create the fracture, the stage of manufacture, and many details about the manufacturing process, such as the direction of the force applied to remove flakes and the type of applied force (Crabtree 1975:106). Flake scar patterns are also valuable sources of information regarding the reworking and resharpening of projectile point artifacts (Buchanan et al. 2007:283). Rejuvenation pressure flakes can be distinguished from initial production pressure flakes on the basis of size: rejuvenation pressure flakes are generally much smaller (Towner and Warburton 1990:317). Finishing or resharpening flakes, associated with the last stages of manufacture, are typically smaller than 20 mm in length and are short and thin, usually between 1 mm and 2 mm thick (Kooyman 2000:58-59). Kooyman (2000:59) noted that a finishing flake is short since it is only intended to modify the edge of the tool. However, caution must be exercised when identifying retouch solely on the basis of secondary flake scars. It has been observed that an immensely skilled flint-knapper has the ability to rework a point and leave no evidence of rejuvenation (Reher pers. comm. 2012). This can generate a retouched projectile that appears as a newly crafted point (Reher pers. comm. 2012). The identification of retouch on projectile points has not been fully explored in regards to Late Middle Prehistoric period (2,500 – 1,350 BP) site assemblages on the north-western Great Plains.

The Hafted Biface Retouch Index (HRI) developed by Andrefsky (2006) was used to measure the amount of retouch on projectiles from the six site assemblages. Andrefsky (2006:746) calculated the Hafted Biface Retouch Index by first isolating the blade portion of the projectile point and then partitioning each side of the blade into four segments. Each segment was then assigned a value dependent on the number of retouch flake scars visible. A value of one was allocated if the entire segment showed retouch, 0.5 was given if only a part of that segment was retouched and a value of zero was assigned if there was no retouch beyond the original crafting (Andrefsky 2006:746). The retouch index is then calculated as

$$\mathrm{HRI} = \sum S_i / n$$

where “HRI is the biface retouch index, S_i is the sum of the section scores and n is the total number of sections” (Andrefsky 2006:746). The higher the HRI value the greater the amount of retouch on the blade of the projectile point.

It should also be noted that several authors (Odell 2001; Bamforth 2002) have suggested trampling as a possible explanation for the retouch visible on artifacts. Odell (2001:54) made mention of experiments that established that trampling can occur, and result in damage that may be erroneously interpreted as retouch or use-wear. Bamforth (2002:92) stated that “trampling and other natural processes can and do modify flakes in ways that mimic intentional retouch by humans and we need to be able to identify artifacts with these modifications in our analyses”. In the thorough examination of the Fincastle site, trampling can be disregarded as a potential cause for any modification and retouch. Most projectile points were found within the bone bed, which was remarkably well preserved. Had trampling occurred the bone ecofacts would exhibit damage.

The final attribute that was identified and recorded on the projectile points analyzed in this study was use-wear (Quigg 1986; Ramsay 1991). According to Ramsay (1991:121), use-wear can be present on both the dorsal and ventral surface edges usually along the blade, but sometimes along the base. It generally takes the form of minuscule chipping, dulling, rubbing, or polishing (Ramsay 1991:121; Andrefsky 2005:143). Andrefsky (2005:144) found that unintentional use-wear can be difficult to identify on flake tools that have been intentionally dulled or backed for safe handling. Many times use-wear can be identified with the naked eye on tools made from microcrystalline materials, such as chert and chalcedony; however, use-wear may not be so obvious on tools made from coarser materials, for instance quartzite and siltstone (Ramsay 1991:120). This may create a bias when analyzing tools for use-wear (Ramsay 1991:121). Ramsay (1991:121) also noted that some use-wear could have resulted from the handling of the artifacts by their original owner(s). These artifacts may have been knocked together in a carrying pouch, or handled extensively by their manufacturers (Ramsay 1991:121). Only clear cases of cultural use-wear were recorded for this project, although future studies may choose to specify low, moderate, and intensive amounts of use-wear shown on projectile points.

As illustrated, there are numerous projectile point attributes that are available for analysis, each of which conveys information about the artifact. Both numerical and non-numerical overall, blade, and basal attributes were included in this study in order to obtain as much data as currently possible. Certain attributes are commonly used to define particular typological groups; however, these attributes are not usually explicitly defined, and, thus, many typologies are of limited application. Attributes were recorded for complete artifacts and those characterized as incomplete, either base/body or base/body/tip. The analysis of these projectile point attributes is important to gain a better understanding of the issue of variability within particular typological groups. For this study, the point assemblages from six single component sites on the north-western

Great Plains dating to the Late Middle Prehistoric period, between 2,500 BP and 1,300 BP, were examined. Site descriptions and data for each site are presented in the following chapter.

CHAPTER 4: Site Descriptions

Site Selection

This research project utilizes single component sites dating to the Late Middle Prehistoric period located on the north-western Great Plains in order to evaluate variability and, therefore, the correlation between the aforementioned attributes and projectile templates. Unique templates are assumed to represent typological groups, but the variability within and between assemblages have not been thoroughly investigated, especially for this region and period. Projectile points from the Fincastle site (Foreman 2010; Bubel in press), the One-Eleven site (Head et al. 2002), the Happy Valley Kill site (Shortt 1993), the Muhlbach site (Gruhn 1969), the Fitzgerald site (Hjermstad 1996), and the Ruby site (Frison 1971) offer a large data set to study this issue (Figure 13). These point assemblages under examination are from securely dated single component sites that date to the Late Middle Prehistoric period (2,500 to 1,300 BP). As Greaves (1982:107) stated, the use of only sites that have been securely radiocarbon dated is advantageous, as the researcher than has control over the chronology. Single component sites are generally thought to represent one population at a single moment in time. Though arguments can be made to question this assumption, such sites are more likely to reflect a single event than surface finds or multi-component sites that may have been mixed by post-depositional processes. As Buchanan and Collard (2010:350-351) cautioned, the inclusion of isolated specimens and surface finds increases the potential for identifying morphological differences between points. Artifacts found on the surface have no context associated with them and the time period that these artifacts were manufactured in would be a

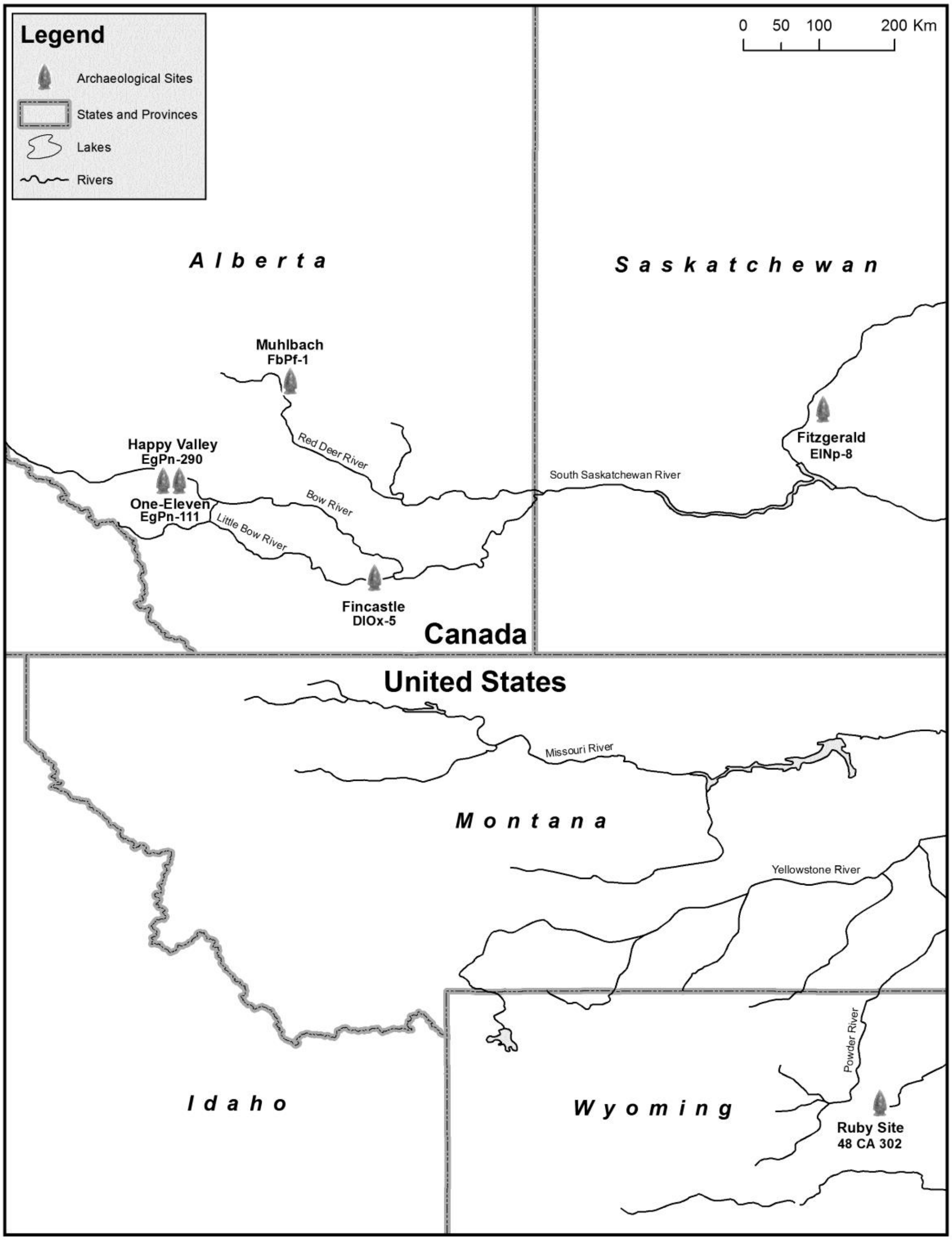

Figure 13: Location of the six sites included in this research project.

relative approximation. In order to eliminate possible functional differences, the sites selected were all bison kill sites. Ramsay (1991:91) and Johnson (1977:36) noted that in-depth studies of Besant and Sonota lithic assemblages should be conducted on sites where the activities conducted were similar, since projectile point usage at different types of sites, for instance, a burial mound site and a bison kill site, would differ. In addition, restricting such investigations regionally is important as Fawcett (1980:19) does in his study of the variability of stylistic elements in the north-western Plains. Following his example, the sites chosen for examination are located in the Northwest Great Plains, in Alberta, Saskatchewan, and Wyoming. Moreover, all of the selected sites were identified as Besant, Outlook, or Sonota by the original excavators.

Fincastle (DlOx-5), Alberta

The Fincastle site is located approximately 100 km east of Lethbridge, Alberta, and lies 3.8 km south of the Oldman River (Foreman 2010:25). It is situated in an area of natural sand hills inside the protected area of the Fincastle Grazing Reserve, where prairie grasses, cacti and other plant species that require little precipitation dominate. Aeolian processes are the main influence on this semi-arid landscape (Foreman 2010:25). The site is located within a parabolic dune and it is thought that after the prehistoric group left the site it was completely covered by the sand dunes in a very short period of time (Bubel in press). This quick burial, combined with the dry environmental conditions, allowed for the preservation of the archaeological remains.

The main objectives of the excavations conducted by Bubel were to acquire a sizeable sample in order to reconstruct the activities that occurred at the site and to confirm the cultural affiliation of its inhabitants (Foreman 2010). The material recovered from the excavations confirmed that the Fincastle site was a Late Middle Prehistoric bison kill. Four field seasons, 2004, 2006, 2007, and 2012 were conducted, using trowels and 1/8 inch (3.2 mm) mesh screens.

Importantly, only a single occupation is represented at the Fincastle site. This is substantiated by the radiocarbon dates, OSL (Optically Stimulated Luminescence) dates, and the stratigraphic profile. A total of seven bone samples were sent to Beta Analytic Inc. for radiocarbon dating (Table 4). From these seven, five were taken from within the bone bed, while two came from deposits above the bone bed. Radiocarbon dates of 2,540 +/- 50 BP, 2,490 +/- 60 BP, 2,490 +/- 40 BP, 2,610 +/- 40 BP, and 2,680 +/- 40 BP were obtained from the bone bed samples (Foreman 2010:33). The two bones found above the bone bed offered dates of 1,310 +/- 40 BP and 3,100 +/- 40 BP. These do not correspond with the dates from the bone bed and were, in all probability, transported to the site from another context (Foreman 2010:33). During the initial investigation, the site was considered to be a Besant occupation; however, because of the relatively early radiocarbon dates of around 2,500 BP this classification was changed to Outlook (Foreman 2010:34; Bubel in press). In addition, Varsakis (2006:333) considered the Fincastle site to represent a Sonota occupation because of the presence of high quantities of Knife River Flint projectile points and a number of other archaeological materials that are also present at traditional Sonota sites. These differing interpretations raise questions about the typological classification of the projectile points found at Fincastle.

Table 4: Radiocarbon dates from the Fincastle Site (Foreman 2010:33).

Beta Sample Number	Date Processed by Beta	Fincastle Excavation Context	Bone Element	Conventional Radiocarbon Date
201909	15/03/2005	East Block, Bone Bed (2004)	Lumbar Vertebra	2,540 +/- 50
201910	13/03/2005	East Block, Bone Bed, Upright (2004)	Metacarpal	2,490 +/- 60
241254	20/03/2008	West Area, Bone Bed (2004)	First Phalanx	2,490 +/- 40
241255	20/03/2008	West Area, Bone Bed (2004)	First Phalanx	2,610 +/- 40
241256	20/03/2008	North Extension of East Block, Above Bone Bed (2007)	Second Phalanx	1,310 +/- 40
241257	20/03/2008	North Extension of East Block, Above Bone Bed (2007)	Lone Bone Fragment	3,100 +/- 40
241258	20/03/2008	East Block, Bone Bed, Upright (2007)	Metacarpal	2,680 +/- 40

Over the four field seasons, a total of 130 m^2 was excavated and a vast amount of archaeological material was recovered. Based on the more than 250,000 bone fragments, a minimum of 62 bison were killed and butchered at the site (Bubel in press). Ten bone upright features were found, and consisted mainly of bison mandibles, scapulae, and metapodials. These features were found beneath the bone bed and were interpreted by Bubel (in press) as ideological in nature since they do not appear to outline a pound or other utilitarian feature, and display no processing or use marks. Non-bison remains include the partially complete skull and several other elements of a wolf (*Canis lupus*), elements of a coyote (*Canis latrans*), pronghorn (*Antilocapra americana*), Richardson Ground Squirrel (*Spermophilus richardsonii*), and a talon from a hawk-sized bird of prey (Foreman 2010:41-44). Other remains from Fincastle include 138 projectile points, 3,501 pieces of debitage, 8 cores, 1 piece of ochre, approximately 120 lithic tools (scrapers, bifaces, utilized flakes, choppers, etc.), and approximately 1,400 fire-broken rocks.

A large amount of microdebitage was found, and it can be presumed that tools, including projectile points, were reworked and resharpened at the site. Seven hundred-seventeen finishing flakes were recovered from the 2004-2007 excavations, indicating that the activities of tool finishing and resharpening did indeed occur at the site. Bubel (in press) stated that this conclusion is further substantiated by the relatively small mean and median values of the debitage assemblage as a whole. It should also be noted that 89.3% (640/717) of the microdebitage flakes found were of exotic material. Only eight cores were found, and since none were of exotic stone, the people who occupied Fincastle must have crafted the tools elsewhere and brought them in from a different location (Bubel in press). However, much of the site remains unexcavated so these items may yet be found.

One-Eleven (EgPn-111), Alberta

EgPn-111 is a single occupation Besant site located on the west terrace of the Elbow River west of the City of Calgary, Alberta. It is within a boreal climatic region, in an area of transition between the short grass prairie and parkland vegetation (Head et al. 2002:3). Grass is the dominant floral species present; however, aspen poplar and other tree species are abundant in areas of escalated moisture, such as river valleys and north facing slopes. Head et al. (2002:5-7) reported that the site area may have at been broken at some point in the past; however, the site itself was not disturbed.

The One-Eleven site was initially identified by students from the University of Calgary in 1974 and was reassessed in 1989 due to the proposed development of the Elbow Valley Golf and Polo Club. Based on eight shovel tests it was recommended that the site be excavated if it could not be avoided. Further work on the site was delayed until 1998 when the development was initiated again. Based on 27 shovel tests, it was estimated that the site covered a minimum 2000 m^2, but perhaps as many as 6000 m^2. Subsequently, EgPn-111 was investigated by Bison Historical Services Ltd. during a Historical Resources Impact Assessment (HRIA).

Head et al. (2002:32) wrote that a total of 200 units were excavated and 175 m^2 of the cultural component was exposed. The initial excavations provided information about the site and identified a single bone bed with three separate activity areas: a kill site, a processing site where hide removal and stone boiling occurred, and a campsite. Within the bone bed, small tools, such as trowels, were used to excavate while outside the bone bed, shovel shaving was the primary method of excavation. Sediment was screened using a 1/4 inch (6 mm) mesh screen. Excavations ceased once the excavators reached culturally sterile colluvial sediments typically between 20-30 centimetres below the surface.

Radiocarbon dates of 1,390 +/- 70 BP (Beta-127231), 1,340 +/- 60 BP (Beta-127232), and 1,310 +/- 60 BP (Beta-127233) were acquired from atlas vertebrae found within the bone bed (Table 5). These dates, along with the stratigraphic profile and the position of the cultural remains within the profile, indicate a single event kill site. Based on the cultural remains recovered, Head et al. (2002:41) considered this to be a Besant site; however, Peck (2011:312) regarded this as a Sonota occupation site because flake points and corner-notched points are commonly found at Sonota sites.

Table 5: Radiocarbon dates from the One-Eleven Site (Head et al. 2002).

Lab Name	Sample Number	Date Processed	Bone Element	Conventional Radiocarbon Date
Beta Analytic	Beta-127231	1998	Atlas vertebra	1,390 +/- 70
Beta Analytic	Beta-127232	1998	Atlas vertebra	1,340 +/- 60
Beta Analytic	Beta-127233	1998	Atlas vertebra	1,310 +/- 60

The 111,453 faunal remains suggest a late fall/early winter occupation and represent a minimum of 48 bison. Kill and primary butchering and processing activities took place at the site, evidenced by the large amount of unidentifiable bone fragments and the amount of fire-broken rock (4,608 pieces) that were recovered (Head et al. 2002:104). The lithic assemblage consisted mainly of projectile points (34) and scrapers (33), but also included other tool types, such as 21 bifaces and biface fragments, 6 choppers, 5 hammer-stones, 5 wedges, 4 mauls and maul fragments, and 4 cores (Head et al. 2002:128). A total of 18 ceramic sherds, likely representing two vessels, were also recovered from the site. Sherds from one vessel display impressions of loosely interwoven bundled fibres, while the external sherd of the other vessel exhibits a smooth surface. It should also be noted that although historic metal and ceramic artifacts were recovered from the top of the first excavation level (between 0-5 cm below surface) these historical activities did not intrude into the Late Middle Prehistoric occupation level (15-25 cm below surface).

Head et al. (2002) recovered 34 complete or partially complete projectile point artifacts. They reported that 3 points were crafted from quartzite, 2 were siltstone, 16 were chalcedony, and 13 were recorded as chert, mainly Knife River Flint (Head et al. 2002:130). Although this is considered a single occupation site, Besant atlatl, Pelican Lake atlatl, and Samantha arrow points were all recorded as being present within the assemblage (Head et al. 2002:40; Peck 2011:315). Head et al. (2002:41) reported that these different types of points were all in use during the time of the kill.

Happy Valley (EgPn-290), Alberta

EgPn-290 is located on the south side of the Bow River within the Calgary, Alberta city limits, situated between the Trans-Canada Highway to the south and the Bow River to the north on a north-facing section of the river valley (Shortt 1993:8-10). The site was excavated in 1991 during the construction of a housing subdivision. Happy Valley is considered to be near the parkland/plains grassland border, which is a mixed vegetation region; however, the area is presently mainly grassland with scattered trees and shrubs.

In his dissertation, Shortt (1993:7-15) documented that the site was initially recorded in 1981, when Lifeways of Canada conducted a Historical Resources Impact Assessment (HRIA) of the area for the proposed Tri-Media Valley Ridge Development, which collapsed before an assessment report could be completed. In May of 1990, Lifeways was again contacted to carry out a HRIA, for the proposed Valley Ridge golf course and residential subdivision. Excavations of the Happy Valley site were conducted in 1991 over a three week period. These were a part of mitigative investigations within the city of Calgary conducted by Dale Walde and six crew members. A total of 39.25 m^2 was excavated (Shortt 1993:15; Peck 2011:245).

There were several objectives to the excavations at the Happy Valley site: to determine the nature of the stratigraphy; the horizontal extent of the archaeological materials; and to collect and record the cultural materials that were in danger of being disturbed (Shortt 1993:13). These excavations were carried out using shovels, trowels, and 1/4 inch (6 mm) mesh screen (Shortt 1993:13).

In 1981 two initial radiocarbon dates were secured from two unknown bison elements recovered by Lifeways from test excavation units in the immediate vicinity of the later excavation block (Shortt 1993:41). Dates of 2,440 +/- 120 and 2,450 +/- 120 BP were obtained (Table 6). A third radiocarbon date of 2,350 +/- 80 was obtained in 1991 from a thoracic vertebra found approximately 30 cm below the surface (Shortt 1993:41). Since these three dates fall in close proximity to one another, Shortt (1993:41) considered it to be a single component site. Shortt (1993:19) also noted that there was no stratigraphic evidence to suggest that the bone bed represented more than one kill event. He regarded the Happy Valley site to be a Besant site since projectile points diagnostic of the Besant phase were recovered (Shortt 1993:1), while Peck (2011:246) considered this site to be representative of an Outlook bison kill and processing site because the points recovered look similar to those from the Fincastle site and the site also has an early date.

Table 6: Radiocarbon dates from the Happy Valley Site (Shortt 1993:41-43).

Lab Name	Sample Number	Date Processed	Bone Element	Conventional Radiocarbon Date
Radiocarbon Ltd.	RL-1657	1982	Unknown	2,440 +/- 120
Radiocarbon Ltd.	RL-1658	1982	Unknown	2,450 +/- 120
Beta Analytic	Beta-51285	1992	Thoracic vertebra	2,350 +/- 80

The lithic artifacts found at the Happy Valley site include 3 bifaces, 11 utilized flakes, 6 choppers, 1 hammer-stone, and 24 flakes and shatter. Of the 38,826 faunal remains recovered from the site, 98.86 % were identified as bison and a minimum of 31 bison were represented. Non-bison remains (44 elements) included Richardson Ground Squirrel (*Spermophililus richardsonii*), small/medium canid (domestic dog or coyote, *Canis familiarus* or *Canis latrans*), large canid (wolf, *Canis lupis*), small mammal (*Lagomorpha* or *Rodentia*), and medium mammals and large mammals, possibly from the family *Cervidae* (Shortt 1993:60-63; Peck 2011:246). No post holes or evidence of a corral structure were found (Shortt 1993:27-30).

There were a total of 13 projectile point artifacts uncovered at the Happy Valley site. Shortt (1993:53-57) identified three as Besant side-notched, two as Pincher Creek side-notched, two as Pelican Lake corner-notched. Two were broken bases and four were unidentifiable projectile point tips. A small number of debitage flakes were recovered, with most being small retouch or resharpening flakes, indicating that some rejuvenation occurred at the site. Shortt (1993:58) stated that “the range of variation exhibited by the projectile points is not uncommon for Besant sites”.

Muhlbach (FbPf-1), Alberta

FbPf-1 is located approximately 10 miles southwest of Stettler, Alberta, in the middle of an area of small, low, vegetated sand dunes. The site is situated in the transition zone between the grassland prairie and the parkland vegetation belt and it is not known which zone was dominant at the time of occupation. To the west of the site area is a broad, water-filled depression. Gruhn (1969:133) speculated that this pond may have extended over the site during the time of occupation, creating marsh-like conditions.

The site was discovered by the landowner, William Muhlbach, during corral and fence construction within his farmyard during the late 1950s (Gruhn 1969:128; Shortt 1993:262). He reported the site to the University of Alberta, which did not have a faculty archaeologist at that time. It was subsequently reported to Dr. Alan Bryan and Dr. Ruth Gruhn, who were conducting a survey of archaeological resources in the area in 1964.

Excavations of this site were carried out in the summer of 1965. Auger testing indicated the site covered an area of approximately 1,200 m^2, of which 128 m^2 of the northern part was excavated. The excavation area was first shoveled by hand to remove the culturally sterile sand above the cultural remains. The bone bed was exposed using trowels, dustpans, dental picks, and spoons. Once the material in an excavation unit was exposed, photographs were taken and the bones were mapped at a 1:10 scale. Excavations terminated at 80 cm below the bone bed due to the high water table (Gruhn 1969:130).

The stratigraphic context and the single layer bone bed support that this bison trap was used for a brief period of time, in all likelihood by a single group of people. An unknown number of charred bone samples also provided a date of 1,350 +/- 150 BP (GSC-696) (Gruhn 1969:144; Peck 2011:316). Considered a Besant site by Gruhn (1969:144) due to the presence of Besant type points, Peck regarded FbPf-1 to be representative of a Sonota occupation because he considered the points found to be different from Besant and distinctive of Sonota (Peck 2011:316-317).

Gruhn (1969:138) estimated that at least 100 bison were butchered and processed at FbPf-1. A multitude of small charred fragments of bone was found, indicating that marrow extraction and grease rendering occurred. Very few cranial components were uncovered and 11 bone uprights were found, with 7 of those appearing to form parallel lines approximately two meters apart (Gruhn 1969:139; Peck 2011:317). Other artifacts recovered included one knife, two knife fragments, one endscraper, one scraper fragment, one perforator, five retouched flakes, two utilized flakes, and one round stone that may have been used as a polisher (Gruhn 1969:143-44).

Sixty-one Besant projectile point artifacts were recovered, with 36 complete or nearly complete bifacial flaked points recorded and 25 trimmed flake points. Gruhn (1969:140) stated that "considering the site represents essentially a single event in time and occupation by one group of people, the observable variation in size, form, and workmanship of the points is of great interest". Tiny finishing flakes, mainly Knife River Flint, were also recorded at the site. Their presence indicates that tool resharpening of tools also occurred.

Fitzgerald (ElNp-8), Saskatchewan

ElNp-8 is a single component bison pound and processing site located 15 km southeast of Saskatoon, Saskatchewan. It is situated within the Saskatchewan Plain region, which is an area of considerable diversity that boasts deep river valleys, spillways, sand dunes, and a number of glacial features (Hjermstad 1996). At the time that the site was occupied, the climatic conditions provided ideal living conditions with a cooler, wetter climate where droughts were rare (Hjermstad 1996:7).

The site was discovered in 1991 by the landowner, Joe Fitzgerald, while he was digging post holes for a fence. He reported to Dr. David Meyer from the University of Saskatchewan. Work on the site began in 1992 after it had been established that an intact cultural layer was located 50 cm below the surface on a 15 cm thick paleosol. Excavations were carried out in the summers of 1992 and 1993.

After the initial examination of archaeological deposits, it was found that the Fitzgerald site was well preserved with the faunal remains intact. It appeared that the site could provide a better understanding of communal bison hunting techniques of the Besant group. The objectives for the investigations included site surveying and mapping, determining site boundaries, seasonality, butchering patterns, and recovering samples to be used in radiocarbon dating (Hjermstad 1996:31-2). Following a structured survey, 105 auger and shovel tests were excavated. All excavated sediment was passed through a 1/4 inch (6 mm) mesh screen. Following these tests, a total of 73 m^2 was excavated. The new objectives were to determine the shape and size of the corral feature and the relationship between kill and processing areas of the site.

Radiocarbon dates of 1,490 +/- 90 BP (Beta 69005), 1,270 +/- 140 BP (S-3546), 1,340 +/- 60 BP (Beta 69004), and 1,160 +/- 170 BP (S-3547) were obtained from faunal samples recovered from the excavations (Table 7). Hjermstad (1996:26) noted that the results from the Beta and Saskatchewan Research Council (SRC) laboratories differ; however, due to the large standard deviation of the SRC dates, the Beta radiocarbon dates are considered to be the more accurate of the two. The site averaged to a calibrated age of 1,283 +/- 20 BP (Hjermstad 1996:29). In addition to the radiocarbon dates, the stratigraphy is also suggestive of a single component kill site. Based on the date, as well as the lithic material that was recovered, Hjermstad (1996) considered this to be a Besant or Outlook type site.

Table 7: Radiocarbon dates from the Fitzgerald Site (Hjermstad 1996:25).

Lab Name	Sample Number	Date Processed	Fitzgerald Excavation Context	Bone Element	Conventional Radiocarbon Date
Beta Analytic	Beta-69004	1993-1996	Level 1 SE 105S 129E	Distal Humerus	1,340 +/- 60 BP
Beta Analytic	Beta-69005	1993-1996	Level 2 SE 86S 79E	Cervical Vertebra	1,490 +/- 90 BP
Sask. Research Council	S-3546	1993-1996	Level 2 SE 90S 85E	Cervical Vertebra	1,270 +/- 140 BP
Sask. Research Council	S-3547	1993-1996	Level 1 SW 105S 129E	Metacarpal	1,160 +/- 170 BP

The Fitzgerald site consists of a kill and primary butchering area, where mainly complete bone elements were found, as well as a secondary processing area, which yielded heavily butchered bone, small pieces of fire-broken rock, endscrapers, and utilized flakes. At minimum, 49 bison were killed and processed at this site (Hjermstad 1996:114). Hjermstad (1996:95) also reported a number of features found at the site, which included seven post holes, two multi-bone uprights, three single bone uprights, three basin-shaped pit features, and three hearth features containing ash and burnt soil stains. Three small ceramic sherds were also recovered from the Fitzgerald site. It seems likely that these represent a vessel that was only partially broken, or chipped, due to the small dimensions of the sherds (Hjermstad 1996:81). No surface decoration is evident on the sherds due to the exfoliated nature of the surface area. Other artifacts recovered include 1 bone scraping tool, 1 bone needle, 3 bone pendants, 14 scrapers, 6 unifaces, 1 biface, 1,563 pieces of fire-broken rock, and 1,144 pieces of debitage. Hjermstad (1996:74) stated that of those, 517 were retouch/resharpening flakes and 382 were thinning flakes.

One hundred forty-three projectile points were recovered from the Fitzgerald site excavations: 122 bifacial points and 21 flake points (Hjermstad 1996:58). Hjermstad (1996) noted that the basal section of the bifacial points displayed very little variation; however, the notch length and depth varied, and the length attribute showed the highest variation. Two of the points found displayed evidence of being re-notched after the original base was broken (Hjermstad 1996:66). Hjermstad (1996:66) also stated that “in nearly three-quarters of the 39 bifacial points with both notches still intact, one notch is long and shallow and the opposite is short and deep”. Knife River Flint was favored at the Fitzgerald site, with over 90% of the lithic tools crafted from this material.

Ruby (48 CA 302), Wyoming

The Ruby site, located in the Powder River Basin in Wyoming, is a single component Besant buffalo pound that dates to the Late Middle Prehistoric period. Frison (1971:77) reported that the pound was located in the bend of an arroyo which, during the time of occupation, was aggrading due to slope wash and alluvium. This process continued and covered parts of the site with up to ten feet of sediment to form a terrace. The terrain surrounding the Ruby site descends steeply to the west. Flora includes grass, sagebrush, and the occasional stand of cottonwood and juniper.

The site is composed of three separate but related sites: a bison pound and drive lane, a processing area, and a ceremonial structure. A campsite with several tipi rings is located on the surrounding bluffs (Frison pers. comm. 2012). Although Frison (1971:90) speculated that the Ruby site is a single component site, due to the extensive amount of work taken to construct the corral he suggested it may have been occupied two or three times within a restricted period of time. Kornfeld et al. (2010:263) estimated that it would have taken a group of 20 people approximately two weeks to construct the corral and surrounding drive lane. Frison (pers. comm. 2012) did, however, also note that there was only a single stratigraphic layer visible within the bone bed.

The Ruby site was originally reported by the property owners when bison bone and artifacts were found eroding out of the steep embankment. It was extensively looted and was referred to as the “arrowhead mine” by the local collectors (Frison pers. comm. 2012). In an attempt to salvage the site before it was destroyed by both pot hunters and the erosional forces of the gully, excavations were conducted in 1968 and 1969 (Frison 1971:77). Frison (1971) determined that the aggraded deposits covering the site were culturally sterile and heavy earth moving equipment was then used to remove the sediment to within two feet of the cultural deposit. After this, the pound area and the entire ceremonial structure were excavated. The processing area has only been minimally tested and thus remains intact (Kornfeld et al. 2010:264).

A number of archaeological remains were recovered from the Ruby site. It was determined that wooden posts, juniper, and cottonwood were used in the construction of the pound and ceremonial structure. Also, eight male bison skulls without the mandibles were found within the ritual structure, as were three holes filled with vertical bison vertebrae (Frison 1971:85; Kornfeld et al. 2010:265). It is not known how many bison were killed at the site; however, the corral was filled with poorly preserved bison bone to a depth of over 30 cm, indicating that substantial amount of bison had been killed (Kornfeld et al. 2010:264). Faunal remains found within the kill area included not only bison, but also badger (*Taxidea taxus*), bobcat (*Lynx rufus*), and hawk (possibly from the *Accipiter* or *Buteo* genus) (Frison 1971:82). Stone artifacts included two manos used as hammer-stones after earlier grinding use, a milling slab, milling slab and mano fragments, endscrapers, side scrapers, and retouch flakes. Bone tools were also recovered, including rib, spinous processes and long bone fragments with worn edges, presumably used for scraping or gouging. Other bone artifacts include two bird bone beads and a grooved large canine tooth. Frison (1971:86) noted the presence of a number of surface or shallow hearth features with burnt bone and fire-broken rock, mainly sandstone, contained within them.

Frison (1971) reported that 201 classifiable atlatl projectile point specimens were recovered from the Ruby site, most of these projectiles came from the drive lane and the bone bed areas (Kornfeld et al. 2010:264). Frison (1971) stated that these points were very difficult to classify typologically, since many specimens display evidence of being modified from their initial form. Many points were asymmetrical. The variation ranges from those with shallow to wide notches, to those with no barb to a deep barb. Frison (1971:80) noted the points display convex blade edges and a corner notch with no barb, with a slightly convex base, which can also be straight or slightly concave, but this is rare. He did not describe the raw material, but he observed that 59% of the points recovered from the Ruby site were broken. Of these, many were damaged across at the notches at the neck, or from one notch down diagonally to the base, either from impact or from use as knives where the twisting motion would result in fractures (Frison 1971:82; Ramsay 1991:122). Frison (1971) theorized that this was due to the rough usage of these points, (e.g. attached to thrusting spears) in addition to dart shafts. It should also be noted that since the site was extensively looted it is possible that collectors gathered artifacts that were whole and left any broken projectiles behind, thereby skewing the data. Based on the projectile points recovered, the site is a Late Middle Prehistoric period occupation site. This is substantiated by the single radiocarbon date of 1,670 +/- 135, (GX-1157).

The data that was obtained from the six site assemblages is amassed in Appendix I. If artifacts were incomplete, measurements were only taken of the complete attributes and any attributes that were missing were left as blanks.

During the time of this study, the Fincastle site collection was housed at the University of Lethbridge, Department of Geography in Lethbridge, Alberta. The Muhlbach site assemblage was made available by Dr. Jack Ives and his graduate student Reid Graham, of the University of Alberta, Department of Anthropology, Institute of Prairie Archaeology in Edmonton, Alberta. The data for the 22 missing artifacts from the Muhlbach site was collected from scanned images of the points made before they were misplaced and was provided by Bob Dawe of the Royal Alberta Museum. Access to the One-Eleven and Happy Valley site collections was provided by Karen Giering, of the Royal Alberta Museum in Edmonton, Alberta. Access to the Fitzgerald projectile assemblage was granted by Dr. Ernie Walker and his graduate students Ian Larsen and Brent Kevinsen of the University of Saskatchewan, Department of Archaeology in Saskatoon, Saskatchewan. At the time of this study the Ruby site projectile point assemblage was housed at two different locations. Part of the collection was located at the Campbell County Rockpile Museum in Gillette, Wyoming, and was made available by Robert Henning. The remainder of the assemblage was located at the University of Wyoming Repository in Laramie, Wyoming, where Jody Clauter and Dr. Charles Reher provided access to the artifacts.

The data, numerical and non-metric, that was collected from the Fincastle, One-Eleven, Happy Valley, Muhlbach, Fitzgerald, and Ruby site projectile point assemblages was used in the statistical analyses in the following chapter. These analyses examined the variation within the sites individually (intra-site), as well as the variation between the sites (inter-site). Similarities and differences in each projectile point attribute are examined.

CHAPTER 5: Review of Applicable Statistical Tests

Introduction

The main aim of this research project was to examine the variability within projectile point assemblages previously labeled as Besant, Outlook, and/or Sonota. Point attribute data was collected from six sites located on the Northwest Plains and statistically evaluated to determine if there are significant differences and/or similarities both within and between the site assemblages. To date, a thorough investigation of the variability within the Besant typological group has not been done. Hannus (1994:187) reported that the "distribution of Besant is particularly difficult to determine due to the tremendous variability in point forms which have never been systematically quantified". Duke (1991:93) also stated that no one has been able to determine why there is internal variability within and between Besant collections.

Using statistical techniques and simple comparisons, this study attempted to quantify the internal variability visible in projectile points associated with the Besant phase. A total of 13 interval/ratio projectile point attributes, 18 nominal attributes, and 2 ordinal attributes from the Fincastle, the One-Eleven, the Happy Valley, the Muhlbach, the Fitzgerald, and the Ruby site collections were measured and recorded. This data was then subjected to an array of statistical tests, including Pearson's *r* Product-Moment Correlation Coefficient, Point-Biserial Correlation, crosstabulation, chi-square test, independent-samples t-test, Analysis of Variance (ANOVA), Scheffé and Tukey HSD post hoc tests, cluster analysis, and principal components analysis in order to identify significant similarities and differences in the projectile point attributes. These tests were then used to examine variability within projectile points associated with the typological groups of Besant, Outlook, and Sonota. The results, each of which is described below, along with their benefits and weaknesses, were evaluated within the context of this research project.

Overview of the Applicable Statistical Tests

A statistical examination of the data was carried out using IBM SPSS Data Editor Version 21 (the Statistical Package for the Social Sciences). The SPSS program is useful for conducting a wide range of social investigations and is commonly used specifically for exploring data (Babbie et al. 2003). It can accommodate large data sets, with thousands of variables (Bronstad and Hemmesch 2010:1,419), making it an ideal tool for organizing and analyzing various elements of archaeological remains, such as projectile point attributes. Thomas (1978), Reher and Frison (1980), Hughes (1981), and Ramsay (1991) also utilized SPSS in their studies of projectiles. Hughes (1981:65) noted that in several statistical analyses, only complete points and metric attributes could be used since SPSS has a tendency to drop any sample with missing values from the analysis. Thus, for a number of the tests done for this study, only complete points were included; however, incomplete points were included when the attributes under consideration were present.

In this study, nominal, ordinal, and interval/ratio data were utilized. Nominal variables are categorical, where the values are named differently (Babbie et al. 2003:23; Williams 2013:4), such as material type, blade edge shape, and notch type. The subcategories of these attributes are simply different; there is no hierarchical order. Ordinal variables, which can also be named, can be ranked (Babbie et al. 2003:23; Williams 2013:4), which is the case with quality of workmanship, where high quality is ranked higher than low quality. Interval and ratio data, although different (interval variables lack a zero point) are often considered the same by social scientists and are labeled as scale data in SPSS (Babbie et al. 2003:24; Williams 2013:4). Any metric attributes, for instance, blade length, neck width, and notch height, are considered scale data. Interval/ratio attributes are continuous variables where the values are measured on a scale where the ‘distance’ between the variables is equal; that is, there is the same ‘distance’ between 2.0 and 3.0 mm as there is between 5.0 and 6.0 mm (Babbie et al. 2003:23-24; Williams 2013:4). Most attributes were classified as either interval or nominal, with only quality of workmanship and retouch index (HRI) value falling into the ordinal category.

The continuous data, or all the metric measurements, were examined first using the minimum, maximum, and average values, as well as one and two standard deviations, and the relative standard deviation (RSD). As stated by Marsh and Elliot (2008:46), it is important to use the measured data as it is generally less influenced by a change in any minor part of the data. The mean and the standard deviation are less influenced by minor errors in measures, and thus, are often used in exploratory and/or descriptive work (Marsh and Elliot 2008:46). The standard deviation is a measure of the average variability within an attribute, as it “measures the average of deviations from the mean” (Levin and Fox 2007:73). The mean and standard deviation were included in this study in order to identify general trends within the data set. The relative standard deviation is the spread of the data measured as a percentage and is used to illustrate measurement variability (Parsons et al. 2009:478). It is calculated by dividing the standard deviation by the mean and multiplying the result by 100 (Parsons et al. 2009:478). The higher the relative standard deviation, the more extensive the spread away from the average, while a low RSD indicates that the values are more clustered around the mean.

The diversity of data meant that a number of different correlation tests could be used. The Pearson's *r* Product-Moment Correlation Coefficient was utilized to measure the direction and strength of the association or correlation between two interval/ratio projectile point attributes (McGrew and Monroe 2009:196). Interval/ratio data are continuous, metric variables, such as maximum length, notch depth, and proximal margin height, making this test ideal to examine these aspects of the projectiles. Pearson's *r* values range from -1.00 to +1.00, which indicate the strength of the relationship between two interval variables (Babbie et al. 2003:270; Fletcher and Lock 2005:116; Norušis 2008:433). A value of -1.00 signifies a perfect negative relationship, while a value of +1.00 is indicative of a perfect positive correlation association, and a value of 0.00 denotes that there is no association (Babbie et al. 2003:270; Fletcher and Lock 2005:116). A perfect positive association is rare in practice, but a positive relationship would be visible when variable *X* increases, *Y* also increases (Drennan 1996:216; Fletcher and Lock 2005:116). For instance, projectile point length is strongly positively correlated with the weight of the artifact; the longer the artifact the greater the probability that it will be heavier. Alternatively, a negative relationship would be displayed if attribute *X* increases, then *Y* decreases (Drennan 1996:216). Such would be expected with notch depth. Alternately, as the depth increases, the weight of the artifact decreases since a greater amount of raw material was removed to create the deeper notch.

Hughes (1981:64) included Pearson's Product-Moment Correlations to compare the Muddy Creek points to a sample of Late Prehistoric points that had not been modified. She found that the Muddy Creek points displayed weak correlations on the blade attributes and stronger associations between the base attributes (Hughes 1981:75). In contrast, the unmodified points from the Vore Buffalo Jump site in north-eastern Wyoming displayed strong blade correlations and no basal correlations, potentially due to the different cultural groups present at the site (Hughes 1981:75). Beck (1998:26) also used Pearson’s *r* Correlation in her study of projectile points from the Gatecliff Shelter site, a multi-occupation cave site in Nevada. She found that the only attributes of atlatl points that were significantly correlated with the mean level dates were the neck width and the proximal shoulder angle (Beck 1998:26). In summary, Pearson’s *r* Correlation is widely used in artifact analyses because it requires that the attribute is normally distributed with a linear relationship (McGrew and Monroe 2009:196; Tanner 2012:278), which is typically the case of this type of data being examined.

The Point-Biserial Correlation Coefficient can be used when one variable is interval/ratio while the other is nominal (Tanner 2012:279). According to the IBM Corporation SPSS support portal (2010), the Point-Biserial Correlation test in SPSS is a special instance of the Pearson *r* Product-Moment Correlation and when a correlation is run with both a nominal and an interval/ratio attribute, this coefficient is automatically applied, enabling correlations between numerical/continuous attributes and nominal/shape attributes to be assessed. In many instances, only correlations between interval/ratio data are examined, with a disregard for nominal attributes; however, the Point-Biserial Correlation allows for the examination of shape attributes in conjunction to interval/ratio attributes. Although not commonly used, the Point-Biserial Correlation Coefficient can be calculated for any interval/ratio and nominal attribute under investigation. In his study of sexual dimorphism, Lewis (1997:35) used Point-Biserial Correlations to determine whether two samples displayed the same sexual dimorphism using height as the continuous variable and sex as the nominal variable. He found that there were significant differences between male and female populations which suggested that some factor was affecting the way physical differences were expressed in the two sexes (Lewis 1997:37). The same test can be used to investigate the relationship between a nominal projectile point attribute and a continuous variable.

If one or two variables under investigation are ordinal, then Spearman's Rank Correlation Coefficient can be used (Fletcher and Lock 2005:117). The resulting values follow the Pearson's r Correlation, with +1.00 and -1.00 indicating strong relationships, while 0.00 implies no correlation (Drennan 1996:228; Fletcher and Lock 2005:116). Before using the Spearman's Rank Correlation Coefficient, the rank orderings of the ordinal variables must be determined (Drennan 1996:228). Drennan (1996:228-232) used the Spearman's Rank Correlation to determine the relationship between zones of soil productivity and villages per kilometer squared in the Konsankoro Plain, and found that there was a strong positive correlation ($r_s = .93$, $p < .001$), since there are a greater number of villages in the productive soil areas. In the context of this study, Spearman's Rank Correlation Coefficient can be used to determine if a particular attribute is positively or negatively associated with a site or time period, or if there are no correlations present.

According to Babbie et al. (2003:259), the gamma measure of association may also be used for two ordinal variables. McNett (1979:55) stated that gamma coefficients, as well as Tau B, can be used for ordinal data in SPSS. In many instances these coefficients are used in order to examine the relationships between attributes, often using crosstabulations. Crosstabulations are powerful tools used to determine whether there is an association between two or more nominal or ordinal variables with a small number of categories (Babbie et al. 2003:189; Norušis 2008:141). Drennan (1996:197) used crosstabulations in his comparison of the number of incised and unincised ceramic sherds between three sites. McNett (1979:69) provided Schaefer's (1977:80) example, where Schaefer used the gamma coefficient to determine that there was a significant, although weak, relationship between the number of artifacts recovered and the size of the settlement (gamma = .40, $p = .02$).

The crosstabulation function makes use of chi-square when examining interval/ratio data, lambda when the data is nominal, and gamma when the data is ordinal. Crosstabulations can be run on a diverse set of data and, thus, can be conducted on a number of various attributes. In this project, ordinal and nominal attributes, such as material type and base shape, were examined at the site level. The crosstabulations function can also allow for the examination of a nominal (categorical) together with an interval (quantitative) variable (IBM Corporation 2010). The Eta association is suitable to use when the dependent variable is measured on an interval scale and the independent variable is nominal, with a limited number of categories. In this instance the categorical variable must be numerically coded, and Eta selected. Eta, like Pearson's *r*, lambda, and gamma is a measure of association that ranges from 0.00 to 1.00, with 1.00 indicating a strong association.

When the data is nominal, or has a limited number of distinct values, a lambda statistic can be used (Babbie et al. 2003:189; Norušis 2008:425). Lambda is a proportional reduction in error measure and indicates the "proportion by which you reduce your error in predicting the dependent variable when you use the independent variable" (Norušis 2008:419-421). This means that two variables may be related to one another. By knowing the value of one attribute, the other attribute can be estimated, since the first value affects, or has an impact on, the second value (Babbie et al. 2003:252). The value of lambda, which varies between 0.00 and +/- 1.00, is indicative of the strength of the association between two or more variables (Babbie et al. 2003:252; Norušis 2008:422). It should be noted that lambda is not a "symmetric measure" and the resulting lambda value is dependent on which variable is used in the prediction (Norušis 2008:422). If the lambda value cannot be calculated, then Goodman and Krustal's tau was used. It is a statistic that accompanies lambda and measures the association between two nominal variables (Kendrick 2000:305). In a number of tests, both a nominal and an ordinal attribute were used. According to Britton (2011), when using different levels of measures, the measurement of the lowest level of association should be used and in this instance the lambda should be used. If the test included an ordinal attribute and a scale, or interval/ratio attribute, gamma should be used.

The chi-square test is used to examine whether there is significant levels of association between to variables (Fletcher and Lock 2005:129). It is employed when examining ordinal and nominal data, and Pearson's *r* is used for interval/ratio data (Babbie et al. 2003:319). According to Babbie et al. (2003:305), the chi-square is a "test of significance that is most appropriate for nominal items". However, it can also be used with ordinal variables or a combination of ordinal and nominal attributes. The values of 0.05 and 0.001 are often used by social scientists as a means of deducing that a relationship between variables reflects a relationship similar to that in the population and is not merely a sampling error (Babbie et al. 2003:307; Kendrick 2000:478). Generally, it is considered that values of less than 0.05 do not occur by chance and are, thus, labeled as significant (Babbie et al. 2003:307).

The chi-square test requires that observations are independent, the categories of a variable do not overlap in any fashion, and that the expected counts must be greater than five, with none less than one (Norušis 2008:369). The observed significance level resulting from the chi-square test provides little information regarding the strength of the association between two variables, or how the two variables are related (Norušis 2008:434). It instead indicates whether or not the observed significance level between two variables is independent (Norušis 2008:434). It is used to "test for independence in a crosstabulation of two variables" (Norušis 2008:377).

The chi-square test has been utilized by a number of researchers in lithic and projectile point studies. Erwin et al. (2005:57) used the chi-square test to determine that two samples of projectile points from the Beaches complex and the Little Passage complex were significantly different based on the numbers of corner-notched and side-notched points in each sample. In their study of the lithic assemblages from the Florida Mountain site and two sites in the Mimbres River Valley, Schriever et al. (2011:111) found that there were no significant differences in the distribution of fine- and coarse-grained raw materials.

T-tests are used to determine if one of two samples, or populations, of different sizes show more variability than the other and are, thus, useful for making comparisons between two samples of different sizes (Fletcher and Lock 2005:90). These tests have been used by a number of researchers, such as Thomas (1981), Davy and Ramos (1994), and Lyman et al. (2008), to examine projectile point attributes. Davy and Ramos (1994) also used discriminant analysis, as well as independent-samples t-tests, in their study of Gunther Series projectile points. They included a number of different metric variables in their study (Davy and Ramos 1994:149), which they measured based on the procedures provided by Thomas (1981). In this instance, the six site assemblages were the samples used. It should be noted, however, that there are issues with running multiple t-tests. When many comparisons are made involving the same means, “the probability increases that one or more comparisons will turn out to be statistically significant, even when all the population means are equal” (Norušis 2008:317). This is known as the ‘multiple comparison problem’, where the more comparisons that are made, the greater the likelihood that one or more pairs will be found to be statistically different (Norušis 2008:317). For this reason, very few t-tests were included in this analysis. Instead, a multiple comparison procedure, an Analysis of Variance (ANOVA), was conducted in order to minimize the chance of identifying a significant difference when there was not one.

When there are three or more samples, an Analysis of Variance (ANOVA) is often used (Drennan 1996:171). An ANOVA can be calculated when the sample sizes are small, less than 100, and can be used to identify significant group separations and differences in attribute means (Reher and Frison 1980:116; Healey 2005:229). This test examines the mean values of the groups in the sample, the variance of the values, or whether the values are clustered or spread out from the mean (Babbie et al. 2003:316). A one-way ANOVA is used to determine if there is a significant separation between groups

(Baxter 2003:110). An Analysis of Variance test can be used to test whether or not the values for numerical attributes at an archaeological site came from the same population or from populations that were significantly different (Peck and Ives 2001:172). In this study, five of the six sites contain large enough sample sizes to run an ANOVA. With a small sample size of four projectiles, with only three points considered complete, the Happy Valley site was not included.

According to Marsh and Elliott (2008:185), within SPSS the multiple comparison procedures associated with one-way Analysis of Variance, one can pinpoint exactly which groups are significantly different from each other. In his study, Benfer (1967:725) used a factor analysis and found that 40 projectile point characteristics were explainable by 10 factors. A subsequent ANOVA test indicated that 3 of the 10 factors could explain the majority of the correlated variation of two or more of the variables to one another, and these factors also varied significantly in time, space and/or both (Benfer 1967:727). These factors included point tang – length of blade, notch point – stem corner and midstem – stem corner (Benfer 1967:726). An ANOVA was also used by Reher and Frison (1980), in their analysis of 201 complete arrow points from the Vore site. They found that the interval scale attributes were significantly different between levels, with the exception of maximum width, neck width, maximum length and blade length (Reher and Frison 1980:102). Reher and Frison (1980:102) noted that these differences do not provide any information about cultural significance, only that additional comparisons of the samples should be conducted.

Reher and Frison (1980) examined a total of 12 attributes. Eleven continuous attributes, including maximum length, width, thickness, blade length and width, notch depth and width, base edge height and haft length, haft width and neck width, and the nominal attribute of base shape (Reher and Frison 1980:103-109). Peck and Ives (2001) used 20 attributes measured on 2,327 Late side-notched projectile points or projectile point fragments from 10 sites on the Northwest Plains. They used a one-way ANOVA to investigate attribute trends through time at stratified sites, such as the Women's Buffalo Jump and Head-Smashed-In Buffalo Jump (Peck and Ives 2001:165). In her study of Upper Republican site assemblages, Macy (2009) used an ANOVA to determine if differences in various projectile point attributes were significant. A number of ANOVA tests were run, including a single factor ANOVA that was used to compare the lengths and widths of points crafted from Flattop chalcedony and Republican River jasper recovered from the 25FT39 site. Macy (2009:316) found that there were no significant differences between the lengths and widths of the points crafted from different materials recovered from the 25FT39 site. However, when she conducted an ANOVA test on 84 points from four sites, the 25FT39 site, the 25FT22 site, the 25FT30 site, and the 5EL1 site (Buick site), using attributes such as length, width, and blade length, differences were identified between the sites (Macy 2009:316). She found that two sites were similar and the other two sites were notably different, which could potentially be a result of the raw material resemblances and differences (Macy 2009:317).

Analysis of Variance post hoc tests have also been conducted on archaeological collections. An ANOVA test "simply asserts that at least one of the population means is different from the others," and in order to determine which differences are significant post hoc tests are carried out (Healey 2005:265). Post hoc tests are important and allow for the reliable identification of significant differences between specific pairs of means

(Healey 2005:265). When the result is significant from an Analysis of Variance, it only indicates that, at minimum, one group differs from the other groups included in the test (Abdi and Williams 2010a:583). According to Abdi and Williams (2010a:583), the test does not provide information regarding the pattern of the differences between the mean values; in order to analyze this pattern, the ANOVA is followed by other comparison techniques, commonly the Tukey HSD (Honestly Significant Difference). Tukey's HSD test is one of the oldest and is still routinely used (Marsh and Elliott 2008:185). It is a conservative test used to compute the largest difference between two means that originate from the same population (Abdi and Williams 2010a:583). According to Abdi and Williams (2010b:897) there are two advantages of the Tukey HSD test. The Tukey test limits the possibility of Type I errors occurring, even when testing all the pairs of means and even if the ANOVA result is not significant (Ramsey 2010:1,057). A Type I Error is an identification of a difference where none exists. The Tukey HSD test keeps Type I Errors equal to the alpha level ($\alpha = .05$ or $\alpha = .01$). In addition, the Tukey test computes the confidence intervals for the differences between the means of the variables under consideration (Abdi and Williams 2010b:897). However, it should be noted that it is common to run a Tukey test only following a significant ANOVA test (Ramsey 2010:1057). In his study of the variety of shapes of Poverty Point objects, Pierce (1998:175) used data relevant to thermal properties and ran a Tukey-type test, which indicated that differences existed between the ellipsoidal forms and the bicones and cylinders. However, after using other techniques (a digitizing technique), he found that the differences were most likely the result of measurement error, rather than differences in heat transfer effectiveness (Pierce 1998:175). Relating more to this study, a Tukey test could be used to evaluate a significant result from an ANOVA test regarding base width and notch depth, for example.

The Scheffé test is another commonly run post hoc test. It is often used for testing a number of means in a study (Ramsey 2010:1,057). If the ANOVA result is significant, then the Scheffé procedure will identify at least one post hoc contrast that is significant (Ramsey 2010:1,057). Howell (2010:1,323) wrote that presently, the Scheffé test is the only post hoc test that allows for an examination of complex contrasts. Howell (2010:1,324) went on to state that the "Scheffé test, like other tests involving the analysis of variance on means, assumes that error is normally distributed and homogeneous across groups". Error is essentially uncertainty, and statistical tests can examine relationships of interest with acceptable quantities of uncertainties (Bartlett 2010:412). There are two types of error: systematic error and random error. Systematic errors can exist due to measurement errors and random error is uncertainty that cannot be attributed to any particular factor (Bartlett 2010:414). Since the projectile points were examined by one individual in this study, random error should be reduced; measurement error may be present but should be equally distributed through the data. Peck and Ives (2001:172) used the Scheffé test in their examination of projectile points from 10 sites, one being the Walter Felt site, to "detect groups of levels at a site with statistically significant differences for an attribute". They concluded that 3 of the 13 continuous attributes (notch height, distal base angle, and shoulder angle) could be used to differentiate the two older occupation levels from five more recent levels (Peck and Ives 2001:172). Both the Tukey's HSD and the Scheffé post hoc tests were used in this research project.

Cluster analysis is a procedure that takes a sample of entities and separates them into homogenous or highly similar groups (Greaves 1982:89; Aldenderfer and Blashfield 1984:7). According to Greaves (1982:89) the number of groups produced in the output is dependent upon the number inherent within the data itself, and in addition, the number that the researcher wants to select. Although there are a number of cluster analyses, the Ward's Error Sum of Squares Cluster Analysis Standardized D2 Distance was selected since it has been utilized in other archaeological contexts. For example, Greaves (1982:89-91) used cluster analysis in her study of the metric variation in projectile points. Her study involved 27 variables measured on 348 points, with an emphasis on the basal variation since many points were incomplete without a body or blade portion (Greaves 1982:45). She examined points that, at the very least, were complete bases, with two sides of the base complete. She noted that no tests for replication were conducted since she was the sole investigator, and that error was randomized (Greaves 1982:48). She found that five groups was the best solution, and that points from each of the sites did not necessarily cluster together (Greaves 1982:91). Her study showcases the value of performing a cluster analysis on projectile point assemblages, and the ability to include incomplete specimens. It should be noted that Benfer (1967:719) wrote that clusters, which are created of two or more variables, are functionally similar attributes that have been grouped together. Although in this study, sites were selected on the basis of belonging to the Besant typological group, or a closely connected group (Outlook or Sonota), it is worthwhile to run a cluster analysis in order to substantiate if, in fact, these morphological types are related, or if there are separations inherent within the site data.

A number of researchers have used discriminant analysis, including Fawcett (1980), Reher and Frison (1980), Hughes (1981), Thomas (1981), Greaves (1982), Davy and Ramos (1994), Shott (1997), and Erwin et al. (2005), to examine projectile point assemblages. Reher and Frison (1980:112) stated that discriminant analysis enhances the "separation of previously defined groups by maximizing the among-group to between-group variance". Discriminant analysis can be used to identify differences and similarities between "previously defined groups of cases," which are defined by a selected set of attributes where the artifacts are predicted to vary (Reher and Frison 1980:116). Greaves (1982) utilized discriminant function analysis, as well as factor analysis and cluster analysis, in her examination of Late Prehistoric period Plains projectile points. She asserted that the main goal of discriminant function analysis was to predict group membership based on a linear combination of the interval variables (Greaves 1982:49). However, the disadvantage of discriminant analysis is that it is based on groups that have been previously defined (Greaves 1982:62). Therefore, since Besant projectiles have been poorly defined, and there is much debate regarding what characterizes a Besant, Outlook, and Sonota projectiles, a cluster analysis was performed rather than discriminant analysis.

Other multivariate analyses may also be used in the statistical examination of projectile points. These include factor analysis and principal components analysis. Factor analysis covers a wide range of approaches that share a common core, and range from descriptive, which includes principal components analysis, to inferential, such as the common factors method (Doran and Hodson 1975:197; Brown 2010:356-357). Factor analysis can be used to maximize the variance and to minimize the covariance, which is the measure of how variables *X* and *Y* are associated with one another, in order for the variable groups to be clearly defined (Reher and Frison 1980:112; Healey 2005:400). Benfer (1967:719) wrote that numerous researchers have cautioned against the use of factor analysis to test hypotheses; that the results that are obtained from factor analysis be suitably verified through other methods. Doran and Hodson (1975:172) noted that groups of related attributes can be used to identify key attributes in artifact types, which can then be used to explore distinctive morphological types later in analysis.

Principal components analysis (PCA) differs from exploratory factor analysis (EFA) in that factors are predictors in EFA, and in PCA, principal components result from the outcome and are created based on linear combinations of observed variables (Hayashi and Yuan 2010:459). PCA is often used for descriptive purposes, as well as in the creation of multivariate graphics (Brown 2010:357). Principal components analysis is used to reduce large data sets, simplify the number of data fields under consideration, identify groups of interrelated attributes, and to understand the interdependencies among the variables (Coleman 2010:1,098). PCA removes the redundant variables that measure the same construct, and then, from the variables that are not correlated to another, creates new variables, or principal components (Doran and Hodson 1975:191; Coleman 2010:1,098). Coleman (2010:1,098) noted that these new condensed variables are "ordered so that the first few components retain most of the variation present in the original data matrix". She went on to state that these components can reflect both the common and unique variance found within the variables, and that factor analysis excludes the unique variance (Coleman 2010:1,098).

Although principal components analysis is often carried out in conjunction with other analyses, by itself it does provide valuable information (Doran and Hodson

1975:195). Ramsay (1991) performed a principal component analysis in her examination of Late Prehistoric projectile points from the Melhagen site located in the Aiktow Sand Hills, near the town of Elbow, Saskatchewan. Even though her sample size was small, with only 53 points included, she was able to test 11 quantitative variables: maximum length, width, thickness, weight, body length (left and right), shoulder width, neck width, notch height (left and right), notch depth (left and right), basal height (left and right), and maximum base width. Based on the principal components analysis results, Ramsay (1991:145) concluded that "no distinct groups of points can be statistically determined with this sample on the basis of cultural differences alone". Instead, she found that there was a continuous range of variation within the Melhagen point collection. Shott and Weedman (2007) utilized principal component analysis in their study of reduction in Gamo hide scrapers from Ethiopia. Using a sample size of over 800 for both the unused and discarded scraper morphologies, they were able to reveal differences between the original and subsequent final dimensions of the artifacts (Shott and Weedman 2007:1019).

The disadvantage of factor and principal components analysis is that a sample size of a minimum of 300 is preferred (Williams 2013:98). Although principal component analysis is a useful exploratory technique for investigating structure in multivariate analyses of archaeological artefacts (Baxter 1991:29), a large sample size is favorable. According to Osborne and Costello (2004), who cite Comfrey and Lee's (1992) recommendations regarding sample size, a sample size of 50 is considered very poor, 100 is poor, 200 is fair, 300 is good, 500 is very good, and 1,000 or more is excellent. They also stated that other studies provide a range from 50 to 400 for a minimum sample size;

however, a larger sample size is preferred to a smaller sample size since a larger sample will “minimize the probability of errors, maximize the accuracy of population estimates, and increase the generalizability of the results” (Osborne and Costello 2004). Healey (2005:235) also stated that larger sample sizes are “better approximations of the populations they represent,” and, thus, results from a large sample are more trusted than results from a small sample. Nevertheless, these statistical tests can be run on small sample sizes. In this study, only a total of 131 complete projectile points were obtained, falling between poor and fair, but the collection was still testable.

The statistical tests described above were used to quantify the extent to which Besant, Outlook, and/or Sonota projectile point assemblages varied. Thirty-three attributes, several with left and right aspects, from 291 projectile points from the Fincastle, the One-Eleven, the Happy Valley, the Muhlbach, the Fitzgerald, and the Ruby site collections were statistically evaluated. This was done in order to determine if there were significant differences and/or similarities both within and between the site assemblages. The results from these tests are described in Chapter 6.

CHAPTER 6: Statistical Results and Interpretation

Introduction

The statistical tests described in Chapter 5 were used in this study in order to identify projectile point attributes which are significantly different, and/or similar, both within and between the six site collections (Fincastle, One-Eleven, Happy Valley, Muhlbach, Fitzgerald, and Ruby). Interval/ratio attribute data, or continuous variables, such as maximum length, notch depth, and proximal margin height, were tested. An intra-site analysis of the variability was performed using the minimum, maximum, and mean values of the continuous attributes, such as maximum length and proximal margin height, with one standard deviation and two standard deviations considered, since the mean and standard deviation values are often used in exploratory data analysis. Crosstabulations, using the chi-square test, were used to assess the associations between the nominal and ordinal point attributes at each of the sites. These nominal attributes include symmetry, body shape, transverse and longitudinal profile shapes, and notch type, orientation, and shape. A Pearson's *r* Product-Moment Correlation Coefficient was used to determine the strength of association between the various interval/ratio projectile point attributes, in addition to Point-Biserial Correlation Coefficients used to examine the relationships between one interval/ratio and one nominal attribute.

Projectile point attributes do not exist in isolation and each is connected to the next. An analysis of which interval/ratio and nominal attributes correlate most strongly with other attributes is important in order to isolate those attributes which are strongly correlated with one another and those that are weakly associated with one another. A principal components analysis was carried out in order to identify groups of interrelated attributes in an attempt to understand the associations between the continuous variables.

A ‘between sites’ analysis was conducted, using t-tests, Analysis of Variance (ANOVA), Scheffé and Tukey post hoc tests, cluster analysis, and principal components analysis. T-tests were run between the Fincastle, Muhlbach, and Ruby assemblages in order to identify which interval/ratio attributes were different and which were similar between site assemblages dominated by Knife River Flint and collections made mostly from locally available materials. An Analysis of Variance and post hoc tests, the Tukey HSD test and the Scheffé test, were also run on the data sets. When the results from the ANOVA test revealed statistically significant attributes, post hoc tests were conducted to identify patterns in the data, as well as differences between the mean values. Post hoc tests were conducted in order to identify which collections were similar and which were different in regards to the continuous attributes, such as maximum length and shoulder width. A cluster analysis was conducted in an effort to determine if there were any distinctive groupings within the site assemblages.

Finally, a principal components analysis was conducted. Like the Pearson’s *r* Correlation, this was run in order to identify any interrelated variables, as well as to recognize the interdependencies between the attributes. As mentioned above, there were six sites included in this study: Fincastle, One-Eleven, Happy Valley, Muhlbach, Fitzgerald, and Ruby; however, due to the small size of the Happy Valley collection, it was not included in the inter-site analysis of the continuous projectile point attributes.

Analysis of the Metric Attributes

The metric, or continuous, attributes from the projectile points from the six site assemblages, Fincastle, One-Eleven, Happy Valley, Muhlbach, Fitzgerald, and Ruby, were examined. The minimum and maximum values and the averages to one and two standard deviations were recorded, in addition to the relative standard deviation (%). These data are commonly used in descriptive and exploratory analyses since they are less likely to be influenced by minor errors. For this reason, these straightforward calculations were examined first. The attribute data collected for each assemblage is presented below.

Fincastle (DlOx-5), Alberta

There were 138 projectile point artifacts found at the Fincastle site. Of these, 72 (52%) were analyzed in this study: 38 complete projectiles and 34 mostly complete specimens. As seen in Table 8, maximum lengths ranged from 17.0 to 72.1 mm, widths from 12.5 to 25.2 mm, and thicknesses from 3.2 to 8.3 mm. Weights varied from 0.69 to 13.71 g. The blade lengths varied from 12.0 to 58.5 mm, with body lengths (left and right) of 11.8 to 60.4 mm. Shoulder widths ranged from 11.3 to 24.7 mm, and neck widths spanned from 8.1 to 18.7 mm. Notch heights varied from very short, 3.3 mm, to very high 14.0 mm, notch depths varied from very shallow, 0.8 mm, to quite deep, 4.1 mm, and stem lengths extended from 4.2 to 14.2 mm. A number of artifacts displayed no proximal margin, with the greatest proximal margin heights being 4.9 mm. Base widths ranged from 12.0 to 22.6 mm.

Table 8: Metric attributes of the Fincastle projectile points.

Attribute	Minimum	Maximum	Average	1 S.D.	2 S.D.	%RSD
Max. Length	17.0	72.1	35.7	11.8	23.6	33.1
Max. Width	12.5	25.2	19.9	2.7	5.5	13.6
Max. Thickness	3.2	8.3	5.8	1.1	2.2	19.0
Weight	0.69	13.71	4.19	2.39	4.78	57.0
Blade Length	12.0	58.5	28.6	10.5	20.9	36.7
Body Length L.	11.8	60.4	29.4	10.3	20.6	35.0
Body Length R.	13.5	59.8	29.5	10.4	20.8	35.3
Shoulder Width	11.3	24.7	19.9	2.7	5.5	13.6
Neck Width	8.1	18.7	14.2	2.1	4.2	14.8
Notch Height L.	3.3	11.4	7.7	1.4	2.8	18.2
Notch Height R.	3.7	14.0	7.8	1.7	3.4	21.8
Notch Depth L.	0.8	4.0	2.4	0.7	1.5	29.2
Notch Depth R.	0.9	4.1	2.2	0.7	1.4	31.8
Stem/Haft Length	4.2	14.2	9.3	1.6	3.1	17.2
Prox. Mar. Height L.	0.0	4.9	2.0	1.1	2.2	55.0
Prox. Mar. Height R.	0.0	4.9	1.8	1.1	2.3	61.1
Base Width	12.0	22.6	17.5	2.5	5.0	14.3

One-Eleven (EgPn-111), Alberta

Sixteen points (47%) from a total of 34 recovered from the One-Eleven site were included in this study. Eleven were classified as complete, and five were considered mostly complete. The lengths recorded ranged from 14.9 to 36.3 mm, with the maximum widths and shoulder widths from 10.9 to 21.2 mm, thicknesses from 2.3 to 7.1 mm, with weights ranging from 0.37 to 3.80 g (Table 9). Blade lengths varied from 8.0 to 29.7 mm, with body lengths ranging from 8.9 to 31.6 mm. The widths of the neck extended from 8.1 to 16.1 mm, notch heights from 2.6 to 8.2 mm, notch depths from 0.9 to 5.3 mm, haft lengths from 3.6 to 9.3 mm, proximal margin heights from 0 to 4.1 mm, and base widths of between 9.3 and 20.1 mm.

Table 9: Metric attributes of the One-Eleven projectile points.

Attribute	Minimum	Maximum	Average	1 S.D.	2 S.D.	%RSD
Max. Length	14.9	36.3	26.7	6.8	13.7	25.5
Max. Width	10.9	21.2	16.4	3.2	6.3	19.5
Max. Thickness	2.3	7.1	4.3	1.3	2.6	30.2
Weight	0.37	3.80	1.95	1.03	2.07	52.8
Blade Length	8.0	29.7	20.1	6.2	12.5	30.8
Body Length L.	10.8	31.6	21.1	6.1	12.2	28.9
Body Length R.	8.9	29.4	20.1	6.6	13.2	32.8
Shoulder Width	10.9	21.2	15.9	3.1	6.2	19.5
Neck Width	8.1	16.1	11.5	2.7	5.5	23.5
Notch Height L.	2.8	8.2	5.2	1.6	3.2	30.8
Notch Height R.	2.6	6.6	4.6	1.4	2.8	30.4
Notch Depth L.	0.9	5.3	2.5	1.0	2.0	40.0
Notch Depth R.	1.2	2.9	1.9	0.6	1.2	31.6
Stem/Haft Length	3.6	9.3	6.7	1.6	3.2	23.9
Prox. Mar. Height L.	0.0	3.4	2.0	1.4	2.7	70.0
Prox. Mar. Height R.	0.0	4.1	1.8	1.2	2.4	66.7
Base Width	9.3	20.1	14.9	3.5	6.9	23.5

Happy Valley (EgPn-290), Alberta

Only 4 (31%) of the 13 projectile points recovered from the Happy Valley site were included in this study. Three were classified as complete. As seen in Table 10, lengths ranged from 21.2 to 33.7 mm, widths and shoulder widths from 14.0 to 17.3 mm, thicknesses from 5.0 to 5.5 mm, and weights from 1.71 to 2.63 g. Blade lengths varied from 13.3 to 23.9 mm, with body lengths of between 14.1 to 25.4 mm. Neck widths varied between 10.4 and 12.3 mm, notch heights between 4.7 and 8.0 mm, notch depths 1.4 to 3.3 mm, haft lengths from 6.2 to 9.8 mm, and proximal margin heights between 1.3 to 3.6 mm. The base widths spanned between 12.6 and 14.8 mm.

Table 10: Metric attributes of the Happy Valley projectile points.

Attribute	Minimum	Maximum	Average	1 S.D.	2 S.D.	%RSD
Max. Length	21.2	33.7	27.3	5.1	10.3	18.7
Max. Width	14.0	17.3	15.5	1.4	2.8	9.0
Max. Thickness	5.0	5.5	5.4	0.2	0.5	3.7
Weight	1.71	2.63	2.15	0.38	0.76	17.7
Blade Length	13.3	23.9	19.1	4.4	8.8	23.0
Body Length L.	15.4	25.4	20.6	5.0	10.0	24.3
Body Length R.	14.1	23.3	19.4	4.8	9.5	24.7
Shoulder Width	14.0	17.3	15.5	1.4	2.8	9.0
Neck Width	10.4	12.3	11.1	0.8	1.7	7.2
Notch Height L.	4.7	6.1	5.4	0.7	1.4	13.0
Notch Height R.	4.9	8.0	6.4	1.3	2.5	20.3
Notch Depth L.	1.5	3.3	2.4	0.8	1.6	33.3
Notch Depth R.	1.4	2.4	1.9	0.4	0.9	21.1
Stem/Haft Length	6.2	9.8	8.2	1.5	3.1	18.3
Prox. Mar. Height L.	1.6	3.6	2.6	0.9	1.8	34.6
Prox. Mar. Height R.	1.3	3.6	2.1	1.1	2.1	52.4
Base Width	12.6	14.8	13.9	0.9	1.8	6.5

Muhlbach (FbPf-1), Alberta

Of the 61 projectile points recovered from the excavations, 45 (74%) were included in this study. Although a number of the Muhlbach projectile points have been misplaced, 23 were available to be physically examined. The remaining 22 were analyzed from scanned images, and, thus, a number of attributes could not be assessed, including longitudinal and transverse profiles and retouch values.

Twenty-three artifacts were classified as complete, and 22 were considered nearly complete. Lengths ranged from 21.7 mm to 58.7 mm with an average of 34.2 mm (Table 11). Widths varied from 12.0 to 25.2 mm, thicknesses from 2.4 to 8.6 mm, and weights from 0.58 to 9.15 g. Blade lengths ranged from 13.6 to 47.4 mm, body lengths (left) extended from 14.1 mm to 42.9 mm, and body lengths (right) exhibited similar variation, 14.9 to 42.1 mm. The widths of the shoulders spanned 12.0 to 25.2 mm, and neck widths from 8.2 to 18.2 mm. Notch heights varied from 3.6 to 12.8 mm on the left and 3.7 to 9.8 mm on the right. The depths of the notches ranged from 1.1 to 3.0 mm on the left to 0.5 to 3.6 mm on the right. Stem/haft lengths ranged from between 6.8 to 13.2 mm, and proximal margin heights varied from 0.0 to 5.6 mm (left) and 0.0 to 4.6 mm (right). Finally, the bases spanned 8.3 to 22.1 mm in width.

Table 11: Metric attributes of the Muhlbach projectile points.

Attribute	Minimum	Maximum	Average	1 S.D.	2 S.D.	%RSD
Max. Length	21.7	58.7	34.2	8.8	17.6	25.7
Max. Width	12.0	25.2	19.5	3.1	6.1	15.9
Max. Thickness	2.4	8.6	5.1	1.4	2.7	27.5
Weight	0.58	9.15	3.89	2.13	4.3	54.8
Blade Length	13.6	47.4	25.7	8.6	17.1	33.5
Body Length L.	14.1	42.9	26.2	7.5	15.0	28.6
Body Length R.	14.9	42.1	26.0	7.4	14.9	28.5
Shoulder Width	12.0	25.2	19.3	3.1	6.1	16.1
Neck Width	8.2	18.2	14.1	2.5	5.1	17.7
Notch Height L.	3.6	12.8	6.8	1.8	3.7	26.5
Notch Height R.	3.7	9.8	6.8	1.4	2.8	20.6
Notch Depth L.	1.1	3.0	2.1	0.5	1.0	23.8
Notch Depth R.	0.5	3.6	2.1	0.6	1.1	28.6
Stem/Haft Length	6.8	13.2	9.3	1.4	2.9	15.0
Prox. Mar. Height L.	0.0	5.6	2.5	1.1	2.2	44.0
Prox. Mar. Height R.	0.0	4.6	2.5	1.1	2.2	44.0
Base Width	8.3	22.1	16.6	3.4	6.8	20.5

Fitzgerald (ElNp-8), Saskatchewan

Fifty-two of the 143 of the projectile points (36%) recovered from the Fitzgerald site were analyzed in this study. Of these, 24 were complete and 28 were nearly complete. The lengths of this assemblage ranged from 13.3 mm to 61.1 mm, widths varied from 10.9 to 26.4 mm, thicknesses from 2.3 to 7.5 mm, and weights from 0.38 to 10.07 g (Table 12). Blade lengths varied significantly, from 7.4 to 48.7 mm. This was also detected in the body lengths (left) 7.9 to 50.4 mm and body lengths (right) 7.1 to 49.7 mm. Shoulder widths extended from 9.6 to 25.9 mm, and neck widths measured between 7.8 and 19.2 mm. Notch heights varied from 2.7 to 10.7 mm on the left, and 3.6 to 9.7 mm on the right. The depths of the notch (left) ranged from 1.1 to 3.7 mm and 0.9 to 3.6 mm (right). Stem/haft lengths ranged from 5.9 to 12.9 mm. Proximal margin heights ranged from 0.0 to 5.1 mm on the left and 0.0 to 6.7 on the right, with base widths spanning from 10.9 to 23.1 mm.

Table 12: Metric attributes of the Fitzgerald projectile points.

Attribute	Minimum	Maximum	Average	1 S.D.	2 S.D.	%RSD
Max. Length	13.3	61.1	37.0	10.8	21.6	29.2
Max. Width	10.9	26.4	20.7	3.1	6.3	15.0
Max. Thickness	2.3	7.5	5.4	1.1	2.1	20.4
Weight	0.38	10.07	4.66	2.25	4.50	48.3
Blade Length	7.4	48.7	28.0	10.0	20.0	35.7
Body Length L.	7.9	50.4	30.1	10.2	20.4	33.9
Body Length R.	7.1	49.7	29.7	10.0	20.0	33.7
Shoulder Width	9.6	25.9	20.4	3.3	6.7	16.2
Neck Width	7.8	19.2	15.2	2.3	4.7	15.1
Notch Height L.	2.7	10.7	6.9	1.5	3.0	21.7
Notch Height R.	3.6	9.7	6.7	1.4	2.9	20.9
Notch Depth L.	1.1	3.7	2.4	0.6	1.3	25.0
Notch Depth R.	0.9	3.6	2.2	0.6	1.3	27.3
Stem/Haft Length	5.9	12.9	9.8	1.6	3.2	16.3
Prox. Mar. Height L.	0.0	5.1	2.3	1.0	2.0	43.5
Prox. Mar. Height R.	0.0	6.7	2.6	1.1	2.2	42.3
Base Width	10.9	23.1	18.4	3.0	6.0	16.3

Ruby (48 CA 302), Wyoming

In this study, 102 (51%) of the 201 projectile points recovered from the excavations were classified as complete (32) or nearly complete (70). The minimum, maximum, mean, one and two standard deviation values are recorded in Table 13. The measured minimum length was 17.7 mm and maximum was 71.4 mm. The maximum widths of the points ranged from 15.6 to 28.3 mm, with thicknesses ranging from 4.0 to 7.6 mm, and weights varying from 1.52 to 12.50 g. Blade lengths extended from 10.7 to 62.2 mm, body lengths left from 12.1 to 64.1 mm, and body lengths right from 14.1 to 62.5 mm. The shoulder widths ranged from 15.6 to 28.3 mm, and the necks ranged from 8.1 to 18.8 mm in width. Notch heights varied from 3.7 to 9.5 mm on the left and 2.6 to 11.6 mm on the right. The depths of the notches varied from 1.3 to 5.7 mm on the left and 0.9 to 4.9 mm on the right, stem/haft lengths varied from 5.3 to 12.6 mm, with proximal margin heights from 0.0 to 5.7 on the left and 0.0 to 5.0 mm on the right. The width of the bases extended from 13.1 to 24.5 mm.

Table 13: Metric attributes of the Ruby projectile points.

Attribute	Minimum	Maximum	Average	1 S.D.	2 S.D.	%RSD
Max. Length	17.7	71.4	41.9	11.4	22.8	27.2
Max. Width	15.6	28.3	22.1	2.5	5.1	11.3
Max. Thickness	4.0	7.6	5.6	0.7	1.4	12.5
Weight	1.52	12.50	5.38	2.17	4.33	40.3
Blade Length	10.7	62.2	35.3	11.2	22.4	31.7
Body Length L.	12.1	64.1	36.6	11.3	22.6	30.9
Body Length R.	14.1	62.5	36.4	11.2	22.4	30.8
Shoulder Width	15.6	28.3	22.0	2.6	5.1	11.8
Neck Width	8.1	18.8	14.5	1.9	3.9	13.1
Notch Height L.	3.7	9.5	6.7	1.3	2.6	19.4
Notch Height R.	2.6	11.6	6.6	1.3	2.6	19.7
Notch Depth L.	1.3	5.7	3.0	0.9	1.9	30.0
Notch Depth R.	0.9	4.9	2.8	0.8	1.5	28.6
Stem/Haft Length	5.3	12.6	9.3	1.3	2.7	14.0
Prox. Mar. Height L.	0.0	5.7	2.4	1.3	2.6	54.2
Prox. Mar. Height R.	0.0	5.0	2.4	1.1	2.2	45.8
Base Width	13.1	24.5	18.5	2.5	4.9	13.5

Summary of the Metric Data

The metric data presented above were summarized and examined (Table 14). A total of 131 points were considered complete. Maximum lengths ranged from 13.3 to 65.4 mm with an average of 36.4 mm. Widths varied from 10.9 to 26.4 mm, averaging 19.5 mm, thicknesses from 2.3 to 8.6 mm with an average of 5.4 mm, and weights ranged from 0.37 to 10.07 g, with an average of 3.98 g. Blade lengths ranged between 7.4 and 56.5 mm, with body lengths ranging from 7.1 to 57.7 mm, and shoulder widths between 9.6 and 25.9 mm. Neck widths varied between 7.8 and 19.2 mm, with notch heights between 2.6 and 11.8 mm, and notch depths of 0.5 to 4.9 mm. The stem lengths ranged between 0.0 and 12.9 mm, with an average of 9.1 mm. Proximal margin heights also varied, from points with no proximal margin present to points with large margin heights, up to 6.7 mm. Base widths extended between 8.3 and 22.4 mm.

Table 14: Metric data for complete projectile points (*n* = 131) from the six sites.

Attribute	Minimum	Maximum	Average	1 S.D.	2 S.D.	%RSD
Max. Length	13.3	65.4	36.4	10.4	20.8	28.8
Max. Width	10.9	26.4	19.5	3.2	6.5	16.4
Max. Thickness	2.3	8.6	5.4	1.2	2.4	22.2
Weight	0.37	10.07	3.98	2.06	4.12	51.8
Blade Length	7.4	56.5	27.3	9.4	18.8	34.4
Body Length L.	7.9	57.7	28.6	9.4	18.9	32.9
Body Length R.	7.1	57.1	28.3	9.5	19.0	33.6
Shoulder Width	9.6	25.9	19.3	3.2	6.5	16.5
Neck Width	7.8	19.2	13.8	2.4	4.9	17.4
Notch Height L.	2.7	11.4	6.8	1.7	3.3	25.0
Notch Height R.	2.6	11.8	6.8	1.6	3.3	23.5
Notch Depth L.	0.8	4.6	2.4	0.8	1.6	33.3
Notch Depth R.	0.5	4.9	2.2	0.8	1.5	36.4
Stem/Haft Length	0.0	12.9	9.1	1.8	3.6	19.7
Prox. Mar. Height L.	0.0	5.1	2.2	1.1	2.3	50.0
Prox. Mar. Height R.	0.0	6.7	2.3	1.2	2.5	52.2
Base Width	8.3	22.4	17.1	3.1	6.2	18.1

Interpretation of the Metric Attributes

The complete points from the Fincastle, One-Eleven, Muhlbach, Happy Valley, Fitzgerald, and Ruby assemblages display similar patterns of variability. However, there are sites that appear to have lower relative standard deviations (RSD) than other sites. Regarding the Fincastle assemblage, 6 of the 17 attributes had RSD values lower than 20.0%: maximum width, maximum thickness, shoulder width, neck width, stem/haft length, and base width. Notch height left had an RSD value of 18.2%, though its mirror attribute, notch height right, had a RSD value of 21.8%. The One-Eleven collection had only two attributes, maximum width and shoulder width, with low RSD values: 19.5% each. The other 15 attributes had high RSD values. This is the only assemblage that displayed this degree of variability within these attributes. The Happy Valley collection, with a sample size of only four, had eight attributes with RSD values of below 20.0%, including maximum length, width, thickness, weight, shoulder width, neck width, stem/haft length, and base width. Four of the 17 attributes in the Muhlbach assemblage, maximum width, shoulder width, neck width, and stem/haft length, had low RSD values of 15.9%, 16.1%, 17.7%, and 15.0% respectively. Within the Fitzgerald collection, five attributes, those of the Muhlbach assemblage in addition to base width, displayed low RSD values. Eight attributes, maximum width, thickness, shoulder width, neck width, notch height left and right, stem/haft length, and base width, on the points in the Ruby collection had relative standard deviation values of less than 20.0%. It would appear that the Happy Valley and the Ruby assemblages have the least amount of variability within the projectile points. However, the weights of the projectile points from all six sites were the most variable, followed by the blade lengths and body lengths, and finally maximum lengths, when the notch heights, notch depths, and proximal margin heights are excluded. These attributes also displayed significant variability. It should be noted, that although these do display significant variability, these are very small aspects, and it may be that a tenth of a millimeter is not sufficient accuracy.

When examining only the complete projectiles, only 5 of the 17 attributes, the maximum width, shoulder width, neck width, stem/haft length, and base width, remain consistent, with relative standard deviations of less than 20.0% of the mean. The other attributes, most notably the maximum lengths, weights, blade length, and body length (left and right) display a large amount of variability as seen by the relative standard deviations of each, 28.8%, 51.8%, 34.4%, 32.9%, and 33.6% respectively. This finding is consistent with the results discussed above, which also included the mostly complete points. It is important to note that the notch heights, notch depths, and proximal margin heights also displayed significant variation as seen by the relative standard deviations of 25.0%, 36.4%, and 52.2% respectively. This pattern was detected in all six of the site collections, with the exception of the Ruby assemblage where the notch height left and right remained constant with RSD values of 19.4% and 19.7% respectively.

Length, body length, and blade length all displayed a significant amount of variability, attested by the relative standard deviation values as well as the minimum, maximum, and average values. Of the collections located on the Canadian Plains, the three dominated by Knife River Flint, Fincastle, Muhlbach, and Fitzgerald, have much longer maximum length and average length values (72.1 mm and 35.7 mm (Fincastle); 58.7 mm and 34.2 mm (Muhlbach); 61.1 mm and 37.0 mm (Fitzgerald) respectively) than the sites dominated by local materials: One-Eleven (36.3 mm, 26.7 mm) and Happy

Valley (33.7 mm, 27.3 mm). The Ruby site points have a maximum length value (71.4 mm) comparable to those from Fincastle, but the average value (41.9 mm) is substantially higher than was calculated for any of the other five collections.

Also of interest is that these maximum length values from the Fincastle and the Ruby point assemblages, come from incomplete points. It can be assumed that these artifacts were initially crafted even longer. Many of the Ruby site projectile points were manufactured from medium-fine quartzite, which is a highly durable material, incredibly resistant to the shock of impact, as well as to dulling. The majority of the points from the Ruby site displayed low amounts of retouch (92/102 = 90.2% with a HRI of 50.0% or lower, see below), which may account for the long length of these points, whereas only 70.8% (51/72) of the Fincastle points had HRI values of 50.0% or lower. It should also be noted that there are numerous good quality lithic raw material acquisition sites near the Ruby site in Wyoming, which may be why there was a lack of curation of artifacts since material would have been readily available.

Correlations between Attributes

Projectile point attributes do not exist in isolation, therefore, necessary to examine the relationships between the attributes in order to gain a better understanding of how they relate with one another. A Pearson's *r* Product-Moment Correlation was conducted in order to determine the relationship between the 13 numerical attributes of the projectile points: maximum length, width, thickness, weight, blade length, body length (left and right), shoulder width, neck width, notch height (left and right), notch depth (left and right), stem length, proximal margin height (left and right), and base width.

The data showed no violation of normality or linearity once the outlier (artifact 892 from the Fincastle site) was removed from the analysis. This artifact was considered to be a possible blank, since it lacks notches, and thus the features associated with notches, such as stem/haft and blade length, shoulder width, neck width, notch height, depth, type, orientation, and so forth. This was the only artifact examined from the six site assemblages that lacks these attributes.

Since SPSS has the capability of running a Point-Biserial Correlation when one attribute is interval/ratio and one is nominal, the correlations between these attributes were also examined. This allowed for the inclusion of nominal data as well as continuous data in the analysis. The results from the Pearson *r* Correlations and the Point-Biserial Correlations are summarized in Tables 15-22.

Table 15: Continuous data significance (Pearson Correlation values) using the complete artifacts from all six sites.

	Value	Max. Length	Max. Width	Max. Thick.	Weight	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Max. Length	*r*	------	.776	.548	.924	.990	.989	.987	.763
	p		.000	.000	.000	.000	.000	.000	.000
	n		130	130	130	130	130	130	130
Max. Width	*r*	.776	------	.661	.859	.729	.759	.770	.989
	p	.000		.000	.000	.000	.000	.000	.000
	n	130		130	130	130	130	130	130
Max. Thickness	*r*	.548	.661	------	.714	.487	.506	.512	.669
	p	.000	.000		.000	.000	.000	.000	.000
	n	130	130		130	130	130	130	130
Weight	*r*	.924	.859	.714	------	.894	.907	.906	.843
	p	.000	.000	.000		.000	.000	.000	.000
	n	130	130	130		130	130	130	130
Blade Length	*r*	.990	.729	.487	.894	------	.992	.991	.716
	p	.000	.000	.000	.000		.000	.000	.000
	n	130	130	130	130		130	130	130
Body Length L.	*r*	.989	.759	.506	.907	.992	-------	.985	.748
	p	.000	.000	.000	.000	.000		.000	.000
	n	130	130	130	130	130		130	130
Body Length R.	*r*	.987	.770	.512	.906	.991	.985	------	.758
	p	.000	.000	.000	.000	.000	.000		.000
	n	130	130	130	130	130	130		130
Shoulder Width	*r*	.763	.989	.669	.843	.716	.748	.758	------
	p	.000	.000	.000	.000	.000	.000	.000	
	n	130	130	130	130	130	130	130	
Neck Width	*r*	.465	.783	.654	.617	.406	.438	.447	.781
	p	.000	.000	.000	.000	.000	.000	.000	.000
	n	130	130	130	130	130	130	130	130

Table 16: Continuous data significance (Pearson Correlation values) using the complete artifacts from all six sites.

	Value	Max. Length	Max. Width	Max. Thick.	Weight	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Notch Ht. Left	*r*	.451	.552	.487	.470	.390	.381	.420	.543
	p	.000	.000	.000	.000	.000	.000	.000	.000
	n	130	130	130	130	130	130	130	130
Notch Ht. Right	*r*	.407	.525	.572	.445	.334	.358	.333	.527
	p	.000	.000	.000	.000	.000	.000	.000	.000
	n	130	130	130	130	130	130	130	130
Notch Depth Left	*r*	.486	.517	.220	.446	.470	.478	.496	.510
	p	.000	.000	.012	.000	.000	.000	.000	.000
	n	130	130	130	130	130	130	130	130
Notch Depth Right	*r*	.568	.595	.302	.557	.554	.566	.568	.581
	p	.000	.000	.000	.000	.000	.000	.000	.000
	n	130	130	130	130	130	130	130	130
Stem Length	*r*	.611	.676	.667	.678	.499	.526	.519	.663
	p	.000	.000	.000	.000	.000	.000	.000	.000
	n	130	130	130	130	130	130	130	130
Prox. Mar. Ht. Left	*r*	-.053	-.066	.067	-.041	-.083	-.084	-.087	-.069
	p	.549	.456	.454	.648	.348	.346	.324	.436
	n	129	129	129	129	129	129	129	129
Prox. Mar. Ht. Right	*r*	.122	.108	.133	.180	.073	.098	.063	.102
	p	.168	.220	.131	.040	.406	.269	.476	.248
	n	130	130	130	130	130	130	130	130
Base Width	*r*	.484	.780	.595	.605	.427	.449	.466	.756
	p	.000	.000	.000	.000	.000	.000	.000	.000
	n	130	130	130	130	130	130	130	130

Table 17: Continuous and nominal data significance (Point-Biserial Correlation values) using the complete artifacts from all six sites.

	Value	Max. Length	Max. Width	Max. Thick.	Weight	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Symmetry	*r*	.107	.107	.103	.129	.089	.091	.098	.075
	p	.224	.224	.244	.145	.313	.305	.267	.399
	n	130	130	130	130	130	130	130	130
Transverse Profile	*r*	-.326	-.368	-.455	-.401	-.307	-.335	-.316	-.382
	p	.000	.000	.000	.000	.001	.000	.001	.000
	n	117	117	117	117	117	117	117	117
Long. Profile	*r*	-.373	-.438	-.548	-.437	-.360	-.374	-.379	-.434
	p	.000	.000	.000	.000	.000	.000	.000	.000
	n	117	117	117	117	117	117	117	117
Tip shape	*r*	-.121	-.033	.045	-.051	-.133	-.148	-.115	-.045
	p	.171	.710	.612	.565	.132	.095	.195	.613
	n	129	129	129	129	129	129	129	129
Blade Edge Shape Left	*r*	.151	.215	.166	.164	.135	.148	.147	.222
	p	.086	.014	.059	.063	.127	.093	.095	.011
	n	130	130	130	130	130	130	130	130
Blade Edge Shape Right	*r*	-.015	-.010	.040	.047	-.023	-.030	-.022	-.031
	p	.864	.910	.654	.594	.799	.732	.808	.724
	n	129	129	129	129	129	129	129	129
Body Shape	*r*	.048	.029	-.011	.015	.036	.038	.039	.047
	p	.585	.743	.898	.863	.682	.669	.663	.595
	n	130	130	130	130	130	130	130	130
Shoulder Shape Left	*r*	-.094	.011	-.073	.084	-.088	-.079	-.074	.015
	p	.288	.905	.411	.340	.320	.370	.405	.861
	n	130	130	130	130	130	130	130	130
Shoulder Shape Right	*r*	.080	.084	.047	.062	.092	.080	.103	.094
	p	.364	.345	.599	.482	.300	.367	.242	.286
	n	130	130	130	130	130	130	130	130

Table 18: Continuous and nominal data significance (Point-Biserial Correlation values) using the complete artifacts from all six sites.

	Value	Max. Length	Max. Width	Max. Thick.	Weight	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Notch Type Left	*r*	-.037	.023	.029	-.059	-.029	-.045	-.027	.008
	p	.674	.793	.741	.503	.746	.608	.760	.932
	n	130	130	130	130	130	130	130	130
Notch Type Right	*r*	.167	.168	.102	.136	.153	.150	.161	.199
	p	.057	.057	.246	.122	.083	.088	.067	.023
	n	130	130	130	130	130	130	130	130
Notch Or. Left	*r*	.027	.033	.009	-.013	.030	.046	.047	.040
	p	.765	.712	.923	.884	.733	.601	.598	.654
	n	130	130	130	130	130	130	130	130
Notch Or. Right	*r*	.015	.101	.003	.075	.020	.018	.025	.095
	p	.863	.253	.974	.394	.822	.839	.781	.280
	n	130	130	130	130	130	130	130	130
Notch Shape Left	*r*	.067	.107	.026	.080	.079	.082	.098	.105
	p	.447	.227	.765	.368	.373	.354	.266	.232
	n	130	130	130	130	130	130	130	130
Notch Shape Right	*r*	.211	.157	-.019	.163	.234	.240	.229	.141
	p	.016	.074	.826	.064	.007	.006	.009	.109
	n	130	130	130	130	130	130	130	130
Prox. Mar. Shape Left	*r*	-.115	-.040	.061	-.101	-.109	-.111	-.106	-.036
	p	.193	.650	.490	.252	.215	.209	.228	.681
	n	130	130	130	130	130	130	130	130
Prox. Mar. Shape Right	*r*	-.061	-.057	.007	-.075	-.075	-.052	-.080	-.054
	p	.488	.517	.933	.399	.394	.558	.364	.540
	n	130	130	130	130	130	130	130	130
Base Shape	*r*	.122	-.036	.059	.094	.112	.104	.103	-.033
	p	.167	.687	.507	.288	.205	.241	.245	.709
	n	130	130	130	130	130	130	130	130

Table 19: Continuous data significance (Pearson Correlation values) using the complete artifacts from all six sites.

	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. Mar. Ht. L.	Prox. Mar. Ht. R.	Base Width
Max. Length	*r*	.465	.451	.407	.486	.568	.611	-.053	.122	.484
	p	.000	.000	.000	.000	.000	.000	.549	.168	.000
	n	130	130	130	130	130	130	129	130	130
Max. Width	*r*	.783	.552	.525	.517	.595	.676	-.053	.122	.780
	p	.000	.000	.000	.000	.000	.000	.549	.168	.000
	n	130	130	130	130	130	130	129	130	130
Max. Thickness	*r*	.654	.487	.572	.220	.302	.667	.067	.133	.595
	p	.000	.000	.000	.012	.000	.000	.454	.131	.000
	n	130	130	130	130	130	130	129	130	130
Weight	*r*	.617	.470	.445	.446	.557	.678	-.041	.180	.605
	p	.000	.000	.000	.000	.000	.000	.648	.040	.000
	n	130	130	130	130	130	130	129	130	130
Blade Length	*r*	.406	.390	.334	.470	.554	.499	-.083	.073	.427
	p	.000	.000	.000	.000	.000	.000	.348	.406	.000
	n	130	130	130	130	130	130	129	130	130
Body Length Left	*r*	.438	.381	.358	.478	.566	.526	-.084	.098	.449
	p	.000	.000	.000	.000	.000	.000	.346	.269	.000
	n	130	130	130	130	130	130	129	130	130
Body Length Right	*r*	.447	.420	.333	.496	.568	.519	-.087	.063	.466
	p	.000	.000	.000	.000	.000	.000	.324	.476	.000
	n	130	130	130	130	130	130	129	130	130
Shoulder Width	*r*	.781	.543	.527	.510	.581	.663	-.069	.102	.756
	p	.000	.000	.000	.000	.000	.000	.436	.248	.000
	n	130	130	130	130	130	130	129	130	130
Neck Width	*r*	------	.342	.436	.104	.191	.604	.179	.190	.877
	p		.000	.000	.240	.029	.000	.042	.030	.000
	n		130	130	130	130	130	129	130	130

Table 20: Continuous data significance (Pearson Correlation values) using the complete artifacts from all six sites.

	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. Mar. Ht. L.	Prox. Mar. Ht. R.	Base Width
Notch Ht. Left	*r* *p* *n*	.342 .000 130	------	.620 .000 130	.287 .001 130	.327 .000 130	.608 .000 130	-.331 .000 129	-.040 .652 130	.364 .000 130
Notch Ht. Right	*r* *p* *n*	.436 .000 130	.620 .000 130	------	.190 .030 130	.285 .001 130	.661 .000 130	-.026 .773 129	-.144 .102 130	.424 .000 130
Notch Depth Left	*r* *p* *n*	.104 .240 130	.287 .001 130	.190 .030 130	-------	.680 .000 130	.321 .000 130	-.138 .118 129	.007 .934 130	.395 .000 130
Notch Depth Right	*r* *p* *n*	.191 .029 130	.327 .000 130	.285 .001 130	.680 .000 130	------	.376 .000 130	-.171 .052 129	-.024 .785 130	.478 .000 130
Stem Length	*r* *p* *n*	.604 .000 130	.608 .000 130	.661 .000 130	.321 .000 130	.376 .000 130	------	.172 .052 129	.353 .000 130	.611 .000 130
Prox. Mar. Ht. Left	*r* *p* *n*	.179 .042 129	-.331 .000 129	-.026 .773 129	-.138 .118 129	-.171 .052 129	.172 .052 129	------	.383 .000 129	.160 .070 129
Prox. Mar. Ht. Right	*r* *p* *n*	.190 .030 130	-.040 .652 130	-.144 .102 130	.007 .934 130	-.024 .785 130	.353 .000 130	.383 .000 129	------	.145 .100 130
Base Width	*r* *p* *n*	.877 .000 130	.364 .000 130	.424 .000 130	.395 .000 130	.478 .000 130	.611 .000 130	.160 .070 129	.145 .100 130	-------

Table 21: Continuous and nominal data significance (Point-Biserial Correlation values) using the complete artifacts from all six sites.

	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. Mar. Ht. L.	Prox. Mar. Ht. R.	Base Width
Symmetry	*r*	.008	.074	.069	.104	.130	.151	.076	.064	.067
	p	.930	.400	.437	.238	.139	.087	.393	.468	.446
	n	130	130	130	130	130	130	129	130	130
Transverse Profile	*r*	-.326	-.117	-.193	-.181	-.286	-.308	-.064	-.166	-.378
	p	.000	.210	.037	.051	.002	.001	.492	.073	.000
	n	117	117	117	117	117	117	116	117	117
Long. Profile	*r*	-.473	-.181	-.228	-.105	-.234	-.306	-.008	-.184	-.472
	p	.000	.051	.013	.258	.011	.001	.928	.047	.000
	n	117	117	117	117	117	117	116	117	117
Tip shape	*r*	.011	.158	.037	-.015	-.163	.019	.052	-.024	-.002
	p	.898	.074	.679	.869	.065	.828	.562	.788	.979
	n	129	129	129	129	129	129	128	129	129
Blade Ed. Shape Left	*r*	.112	.137	.097	.116	.167	.174	-.011	.075	.081
	p	.205	.120	.272	.189	.058	.048	.905	.396	.359
	n	130	130	130	130	130	130	129	130	130
Blade Ed. Shape Right	*r*	.096	-.070	-.010	-.027	.021	.064	.114	.137	.109
	p	.281	.429	.908	.761	.813	.472	.201	.123	.217
	n	129	129	129	129	129	129	128	129	129
Body Shape	*r*	-.055	.026	.131	.135	.114	.095	-.031	.063	-.082
	p	.534	.770	.138	.127	.195	.282	.726	.480	.355
	n	130	130	130	130	130	130	129	130	130
Shoulder Shape Left	*r*	.019	.023	.015	.056	.019	-.082	-.109	-.079	.031
	p	.829	.793	.861	.527	.830	.352	.220	.374	.725
	n	130	130	130	130	130	130	129	130	130
Shoulder Shape Right	*r*	.054	.208	.027	.075	.171	-.015	-.110	-.094	.105
	p	.540	.018	.761	.396	.052	.869	.214	.288	.235
	n	130	130	130	130	130	130	129	130	130

Table 22: Continuous and nominal data significance (Point-Biserial Correlation values) using the complete artifacts from all six sites.

	Value	**Neck Width**	**Notch Ht. L.**	**Notch Ht. R.**	**Notch Depth L.**	**Notch Depth R.**	**Stem Length**	**Prox. Mar. Ht. L.**	**Prox. Mar. Ht. R.**	**Base Width**
Notch Type Left	*r*	.027	-.038	.028	.015	-.114	-.047	.204	.042	-.029
	p	.760	.667	.754	.865	.197	.597	.021	.631	.746
	n	130	130	130	130	130	130	129	130	130
Notch Type Right	*r*	.087	.246	.071	.073	.058	.157	-.067	.232	-.001
	p	.323	.005	.419	.406	.512	.074	.454	.008	.994
	n	130	130	130	130	130	130	129	130	130
Notch Or. Left	*r*	.013	-.013	-.029	.080	-.049	-.012	-.052	-.076	.020
	p	.883	.888	.741	.363	.580	.890	.561	.388	.818
	n	130	130	130	130	130	130	129	130	130
Notch Or. Right	*r*	.051	.066	-.031	.065	.068	-.037	-.027	.081	.042
	p	.564	.458	.730	.461	.444	.674	.761	.360	.635
	n	130	130	130	130	130	130	129	130	130
Notch Shape Left	*r*	-.027	-.121	-.125	.347	.234	-.044	.109	-.034	.144
	p	.757	.169	.156	.000	.007	.623	.218	.701	.102
	n	130	130	130	130	130	130	129	130	130
Notch Shape Right	*r*	-.050	-.158	-.171	.351	.527	-.026	-.024	-.009	.184
	p	.568	.073	.051	.000	.000	.767	.790	.920	.036
	n	130	130	130	130	130	130	129	130	130
Prox. Mar. Shape Left	*r*	.121	-.206	.029	-.048	-.164	-.073	.484	.122	.111
	p	.169	.019	.745	.589	.062	.407	.000	.166	.209
	n	130	130	130	130	130	130	129	130	130
Prox. Mar. Shape Right	*r*	.042	-.009	-.009	-.085	-.053	.042	.209	.500	.045
	p	.633	.915	.915	.334	.547	.633	.018	.000	.614
	n	130	130	130	130	130	130	129	130	130
Base Shape	*r*	-.047	-.086	-.079	-.049	.025	.121	-.017	.077	-.056
	p	.597	.330	.373	.580	.775	.169	.848	.381	.530
	n	130	130	130	130	130	130	129	130	130

Interpretation of the Correlation Coefficient Results

The values of the Pearson Correlation Coefficients and the Point-Biserial Correlation Coefficients indicate the strength of the relationship between the two attributes. Based on these results, maximum length was strongly positively correlated with maximum width ($r = .776$, $n = 130$, $p < .01$), weight ($r = .924$, $n = 130$, $p < .01$), blade length ($r = .990$, $n = 130$, $p < .01$), body length left ($r = .989$, $n = 130$, $p < .01$), body length right ($r = .987$, $n = 130$, $p < .01$), and shoulder width ($r = .763$, $n = 130$, $p < .01$), and notch depth and proximal margin height are not strongly correlated with any of the other numerical attributes. The same outcomes were obtained from the principal components analysis, discussed later in this chapter. It appears that these two attributes are not significantly influenced by the other attributes, though the notch depth (right) does have a moderate correlation with maximum length ($r = .568$, $n = 130$, $p < .01$), maximum width ($r = .595$, $n = 130$, $p < .01$), which is regularly the shoulder width ($r = .581$, $n = 130$, $p < .01$), blade width ($r = .554$, $n = 130$, $p < .01$), body length left ($r = .566$, $n = 130$, $p < .01$), and body length right ($r = .568$, $n = 130$, $p < .01$). Clearly, a larger surface area would affect the total area that could be removed to craft the notch, and narrow shoulders would also reduce the area where the notches could be crafted. Having said that, it seems that there are other factors related to the notch depth and proximal margin height.

The base width is strongly correlated to the maximum width, shoulder width, and neck width. Since the majority of the points were widest at the shoulders, this correlation is not surprising. The base width of these points is frequently very close to the maximum width, usually within a couple millimeters. The strongest correlations were detected with the neck width. Neck width is highly dependent on the overall width of the point (r = .783, n = 130, p < .01), with a wider point typically displaying a greater neck width. Based on the metric attributes, the maximum width and the neck width remain relatively constant, with low relative standard deviations, 16.4% and 17.4% respectively. This seems to suggest that the objective was to create a point of a particular width that was then notched until a certain neck width was reached. In this case, a neck width of approximately 14.0 mm was sought. The neck width is directly related to the thickness of the shaft or foreshaft to which the point was once attached (Forbis 1962:87; Christenson 1986:119; Pyszczyk 2003:59).

Very few of the Point-Biserial Correlation Coefficients were considered even moderately significant, and there were no correlations with a value over .600. Those that were considered moderate were between the longitudinal profile and thickness (r = -.548, n = 117, p < .01), weight (r = -.437, n = 117, p < .01), shoulder width (r = -.434, n = 117, p < .01), neck width (r = -.473, n = 117, p < .01), and base width (r = -.472, n = 117, p < .01), as well as the associations between the transverse profile and thickness (r = -.455, n = 117, p < .01), and weight (r = -.401, n = 117, p < .01). The association between the cross sections and the thickness of the projectile is not surprising since most points were biconvex and thicker than, for instance, points with a plano-triangular cross section, which are thinner and typically still displayed aspects of the original flake from which they were crafted. The shoulder, neck, and base widths were associated with one another and their associations with the longitudinal profile were similar. This may be because wider, larger projectiles displayed biconvex sections, while other smaller and less wide artifacts displayed cross sections associated with points that still retain aspects of the flake. The association between the cross sections and the weight is also a result of these size differences.

Analysis of the Non-metric Attributes

The non-numerical attribute data collected is discussed as a whole for ease of interpretation and to allow for site comparisons. The overall point, blade, and basal attributes are presented in these groupings to identify significant patterns of each. Chi-square tests were used to determine the significance of each nominal and ordinal attribute.

Overall attributes include raw material, symmetry, quality of workmanship, and transverse and longitudinal cross sections. The colour of the raw material, although recorded, was not included since it is inherently connected to the raw material that was chosen in the manufacture of the projectile points. Nominal blade attributes recorded were tip shape, blade edge shape (left and right), body shape, retouch value, and shoulder shape. Basal attributes that were classified as nominal were the notch type, notch orientation, notch shape, presence of notch grinding, proximal margin shape, base shape, and the presence of basal thinning and basal grinding.

Overall Attributes

A chi-square test of independence was performed to examine the relationship between the site collections and the raw material. A total of 21 various material types were recorded in the initial examinations of the projectile points. For ease of interpretation, these materials were congregated into five variations: Brown chert (Knife River Flint), miscellaneous cherts, chalcedonies, quartzites, and other materials, which included obsidian, porcellanite, petrified wood, and siltstone. A summary of the materials present in the six site assemblages can be seen in Table 23. During the initial examination of the projectile points from each site it was noted that the Fincastle, Muhlbach, and Fitzgerald collections displayed overwhelming preference for brown chert, Knife River Flint. The relationship between the material types was significant, X^2 (20, $n = 291$) = 213.432, $p < .01$. Lambda was .314 and was statistically significant ($p < .01$). This confirmed that the association between the site and the raw material choice between the six sites is significant.

Table 23: Raw materials recorded for the projectile points from each of the six sites.

Site	Knife River Flint	Misc. Cherts	Chalcedony	Quartzite	Other Materials	Total Analyzed
Fincastle	54	3	6	1	8	72
One-Eleven	7	3	1	3	2	16
Muhlbach	41	3	0	0	1	45
Happy Valley	0	3	0	1	0	4
Fitzgerald	49	1	1	0	1	52
Ruby	7	15	12	58	10	102
Total	158	28	20	63	22	291

Several site assemblages had a predominance of Knife River Flint. The Fincastle site projectiles were mainly Knife River Flint (54 of the 72 artifacts (75%)), while the remaining specimens were crafted from a number of materials including siltstone, translucent chalcedony, grey/white/brown chalcedony, Swan River chert, miscellaneous chert, medium fine quartzite, petrified wood, porcellanite (grey), and obsidian. Only 4 of the 45 projectile points recovered from the Muhlbach site were crafted from materials other than Knife River Flint, and these consisted of pebble chert, opaque yellow chert, miscellaneous chert, and siltstone. The Fitzgerald assemblage was also manufactured predominantly from Knife River Flint (48 of the 52 artifacts (92%)). The remaining specimens were crafted from a number of materials including of patinated brown chert (Knife River Flint), translucent chalcedony, miscellaneous chert, and siltstone.

The other assemblages were manufactured from mainly locally available raw materials. Although 7 of the 16 artifacts (44%) recovered from EgPn-111 were crafted from Knife River Flint, this was not enough to have a clear predominance of the material over locally available materials. The remaining nine specimens from EgPn-111 were manufactured from medium fine quartzite, siltstone, miscellaneous chert, grey/white/brown chalcedony, opaque yellow chert, and patinated yellow chert. The four projectile points examined from the Happy Valley site assemblage were each manufactured from a different material: black chert, miscellaneous chert, medium-fine quartzite, and Swan River chert. The Ruby site assemblage also displayed a predominance of locally available materials. Many points were manufactured from medium-fine quartzite (35 of the 102 artifacts (34%)). The remaining specimens were crafted from Hartville Uplift orthoquartzite, miscellaneous chert, grey/white/brown chalcedony, Knife River Flint, porcellanite (reds), Morrison orthoquartzite, opaque red chert, yellow chalcedony, siltstone, green chert, petrified wood, and red chalcedony.

Eta values were obtained between the variables of material type (nominal) and the interval/ratio variables of maximum length, width, thickness, weight, blade length, body length left and right, shoulder width, neck with, notch height left and right, notch depth left and right, stem length, proximal margin height left and right, and base width. When the maximum length was dependent on the material type, an eta value of .837 was recorded. This means that there was a strong association between the material type and the resulting maximum length. This strength of association was also seen with the attributes of weight (η = .920), blade length (η = .859), body length left (η = .885), and body length right (η = .929). Attributes with moderate associations to material type were maximum width, where the eta value was .633, shoulder width (η = .650), neck width (η = .539), stem length (η = .519), and the width of the base (η = .656). The attributes with weak associations to material type were the thickness (η = .450), notch height left (η = .481), notch height right (η = .546), notch depth left (η = .472), notch depth right (η = .497), proximal margin height left (η = .473), and proximal margin height right (η = .378).

In order to examine the relationship between the site and the symmetry of the projectile points, a chi-square test of independence was conducted. The relationship between the variables was not statistically significant: X^2 (10, n = 281) = 12.018, p = .284. Lambda was .019 and was not statistically significant (p = .396). Most projectile points, regardless of which site they were recovered from, were created with a symmetrical form (Table 24). Although a number of artifacts displayed a less symmetrical form (slight asymmetry), very few were classified as asymmetrical, and this digression was present across the assemblages.

Table 24: Symmetry recorded for the projectile points from each of the six sites.

Site	Symmetrical	Slightly Asymmetrical	Asymmetrical	Total Analyzed
Fincastle	37	28	5	70
One-Eleven	10	3	3	16
Happy Valley	1	3	0	4
Muhlbach	27	12	5	44
Fitzgerald	21	25	4	50
Ruby	46	39	12	97
Total	142	110	29	281

A chi-square test of independence was executed in order to evaluate the relationship between the site assemblage and the quality of workmanship listed in Table 25. The relationship between the variables was statistically significant: X^2 (20, n = 291) = 75.946, $p < .01$. Since the site is a nominal value, and quality of workmanship is an ordinal value, both lambda and gamma were calculated. Lambda was .131 and was statistically significant ($p < .01$); however, gamma was -.118 and was not statistically significant ($p = .077$). As previously discussed, in instances where both a nominal and an ordinal attribute are included in the same test, the lower measure of association should be used. In this instance the lambda was used.

Table 25: Quality of workmanship recorded for the projectile points from each of the six sites.

Site	Low	Med /Low	Med	Med /High	High	Total Analyzed
Fincastle	4	5	9	24	30	72
One-Eleven	1	4	5	5	1	16
Happy Valley	1	1	2	0	0	4
Muhlbach	6	9	17	12	1	45
Fitzgerald	3	4	16	21	8	52
Ruby	0	6	47	36	13	102
Total	15	29	96	98	53	291

A chi-square test of independence was conducted in order to examine the relationship between the site and the transverse cross section. The relationship between the variables was significant: X^2 (20, n = 269) = 77.190, $p < .01$. Lambda was .092 and was statistically significant ($p = .011$). As seen in Table 26, the majority of the projectile points were biconvex in cross section (77.0 %).

Table 26: Transverse cross section recorded for the projectile points from each of the six sites.

Site	Biconvex	Plano-Convex	Plano-Triangular	Lenticular	Concave /Convex	Total Analyzed
Fincastle	53	13	5	0	1	72
One-Eleven	7	4	3	1	1	16
Happy Valley	4	0	0	0	0	4
Muhlbach	8	4	10	1	0	23
Fitzgerald	39	6	7	0	0	52
Ruby	96	4	0	1	1	102
Total	207	31	25	3	3	269

In order to examine the relationship between the site and the longitudinal cross section of the projectile points, a chi-square test of independence was performed. The relationship between the variables was statistically significant: X^2 (20, n = 268) = 61.080, p < .01. Lambda was .076 and that it was statistically significant (p < .01). Most projectiles were created with a biconvex longitudinal cross section (Table 27). However, the Fincastle site differs from the others, with a considerable number of artifacts (23 of the 71 artifacts) have other cross section shapes.

Table 27: Longitudinal cross section recorded for the projectile points from each of the six sites.

Site	Biconvex	Plano-Convex	Plano-Triangular	Lenticular	Concave /Convex	Total Analyzed
Fincastle	48	10	1	10	2	71
One-Eleven	7	3	0	5	1	16
Happy Valley	2	0	1	0	1	4
Muhlbach	10	3	3	6	1	23
Fitzgerald	36	3	3	6	4	52
Ruby	93	2	3	4	0	102
Total	196	21	11	31	9	268

Blade Attributes

Blade attributes are more likely to display functional characteristics, such as retouch, than are the basal attributes of projectile points for reasons discussed previously. Thus, functional qualities may be seen in the four nominal blade attributes: tip shape, blade edge shape (left and right), body shape, and shoulder shape.

A chi-square test of independence was conducted in order to examine the relationship between the site and the shape of the tip. The relationship between the variables was statistically significant: X^2 (15, *n* = 158) = 28.083, *p* = .021. Lambda was .071 and was not significant (*p* = .125). As seen in Table 28, the majority of the points (65.8%) have a pointed tip (104 of the 158 artifacts). A pointed tip is more functionally desirable to ensure the penetration of the hide and flesh of the prey animal.

Table 28: Tip shape recorded for the projectile points from each of the six sites.

Site	Pointed	Sharp	Blunted	Rounded	Total Analyzed
Fincastle	24	11	7	1	43
One-Eleven	12	0	0	3	15
Happy Valley	1	0	1	0	2
Muhlbach	15	3	4	5	27
Fitzgerald	20	0	3	5	28
Ruby	32	4	3	4	43
Total	104	18	18	18	158

A chi-square test of independence was performed in order to examine the association between the site and the blade edge shape, both left and right. The relationship between the variables was statistically significant for the left: X^2 (20, *n* = 283) = 30.639, *p* = .060. However, it was not significant for the right aspect: X^2 (20, *n* = 278) = 24.300, *p* = .230. Lambda for the left side was .004 and that it was not significant (*p* = .316); for the right side lambda was .004 and also was not significant (*p* = .763). A summary of the blade edge shape data can be seen in Table 29, where a majority of the blade edge shapes were excurvate (65.7% for the left, 67.6% for the right). Since one aspect was considered significant, and its mirror attribute, blade edge shape right, displayed no significant difference, this result must be disregarded and when the attribute as a whole is considered, there are no significant differences.

Table 29: Blade edge shape recorded for the projectile points from each of the six sites.

Site	Side	Straight	Excurvate	Incurvate	Excurvate/ Incurvate	Recurved	Total Analyzed
Fincastle	Left	6	45	0	12	7	70
	Right	13	45	1	7	2	68
One-Eleven	Left	6	9	0	1	0	16
	Right	3	8	1	3	1	16
Happy Valley	Left	1	3	0	0	0	4
	Right	1	3	0	0	0	4
Muhlbach	Left	3	30	0	6	5	44
	Right	1	32	1	5	4	43
Fitzgerald	Left	0	40	1	6	4	51
	Right	0	37	1	6	5	49
Ruby	Left	14	59	0	13	12	98
	Right	16	63	1	14	4	98
Total	Left	30	186	1	38	28	283
Total	Right	34	188	5	35	16	278

In order to examine the relationship between the site and the shape of the body, a chi-square test of independence was conducted. The relationship between the variables was statistically significant: X^2 (20, *n* = 267) = 37.194, *p* = .011. The value for lambda was .013 and not statistically significant (*p* = .466). Most projectile points were created with an ovate body shape (Table 30). A number of artifacts have a triangular and an excurvate/incurvate form, and this digression was present across the assemblages.

Table 30: Body shape recorded for the projectile points from each of the six sites.

Site	Ovate	Triangular	Incurvate	Excurvate/ Incurvate	Recurved	Total Analyzed
Fincastle	50	10	0	7	0	67
One-Eleven	10	6	0	0	0	16
Happy Valley	2	2	0	0	0	4
Muhlbach	39	1	1	3	1	45
Fitzgerald	42	0	0	3	2	47
Ruby	69	12	0	5	2	88
Total	212	31	1	18	5	267

Table 31: Shoulder shape recorded for the projectile points from each of the six sites.

Site	Side	RND /OBT	RND /RT	RND /ACT	ANG /OBT	ANG /RT	ANG /ACT	Total Analyzed
Fincastle	Left	35	2	0	31	3	0	71
	Right	28	3	0	35	4	0	70
One-Eleven	Left	6	0	1	3	3	2	15
	Right	9	0	0	2	2	0	13
Happy Valley	Left	3	0	0	0	1	0	4
	Right	2	0	0	1	1	0	4
Muhlbach	Left	29	2	0	10	2	0	43
	Right	29	4	0	11	1	0	45
Fitzgerald	Left	31	1	0	14	4	0	50
	Right	32	2	0	11	5	0	50
Ruby	Left	48	14	3	18	15	3	101
	Right	49	13	2	25	8	2	99
Total	Left	152	19	4	76	28	5	284
Total	Right	149	22	2	85	21	2	281

A chi-square test of independence was performed to examine the relationship between the site and the shoulder shape, both left and right. The relationship between the variables was statistically significant for the left: X^2 (25, n = 284) = 59.647, $p < .01$. However, it was not statistically significant for the right aspect: X^2 (25, n = 281) = 37.344, $p = .054$. Lambda for the left side was .041 and that it was not statistically significant ($p = .062$). The lambda value for the right side was .054 and it was not significant (*p* = .220). Since the right side displayed no significance, then it is assumed that this result is erroneous and as a whole the attribute will be considered not statistically significant. As seen in Table 31 (previous page), the majority of the projectiles have obtuse shoulders that were either rounded or angled (80.2 % for the left, 83.2% for the right).

Basal Attributes

Basal attributes are considered to be more reflective of the initial manufacturing process and potentially of the cultural preferences than those of the blade. Many blade attributes appear to have a strong functional link, although they may also display cultural choices. Basal attributes were sheltered by the haft, and were thus less likely to be exposed to secondary modifications, such as retouch and resharpening. However, as noted above, the neck width is functionally correlated with the shaft diameter to facilitate hafting. Nominal base attributes include notch type, notch orientation, notch shape, presence of notch grinding, proximal margin shape, base shape, and the presence of basal thinning and grinding.

A chi-square test of independence was conducted in order to examine the relationship between the site and the notch type, both left and right. The relationship between the variables was not significant: X^2 (15, n = 273) = 19.536, p = .190 (left), X^2 (15, n = 270) = 17.850, p = .271 (right). Lambda for the left side was .004 and was not statistically significant (p = .655). This was also the case for the right side, where the value of lambda was .011 and not significant (p = .548). As seen in Table 32, the majority of the points are corner/side-notched (63.7% left, 67.4% right).

Table 32: Notch type recorded for the projectile points from each of the six sites.

Site	Side	Corner Notch	Side Notch	Corner/ Side	No Notch	Total Analyzed
Fincastle	Left	6	17	46	1	70
	Right	7	12	49	1	69
One-Eleven	Left	5	4	6	0	15
	Right	3	6	5	0	14
Happy Valley	Left	0	2	2	0	4
	Right	0	0	4	0	4
Muhlbach	Left	1	13	28	0	42
	Right	2	11	30	0	43
Fitzgerald	Left	5	10	36	0	51
	Right	2	11	37	0	50
Ruby	Left	15	20	56	0	91
	Right	6	27	57	0	90
Total	Left	32	66	174	1	273
Total	Right	20	67	182	1	270

In order to examine the relationship between the site and the notch orientation, both left and right aspects, a chi-square test of independence was executed. The relationship between the variables was not statistically significant for the left: X^2 (10, *n* = 271) = 18.044, *p* = .054; however, it was statistically significant for the right aspect: X^2 (10, *n* = 268) = 19.460, *p* = .035. Lambda for the left side was .011 and was not statistically significant (*p* = .768), and this is reflected by the right side, were the value of lambda was .010 and also was not significant (*p* = .590). The majority of projectile point notches were skewed distally (Table 33). A number of artifacts also have notches that were symmetrical and skewed proximally, and this pattern was visible across the assemblages.

Table 33: Notch orientation recorded for the projectile points from each of the six sites.

Site	Side	Symmetrical	Skewed Distally	Skewed Proximally	Total Analyzed
Fincastle	Left	13	53	3	69
	Right	17	43	8	68
One-Eleven	Left	5	7	3	15
	Right	2	10	2	14
Happy Valley	Left	1	3	0	4
	Right	0	3	1	4
Muhlbach	Left	7	26	9	42
	Right	12	18	14	44
Fitzgerald	Left	11	32	8	51
	Right	13	31	6	50
Ruby	Left	16	50	24	90
	Right	14	46	28	88
Total	Left	53	171	47	271
Total	Right	58	151	59	268

A chi-square test of independence was performed in order to examine the relationship between the site and the notch shape, both left and right. The relationship between the variables was significant for the left: X^2 (10, n = 274) = 46.923, $p < .01$. However, it was not statistically significant for the right aspect: X^2 (10, n = 274) = 58.696, $p < .01$. Lambda for the left side was .069 and that it was not statistically significant ($p = .284$), while for the right side lambda was .131 and that was statistically significant ($p = .032$). Since the right attribute displayed no significant difference, the result from the left must be disregarded and the attribute as a whole, considered not significantly different between the sites. As seen in Table 34, the majority of points have rounded notch shapes (71.5% for the left, 69.0% for the right).

Table 34: Notch shape recorded for the projectile points from each of the six sites.

Site	Side	Rounded	Angled	Rounded/ Squared	Total Analyzed
Fincastle	Left	60	0	10	70
	Right	61	2	8	71
One-Eleven	Left	8	0	7	15
	Right	8	0	6	14
Happy Valley	Left	3	0	1	4
	Right	2	0	2	4
Muhlbach	Left	35	0	8	43
	Right	37	2	5	44
Fitzgerald	Left	46	1	4	51
	Right	42	1	7	50
Ruby	Left	44	1	46	91
	Right	39	1	51	91
Total	Left	196	2	76	274
Total	Right	189	6	79	274

A chi-square test of independence was performed in order to examine the relationship between the site and the presence of notch grinding. The relationship between the variables was statistically significant: X^2 (5, n = 290) = 22.657, $p < .01$. Lambda was .020 and was not statistically significant (p = .101). As seen in Table 35, the notches of the majority of the projectile points were ground (94.8%). The intensity of the notch grinding was not examined in this study, and may be an interesting aspect to examine in future investigations.

Table 35: Notch grinding presence recorded for the projectile points from each of the six sites.

Site	YES	NO	Total
Fincastle	70	1	71
One-Eleven	12	4	16
Happy Valley	4	0	4
Muhlbach	40	5	45
Fitzgerald	48	4	52
Ruby	101	1	102
Total	275	15	290

In order to examine the relationship between the site and the proximal margin shape, both left and right aspects, a chi-square test of independence was performed. The relationship between the variables was statistically significant for the left: X^2 (45, *n* = 266) = 80.619, *p* < .01. However, for the right aspect it was not significant: X^2 (35, *n* = 263) = 43.666, *p* = .149. Lambda for the left side was .015 and that it was not statistically significant (*p* = .558).The right side lambda was .025 and it was also not significant (*p* = .086). The majority of projectile point proximal margins are rounded/basally constricted (Table 36). A number of artifacts also have proximal margins that are rounded/squared, rounded/basally expanding, and squared/basally constricted, and this pattern was visible across the assemblages.

Table 36: Proximal margin shape recorded for the projectile points from each of the six sites.

Site	Side	RND	ANG	SQ	ANG/ RND	RND /ANG	RND/ SQ	RND/ CON	RND/ EXP	SQ/ CON	SQ/ EXP	Total
Fincastle	L.	2	7	1	2	1	4	26	4	20	1	68
	R.	4	8	0	2	0	3	27	6	15	3	68
One-Eleven	L.	3	0	0	0	1	1	4	4	0	0	13
	R.	2	1	0	0	0	2	3	3	3	0	14
Happy Valley	L.	0	0	0	0	0	1	2	1	0	0	4
	R.	0	0	0	0	0	0	3	0	1	0	4
Muhlbach	L.	1	1	0	1	0	5	26	0	6	2	42
	R.	1	3	0	1	0	4	22	4	7	0	42
Fitzgerald	L.	5	0	0	0	0	11	28	4	3	0	51
	R.	1	2	0	0	0	6	33	6	1	0	49
Ruby	L.	7	5	1	4	1	16	27	5	22	0	88
	R.	3	2	0	5	0	10	34	13	17	2	86
Total	L.	18	13	2	7	3	38	113	18	51	3	266
Total	R.	11	16	0	8	0	25	122	32	44	5	263

A chi-square test of independence was performed in order to examine the relationship between the site and the shape of the base. The relationship between the variables was not statistically significant: X^2 (15, n = 283) = 17.605, p = .284. Lambda was .003 and was not statistically significant (p = .835). As seen in Table 37, the majority of the points have straight bases (59.4%).

Table 37: Base shape recorded for the projectile points from each of the six sites.

Site	Straight	Concave	Convex	Concave /Convex	Total Analyzed
Fincastle	44	13	11	4	72
One-Eleven	10	2	3	1	16
Happy Valley	2	0	2	0	4
Muhlbach	27	7	6	4	44
Fitzgerald	33	6	12	0	51
Ruby	52	26	11	7	96
Total	168	54	45	16	283

In order to examine the relationship between the site and the presence of basal thinning, a chi-square test of independence was performed. The relationship between the variables was significant: X^2 (5, n = 289) = 7.709, p = .173. Lambda was .015 and was not statistically significant (p = .256). As seen in Table 38, the majority of the projectile points were basally thinned (95.2%), which fits the statistical results.

Table 38: Base thinning presence recorded for the projectile points from each of the six sites.

Site	Yes	No	Total
Fincastle	70	2	72
One-Eleven	15	1	16
Happy Valley	4	0	4
Muhlbach	39	5	44
Fitzgerald	48	4	52
Ruby	99	2	101
Total	275	14	289

A chi-square test of independence was performed in order to examine the relationship between the site and the presence of basal grinding. The relationship between the variables was statistically significant: X^2 (5, n = 285) = 16.315, $p < .01$. Lambda was .020. Unfortunately, the significance value for lambda could not be computed for this variable since the asymptotic standard error equaled zero. However, the Goodman and Kruskal tau value was .018 and was significant ($p < .01$) based on the chi-square value. As seen in Table 39, the majority of the projectile points have basal grinding (74.4%), and, thus, although the association between the site and basal grinding was weak, basal grinding was significant.

Table 39: Base grinding recorded for the projectile points from each of the six sites.

Site	Yes	No	Total
Fincastle	66	6	72
One-Eleven	12	4	16
Happy Valley	2	2	4
Muhlbach	31	13	44
Fitzgerald	34	17	51
Ruby	67	31	98
Total	212	73	285

Within this research project, an attempt was made to calculate Andrefsky's (2006) Hafted Biface Retouch Index (HRI) values for each artifact from the six site assemblages under investigation. Since Andrefsky (2006) stated that the HRI values should only be used as an approximate measure, the projectile points were divided into those with no (zero) retouch, and values between 3 to 25%, 25 to 50%, 50 to 75%, and 75 to 100%.

A chi-square test of independence was performed in order to examine the relationship between the site and the Hafted Biface Retouch Index values. Since both a nominal attribute, the site, and an ordinal attribute, the HRI value, were included, a lambda and a gamma coefficient were run. The relationship between the variables was statistically significant: X^2 (20, n = 291) = 125.966, $p < .01$. Lambda was .175 and was statistically significant ($p < .01$). Gamma was .192 and was statistically significant ($p < .01$). As seen in Table 40, many projectile points did not have any retouch (40.9%), and many that did were on the lower end of the scale, between 3 and 50% (44.3%). This indicates that retouch may not be a significant factor influencing the morphology of projectile points; however, as previously noted, a skilled flint-knapper has the ability to retouch a projectile point and leave no evidence, making it very difficult to identify if retouch activities have occurred.

Table 40: HRI value recorded for the projectile points from each of the six sites.

Site	0	0.5 – 4.0 (3 – 25%)	4.5 – 8.0 (25 – 50%)	8.5 – 12.0 (50 – 75%)	12.5 – 16.0 (75 – 100%)	Total Analyzed
Fincastle	30	4	17	12	9	72
One-Eleven	15	0	1	0	0	16
Happy Valley	3	1	0	0	0	4
Muhlbach	37	3	2	3	0	45
Fitzgerald	21	9	13	6	3	52
Ruby	13	41	38	9	1	102
Total	119	58	71	30	13	291

Interpretation of the Chi-Square Results

A number of patterns were noted in the results of the chi-square, lambda, and gamma measures of association. The majority of the nominal attributes did not have any statistically significant differences between the six site assemblages. These attributes include symmetry, tip shape, blade edge shape, body shape, shoulder shape, notch type, notch orientation, notch shape, presence of notch grinding, proximal margin shape, base shape and the presence of basal thinning. The projectile point attributes that denoted statistically significant differences between the site collections were the raw material, the quality of workmanship, the transverse and longitudinal cross sections, and the Hafted Biface Retouch Index (HRI) values.

A number of nominal and ordinal attributes did not have any significant differences between sites, and these can be interpreted as attributes that remain constant across Besant, Outlook, and Sonota sites. These similarities may reflect functionality within those attributes or cultural homogeneity. In regards to function, the more symmetrical a projectile point is the greater the accuracy while in flight. However, it seems unlikely that a slight asymmetry would severely affect the functional performance of these artifacts, though this should be confirmed through experimental research. As well, a pointed tip would be preferred over a blunted or rounded tip, primarily to guarantee that the point would penetrate the hide of the prey.

Excurvate blade edges and an ovate body shape may facilitate the distribution of the force of the impact along the edge of the blade, reducing the likelihood of the point fracturing on contact. The obtuse shoulders, either angled or rounded, would also be less likely to break than acutely angled shoulders, which would allow for the potential reuse of the artifacts. Of the artifacts included in this study, 59.1% (172/291) had at least some retouch, which is suggestive of reuse. Having said that, many projectile points did not have intensive retouch. Grinding in the notches, straight bases, and basal thinning may also be functional characteristics, as grinding the notches would reduce the chances of severing the sinew or the material that would have been used to haft the point to the shaft, and a straight, basally thinned base would be easier to insert into a shaft or foreshaft. Basally constricted proximal margins may also be functional, creating a margin that would be strong and less susceptible to shatter while within the flesh of the prey animal.

Although these attributes display functionality, it should be noted that blade edge shape, body shape, shoulder shape, notch type, notch orientation, notch shape, proximal margin shape, and base shape may also be culturally suggestive since slight variations would not impede the functional use of the projectile point. For instance, Besant blade edges are typically excurvate while Pelican Lake type points have straight edges. Additionally, Besant points are generally side notched, while Pelican Lake type points are corner notched. The function of the body of these atlatl points is the same, to penetrate an animal, but the clear difference in shape suggest unique cultural groups. This is the same for the notch type. Functionally, a notch is required in order to haft the point to the shaft, but the shape is distinctive of different choices made in the manufacturing process, and thus potentially different typological groups.

T-Tests

A number of independent-samples t-tests were used to draw comparisons between the continuous variables recorded for the projectile point assemblages. These comparisons were conducted in order to isolate similar and different point attributes connected with sites labeled as Besant, or an associated type, such as Outlook or Sonota. One t-test was conducted on the continuous attributes of the Muhlbach and the Ruby point assemblages, one on the Fincastle and Ruby points, and one between the Fincastle and Muhlbach points. These comparisons were selected in order to identify statistically significant differences between sites dominated by Knife River Flint and those that used locally available raw material. Knife River Flint was predominately used to craft the Muhlbach and Fincastle projectile points, while the Ruby site collection was mainly made up of local materials. In addition, the projectile point assemblages of these three sites were comparatively large.

The first independent-samples t-test indicated that there were significant differences between a number of continuous attributes between the Muhlbach and the Ruby site (Table 41). There were 10 attributes that were found to be statistically significantly different: maximum length ($M = -8.85$, $SD = 2.56$), t (53) = -3.45, $p < .01$, maximum width ($M = -2.51$, $SD = .71$), t (53) = -3.56, $p < .01$, weight ($M = -1.42$, $SD = .52$), t (53) = -2.73, $p < .01$, blade length ($M = -8.52$, $SD = 2.43$), t (53) = -3.51, $p < .01$, body length left ($M = -8.91$, $SD = 2.40$), t (53) = -3.70, $p < .01$, body length right ($M = -8.73$, $SD = 2.39$), t (53) = -3.65, $p < .01$, shoulder width ($M = -2.62$, $SD = .69$), t (53) = -3.81, $p < .01$, notch depth left ($M = -.85$, $SD = .20$), t (53) = -4.20, $p < .01$, notch depth right ($M = -.91$, $SD = .20$), t (53) = -4.56, $p < .01$, and base width ($M = -2.33$, $SD = .82$), t (53) = -2.84, $p < .01$.

Table 41: Continuous data significance (t-test) values using the complete artifacts from the Muhlbach and Ruby sites.

Attribute	F value	t	Df	Sig.	Mean diff.	Stand. Dev.
Maximum Length	5.368	-3.452	53	.001	-8.8493	2.5638
Maximum Width	2.419	-3.559	53	.001	-2.5094	.7050
Maximum Thickness	16.395	-1.385	53	.172	-.3992	.2883
Weight	.003	-2.728	53	.009	-1.41723	.51942
Blade Length	6.517	-3.513	53	.001	-8.5245	2.4267
Body Length Left	6.157	-3.707	53	.001	-8.9128	2.4041
Body Length Right	5.404	-3.652	53	.001	-8.7346	2.3915
Shoulder Width	1.725	-3.807	53	.000	-2.6194	.6881
Neck Width	3.171	-1.192	53	.239	-.7064	.5926
Notch Height Left	5.279	.341	53	.734	.1401	.4104
Notch Height Right	.838	-.620	53	.538	-.2003	.3232
Notch Depth Left	8.138	-4.195	53	.000	-.8505	.2028
Notch Depth Right	8.761	-4.562	53	.000	-.9092	.1993
Stem/Haft Length	.904	-.391	53	.697	-.1374	.3510
Prox. Mar. Height Left	.077	.557	53	.580	.1704	.3058
Prox. Mar. Height Right	2.303	.399	53	.692	.1272	.3190
Base Width	4.148	-2.841	53	.006	-2.3280	.8194

A second t-test was run on the continuous attributes from the Fincastle and the Ruby site data. Thirteen continuous attributes were found to be significantly different (Table 42). Similar to the t-test conducted between the Muhlbach and the Ruby site collections, the maximum length (*M* = -7.37, *SD* = 2.27), *t* (67) = -3.24, *p* < .01, maximum width (*M* = -2.10, *SD* = .57), *t* (67) = -3.71, *p* < .01, weight (*M* = -1.31, *SD* = .43), *t* (67) = -3.06, *p* < .01, blade length (*M* = -7.08, *SD* = 2.13), *t* (67) = -3.33, *p* < .01, body length left (*M* = -7.92, *SD* = 2.07), *t* (67) = -3.83, *p* < .01, body length right (*M* = -7.86, *SD* = 2.10), *t* (67) = -3.75, *p* < .01, shoulder width (*M* = -2.05, *SD* = .57), *t* (67) = -3.57, *p* < .01, notch height left (*M* = .90, *SD* = .34), *t* (67) = 2.63, *p* < .01, notch height right (*M* = 1.16, *SD* = .35), *t* (67) = 3.32, *p* < .01, notch depth left (*M* = -.52, *SD* = .20), *t* (67) = -2.60, *p* = .012, notch depth right (*M* = -.64, *SD* = .18), *t* (67) = -3.50, *p* < .01, and base width (*M* = -1.33, *SD* = .57), *t* (67) = -2.33, *p* = .023 were significant.

Table 42: Continuous data significance (t-test) values using the complete artifacts from the Fincastle and Ruby sites.

Attribute	F value	t	df	Sig.	Mean diff.	Stand. Dev.
Maximum Length	4.091	-3.244	67	.002	-7.3704	2.2720
Maximum Width	.329	-3.707	67	.000	-2.0959	.5653
Maximum Thickness	10.710	.520	67	.605	.1177	.2265
Weight	.517	-3.059	67	.003	-1.30753	.42747
Blade Length	6.348	-3.327	67	.001	-7.0753	2.1264
Body Length Left	7.258	-3.829	67	.000	-7.9157	2.0675
Body Length Right	4.699	-3.749	67	.000	-7.8592	2.0963
Shoulder Width	.403	-3.571	67	.001	-2.0470	.5733
Neck Width	.002	-1.497	67	.139	-.6768	.4521
Notch Height Left	.289	2.634	67	.010	.8964	.3404
Notch Height Right	2.501	3.316	67	.001	1.1617	.3503
Notch Depth Left	.406	-2.594	67	.012	-.5240	.2020
Notch Depth Right	3.754	-3.500	67	.001	-.6443	.1841
Stem/Haft Length	.400	-.329	67	.744	-.1075	.3273
Prox. Mar. Height Left	.089	-.690	67	.493	-.1823	.2643
Prox. Mar. Height Right	.861	-2.333	67	.023	-.6142	.2633
Base Width	.342	-2.327	67	.023	-1.3252	.5695

A third t-test was conducted using the continuous attributes from the Fincastle and the Muhlbach sites. The results of the t-test, listed in Table 43, revealed that these assemblages are not statistically significantly different, with the exception of the proximal margin height right. Since its mirror attribute, proximal margin height left, displayed no significant difference, this result must be disregarded and when the attribute as a whole is considered, there are no significant differences between the two site assemblages.

Table 43: Continuous data significance (t-test) values using the complete artifacts from the Fincastle and Muhlbach sites.

Attribute	F value	t	df	Sig.	Mean diff.	Stand. Dev.
Maximum Length	.185	.686	58	.496	1.4790	2.1565
Maximum Width	1.364	.596	58	.554	.4135	.6944
Maximum Thickness	1.487	1.509	58	.137	.5169	.3426
Weight	.505	.233	58	.816	.10969	.47013
Blade Length	.021	.745	58	.459	1.4491	1.9456
Body Length Left	.000	.528	58	.600	.9971	1.8898
Body Length Right	.121	.441	58	.661	.8754	1.9859
Shoulder Width	.622	.825	58	.413	.5724	.6938
Neck Width	2.849	.050	58	.960	.0296	.5904
Notch Height Left	2.308	1.748	58	.086	.7563	.4326
Notch Height Right	.473	3.226	58	.002	1.3619	.4222
Notch Depth Left	4.590	1.717	58	.091	.3266	.1902
Notch Depth Right	1.368	1.666	58	.101	.2650	.1590
Stem/Haft Length	.059	.076	58	.940	.0298	.3919
Prox. Mar. Height Left	.001	-1.178	58	.243	-.3526	.2993
Prox. Mar. Height Right	.494	-2.195	58	.032	-.7414	.3377
Base Width	6.572	1.315	58	.194	1.0028	.7627

Interpretation of the T-test Results

The results from the t-tests conducted between the Fincastle, Muhlbach, and Ruby site assemblages indicated that the two sites dominated by Knife River Flint, Fincastle and Muhlbach, were similar to each other and were significantly different from the Ruby site. These results were very similar to those of the Analysis of Variance (ANOVA) tests described below.

Interestingly, as a whole, the points from the Ruby site were larger than those from the Muhlbach site, although certain attributes, such as thickness, stem length, neck width, notch height, and proximal margin height, remained similar between the two assemblages. This pattern was repeated in the results of the t-test between the Fincastle and the Ruby site points. Although Ruby points are typically larger, the attributes that were not significantly different between the two site assemblages were the thickness, neck width, stem length, and proximal margin height. These are mainly basal attributes suggesting that basal attributes are stable between the collections, while attributes found on the blade portion of the projectile vary greatly. Although other attributes differ between the site collections, these basal attributes remain fairly constant. There may be functional constraints placed on the aspects of the base, but these are then shared across the three typological groups. Since these basal attributes are not statistically different between the sites they must be interpreted as consistent typologically significant aspects of the Besant, Outlook, and Sonota complexes/phases.

ANOVA

One-way Analyses of Variance (ANOVA) are commonly used when comparing three or more samples. For this research project, ANOVA tests were conducted in an attempt to determine if continuous attributes recorded at each site came from the same population or from statistically significantly different populations. The 13 continuous projectile point attributes between each of the site collections were compared excluding the Happy Valley site due to the small sample size (*n* = 4). Only complete points were used, and once again, artifact 892 from Fincastle was removed from the analysis.

An Analysis of Variance conducted between the Fincastle, One-Eleven, Muhlbach, Fitzgerald, and Ruby site assemblages revealed that most of the attributes were statistically significant (Table 44). Significant differences were found in the maximum length, $F(4, 122) = 7.552$, $p < .01$, maximum width, $F(4, 122) = 8.383$, $p < .01$, thickness, $F(4, 122) = 3.236$, $p = .015$, weight, $F(4, 122) = 6.860$, $p < .01$, blade length, $F(4, 122) = 7.079$, $p < .01$, body length left, $F(4, 122) = 8.599$, $p < .01$, body length right, F (4, 122) = 7.910, p < .01, shoulder width, F (4, 122) = 8.429, p < .01, neck width, F (4, 122) = 4.367, p < .01, notch height left, F (4, 122) = 4.839, p < .01, notch height right, F (4, 122) = 11.056, p < .01, notch depth left, F (4, 122) = 5.169, p < .01, notch depth right, F (4, 122) = 7.388, p < .01, stem length, F (4, 122) = 6.972, p < .01, and base width, F (4, 122) = 4.569, p < .01. The only attribute that was not statistically significantly different between the five sites was proximal margin height left, *F* (4, 122) = .343, *p* = .848. Proximal margin height right did have significant differences, therefore, the results relating to the left must be disregarded and when the attribute as a whole is considered, there are no significant differences between the site assemblages.

When only the collections containing high concentrations of Knife River Flint, Fincastle, Muhlbach, and Fitzgerald, were included in an ANOVA, there were no statistically significant differences between the continuous attributes. As seen in Table 45, there are two attributes, notch height right and proximal margin height right, which displayed statistically significant results. However, again, since their mirrored attributes displayed no significant differences, these results must be disregarded. When these attributes were evaluated as a whole, there were no significant differences between the three sites.

Table 44: Continuous data significance (ANOVA) values using the complete artifacts from all sites, excluding Happy Valley.

Attribute		df	Mean Square	F value	Sig.
Maximum Length	Between	4	668.875	7.552	.000
	Within	122	88.573		
Maximum Width	Between	4	69.743	8.383	.000
	Within	122	8.319		
Maximum Thickness	Between	4	4.342	3.236	.015
	Within	122	1.342		
Weight	Between	4	24.508	6.860	.000
	Within	122	3.573		
Blade Length	Between	4	527.341	7.079	.000
	Within	122	74.496		
Body Length Left	Between	4	617.119	8.599	.000
	Within	122	71.770		
Body Length Right	Between	4	586.537	7.910	.000
	Within	122	74.147		
Shoulder Width	Between	4	71.579	8.429	.000
	Within	122	8.492		
Neck Width	Between	4	23.517	4.367	.002
	Within	122	5.385		
Notch Height Left	Between	4	11.783	4.839	.001
	Within	122	2.435		
Notch Height Right	Between	4	22.424	11.056	.000
	Within	122	2.028		
Notch Depth Left	Between	4	2.781	5.169	.001
	Within	122	.538		
Notch Depth Right	Between	4,	3.505	7.388	.000
	Within	122	.474		
Stem/Haft Length	Between	4	15.126	6.972	.000
	Within	122	2.169		
Prox. Mar. Height Left	Between	4	.462	.343	.848
	Within	121	1.346		
Prox. Mar. Height Right	Between	4	4.938	3.500	.010
	Within	122	1.411		
Base Width	Between	4	39.828	4.569	.002
	Within	122	8.717		

Table 45: Continuous data significance (ANOVA) values using the complete artifacts from the Fincastle, Muhlbach and Fitzgerald sites.

Attribute		df	Mean Square	F value	Sig.
Maximum Length	Between	2	60.723	.708	.496
	Within	81	85.752		
Maximum Width	Between	2	10.648	1.137	.326
	Within	81	9.368		
Maximum Thickness	Between	2	2.213	1.353	.264
	Within	81	1.636		
Weight	Between	2	5.289	1.366	.261
	Within	81	3.872		
Blade Length	Between	2	36.766	.530	.591
	Within	81	69.436		
Body Length Left	Between	2	41.479	.616	.542
	Within	81	67.289		
Body Length Right	Between	2	22.840	.324	.724
	Within	81	70.537		
Shoulder Width	Between	2	10.347	1.053	.354
	Within	81	9.828		
Neck Width	Between	2	14.903	2.425	.095
	Within	81	6.147		
Notch Height Left	Between	2	6.337	2.335	.103
	Within	81	2.714		
Notch Height Right	Between	2	15.669	6.552	.002
	Within	81	2.392		
Notch Depth Left	Between	2	1.156	2.415	.096
	Within	81	.479		
Notch Depth Right	Between	2	.680	1.794	.173
	Within	81	.379		
Stem/Haft Length	Between	2	4.196	1.702	.189
	Within	81	2.466		
Prox. Mar. Height Left	Between	2	.888	.650	.525
	Within	80	1.365		
Prox. Mar. Height Right	Between	2	7.910	4.992	.009
	Within	81	1.584		
Base Width	Between	2	28.147	3.027	.054
	Within	81	9.299		

Interpretation of the ANOVA Results

The results of the first ANOVA test suggested that there were differences between the five site collections. The results from the second ANOVA indicated that there were similarities between the three sites that were dominated by Knife River Flint. Based on these findings, the raw material type may be a factor that does have significant influence over the form of a projectile point. Different raw materials have different levels of homogeneity, density, and hardness, and these, together with the skill of the flint-knapper, can have a considerable influence on the morphological traits of the projectile point. At sites where there is a preference for Knife River Flint, the projectile point assemblages are highly homogenous between the collections. When these were compared to collections that displayed a preference for locally available materials, the One-Eleven and the Ruby sites, the attributes were found to be statically significantly different. These differences may simply be the result of using different raw materials to craft the points using the same cultural template. However, the differences may be an indication that the people who made the Knife River Flint points maintained discrete cultural connections. An alternative explanation may also be that these artifacts, projectile points, were traded as complete objects between different groups of people.

ANOVA Post Hoc Tests

The results from the ANOVA test revealed that a number of continuous attributes were considered significant, and thus post hoc tests, the Tukey HSD (Honestly Significant Difference) test and the Scheffé test, were subsequently run. Post hoc tests provide information concerning the pattern of the differences between the mean values. Here the Tukey's HSD and Scheffé post hoc tests were run in order to identify which specific assemblages displayed similarities and differences in the continuous attributes. Significance values from the ANOVA Scheffé and Tukey HSD post hoc tests are recorded in Tables 46-65.

Table 46: Scheffé test comparing the metric attributes of the complete Fincastle projectile points with the other collections.

Site	Site	Value	Max. Length	Max. Width	Max. Thick.	Wgt	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Fincastle	One-Eleven	*M*	9.39	3.42	1.33	1.91	7.28	7.67	7.22	3.55
		SD	3.23	0.99	0.40	0.65	2.96	2.09	2.96	1.00
		p	.084	.022	.029	.077	.204	.146	.209	.017
	Muhlbach	*M*	1.48	0.41	0.52	0.11	1.45	1.00	0.88	0.57
		SD	2.50	0.77	0.31	0.50	2.29	2.25	2.29	0.77
		p	.986	.990	.589	1.000	.982	.995	.997	.968
	Fitzgerald	*M*	-1.73	-0.89	0.39	-0.74	-1.04	-1.62	-1.09	-0.75
		SD	2.47	0.76	0.30	0.50	2.26	2.22	2.26	0.76
		p	.974	.846	.798	.697	.995	.970	.994	.915
	Ruby	*M*	-7.37	-2.10	0.12	-1.31	-7.08	-7.92	-7.86	-2.05
		SD	2.27	0.70	0.28	0.46	2.08	2.05	2.08	0.70
		p	.038	.066	.996	.091	.025	.007	.009	.083

Table 47: Scheffé test comparing the metric attributes of the complete Fincastle projectile points with the other collections.

Site	Site	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. Mar. Ht. L.	Prox. Mar. Ht. R.	Base Width
Fincastle	One-Eleven	*M*	2.03	2.28	3.11	0.19	0.21	2.11	-0.12	0.07	2.15
		SD	0.80	0.54	0.49	0.25	0.24	0.51	0.40	0.41	1.01
		p	.172	.002	.000	.968	.943	.003	.999	1.000	.347
	Muhlbach	*M*	0.03	0.76	1.36	0.33	0.27	0.03	-0.35	-0.74	1.00
		SD	0.62	0.41	0.38	0.19	0.18	0.39	0.31	0.32	0.78
		p	1.000	.507	.014	.591	.718	1.000	.859	.244	.802
	Fitzgerald	*M*	-1.31	0.81	1.06	-0.09	-0.04	-0.69	-0.11	-0.97	-1.18
		SD	0.61	0.41	0.37	0.19	0.18	0.39	0.31	0.31	0.77
		p	.334	.426	.094	.994	1.000	.532	.998	.052	.676
	Ruby	*M*	-0.68	0.90	1.16	-0.52	-0.64	-0.11	-0.18	-0.61	-1.33
		SD	0.56	0.38	0.34	0.18	0.17	0.36	0.28	0.29	0.71
		p	.833	.233	.027	.074	.006	.999	.980	.338	.488

Table 48: Scheffé test comparing the metric attributes of the complete One-Eleven projectile points with the other collections.

Site	Site	Value	Max. Length	Max. Width	Max. Thick.	Wgt	Blade Length	Body Length L.	Body Length R.	Shoulder Width
One-	Fincastle	*M*	-9.39	-3.42	-1.33	-1.91	-7.28	-7.67	-7.22	-3.55
		SD	3.23	0.99	0.40	0.65	2.96	2.91	2.96	1.00
		p	.084	.022	.029	.077	.204	.146	.209	.017
Eleven	Muhlbach	*M*	-7.91	-3.01	-0.82	-1.80	-5.83	-6.67	-6.34	-2.98
		SD	3.45	1.06	0.42	0.69	3.16	3.11	3.16	1.07
		p	.269	.095	.454	.156	.497	.335	.405	.107
	Fitzgerald	*M*	-11.12	-4.31	-0.94	-2.65	-8.32	-9.29	-8.31	-4.30
		SD	3.43	1.05	0.42	0.69	3.14	3.08	3.14	1.06
		p	.038	.003	.295	.007	.143	.066	.142	.004
	Ruby	*M*	-16.76	-5.52	-1.21	-3.22	-14.36	-15.58	-15.08	-5.60
		SD	3.23	1.01	0.40	0.66	3.02	2.96	3.01	1.02
		p	.000	.000	.068	.000	.000	.000	.000	.000

Table 49: Scheffé test comparing the metric attributes of the complete One-Eleven projectile points with the other collections.

Site	Site	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. Mar. Ht. L.	Prox. Mar. Ht. R.	Base Width
One-	Fincastle	*M*	-2.03	-2.28	-3.11	-0.19	-0.21	-2.11	0.12	-0.07	-2.15
		SD	0.80	0.54	0.49	0.25	0.24	0.51	0.40	0.41	1.01
		p	.172	.002	.000	.968	.943	.003	.999	1.000	.347
Eleven	Muhlbach	*M*	-2.00	-1.52	-1.74	0.14	0.06	-2.08	-0.23	-0.82	-1.15
		SD	0.85	0.57	0.52	0.27	0.25	0.54	0.43	0.44	1.08
		p	.242	.139	.029	.991	1.000	.007	.990	.480	.889
	Fitzgerald	*M*	-3.34	-1.47	-2.04	-0.28	-0.25	-2.80	0.01	-1.04	-3.34
		SD	0.84	0.57	0.52	0.27	0.25	0.54	0.43	0.43	1.08
		p	.005	.158	.005	.898	.909	.000	1.000	.221	.053
	Ruby	*M*	-2.71	-1.38	-1.94	-0.71	-0.85	-2.22	-0.06	-0.69	-3.48
		SD	0.81	0.55	0.50	0.26	0.24	0.51	0.41	0.42	1.03
		p	.029	.177	.006	.112	.017	.002	1.000	.602	.027

Table 50: Scheffé test comparing the metric attributes of the complete Muhlbach projectile points with the other collections.

Site	Site	Value	Max. Length	Max. Width	Max. Thick.	Wgt	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Muhlbach	Fincastle	*M*	-1.48	-0.41	-0.52	-0.11	-1.45	-1.00	-0.88	-0.57
		SD	2.50	0.77	0.31	0.50	2.29	2.25	2.29	0.77
		p	.986	.990	.589	1.000	.982	.995	.997	.968
	One-Eleven	*M*	7.91	3.01	0.82	1.80	5.83	6.67	6.34	2.98
		SD	3.45	1.06	0.42	0.69	3.16	3.11	3.16	1.07
		p	.269	.095	.454	.156	.497	.335	.405	.107
	Fitzgerald	*M*	-3.21	-1.30	-0.13	-0.85	-2.49	-2.62	-1.96	-1.32
		SD	2.75	0.84	0.34	0.55	2.52	2.47	2.51	0.85
		p	.850	.663	.998	.671	.912	.890	.961	.661
	Ruby	*M*	-8.85	-2.51	-0.40	-1.42	-8.52	-8.91	-8.73	-2.62
		SD	2.57	0.79	0.32	0.52	2.36	2.32	2.35	0.80
		p	.023	.044	.810	.118	.014	.007	.011	.034

Table 51: Scheffé test comparing the metric attributes of the complete Muhlbach projectile points with the other collections.

Site	Site	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. Mar. Ht. L.	Prox. Mar. Ht. R.	Base Width
Muhlbach	Fincastle	*M*	-0.03	-0.76	-1.36	-0.33	-0.27	-0.03	0.35	0.74	-1.00
		SD	0.62	0.41	0.38	0.19	0.18	0.39	0.31	0.32	0.78
		p	1.000	.507	.014	.591	.718	1.000	.859	.244	.802
	One-Eleven	*M*	2.00	1.52	1.74	-0.14	-0.06	2.08	0.23	0.82	1.15
		SD	0.85	0.57	0.52	0.27	0.25	0.54	0.43	0.44	1.08
		p	.242	.139	.029	.991	1.000	.007	.990	.480	.889
	Fitzgerald	*M*	-1.34	0.05	-0.30	-0.42	-0.31	-0.72	0.24	-0.23	-2.18
		SD	0.68	0.46	0.42	0.21	0.20	0.43	0.34	0.35	0.86
		p	.424	1.000	.972	.438	.669	.596	.973	.980	.177
	Ruby	*M*	-0.71	0.14	-0.20	-0.85	-0.91	-0.14	0.17	0.13	-2.33
		SD	0.63	0.43	0.39	0.20	0.19	0.40	0.32	0.32	0.81
		p	.871	.999	.992	.002	.000	.998	.990	.997	.088

Table 52: Scheffé test comparing the metric attributes of the complete Fitzgerald projectile points with the other collections.

Site	Site	Value	Max. Length	Max. Width	Max. Thick.	Wgt	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Fitzgerald	Fincastle	*M*	1.73	0.89	-0.39	0.74	1.04	1.62	1.09	0.75
		SD	2.47	0.76	0.30	0.50	2.26	2.22	2.26	0.76
		p	.947	.846	.798	.697	.995	.970	.994	.915
	One-Eleven	*M*	11.12	4.31	0.94	2.65	8.32	9.29	8.31	4.30
		SD	3.43	1.05	0.42	0.69	3.14	3.08	3.14	1.06
		p	.038	.003	.295	.007	.143	.066	.142	.004
	Muhlbach	*M*	3.21	1.30	0.13	0.85	2.49	2.62	1.96	1.32
		SD	2.75	0.84	0.34	0.55	2.52	2.47	2.51	0.85
		p	.850	.663	.998	.671	.912	.890	.961	.661
	Ruby	*M*	-5.64	-1.21	-0.27	-0.57	-6.03	-6.29	-6.77	-1.30
		SD	2.54	0.78	0.31	0.51	2.33	2.29	2.33	0.79
		p	.301	.664	.943	.869	.160	.116	.082	.606

Table 53: Scheffé test comparing the metric attributes of the complete Fitzgerald projectile points with the other collections.

Site	Site	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. Mar. Ht. L.	Prox. Mar. Ht. R.	Base Width
Fitzgerald	Fincastle	*M*	1.31	-0.81	-1.06	0.09	0.04	0.69	0.11	0.97	1.18
		SD	0.61	0.41	0.37	0.19	0.18	0.39	0.31	0.31	0.77
		p	.334	.426	.094	.994	1.000	.532	.998	.052	.676
	One-Eleven	*M*	3.34	1.47	2.04	0.28	0.25	2.80	-0.01	1.04	3.34
		SD	0.84	0.57	0.52	0.27	0.25	0.54	0.43	0.43	1.08
		p	.005	.158	.005	.898	.909	.000	1.000	.221	.053
	Muhlbach	*M*	1.34	-0.05	0.30	0.42	0.31	0.72	-0.24	0.23	2.18
		SD	0.68	0.46	0.42	0.21	0.20	0.43	0.34	0.35	0.86
		p	.424	1.000	.972	.438	.669	.596	.973	.980	.177
	Ruby	*M*	0.63	0.09	0.10	-0.43	-0.60	0.58	-0.07	0.35	-0.14
		SD	0.63	0.42	0.38	0.20	0.19	0.40	0.32	0.32	0.80
		p	.907	1.000	.999	.316	.039	.712	1.000	.874	1.000

Table 54: Scheffé test comparing the metric attributes of the complete Ruby projectile points with the other collections.

Site	Site	Value	Max. Length	Max. Width	Max. Thick.	Wgt	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Ruby	Fincastle	*M*	7.37	2.10	-0.12	1.31	7.08	7.92	7.86	2.05
		SD	2.27	0.70	0.28	0.46	2.08	2.05	2.08	0.70
		p	.038	.066	.996	.091	.025	.007	.009	.083
	One-Eleven	*M*	16.76	5.52	1.21	3.22	14.36	15.58	15.08	5.60
		SD	3.29	1.01	0.40	0.66	3.02	2.96	3.01	1.02
		p	.000	.000	.068	.000	.000	.000	.000	.000
	Muhlbach	*M*	8.85	2.51	0.40	1.42	8.52	8.91	8.73	2.62
		SD	2.57	0.79	0.32	0.52	2.36	2.32	2.35	0.80
		p	.023	.044	.810	.118	.014	.007	.011	.034
	Fitzgerald	*M*	5.64	1.21	0.27	0.57	6.03	6.29	6.77	1.30
		SD	2.54	0.78	0.31	0.51	2.33	2.29	2.33	0.79
		p	.301	.664	.943	.869	.160	.116	.082	.606

Table 55: Scheffé test comparing the metric attributes of the complete Ruby projectile points with the other collections.

Site	Site	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. Mar. Ht. L.	Prox. Mar. Ht. R.	Base Width
Ruby	Fincastle	*M*	0.68	-0.90	-1.16	0.52	0.64	0.11	0.18	0.61	1.33
		SD	0.56	0.38	0.34	0.18	0.17	0.36	0.28	0.29	0.71
		p	.833	.233	.027	.074	.006	.999	.980	.338	.488
	One-Eleven	*M*	2.71	1.38	1.94	0.71	0.85	2.22	0.06	0.69	3.48
		SD	0.81	0.55	0.50	0.26	0.24	0.51	0.41	0.42	1.03
		p	.029	.177	.006	.112	.017	.002	1.000	.602	.027
	Muhlbach	*M*	0.71	-0.14	0.20	0.85	0.91	0.14	-0.17	-0.13	2.33
		SD	0.63	0.43	0.39	0.20	0.19	0.40	0.32	0.32	0.81
		p	.871	.999	.992	.002	.000	.998	.990	.997	.088
	Fitzgerald	*M*	-0.63	-0.09	-0.10	0.43	0.60	-0.58	0.07	-0.35	0.14
		SD	0.63	0.42	0.38	0.20	0.19	0.40	0.32	0.32	0.80
		p	.907	1.000	.999	.316	.039	.712	1.000	.874	1.000

Table 56: Tukey test comparing the metric attributes of the complete Fincastle projectile points with the other collections.

Site	Site	Value	Max. Length	Max. Width	Max. Thick.	Wgt	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Fincastle	One-Eleven	*M*	9.39	3.42	1.33	1.91	7.28	7.67	7.22	3.55
		SD	3.23	0.99	0.40	0.65	2.96	2.91	2.96	1.00
		p	.035	.007	.009	.031	.108	.070	.111	.005
	Muhlbach	*M*	1.48	0.41	0.52	0.11	1.45	1.00	0.88	0.57
		SD	2.50	0.77	0.31	0.50	2.29	2.25	2.29	0.77
		p	.976	.983	.450	.999	.970	.992	.995	.947
	Fitzgerald	*M*	-1.73	-0.89	0.39	-0.74	-1.04	-1.62	-1.09	-0.75
		SD	2.47	0.76	0.30	0.50	2.26	2.22	2.26	0.76
		p	.956	.764	.700	.572	.991	.949	.989	.864
	Ruby	*M*	-7.37	-2.10	0.12	-1.31	-7.08	-7.92	-7.86	-2.05
		SD	2.27	0.70	0.28	0.46	2.08	2.05	2.08	0.70
		p	.013	.026	.993	.039	.008	.002	.002	.034

Table 57: Tukey test comparing the metric attributes of the complete Fincastle projectile points with the other collections.

Site	Site	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. M. Ht. L.	Prox. M. Ht. R.	Base Width
Fincastle	One-Eleven	*M*	2.03	2.28	3.11	0.19	0.21	2.11	-0.12	0.07	2.15
		SD	0.80	0.54	0.49	0.25	0.24	0.51	0.40	0.41	1.01
		p	.086	.000	.000	.947	.906	.001	.998	1.000	.217
	Muhlbach	*M*	0.03	0.76	1.36	0.33	0.27	0.03	-0.35	-0.74	1.00
		SD	0.62	0.41	0.38	0.19	0.18	0.39	0.31	0.32	0.78
		p	1.000	.364	.004	.452	.597	1.000	.782	.136	.704
	Fitzgerald	*M*	-1.31	0.81	1.06	-0.09	-0.04	-0.69	-0.11	-0.97	-1.18
		SD	0.61	0.41	0.37	0.19	0.18	0.39	0.31	0.31	0.77
		p	.206	.287	.040	.990	.999	.389	.997	.019	.547
	Ruby	*M*	-0.68	0.90	1.16	-0.52	-0.64	-0.12	-0.18	-0.61	-1.33
		SD	0.56	0.38	0.34	0.18	0.17	0.36	0.28	0.29	0.71
		p	.747	.128	.009	.030	.002	.998	.966	.209	.345

Table 58: Tukey test comparing the metric attributes of the complete One-Eleven projectile points with the other collections.

Site	Site	Value	Max. Length	Max. Width	Max. Thick.	Wgt	Blade Length	Body Length L.	Body Length R.	Shoulder Width
EgPn-111	Fincastle	*M*	-9.39	-3.42	-1.33	-1.91	-7.28	-7.67	-7.22	-3.55
		SD	3.23	0.99	0.40	0.65	2.96	2.91	2.96	1.00
		p	.035	.007	.009	.031	.108	.070	.111	.005
	Muhlbach	*M*	-7.91	-3.01	-0.82	-1.80	-5.83	-6.67	-6.34	-2.98
		SD	3.45	1.06	0.42	0.69	3.16	3.11	3.16	1.07
		p	.154	.041	.313	.077	.354	.207	.268	.047
	Fitzgerald	*M*	-11.12	-4.31	-0.94	-2.65	-8.32	-9.29	-8.31	-4.30
		SD	3.43	1.05	0.42	0.69	3.14	3.08	3.14	1.06
		p	.013	.001	.175	.002	.068	.026	.068	.001
	Ruby	*M*	-16.76	-5.52	-1.21	-3.22	-14.36	-15.58	-15.08	-5.60
		SD	3.29	1.01	0.40	0.66	3.02	2.96	3.01	1.02
		p	.000	.000	.027	.000	.000	.000	.000	.000

Table 59: Tukey test comparing the metric attributes of the complete One-Eleven projectile points with the other collections.

Site	Site	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. M. Ht. L.	Prox. M. Ht. R.	Base Width
EgPn-111	Fincastle	*M*	-2.03	-2.28	-3.11	-0.19	-0.21	-2.11	0.12	-0.07	-2.15
		SD	0.80	0.54	0.49	0.25	0.24	0.51	0.40	0.41	1.01
		p	.086	.000	.000	.947	.906	.001	.998	1.000	.217
	Muhlbach	*M*	-2.00	-1.52	-1.74	0.14	0.06	-2.08	-0.23	-0.82	-1.15
		SD	0.85	0.57	0.52	0.27	0.25	0.54	0.43	0.44	1.08
		p	.135	.066	.010	.985	.999	.002	.983	.337	.825
	Fitzgerald	*M*	-3.34	-1.47	-2.04	-0.28	-0.25	-2.80	0.01	-1.04	-3.34
		SD	0.84	0.57	0.52	0.27	0.25	0.54	0.43	0.43	1.08
		p	.001	.078	.001	.838	.854	.000	1.000	.119	.020
	Ruby	*M*	-2.71	-1.38	-1.94	-0.71	-0.85	-2.22	-0.06	-0.69	-3.48
		SD	0.81	0.55	0.50	0.26	0.24	0.51	0.41	0.42	1.03
		p	.010	.089	.001	.050	.005	.000	1.000	.463	.009

Table 60: Tukey test comparing the metric attributes of the complete Muhlbach projectile points with the other collections.

Site	Site	Value	Max. Length	Max. Width	Max. Thick.	Wgt	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Muhlbach	Fincastle	*M*	-1.48	-0.41	-0.52	-0.11	-1.45	-1.00	-0.88	-0.57
		SD	2.50	.077	0.31	0.50	2.29	2.25	2.29	0.77
		p	.976	.983	.450	.999	.970	.992	.995	.947
	One-Eleven	*M*	7.91	3.01	0.82	1.80	5.83	6.67	6.34	2.98
		SD	3.45	1.06	0.42	0.69	3.16	3.11	3.16	1.07
		p	.154	.041	.313	.077	.354	.207	.268	.047
	Fitzgerald	*M*	-3.21	-1.30	-0.13	-0.85	-2.49	-2.62	-1.96	-1.32
		SD	2.75	.084	0.34	0.55	2.52	2.47	2.51	0.85
		p	.769	.533	.996	.542	.860	.827	.935	.530
	Ruby	*M*	-8.85	-2.51	-0.40	-1.42	-8.52	-8.91	-8.73	-2.62
		SD	2.57	0.79	0.32	0.52	2.36	2.32	2.35	0.80
		p	.007	.016	.716	.054	.004	.002	.003	.011

Table 61: Tukey test comparing the metric attributes of the complete Muhlbach projectile points with the other collections.

Site	Site	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. M. Ht. L.	Prox. M. Ht. R.	Base Width
Muhlbach	Fincastle	*M*	-0.03	-0.76	-1.36	-0.33	-0.27	-0.03	0.35	0.74	-1.00
		SD	0.62	0.41	0.38	0.19	0.18	0.39	0.31	0.32	0.78
		p	1.000	.364	.004	.452	.597	1.000	.782	.136	.704
	One-Eleven	*M*	2.00	1.52	1.74	-0.14	-0.06	2.08	0.23	0.82	1.15
		SD	0.85	0.57	0.52	0.27	0.25	0.54	0.43	0.44	1.08
		p	.135	.066	.010	.985	.999	.002	.983	.337	.825
	Fitzgerald	*M*	-1.34	0.05	-0.30	-0.42	-0.31	-0.72	0.24	-0.23	-2.18
		SD	0.68	0.46	0.42	0.21	0.20	0.43	0.34	0.35	0.86
		p	.285	1.000	.952	.297	.540	.457	.953	.965	.090
	Ruby	*M*	-0.71	0.14	-0.20	-0.85	-0.91	-0.14	0.17	0.13	-2.32
		SD	0.63	0.43	0.39	0.20	0.19	0.40	0.32	0.32	0.81
		p	.799	.997	.986	.000	.000	.997	.983	.995	.037

Table 62: Tukey test comparing the metric attributes of the complete Fitzgerald projectile points with the other collections.

Site	Site	Value	Max. Length	Max. Width	Max. Thick.	Wgt	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Fitzgerald	Fincastle	*M*	1.73	0.89	-0.39	0.74	1.04	1.62	1.09	0.75
		SD	2.47	0.76	0.30	0.50	2.26	2.22	2.26	0.76
		p	.956	.764	.700	.572	.991	.949	.989	.864
	One-Eleven	*M*	11.12	4.31	0.94	2.65	8.32	9.29	8.31	4.30
		SD	3.43	1.05	0.42	0.69	3.14	3.08	3.14	1.06
		p	.013	.001	.175	.002	.068	.026	.068	.001
	Muhlbach	*M*	3.21	1.30	0.13	0.85	2.49	2.62	1.96	1.32
		SD	2.75	0.84	0.34	0.55	2.52	2.47	2.51	0.86
		p	.769	.533	.996	.542	.860	.827	.935	.530
	Ruby	*M*	-5.64	-1.21	-0.27	-0.57	-6.03	-6.29	-6.77	-1.30
		SD	2.54	0.78	0.31	0.51	2.33	2.29	2.33	0.79
		p	.179	.534	.906	.797	.079	.052	.034	.468

Table 63: Tukey test comparing the metric attributes of the complete Fitzgerald projectile points with the other collections.

Site	Site	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. M. Ht. L.	Prox. M. Ht. R.	Base Width
Fitzgerald	Fincastle	*M*	1.31	-0.81	-1.06	0.09	0.04	0.69	0.11	0.97	1.18
		SD	0.61	0.41	0.37	0.19	0.18	0.39	0.31	0.31	0.77
		p	.206	.287	.040	.990	.999	.389	.997	.019	.547
	One-Eleven	*M*	3.34	1.47	2.04	0.28	0.25	2.80	-0.01	1.04	3.34
		SD	0.84	0.57	0.52	0.27	0.25	0.54	0.43	0.43	1.08
		p	.001	.078	.001	.838	.854	.000	1.000	.119	.020
	Muhlbach	*M*	1.34	-0.05	0.30	0.42	0.31	0.72	-0.24	0.23	2.18
		SD	0.68	0.46	0.42	0.21	0.20	0.43	0.34	0.35	0.86
		p	.285	1.000	.952	.297	.540	.457	.953	.965	.090
	Ruby	*M*	0.63	0.09	0.10	-0.43	-0.60	0.58	-0.07	0.35	-0.14
		SD	0.63	0.42	0.38	0.20	0.19	0.40	0.32	0.32	0.80
		p	.852	1.000	.999	.191	.014	.591	.999	.804	1.000

Table 64: Tukey test comparing the metric attributes of the complete Ruby projectile points with the other collections.

Site	Site	Value	Max. Length	Max. Width	Max. Thick.	Wgt	Blade Length	Body Length L.	Body Length R.	Shoulder Width
Ruby	Fincastle	*M*	7.37	2.10	-0.12	1.31	7.08	7.92	7.86	2.05
		SD	2.27	0.70	0.28	0.46	2.08	2.05	2.08	0.70
		p	.013	.026	.993	.039	.008	.002	.002	.034
	One-Eleven	*M*	16.76	5.52	1.21	3.22	14.36	15.58	15.08	5.60
		SD	3.29	1.01	0.40	0.66	3.02	2.96	3.01	1.02
		p	.000	.000	.027	.000	.000	.000	.000	.000
	Muhlbach	*M*	8.85	2.51	0.40	1.42	8.52	8.91	8.73	2.62
		SD	2.57	0.79	0.32	0.52	2.36	2.32	2.35	0.80
		p	.007	.016	.716	.054	.004	.002	.003	.011
	Fitzgerald	*M*	5.64	1.21	0.27	0.57	6.03	6.29	6.77	1.30
		SD	2.54	0.78	0.31	0.51	2.33	2.29	2.33	0.79
		p	.179	.534	.906	.797	.079	.052	.034	.468

Table 65: Tukey test comparing the metric attributes of the complete Ruby projectile points with the other collections.

Site	Site	Value	Neck Width	Notch Ht. L.	Notch Ht. R.	Notch Depth L.	Notch Depth R.	Stem Length	Prox. M. Ht. L.	Prox. M. Ht. R.	Base Width
Ruby	Fincastle	*M*	0.68	-0.90	-1.16	0.52	0.64	0.11	0.18	0.61	1.33
		SD	0.56	0.38	0.34	0.18	0.17	0.36	0.28	0.29	0.71
		p	.747	.128	.009	.030	.002	.998	.966	.209	.345
	One-Eleven	*M*	2.71	1.38	1.94	0.71	0.85	2.22	0.06	0.69	3.48
		SD	0.81	0.55	0.50	0.26	0.24	0.51	0.41	0.42	1.03
		p	.010	.089	.001	.050	.005	.000	1.000	.463	.009
	Muhlbach	*M*	0.71	-0.14	0.20	0.85	0.91	0.14	-0.17	-0.13	2.33
		SD	0.63	0.43	0.39	0.20	0.19	0.40	0.32	0.32	0.81
		p	.799	.997	.986	.000	.000	.997	.983	.995	.037
	Fitzgerald	*M*	-0.63	-0.09	-0.10	0.43	0.60	-0.58	0.07	-0.35	0.14
		SD	0.63	0.42	0.38	0.20	0.19	0.40	0.32	0.32	0.80
		p	.852	1.000	.999	.191	.014	.591	.999	.804	1.000

Interpretation of the Post Hoc Scheffé and Tukey Results

Since two post hoc tests were run, a visual comparison of the two was conducted. The results of the two tests were found to be similar. The Tukey HSD test did display a greater number of attributes with significant differences than the Scheffé test did. Having said that, these tests indicated that that the Fincastle, Muhlbach, and Fitzgerald site collections are similar in all the attributes, with the exceptions of notch height right, and that there is a significant difference between the Fitzgerald and the Fincastle points in regards to the proximal margin height right. As a whole, these attributes were not considered significant since the left aspects displayed no significant differences.

It appears that the Ruby and the One-Eleven point assemblages have the highest number of attributes with significant differences. When the Scheffé test results were examined, it was found that maximum length ($M = 16.76$, $SD = 3.29$), $F(4, 122) = 7.552$, $p > 0.01$, maximum width ($M = 5.52$, $SD = 1.01$), $F(4, 122) = 8.383$, $p > 0.01$, weight ($M = 3.22$, $SD = 0.66$), $F(4, 122) = 6.860$, $p > 0.01$, blade length ($M = 14.36$, $SD = 3.02$), $F(4, 122) = 7.079$, $p > 0.01$, body length left ($M = 15.58$, $SD = 2.96$), $F(4, 122) = 8.599$, $p > 0.01$, body length right ($M = 15.08$, $SD = 3.01$), $F(4, 122) = 7.910$, $p > 0.01$, shoulder width ($M = 5.60$, $SD = 1.02$), $F(4, 122) = 8.429$, $p > 0.01$, neck width ($M = 2.71$, $SD = 0.81$), $F(4, 122) = 4.367$, $p = 0.029$, notch height right ($M = 1.94$, $SD = 0.50$), $F(4, 122) = 11.056$, $p > 0.01$, notch depth right ($M = 0.85$, $SD = 0.24$), $F(4, 122) = 7.388$, $p = 0.017$, stem length ($M = 2.22$, $SD = 0.51$), $F(4, 122) = 6.972$, $p > 0.01$ and base width ($M = 3.48$, $SD = 1.03$), $F(4, 122) = 4.569$, $p = 0.027$, were significantly different.

When the results of the Tukey HSD test were examined, it was found that the maximum width, shoulder width, and stem length of the points from the One-Eleven collection were statistically significantly different from the other sites assemblages (Fincastle, Muhlbach, Fitzgerald, and Ruby). These points also differed from the Ruby assemblage in every attribute with the exception of proximal margin height left (*M* = -0.06, *SD* = 0.41), *F* (4, 122) = .343, *p* = 1.000, and proximal margin height right (*M* = -0.69, *SD* = 0.42), *F* (4, 122) = 3.500, *p* = .463. The Scheffé test results revealed that the One-Eleven site collection did not differ from the Ruby assemblage in the proximal margin heights, notch depths left, or the maximum thicknesses. Based on the Tukey HSD test results the One-Eleven points were similar to the Muhlbach projectiles in the attributes of maximum length, thickness, weight, blade length, body length, neck width, notch height left, notch depth (left and right), proximal margin height, and base width, although they displayed significant differences in a number of attributes recorded for the other site collections. In fact, these assemblages only differ in the lengths of the stem/haft based on the Scheffé test results.

According to the Scheffé test outputs, the Ruby site points are similar to the Fitzgerald points in every attribute with the exception of notch height right (*M* = 0.60, *SD* = 0.19), *F* (4, 122) = 7.388, *p* = 0.039. The Tukey test recorded significant differences in notch height right, as well as body length right. However, their mirror attributes displayed no significant difference.

Although there are clear differences in the point attributes associated with the Fincastle, One-Eleven, Muhlbach, Fitzgerald, and Ruby assemblages, a number of attributes remained similar across the collections. According to the Scheffé test, the attributes that were broadly similar between the assemblages were the maximum thickness, weight, neck width, notch height, notch depth, proximal margin height, and base width. The majority of these are basal attributes. The results from the relative standard deviations indicated that there was a high degree of variability within each of the assemblages found between the attributes of weight, notch depth and proximal margin height; however, it is clear from these post hoc tests that although there are differences within the individual assemblages, these differences also extend across the collections, causing them to be seen as similar.

Based on a visual examination, it was seen that Pelican Lake type points were present within the One-Eleven and Ruby collections. When these 12 artifacts were removed and an ANOVA run, the results were similar to the tests previously run that included the Pelican Lake type points. Upon the examination of the Scheffé and Tukey HSD post hoc tests it was found that there were more attributes that displayed significant differences between the assemblages that were not seen in the previous tests. These results are the opposite of what would be expected. These will not be discussed in detail here since the focus of this study is on the variability of Besant type projectile points. These results do, however, indicate that there is significant variability between Besant type point collections and that this variability is not the result of the inclusion of Pelican Lake type points.

Cluster Analysis

Cluster analysis is usually used to separate a sample into groups which are similar. The number of clusters is dependent on the data and the number that the researcher wants to select. In this study, the Ward's Method was used to create the clusters. For this study, the attributes used were shoulder width, notch height (left), notch depth (left), stem length, proximal margin height (left), and base width, since as Thomas

(1981:15) noted, basal attributes provide the most stable variables, especially in the examination of temporal change in projectile points.

Initially, a cluster analysis was run with no predicted group memberships in order to identify, based on the coefficient value, the number of groups that would best represent the data. The 237 points included in the cluster analysis were divided into four clusters. Thirty-two artifacts were included in Cluster 1, 115 in Cluster 2, 38 in Cluster 3, and 52 in Cluster 4. Group membership varied within the site collections, with the exception of the Happy Valley site projectiles, which all boasted Cluster 1 membership. On closer examination, it was found that these clusters were in fact based on size. The smaller artifacts were grouped into Cluster 1 and the largest artifacts into Cluster 4. The medium-small artifacts were placed in Cluster 3, while the medium-large artifacts fell into Cluster 2. This pattern was relatively constant for all the attributes include in this test. These clusters are assumed size categories, and these cluster memberships varied throughout the site assemblages. Thus, the results from this analysis indicate that basal attributes vary within each of the site collections.

It has been suggested that basal attributes are more indicative of different typological groupings than are blade attributes. However, it was found that notch height, notch depth, and proximal margin height displayed relative standard deviation values in excess of 20%, and subsequently a cluster analysis was run using only these attributes. It was found that three clusters most accurately represented this data. These results differed from the previous cluster analysis in that not all the attributes had the same pattern; that is, for the notch heights, Cluster 2 had the largest values, with Cluster 3 being slightly smaller and Cluster 1 had the lowest values. With the notch depths, this pattern was also displayed, although the differences between Cluster 2 and Cluster 3 were negligible. When the proximal margin heights were examined, it was found that Cluster 3 had the largest values, with Cluster 1 having slightly smaller values and Cluster 2 had the smallest. This means that when the notch heights are the largest, the proximal margin heights are the smallest. Although the Pearson's *r* Correlations found only a weak relationship between these attributes, within the cluster analysis there does appear to be a relationship. However, once again, these appeared to be largely assumed size categories. Additionally, projectiles from each of the six site assemblages were found to be in each of the clusters, indicating that there are no significant differences in these attributes between the collections. These results also indicate that various sizes of projectile points are common in a single occupation site assemblage.

Principal Components Analysis

Principal components analysis (PCA) is particularly useful in the identification of groups of interrelated variables. PCA reduces a large number of variables into a small number of attributes that account for a large percentage of the variation within the data.

For this study, the principal components analysis agglomerated the 17 continuous attributes into four key components (Table 66). Component 1 consisted of blade length, body length (left and right), maximum length, and weight. These are mainly length attributes, from the blade portion of the point in particular. Component 2 consisted of neck width, notch height (left and right), stem length, thickness, base width, maximum width, and shoulder width. These are mainly basal attributes. Component 3 consisted of the notch depths (left and right), and Component 4 the proximal margin heights (left and right). These groups were created based on the Pearson's *r* Correlation Coefficients between the various continuous attributes, which can be seen individually in the previous section.

Table 66: Principal Components Rotated Component Matrix.

Point Attribute	Component			
	1	2	3	4
Blade Length	.942			
Body Length Left	.930			
Body Length Right	.921			
Max Length	.913	.324		
Weight	.795	.493		
Neck Width		.795		.332
Notch Height Right		.785		
Stem/Haft Length	.349	.758		
Max Thickness	.352	.755		
Base Width		.718	.481	
Max. Width	.526	.668	.433	
Shoulder Width	.517	.668	.422	
Notch Height Left		.668		-.437
Notch Depth Left			.836	
Notch Depth Right	.372		.785	
Prox. Mar. Height Left				.802
Prox. Mar. Height Right				.739

Interpretation of the Principal Component Analysis Results

The results from the principal components analysis indicated that the four components that were created very closely resembled the attribute separations listed in Chapter 3: a blade component and a basal component. Notch depth and proximal margin height were considered relatively unrelated to any other attribute, which may indicate that these attributes remain consistent. However, the Pearson's *r* Correlation Coefficient revealed that although these attributes were not strongly associated with any other point attributes, notch depth was moderately associated with maximum length, maximum width, shoulder width, blade width, body length left, and body length right. Although the notch depth may be associated with other point attributes, this appears to be consistent across the six site assemblages. Both the Scheffé and Tukey HSD post hoc tests confirmed that there are no statistically significant differences between the six site collections in a number of attributes, including the notch depth and proximal margin height.

Interpretation of the Statistical Results

Pearson's *r* Product-Moment Correlation, Point-Biserial Correlation, crosstabulation, chi-square test, independent-samples t-test, Analysis of Variance (ANOVA), Scheffé and Tukey HSD post hoc tests, cluster analysis, and principal components analysis were conducted in an effort to identify significant similarities and differences in the projectile point attributes from within and between each of the six site assemblages. The results from these tests were then used to determine the amount of variability displayed in the projectile point morphological types suggested to be within Besant, Outlook, and Sonota typological groups. When the results of these statistical tests were examined, a number of interesting patterns emerged.

When the site collections were assessed individually and the minimum, maximum, average, one and two standard deviations, and the relative standard deviation (RSD) examined, it was apparent that a number of attributes varied significantly. Attributes that had large RSD values, in excess of 20.0%, were the maximum lengths, weights, blade lengths, body lengths (left and right), notch heights, notch depths, and proximal margin heights. This indicates that these attributes are highly variable within each site assemblage and this pattern is consistent across the six site collections. The maximum widths, shoulder widths, neck widths, stem/haft lengths and base widths were attributes that had RSD values of less than 20.0%. Half of these attributes are found on the basal portion of the projectile point. Thus, it is important to note that that the basal attributes, notably the length of the stem, remained constant, while the blade aspects varied significantly within each site assemblage.

In this study, the maximum lengths of the Fincastle points had an RSD value of 33.1%, 25.5% for the One-Eleven points, 25.7% for the Muhlbach points, 29.2% for the Fitzgerald points, and 27.2% at the Ruby points. Overall the Fincastle, Muhlbach, and Fitzgerald collections contained points with greater lengths than those found at the One-Eleven and Happy Valley sites. This could be the result of the raw material usage or trade, since Fincastle, Muhlbach, and Fitzgerald denote a predominance of Knife River Flint, while the One-Eleven and Happy Valley assemblages are dominated by locally available materials. However, the Ruby site collection has the highest average length, and is also dominated by locally available materials. It should be noted that the Ruby site assemblage is made of high quality local material, enabling the knapper to create long projectiles, and since the raw material was readily available, there was potentially less necessity to reuse points.

Although examined separately, the principal components analysis uses the Pearson's *r* Correlation Coefficient in the creation of components. For this reason, the results from these tests will be discussed together. Both examined the relationships between the individual continuous attributes. The maximum length correlated strongly with maximum width, weight, blade length, body length left, and body length right. The tests indicated that there were strong correlations between the base width, maximum width, shoulder width, and neck width, as well as the maximum width, the notch height and the stem/haft length. The notch depth and proximal margin height are not correlated with any of the other attributes, indicating that these attributes may in fact stand alone.

The site collections included in this investigation are from single component sites, therefore, the inconsistencies in the length of the blade attributes denote the variability that researchers should anticipate for Besant, Outlook, and/or Sonota projectile point assemblages. In most cases the blade (versus the stem/haft) comprises the majority of the projectile point, and the variability in length is therefore strongly connected with this portion of the artifact. Since the maximum lengths, blade lengths, and body lengths are highly variable, these are not reliable indicators of typological (sub) groups. Archaeologists should be cautious when using these attributes, particularly maximum length, as a means to categorize different projectile typological groups.

In the examination of the nominal attributes using the chi-square test, lambda and gamma measures, a number of attributes did not exhibit statistically significant differences. The attributes that did display significant differences between the six site collections were the raw material, the quality of workmanship, the transverse and longitudinal cross sections, and the Hafted Biface Retouch Index (HRI) values.

The results of statistical t-tests, Analysis of Variance (ANOVA), and post hoc tests, indicated that there were no statistically significant differences between the continuous projectile point attributes from the Fincastle, Muhlbach, and Fitzgerald sites, whose assemblages were dominated by Knife River Flint. When these collections were analyzed in comparison to the other assemblages a number of continuous attributes remained statically similar. These attributes were the maximum thickness, weight, neck width, notch height, notch depth, proximal margin height, and base width. The majority of these attributes have been classified as basal attributes, and the base is where the bulk of the typologically significant attributes are located since they are protected by the haft and less likely to be subjected to breakage, reuse, and secondary modifications.

When eta values were obtained from between the raw material type and the interval/ratio attributes, it was found that there were strong associations between the material and the maximum length, weight, blade length, and body length left and right. Moderate associations were recorded between the material and maximum width, shoulder width, neck width, stem length, and base width. Attributes with weak associations to raw material were thickness, notch height, notch depth, and proximal margin height. It should be noted that when basal attributes are considered, most had moderate to weak associations with material type. This suggests that raw material, rather than "cultural choice" (typological change), had the most influence on the final length of the point. Raw material is responsible for the variability detected between projectile points within the site assemblages, as well as between them. The moderate and weak associations of the basal attributes to raw material also confirmed that although raw material played a role in these attributes, there must be other factors involved in creating the final product.

There was also a notable relationship that existed between the raw material and the quality of workmanship. Points made of Knife River Flint had the highest occurrence of high quality of workmanship, with 61.4% of the artifacts being of high or medium/high quality. These artifacts also displayed long lengths; this is likely due to the fact that is easier for a skilled flint-knapper to control the final form of a point that is made of a higher quality, finer-grained material. Nearly 86% of quartzite artifacts fell into the medium or medium/high quality categories. Many of the low quality points were made from what was classified as ‘other materials’, which included petrified wood, siltstone, and porcellanite, and were generally much shorter in length than the high quality workmanship projectiles. Hughes (1981:127) stated that at the Muddy Creek site, when the prehistoric hunters used inferior materials, they did not exhibit the highest quality of workmanship, they exhibited short lengths, and they appeared to be expediently made with a lack of concern for point aesthetics. In addition, Ramsay (1991:134-135) found that points made of jasper and Swan River chert (locally available material) from the Melhagen site excavations, tended to be smaller in overall size than those made of Knife River Flint.

The six collections examined all displayed similarities as well as differences, but the One-Eleven points had the highest number of statistically significant differences when compared to the others. This collection had the lowest number of numerical attributes with relative standard deviation values of less than 20.0%. It was also the only assemblage included in this analysis that did not have an overwhelming predominance of Knife River Flint (43.7%) or locally available materials (56.3%). This mixture of raw materials may explain the variability within the numerical attributes. The results of the Tukey HSD test also indicated that the One-Eleven collection differed greatly from the Fincastle, the Fitzgerald, and the Ruby projectiles, but was similar in numerous interval/ratio attributes to the Muhlbach points. These attributes included maximum length, thickness, weight, blade length, body length, neck width, notch height left, notch depth (left and right), proximal margin height, and base width. It is interesting to note that the radiocarbon dates from the One-Eleven and the Muhlbach sites are very similar; both date to approximately 1,350 BP.

The HRI developed by Andrefsky (2006) was used in an attempt to determine if the amount of retouch on the point was a significant attribute, particularly in relation to its maximum length. There does appear to be a relationship between the amount of retouch and the maximum length of a projectile point. High amounts of retouch were present on the shorter points, while points that are longer had less retouch. Andrefsky (2006:755) stated that the HRI may not be an absolute value, but may instead provide a relative measure. He also suggested that "it may be important to control for differences in lithic raw material types (such as chert, obsidian, quartzite) as well when using the HRI" (Andrefsky 2006:755). Only 172 (59.1%) of the artifacts had any amount of visible retouch. The remaining 119 (40.9%) did not have any retouch. Of these, 77 points (64.7%) were crafted from Knife River Flint. Of the points less than 30.0 mm in length, 22 of 50 projectiles (44.0%) were not Knife River Flint, while of the projectiles greater than 30.0 mm in length, only 19 out of 69 (27.5%) were crafted from materials other than Knife River Flint. The smaller projectiles in this study collection had no retouch but many were not made of Knife River Flint, confirming Andrefsky's point.

When the relationship between the raw material and the HRI values was examined, it was found that the relationship between the variables was statistically significant: X^2 (16, n = 291) = 44.823, $p < .01$. However, the lambda value was .062 and was not statistically significant (p = .108). That being said, 34 out of 158 (21.5%) projectile points made from Knife River Flint had HRI values of 50.0% or greater and only 9 out of 133 (6.8%) projectiles of non-Knife River Flint had HRI values of over 50.0%. This could result from the more intensive reuse and resharpening of Knife River Flint artifacts in comparison to other materials, or it may be the result of an apparent identification of retouch flakes on Knife River Flint versus other coarser materials where retouch would be more difficult to identify, for instance quartzite and siltstone.

Figure 14 displays the maximum length of projectile points in conjunction with Andrefsky's (2006) HRI value. It is clear that many of the small points did not have retouch beyond the initial manufacturing stage. These points also tended to reflect lower quality workmanship. Of the 45 complete points that did not have any visible retouch, 34 (75.5%) had a length less than 40.0 mm, and 31 (68.9%) were of medium or lower quality. The lengths of the points with the highest amounts of retouch are between 30.1 and 40.0 mm. There were no points greater than 50.1 mm with retouch values exceeding 12.0 (75%). This confirms that retouch is one plausible explanation for the length variation seen in Besant/Outlook/Sonota projectile point assemblages.

Tools were frequently modified, retouched, and recycled during their use-life, thus modifying them from their original form (Dibble 1987; Towner and Warburton 1990; Odell 2001; Buchanan et al. 2007). Hughes (1981:128-129) suggested that the Muddy Creek projectile point variability could be explained through reworking modifications, which are functional. She noted that "given that other Besant point samples exhibit similar variety it is probable that reworking is a common factor in Besant variability" (Hughes 1981:129). She also found that Knife River Flint points were more highly retouched than those of other materials. As seen in Table 67, the Fincastle Knife River Flint points had the most retouch: more than 50.0% of the blade edges of 15 points were retouched. Four points from both the Fitzgerald and Ruby site assemblages have more than 50.0% retouch. The Ruby site collection also included a high number of artifacts that exhibited retouch, but few points had a HRI value greater than .500.

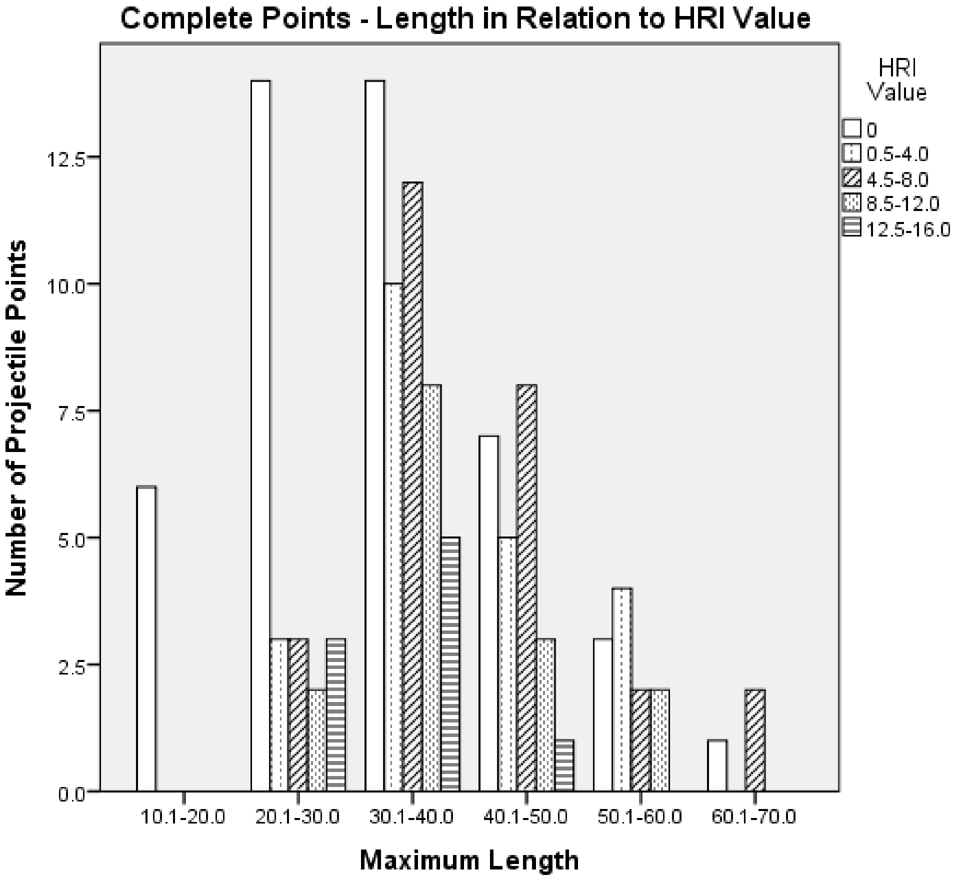

Figure 14: Relationship between maximum length and HRI values.

Table 67: HRI value recorded for the complete projectile points from each of the six sites.

Site	0	0.5 – 4.0 (3 – 25%)	4.5 – 8.0 (25 – 50%)	8.5 – 12.0 (50 – 75%)	12.5 – 16.0 (75 – 100%)	Total Analyzed
Fincastle	14	3	6	7	8	38
One-Eleven	10	0	1	0	0	11
Muhlbach	6	2	1	1	0	10
Happy Valley	2	1	0	0	0	3
Fitzgerald	10	5	5	4	0	24
Ruby	3	11	14	3	1	32
Overall Total	45	22	27	15	9	118

The Fincastle collection had the highest number of highly retouched projectiles, is dominated by Knife River Flint, and is the oldest of the six sites in this investigation. It is possible that different raw material use strategies were practiced at different time periods, or different approaches to the use and curation of lithic materials may have been carried out as seen in the site assemblages.

Nominal attributes that did not show any statistically significant differences between the site assemblages were symmetry, tip shape, blade edge shape, body shape, shoulder shape, notch type, notch orientation, notch shape, presence of notch grinding, proximal margin shape, base shape, and the presence of basal thinning. These attributes remained constant, and without internal variability, across the six assemblages.

A relationship was also detected between the raw materials and the Pelican Lake type points found. These points were only present in collections made predominately of locally available lithic materials. These Pelican Lake type points were not separated out statistically, which is very interesting since these are considered to be typologically different. It should be noted, however, that a number of these statistical tests focus on numerical attributes, such as maximum length and notch depth. Statistical tests which include the nominal and ordinal attributes are uncommon, and it is these attributes, most notably the shape attributes, that are the aspects in which the two point types are the most distinctive.

Based on the statistical examination of the projectile point attribute data from the six single component bison kill sites located on the Northwest Great Plains, a number of distinctive patterns are apparent. The assemblages dominated by Knife River Flint, Fincastle, Fitzgerald, and Muhlbach, are more homogenous in their attributes, and were statistically different from the One-Eleven, Happy Valley, and Ruby assemblages made up mostly of local materials. There was also great variability in the maximum lengths of the projectile points. One reason for this may be due to reworking, which should be evident in the amount of retouch on the blade of projectile. It should be noted that retouch was apparent on only 59.1% of the artifacts, and thus, retouch is not the only acceptable explanation for the variability seen on the blade attributes. Many basal attributes remained constant across the six site assemblages. These included the maximum thickness, weight, neck width, notch height, notch depth, proximal margin height, and base width. Since the base is protected by the haft element, and is less likely to be affected by reuse and secondary modifications, it is where the bulk of the typologically significant aspects are located. This in turn indicates that the types that archaeologists are calling Besant, Outlook, and Sonota, display similar morphological attributes and in all likelihood, based on the projectile points, represent one highly variable typological group. It appears that typological groupings may need to be flexible and accept that variation in a point form is not only plausible but certain.

Data was collected from projectile points from six single component sites on the Northwest Great Plains. From the statistical analysis of this data, interpretations can be made regarding the typological groups labeled as Besant, Outlook, and Sonota. These are discussed in greater detail in Chapter 7.

CHAPTER 7: Conclusion

Variations in the form and style of projectile point are often regarded as being representative of separate typological groups. On the Great Plains, projectile points are used to create temporal sequences based on the morphological similarities and differences between their attributes. Typological classification is useful to archaeologists as a way to understand broad human choices, changes through time, and cultural interaction. However, a number of other factors can account for the variability present within a typological group, including reuse and retouch, intra-group social variability, trade, inter-community relationships, cultural values, personal preferences, skill level, culturally transmittable variability, and raw material type (Greaves 1982; Wiessner 1983; Duke 1991; Larick 1991; Griffin 1997).

This research project set out to examine projectile points that had been labeled as Besant, Outlook, and/or Sonota in order to assess the amount of variability both within a single component site collection and between assemblages classified as such. Based on the literature reviewed, the working hypothesis was that the variability within these projectile point assemblages was equal to the variability between these typological groups. As a whole, these three typological groups are more similar to each other than they are different.

Point attributes may be functional, and/or they may reflect culturally significant preferences. However, these aspects are not necessarily mutually exclusive and attributes can be both functional and cultural in nature. Additionally, many attributes can be altered over their use-life through reuse and retouch activities. Fawcett (1980) and Charlin and González-José (2012) have suggested that culturally indicative attributes are generally located on the basal section of projectile points, while functional attributes tend to be found on the blade portion of the point for this reason. Therefore, basal aspects were examined in detail, though other attributes were recorded as well.

To investigate the variability and similarities between Besant, Outlook, and Sonota projectile points, assemblages from six sites were selected for analysis: Fincastle, One-Eleven, Happy Valley, Muhlbach, Fitzgerald, and Ruby. These single component bison kill sites are located on the Northwest Great Plains and date to the Late Middle Prehistoric period (2,500 to 1,300 BP). Numerous attributes, such as maximum length, notch depth, shoulder shape, notch orientation, and quality of workmanship, were examined.

The nominal, ordinal, and interval/ratio attribute data from the 291 projectile points was subject to a number of statistical tests. Based on their results it is clear that there are significant differences and similarities in the individual attributes both within and between the six site assemblages. However, this variability was mainly restricted to the blade portion of the projectile points, in attributes such as body length and blade length. Basal attributes, notably base width, remained constant across the six assemblages, suggesting that a particular shaft size was preferred.

Statistical Results in Context

Within each site assemblage, a number of metric attributes displayed a high degree of variability, while others remained constant. Based on the relative standard deviation (RSD) values, the attributes that are highly variable are maximum length, thickness, weight, blade length, left and right body length, as well as notch height, notch depth and proximal margin height. When the Pearson's *r* Correlation and the principal components analysis (PCA), was run using all six assemblages, it was revealed that the maximum length is strongly associated with the maximum width, weight, blade length, and body length left and right. Any variation in the maximum length is thus linked with these other closely associated attributes. This was not surprising because when the maximum length is large, the blade lengths and body lengths can also be longer, and in addition, the larger the point, the greater its weight.

Notch depth and proximal margin height, although highly variable within each site collection, are not significantly different between sites. Notch depth correlates with the neck width. The knapper’s objective seems to have been to create a point with a particular neck width, and hence, the wider the blank, the deeper the notch had to be in order to achieve this. The neck width and the corresponding notch depths are considered to be functionally significant. The neck width is directly related to the thickness of the shaft of the projectile (Zeier 1983:39-40) and an attempt was made to remove more or less material at the notches until the desired width was attained. Based on these assemblages, a neck with of approximately 14.0 mm was desired. Although the base is considered to be the most culturally significant aspect of the point, while the body is largely functional, it appears that the neck width, and corresponding notch depths, are largely functional as well.

Other attributes that remained constant were the maximum width, shoulder width, stem/haft length, and base width. These are also strongly correlated based on the Pearson’s *r* and the PCA tests. The average stem/haft length of the points examined in this study was 9.1 mm, which is close to the 9.7 mm that Zeier (1983:36-37) considered the minimum acceptable haft length on Besant projectiles. It was found that the elements that were unvarying are all located on, or near, the base of the projectile point. This indicates that the dimensions of these attributes were templated and may be considered to be culturally chosen aspects. The consistency of these basal attributes may also indicate that Besant, Outlook, and Sonota groups were hafting their points in a similar way, and using shafts and foreshafts of the same dimensions.

The outcome from the t-tests indicated that numerous basal attributes, including neck width, stem length and proximal margin height, were not statistically significantly different between the Fincastle, Muhlbach, and Ruby site assemblages. The results of the Scheffé test also indicated that the attributes of maximum thickness, weight, neck width, notch height, notch depth, proximal margin height, and base width were similar across the six assemblages. Additionally, the relative standard deviations indicated that there is a high degree of variability within each of the assemblages found between the attributes of weight, notch depth and proximal margin height; however, it is clear from these post hoc tests that although there is variability within the individual assemblages, this amount of variation extends across the collections, which causes them to appear as similar. Important to note is that although other attributes differ between the assemblages, the basal attributes remain fairly constant.

It also appears that there were different raw material use strategies occurring at the six sites. In particular, the Fincastle assemblage dominated by Knife River Flint, had the highest number of highly retouched projectiles, and was the oldest of the six sites included in this investigation. It is possible that different strategies, in regards to raw material use, were practiced at different times, and/or different approaches to the use and curation of lithic materials were carried out at the six sites. This would have been dependent on access to raw materials via direct acquisition or trade.

Presence of Pelican Lake

A number of points were identified as Pelican Lake forms were identified in two of the site collections included in this study: four from One-Eleven and eight from Ruby. Their classification was based on a visual assessment of the points in each assemblage. Though these two point types were developed as atlatl projectiles serving the same function, their nominal, or shape, attributes do differ significantly. Pelican Lake points tend to have a triangular body shape, straight blade edge shape, angled/acute, rounded/acute, or angled/right shoulder shapes, and are corner notched, with angled or rounded proximal margins, or with very small proximal margin heights if other shapes were identified. Interestingly, the points identified as Pelican Lake in these two assemblages were not statically different from the Besant/Outlook/Sonota points on the basis of their metric attributes. For instance, the average width of Besant type points included in this study is 20.5 mm, and it is 20.9 mm for Pelican Lake. It is also noteworthy that Pelican Lake type points were only identified within assemblages that were not dominated with Knife River Flint. Only 2 of the 12 Pelican Lake type points were made from Knife River Flint, while the other 10 consisted of medium-fine quartzite, Hartville Uplift quartzite, miscellaneous chert, opaque yellow chert, siltstone, and white/grey/brown chalcedony. Moreover, when the 12 Pelican Lake type points were excluded from the ANOVA and Scheffé and Tukey tests, there was no significant impact on the results, indicating that Besant is highly variable on its own.

The presence of Pelican Lake and Besant type points in the same occupation event is not uncommon. Reeves (1983:98) reported three Besant projectile points were found in the Pelican Lake levels at Head-Smashed-In Buffalo Jump, Vickers (1986:13) wrote that Besant type points were found at Pelican Lake sites in the mountain areas of Alberta, Forbis (1962) found both point types in the same levels at the Old Women's Buffalo Jump, and Dyck and Morlan (1995:333) recovered Besant points and Pelican Lake-like projectiles in Layer X at the Sjovold site in south central Saskatchewan. It is plausible that different types of points were in use during the same temporal period. Their presence together may also indicate the transition from the two forms, an adoption of the new Besant point type with a continuing use of the Pelican Lake type projectiles. Temporally, Pelican Lake (3,600 to 2,800 BP) predates Besant (2,100 to 1,500 BP) (Peck 2011:224, 282), with no overlap if these temporal brackets are used. However, Gregg (1985) proposed that the date of Pelican Lake be extended to 1,500 BC to AD 300 (3,450 to 1,650 BP). Having said that, the Ruby site, which dates to 1,670 BP, falls at the very end of the Pelican Lake phase and the more recent, One-Eleven assemblage, 1,350 BP, is well after the extended dates for this typological point form. Either these temporal brackets need to be widened or alternative explanations need to be sought.

Final Conclusions

Based on the findings in this study, Besant/Outlook/Sonota projectile points can be highly variable, mainly in the blade aspects of the points. Besant sites (One-Eleven, Happy Valley, Muhlbach, Fitzgerald, Ruby), Outlook sites (Fincastle), and Sonota sites (One-Eleven and Muhlbach as interpreted by Peck (2011)), varied in their basic attributes: between 13.0 mm to in excess of 70.0 mm in maximum length, 10.0 to 30.0

mm in maximum width, 2.0 to 9.0 mm in thickness, and between 0.40 to over 13.00 g in weight. Although highly variable, the results of the cluster analysis showed that projectile points from each of the six site assemblages were included in each of the four clusters. Therefore, no culturally distinctive groups are present within the six collections examined. Besant, Outlook, and Sonota types should be grouped together into one typological group.

It is also clear that the projectile points from these six site assemblages display significant variability, although many attributes remain constant across the collections. These results fit with the findings of Peck and Ives (2001:172), who, in their analysis of Late Prehistoric period side-notched projectile points, found that continuous (numerical) data did not provide an “objective basis for a typological break in projectile point styles”. This study produced similar results. The metric attributes are not linked to any of these three typological groups.

Several attributes, however, were consistent across the six site assemblages, and these were found mainly on the basal portion of the projectile point. These attributes included the maximum thickness, weight, neck width, notch height, notch depth, proximal margin height, and base width. These attributes may be of greater assistance in the delineation of typological groups from other groups that are unmistakably different, but in this case, Outlook, Besant, and Sonota points had similar measurements. Slight differences in these aspects reflect internal typological variability. Typological groups should remain flexible in order to accept some degree of variability.

Projectile points were most certainly important to the prehistoric groups of people, as they were required in order to secure a food source. Differences in their form are often regarded as *the* distinguishing cultural element by archaeologists. The fact that they are among the best preserved archaeological remains accentuates this focus. However, these artifacts are not the only culturally unique archaeological remains. The shaft, foreshaft, and fletching, may also have carried cultural significance. Wissler (1910:157-161) described a number of alterations that could be made on an arrow, potentially to identify it with greater ease. These differences could be seen in the colour of the dyed stabilization feathers, the number and width of the bands that decorated the shaft, the colours used in bands around the shaft, the number and pattern of grooved lines around the shaft, as well as the maximum length of the wooden shaft itself (Wissler 1910:157-161). These aspects may have been seen as more culturally significant than the actual points themselves. Unfortunately, on the Great Plains, these pieces are rarely preserved for archaeologists to recover. Other culturally specific practices may include burial features and settlement patterns, butchering practices, and the use of ceramic vessels.

Although several scholars, namely Neuman (1975), Dyck and Morlan (1995), Varsakis (2006), and Peck (2011) separate Outlook, Sandy Creek, Besant, and Sonota into different typological groups on the basis of the slight morphological differences between the projectile point attributes, others (Reeves 1983; Foreman 2010; Bubel in press) have argued for similarities. The findings of this study support the latter theory of grouping that there are no differences based on the projectile points. Thus, the definition of Besant projectile point forms should be expanded as follows: points denoting a tendency for a symmetrical body, a pointed tip, excurvate blade edge, ovate body shape, rounded/obtuse or angled/obtuse shoulders, corner/side notches that were ground, a skewed distally notch orientation, rounded notch shape, rounded/basally constricted or squared/basally constricted proximal margins, and straight bases that were basally thinned.

Furthermore, the ‘morphological’ differences between these projectile points are, in actuality, functional and not cultural, probably representing different stages of their use-life. Basal attributes reflect constant shaft sizes and blade aspects are a product of material type, retouch, and reuse. These three typological groups are essentially archaeological constructs that cannot be separated on the basis of the projectile points alone.

Future Research

This study was limited to 291 points in six site assemblages originally assigned to the Besant, Outlook or Sonota phase/complexes. A larger inquiry should be conducted, using both single and multi-occupation site projectile point assemblages that have been radiocarbon dated and date to the Late Middle Prehistoric period (2,500 to 1,300 BP). It would also be interesting to study the differences between Besant and Pelican Lake projectile points and other forms identified in the Late Middle Prehistoric period.

It should be noted that projectile points were used exclusively in this research project. Although no typological differences were identified between Besant, Outlook, and Sonota point types, other archaeological materials, for instance, ceramics, and features, for instance, bone uprights and burials, etc., should also be examined. Prehistoric groups made more than just projectile points. Archaeologists should study the complete cultural assemblages, especially when attempting to define typological groups.

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APPENDIX I

Abbreviations used in data tables that follow.

Abbreviation	Term	Abbreviation	Term
ANG	Angled	MG	Medium Grey
ANG/ACT	Angled/Acute	OVT	Ovate
ANG/OBT	Angled/Obtuse	P	Purple
ANG/RND	Angled/Rounded	PLCX	Plano-Convex
ANG/RT	Angled/Right	PLTR	Plano-Triangular
ASY	Asymmetrical	PT	Pointed
B/B	Base/Body	R	Red
B/B/T	Base/Body/Tip	REC	Recurved
BI	Biconvex	RND	Rounded
BL	Blunted	RND/ACT	Rounded/Acute
BK	Black	RND/ANG	Rounded/Angled
B	Blue	RND/CON	Rounded/Basally Constricted
BR	Brown	RND/EXP	Rounded/Basally Expanding
CCV	Concave	RND/OBT	Rounded/Obtuse
CCV/CVX	Concave/Convex	RND/RT	Rounded/Right
Comp.	Complete Projectile	RND/SQ	Rounded/Squared
COR	Corner	SH	Sharp
COR/SID	Corner/Side	SID	Side
CVX	Convex	SKWDST	Skewed Distally
DG	Dark Grey	SKWPRX	Skewed Proximally
EXC	Excurvate	SLASY	Slightly Asymmetrical
EXC/INC	Excurvate/Incurvate	SQ	Squared
GR	Green	SQ/CON	Squared/Basally Constricted
G	Grey	SQ/EXP	Squared/Basally Expanding
H. U.	Hartville Uplift	STR	Straight
INC	Incurvate	SYM	Symmetrical
KRF	Knife River Flint	TRI	Triangular
LEN	Lenticular	W	White
LG	Light Grey	W-LG	White to Light Grey
MED	Medium	Y	Yellow

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
705	Comp.	31.1	18.3	4.9	2.50	Obsidian	BK	SLASY	LOW	PLCX	PLCX
848	Comp.	42.2	19.8	5.8	4.75	Brown Chert (KRF)	BR	SYM	MED/HIGH	PLCX	PLCX
852	Comp.	33.9	17.5	4.4	2.39	Brown Chert (KRF)	BR	SLASY	MED	PLTR	LEN
855	Comp.	26.7	16.5	4.3	1.61	Siltstone	MG	SYM	LOW	BI	LEN

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
705	SH	21.8	EXC	STR	25.3	23.6	OVT	Yes	12.5	Yes	18.3
848	SH	31.6	EXC	EXC	32.5	31.8	OVT	Yes	5.0	Yes	19.8
852	BL	25.0	EXC	EXC	24.3	25.4	OVT	No		Yes	17.5
855	PT	18.4	EXC	EXC	19.8	19.5	OVT	No		Yes	16.5

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
705	ANG/OBT	RND/OBT	12.6	9.2	10.1	1.9	1.3	COR/SID	COR/SID	SKWDST	SKWPRX
848	RND/OBT	RND/OBT	13.4	8.0	9.5	1.6	2.2	COR/SID	COR/SID	SKWDST	SKWDST
852	ANG/OBT	RND/RT	11.3	8.3	6.6	2.7	1.9	COR/SID	COR/SID	SKWDST	SKWDST
855	ANG/OBT	ANG/OBT	11.9	5.6	6.0	1.2	1.5	COR/SID	COR/SID	SKWPRX	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
705	RND	RND	Yes	9.3	1.6	0.6	SQ/CON	SQ/CON	15.5	STR	Yes	Yes
848	RND	RND	Yes	10.6	2.6	4.9	RND/CON	RND/EXP	16.1	CCV/CVX	Yes	Yes
852	RND	RND	Yes	8.9	1.4	0.0	ANG/RND	RND	14.5	CVX	Yes	Yes
855	RND	RND	Yes	8.3	3.5	2.6	RND/CON	RND/CON	13.1	CCV/CVX	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
857	Comp.	30.1	20.0	5.7	3.20	Brown Chert (KRF)	BR	SYM	HIGH	PLCX	PLCX
858	Comp.	39.0	20.0	4.3	3.10	Brown Chert (KRF)	BR	SYM	HIGH	BI	CCV/CVX
860	Comp.	31.8	17.6	4.9	2.51	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
861	B / B / T	47.9	23.8	4.9	5.43	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
857	PT	21.2	EXC	EXC	21.9	22.3	OVT	Yes	14.0	Yes	20.0
858	PT	27.5	EXC	EXC/INC	28.2	27.6	EXC/INC	Yes	15.0	Yes	20.0
860	PT	23.1	EXC	EXC	24.7	23.9	TRI	Yes	6.0	Yes	17.6
861	BL	37.3	EXC/INC	EXC	36.4	38.0	OVT	Yes	11.5	Yes	24.0

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
857	ANG/OBT	ANG/RT	15.9	9.1	8.1	1.5	2.2	SID	COR/SID	SYM	SKWDST
858	ANG/OBT	ANG/OBT	12.6	11.4	11.2	2.7	2.9	COR	COR/SID	SKWDST	SKWDST
860	ANG/OBT	ANG/OBT	12.3	8.1	6.9	1.8	2.0	COR	SID	SKWDST	SKWPRX
861	ANG/RT	ANG/RT	15.0	9.5		3.5		SID		SKWDST	

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
857	RND	RND	Yes	8.9	4.1	2.3	RND/SQ	SQ/CON	19.2	STR	Yes	Yes
858	RND	RND	Yes	11.5	0.0	2.0	ANG	RND/CON	16.9	STR	Yes	Yes
860	RND	RND	Yes	8.7	0.0	2.2	ANG	RND/CON	14.7	STR	Yes	Yes
861	RND/SQ	RND/SQ	Yes	10.6	2.7		SQ/CON		19.8	CCV/CVX	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
864	B / B / T	36.8	22.3	6.9	5.27	Brown Chert (KRF)	BR	SYM	HIGH	PLCX	BI
865	Comp.	36.4	20.7	4.7	3.31	Brown Chert (KRF)	BR	SLASY	MED/HIGH	PLCX	CCV/CVX
866	Comp.	40.3	22.7	6.0	4.98	Brown Chert (KRF)	BR	SYM	MED/HIGH	PLCX	PLCX
867	B / B	30.0	17.6	5.5	2.88	Brown Chert (KRF)	BR	SYM	MED/HIGH	PLCX	PLCX

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
864	PT	24.8	EXC	STR	27.2	25.2	TRI	No		Yes	22.4
865	BL	26.6	EXC/INC	EXC	27.9	26.4	OVT	Yes	5.5	Yes	20.6
866	PT	31.0	EXC	REC	31.1	32.2	OVT	Yes	6.0	Yes	22.7
867		21.9	EXC	EXC			OVT	Yes	8.0	Yes	17.6

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
864	ANG/OBT	ANG/OBT	18.7	9.5		2.3		SID	SID	SYM	SYM
865	ANG/OBT	ANG/OBT	13.7	7.5	8.4	3.0	3.1	SID	COR/SID	SYM	SKWDST
866	RND/OBT	ANG/RT	14.7	9.8	8.8	4.0	4.0	COR/SID	COR/SID	SKWDST	SKWDST
867	RND/OBT	ANG/OBT	12.7	8.0		2.8		COR/SID		SKWDST	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
864	RND	RND	Yes	12.0	3.6		SQ/CON		21.6	CCV	Yes	Yes
865	RND	RND/SQ	Yes	9.8	2.3	1.3	RND/SQ	RND/CON	19.6	CVX	Yes	Yes
866	RND	RND	Yes	9.3	1.3	1.1	RND/CON	SQ/CON	21.4	STR	Yes	Yes
867	RND/SQ	RND	Yes	8.1	1.8		RND/EXP		17.7	STR	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
869	Comp.	38.9	19.5	5.9	3.65	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
870	Comp.	33.4	17.2	5.2	2.99	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
876	B / B	58.8	24.6	7.0	9.51	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
877	B / B	38.1	22.8	6.6	5.64	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
869	PT	28.7	STR	STR	30.1	29.9	TRI	Yes	9.5	Yes	19.5
870	PT	25.9	EXC/INC	EXC/INC	26.3	25.6	EXC/INC	Yes	4.0	Yes	17.2
876		49.7	EXC/INC	EXC	50.0	49.1	TRI	Yes	4.5	Yes	24.6
877		28.0	REC	EXC	27.5	25.4	EXC/INC	Yes	5.0	Yes	22.8

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
869	RND/RT	ANG/RT	13.1	7.5	7.2	2.5	1.8	COR/SID	COR/SID	SKWDST	SYM
870	ANG/OBT	RND/OBT	13.6	6.8	7.7	1.6	1.3	COR/SID	COR/SID	SYM	SKWPRX
876	RND/OBT	RND/OBT	17.6	8.0	7.2	3.1	3.0	COR/SID	COR/SID	SKWPRX	SKWDST
877	RND/OBT	RND/OBT	14.5	8.8	9.4	3.5	3.2	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
869	RND	RND	Yes	10.2	1.7	3.3	SQ/CON	RND/CON	15.8	CVX	Yes	Yes
870	RND/SQ	RND	Yes	7.5	1.2	1.1	SQ/CON	SQ/CON	14.7	STR	Yes	Yes
876	RND	RND	Yes	9.1	1.5	2.5	RND/CON	RND/CON	22.6	STR	Yes	Yes
877	RND	RND	Yes	10.1		2.0	RND	ANG/RND	18.8	STR	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
879	Comp.	57.4	22.9	7.2	8.38	Brown Chert (KRF)	BR	SLASY	HIGH	BI	BI
880	B / B	31.6	19.7	7.1	3.43	Porcellanite (Greys)	LG	SLASY	MED/LOW	BI	BI
881	Comp.	27.2	17.3	5.5	2.54	Brown Chert (KRF)	BR	SLASY	HIGH	PLCX	BI
882	Comp.	30.5	21.9	6.4	3.87	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
879	PT	47.6	EXC	EXC	47.4	48.7	OVT	No		Yes	21.4
880		21.2	EXC	EXC			OVT	No		No	19.6
881	SH	19.0	EXC	EXC	19.3	18.8	OVT	Yes	13.5	No	17.2
882	SH	21.5	STR	EXC	23.0	21.3	TRI	Yes	9.0	Yes	21.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
879	RND/OBT	ANG/OBT	15.3	6.3	9.2	1.7	2.7	COR/SID	COR/SID	SKWDST	SKWDST
880	RND/OBT	RND/OBT	14.6	7.1	7.4	1.4	1.1	COR/SID	COR	SKWDST	SYM
881	ANG/OBT	RND/RT	13.4	7.5	7.4	1.6	1.9	COR/SID	COR/SID	SKWDST	SKWDST
882	ANG/OBT	ANG/OBT	17.9	6.3	9.0	1.9	2.1	SID	SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
879	RND	RND	Yes	9.8	2.8	0.0	SQ/CON	ANG	18.3	CCV	Yes	Yes
880	RND	ANG	Yes	10.4	4.9	0.0	SQ/CON	ANG	15.4	CCV/CVX	No	No
881	RND	RND	Yes	8.2	1.5	2.1	SQ/CON	RND/SQ	17.3	CVX	Yes	Yes
882	RND	RND	Yes	9.0	4.1	2.3	SQ/CON	SQ/CON	21.9	STR	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
883	Comp.	23.8	18.1	5.2	1.90	Brown Chert (KRF)	BR	SYM	HIGH	PLCX	BI
884	Comp.	34.4	18.9	4.8	3.06	Brown Chert (KRF)	BR	SYM	MED/HIGH	PLCX	PLTR
886	B / B	25.1	25.2	7.0	4.93	Brown Chert (KRF)	BR		HIGH	BI	BI
891	B / B	29.8	18.4	4.6	2.21	Brown Chert (KRF)	BR		MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
883	PT	14.4	EXC	EXC	16.7	16.3	OVT	Yes	15.0	Yes	17.0
884	SH	24.1	EXC	EXC	24.9	24.4	OVT	Yes	8.5	Yes	19.0
886								No		Yes	24.7
891			EXC		21.5			Yes	5.5	Yes	

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
883	ANG/OBT	ANG/OBT	13.3	8.2	7.7	2.5	2.3	SID	SID	SKWDST	SKWDST
884	RND/OBT	ANG/OBT	14.2	7.5	7.8	1.8	1.8	COR/SID	COR/SID	SKWDST	SYM
886	RND/OBT	ANG/OBT	17.1	8.4	8.4	2.3	2.2	COR/SID	COR/SID	SKWDST	SKWDST
891	RND/OBT		14.4	6.7		2.0		COR/SID	COR/SID	SKWDST	

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
883	RND/SQ	RND	Yes	9.4	2.3	2.3	RND/CON	SQ/CON	18.1	STR	Yes	Yes
884	RND	RND	Yes	10.3	2.5	1.8	RND/CON	RND/EXP	16.8	CVX	Yes	Yes
886	RND	RND	Yes	9.8	3.4	3.3	RND/SQR	RND/CON	18.9	CCV	Yes	Yes
891	RND	RND	Yes	9.2	1.6	0.0	SQ/CON	ANG	18.7	CVX	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
892	Comp.	19.6	14.3	4.8	1.21	Med-Fine Quartzite	LG	SLASY	MED	BI	BI
917	Comp.	32.4	18.5	5.2	3.08	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
8376	Comp.	48.3	18.0	6.1	5.06	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
8386	Comp.	29.0	18.9	5.6	3.08	Brown Chert (KRF)	BR	SLASY	MED/LOW	PLTR	LEN

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
892	PT	19.6	EXC/INC	EXC/INC	17.2	19.9	EXC/INC	No		No	
917	RND	23.3	EXC/INC	EXC	24.2	23.5	OVT	Yes	10.0	Yes	18.5
8376	BL	39.1	REC	EXC	38.5	39.5	EXC/INC	No		No	18.0
8386	BL	20.6	EXC	EXC	21.6	20.9	OVT	No		Yes	18.9

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
892								NONE	NONE		
917	RND/OBT	ANG/OBT	12.1	8.6	8.1	2.6	2.1	COR/SID	COR/SID	SKWDST	SKWDST
8376	ANG/OBT	RND/OBT	12.7	7.1	8.1	2.2	1.7	SID	COR/SID	SKWDST	SKWDST
8386	RND/OBT	ANG/OBT	13.3	8.3	5.5	1.6	1.0	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
892				0.0			RND	ANG	14.2	CVX	Yes	No
917	RND	RND	Yes	9.1	1.4	1.0	SQ/CON	RND/CON	15.4	STR	Yes	Yes
8376	RND/SQ	RND	Yes	9.2	3.9	1.6	RND/CON	SQ/CON	15.0	STR	Yes	Yes
8386	RND	RND	Yes	8.4	2.2	3.8	SQ/CON	SQ/CON	14.2	STR	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
8804	B / B	23.7	15.9	4.8	1.86	Trans. Chalcedony	T	SYM	MED/HIGH	BI	BI
9002	Comp.	43.2	21.5	7.6	6.33	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI
9368	B / B / T	24.5	16.7	4.0	1.60	Swan River Chert	W	SLASY	MED	PLTR	LEN
9445	B / B	25.4	17.2	3.2	1.72	Siltstone	DG	SYM	LOW	CCV/CVX	LEN

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
8804		17.4	EXC/INC	EXC	18.1	18.2	OVT	No		Yes	15.9
9002	SH	32.9	EXC	EXC	32.0	35.2	OVT	No		Yes	21.5
9368	SH	18.1	EXC	EXC	18.3	20.2	OVT	No		No	16.7
9445			EXC	EXC			OVT	No		Yes	17.2

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
8804	RND/OBT	ANG/OBT	12.0	5.2	5.4	1.4	1.7	COR/SID	COR/SID	SKWDST	SKWPRX
9002	RND/OBT	ANG/OBT	15.8	8.6	7.7	2.7	2.0	SID	COR/SID	SYM	SKWDST
9368	RND/OBT	ANG/OBT	13.6		6.0		1.5		COR/SID		SKWDST
9445	ANG/RT	RND/OBT	10.4	6.2	6.1	2.2	2.0	COR/SID	COR/SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
8804	RND	RND	Yes	6.3	1.3	1.9	RND/ANG	RND/SQ	13.6	CCV	Yes	Yes
9002	RND/SQ	RND	Yes	10.3	2.7	2.1	SQ/CON	RND/CON	19.8	STR	Yes	Yes
9368		RND	Yes	6.4		0.0		ANG		STR	Yes	Yes
9445	RND	RND	Yes	8.0	1.8	0.9	SQ/CON	RND/CON	12.0	STR	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
9446	Comp.	18.5	15.7	4.3	1.32	Siltstone	DG	ASY	LOW	BI	BI
9450	B / B	72.1	23.6	8.3	13.71	Brown Chert (KRF)	BR	ASY	HIGH	BI	BI
9451	B / B	23.6	19.6	5.7	2.55	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
9452	B / B	44.1	21.6	6.8	6.72	Brown Chert (KRF)	BR	SLASY	HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
9446	PT	12.3	EXC	EXC	13.7	13.7	OVT	No		No	15.7
9450		57.9	EXC	STR	59.0	59.8	OVT	No		No	23.6
9451			EXC	EXC			OVT	No		No	18.2
9452		34.9	EXC	STR	32.9	35.4	OVT	Yes	5.0	Yes	21.6

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
9446	ANG/OBT	ANG/OBT	14.3	4.2	4.4	0.8	1.1	SID	SID	SYM	SKWPRX
9450	RND/OBT	ANG/OBT	17.5	9.9	14.0	3.3	2.3	COR/SID	COR/SID	SKWDST	SKWDST
9451	ANG/OBT	ANG/OBT	14.2	7.5	7.8	2.3	2.2	COR/SID	SID	SKWDST	SYM
9452	RND/OBT	RND/OBT	15.4	9.3	5.4	2.7	1.4	COR/SID	COR/SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
9446	RND	RND	No	6.2	3.3	2.8	SQ/CON	SQ/CON	15.7	CCV	Yes	Yes
9450	RND	RND	Yes	14.2	0.0	0.8	ANG	RND/CON	22.5	STR	Yes	Yes
9451	RND	RND	Yes	9.6	1.6	2.0	SQ/CON	RND/CON	19.6	STR	Yes	Yes
9452	RND	RND	Yes	9.2	1.6	3.8	RND/CON	RND/SQ	17.1	STR	Yes	No

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
9453	Comp.	42.0	20.7	6.2	5.14	Brown Chert (KRF)	BR	ASY	HIGH	BI	BI
9457	Comp.	43.8	21.5	8.1	6.75	Brown Chert (KRF)	BR	SLASY	HIGH	BI	BI
9458	B / B	29.5	22.5	5.3	4.03	Brown Chert (KRF)	BR	SYM	MED/HIGH	PLCX	BI
9459	B / B	55.1	17.4	6.7	5.72	Brown Chert (KRF)	BR	ASY	MED	BI	LEN

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
9453	BL	32.1	REC	STR	30.9	33.2	TRI	Yes	12.5	Yes	20.7
9457	PT	34.4	EXC	EXC/INC	34.2	35.5	OVT	No		Yes	21.5
9458			EXC	EXC			OVT	No		Yes	22.5
9459		45.8	EXC/INC	EXC/INC	45.1	45.9	EXC/INC	Yes	11.0	Yes	17.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
9453	ANG/OBT	ANG/OBT	14.0	7.9	8.5	2.2	2.1	COR/SID	COR/SID	SYM	SKWDST
9457	RND/OBT	RND/OBT	14.7	8.5	9.6	2.9	2.0	COR/SID	COR	SKWDST	SKWDST
9458	ANG/OBT	ANG/OBT	17.0	7.8	8.1	2.5	2.2	SID	COR/SID	SYM	SKWDST
9459	ANG/OBT	RND/OBT	13.4	6.8	7.7	2.3	2.0	SID	SID	SYM	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
9453	RND	RND	Yes	9.9	1.2	2.4	RND/EXP	SQ/CON	16.4	STR	Yes	Yes
9457	RND	RND	Yes	9.4	2.1	0.0	RND/CON	RND	17.1	CCV	Yes	Yes
9458	RND	RND	Yes	9.3	3.1	1.7	RND/CON	RND/CON	21.2	STR	Yes	Yes
9459	RND	RND	Yes	9.3	2.8	2.8	RND/CON	SQ/CON	16.6	STR	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
9461	Comp.	22.6	15.3	4.9	1.50	Trans. Chalcedony	Y	ASY	MED/LOW	PLCX	PLCX
9464	Comp.	36.4	20.2	7.0	4.90	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
9465	B / B	29.2	20.5	5.4	3.44	Brown Chert (KRF)	Y	SYM	MED/HIGH	BI	BI
9466	B / B	32.2	20.1	5.2	2.86	W/G/BR Chalcedony	BR	SLASY	MED/HIGH	BI	PLCX

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
9461	BL	14.0	EXC	EXC/INC	14.6	15.6	OVT	No		Yes	14.9
9464	SH	27.1	EXC/INC	STR	30.0	29.6	OVT	Yes	15.0	Yes	20.2
9465			EXC/INC	EXC			OVT	Yes	8.5	Yes	20.5
9466		23.0	EXC	EXC	23.3	25.0	OVT	Yes	5.0	Yes	20.1

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
9461	ANG/OBT	RND/OBT	9.6	7.0	5.5	3.9	2.1	COR/SID	COR/SID	SKWDST	SYM
9464	RND/OBT	ANG/OBT	15.2	6.9	7.6	2.4	2.7	COR/SID	COR/SID	SKWDST	SKWDST
9465	ANG/OBT	ANG/OBT	16.7	7.8	7.4	1.8	1.7	COR	COR/SID	SKWDST	SYM
9466	RND/OBT	ANG/OBT	14.3	6.4	6.5	2.5	2.6	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
9461	RND	RND	Yes	8.6	1.5	3.1	RND/SQ	RND/EXP	15.4	STR	Yes	Yes
9464	RND	RND	Yes	9.3	3.1	1.9	RND/CON	RND/CON	19.0	STR	Yes	Yes
9465	RND	RND	Yes	7.8	0.0	1.4	ANG	RND/CON	18.9	STR	Yes	Yes
9466	RND	RND	Yes	9.2	2.1	2.9	SQ/CON	SQ/EXP	17.4	STR	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
9467	B / B	41.0	24.5	6.0	5.92	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	PLCX
9468	B / B	71.0	23.0	6.5	10.70	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
9469	B / B	34.5	20.5	7.7	4.66	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI
9470	B / B	17.0	22.3	6.0	2.22	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
9467		30.4	STR	STR	30.8	30.4	TRI	Yes	6.0	Yes	24.5
9468		58.5	EXC	STR	60.4	57.6	OVT	No		Yes	23.0
9469		24.4	EXC	STR	26.6	26.1	OVT	Yes	9.0	Yes	20.5
9470								No		No	22.3

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
9467	ANG/OBT	RND/OBT	17.1	8.5	8.8	3.3	1.6	COR/SID	COR/SID	SKWDST	SKWDST
9468	RND/OBT	RND/OBT	16.7	8.6	8.8	3.0	2.2	SID	SID	SYM	SYM
9469	RND/OBT	RND/OBT	16.5	7.1	8.1	2.1	1.8	COR	COR	SKWDST	SYM
9470	ANG/OBT	ANG/OBT	15.2	9.0	7.1	2.8	4.1	COR	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
9467	RND	RND	Yes	10.6	2.8	2.6	RND/CON	SQ/CON	19.4	CCV	Yes	Yes
9468	RND	RND	Yes	12.5	3.3	3.0	RND/CON	RND/CON	20.2	STR	Yes	Yes
9469	RND	RND	Yes	10.1	0.0	0.0	ANG	ANG	19.2	CVX	Yes	Yes
9470	RND	RND	Yes	9.8	0.0	1.3	ANG	SQ/EXP	20.7	STR	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
13970	B / B	21.2	16.8	5.9	2.41	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI
13971	Comp.	40.8	22.3	7.1	5.4	W/G/BR Chalcedony	W	SYM	HIGH	BI	BI
13972	Comp.	36.1	21.1	5.5	3.78	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	LEN
13973	B / B	40.2	21.8	6.9	6.38	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
13970			EXC	INC			EXC/INC	Yes	6.0	Yes	16.8
13971	SH	30.9	EXC	EXC	31.9	31.0	OVT	Yes	10.5	Yes	22.3
13972	SH	27.3	EXC	STR	29.1	28.8	OVT	Yes	8.0	Yes	21.1
13973		31.1	EXC	EXC	31.3	30.6	OVT	Yes	6.5	Yes	21.9

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
13970	ANG/OBT	ANG/OBT	14.6	8.1	7.5	1.4	1.3	COR/SID	COR/SID	SKWDST	SKWDST
13971	RND/OBT	ANG/OBT	14.8	7.1	8.9	2.0	2.1	SID	COR	SYM	SKWDST
13972	ANG/OBT	ANG/OBT	15.4	7.9	7.8	2.5	2.3	COR/SID	COR	SKWDST	SKWDST
13973	RND/OBT	RND/OBT	16.4	8.1	7.9	2.9	2.6	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
13970	RND	RND/SQ	Yes	8.9	2.2	1.9	SQ/CON	RND/CON	16.8	STR	Yes	Yes
13971	RND	ANG	Yes	9.9	2.4	0.0	RND/CON	RND	16.8	STR	Yes	Yes
13972	RND	RND	Yes	8.8	2.1	0.0	RND/CON	ANG	18.3	STR	Yes	Yes
13973	RND	RND	Yes	9.1	1.3	1.5	RND/CON	SQ/CON	20.0	STR	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
13974	B / B	50.5	24.7	5.7	7.66	Brown Chert (KRF)	BR	SLASY	HIGH	BI	LEN
13975	Comp.	50.4	20.9	5.8	5.63	Brown Chert (KRF)	BR	SLASY	HIGH	BI	BI
13984	B / B	21.5	17.7	4.9	1.95	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI
13985	Comp.	37.3	17.4	6.3	3.20	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
13974		40.7	EXC	REC	40.4	41.2	OVT	Yes	12.5	Yes	24.7
13975	PT	38.9	EXC	EXC	38.3	40.8	OVT	No		Yes	20.9
13984			REC	EXC			OVT	Yes	2.0	Yes	17.7
13985	PT	28.9	EXC/INC	EXC	28.5	29.4	OVT	No		Yes	17.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
13974	RND/OBT	RND/RT	16.4	8.3	8.5	3.6	3.0	COR/SID	COR/SID	SKWDST	SKWDST
13975	RND/OBT	RND/OBT	13.5	8.5	8.0	3.6	2.7	SID	COR/SID	SYM	SKWPRX
13984	ANG/RT	ANG/OBT	11.8	6.1	5.6	2.6	2.2	COR/SID	SID	SKWDST	SYM
13985	RND/OBT	ANG/OBT	12.2	8.6	6.5	2.8	2.2	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
13974	RND	RND	Yes	9.8	2.8	1.2	RND/CON	RND/CON	20.2	STR	Yes	Yes
13975	RND	RND	Yes	11.5	3.5	2.4	SQ	RND/EXP	18.4	CVX	Yes	Yes
13984	RND	RND	Yes	7.0	1.3	2.2	RND/CON	RND/EXP	14.6	STR	Yes	Yes
13985	RND	RND	Yes	8.4	1.4	1.7	RND/CON	RND/CON	16.8	CCV	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
13986	Comp.	37.4	21.7	7.7	5.30	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
13987	B / B / T	18.9	14.7	3.9	0.99	Trans. Chalcedony	Y	SLASY	MED	BI	BI
13989	Comp.	51.2	22.3	6.1	5.84	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
13990	B / B	25.5	23.4	5.8	3.46	W/G/BR Chalcedony	W	SLASY	HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
13986	SH	26.4	REC	EXC	28.6	27.2	OVT	Yes	13.0	Yes	21.7
13987	PT	12.0	EXC/INC	EXC	11.8	13.5	OVT	No		No	14.7
13989	PT	41.2	REC	EXC	42.7	42.3	OVT	Yes	4.0	Yes	22.3
13990			STR	STR				No		No	23.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
13986	RND/OBT	RND/OBT	16.3	8.2	8.2	1.8	2.3	COR/SID	COR/SID	SKWDST	SKWDST
13987	ANG/OBT	ANG/OBT	9.9		6.7		2.3	COR/SID	COR/SID	SKWDST	SKWDST
13989	RND/OBT	ANG/OBT	15.8	9.1	9.1	2.4	2.7	COR/SID	COR/SID	SKWDST	SKWDST
13990	ANG/OBT	ANG/OBT	15.5	8.1	9.3	3.4	3.4	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
13986	RND	RND	Yes	11.0	1.9	2.5	SQ/EXP	ANG/RND	18.8	STR	Yes	Yes
13987	RND	RND	Yes	6.9		1.1		RND/CON		CCV	Yes	Yes
13989	RND	RND	Yes	10.0	1.3	1.8	RND/CON	RND/CON	18.3	CCV	Yes	Yes
13990	RND	RND/SQ	Yes	9.9	2.3	2.1	RND/CON	RND/CON	19.3	STR	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
13992	B / B	39.4	22.0	6.1	4.80	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
13995	B / B / T	45.6	21.8	5.2	4.58	Brown Chert (KRF)	BR	SYM	MED/HIGH	PLCX	LEN
13997	Comp.	35.0	19.1	7.8	4.01	Petrified Wood	BR	SLASY	MED	PLTR	BI
19565	B / B	33.1	20.8	6.5	4.84	Brown Chert (KRF)	BR	SLASY	HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
13992		29.1	REC	STR	31.2	31.2	TRI	Yes	11.5	Yes	22.0
13995	PT	35.0	EXC	EXC	35.8	37.3	OVT	No		Yes	21.8
13997	PT	24.2	STR	EXC/INC	28.3	24.6	OVT	Yes	6.0	No	19.1
19565			EXC	EXC			OVT	No		Yes	20.8

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
13992	RND/OBT	RND/OBT	14.3	6.5	6.9	2.0	2.2	COR/SID	COR/SID	SKWDST	SKWDST
13995	ANG/OBT	RND/OBT	14.4	9.2		2.8		SID		SKWPRX	
13997	ANG/OBT	RND/OBT	15.8	6.7	11.8	1.5	1.6	COR/SID	SID	SKWDST	SYM
19565	ANG/OBT	ANG/OBT	16.0	8.8	7.1	2.3	2.1	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
13992	RND	RND	Yes	10.3	2.8	2.2	RND/CON	SQ/EXP	16.4	CCV	Yes	Yes
13995	RND	RND	Yes	10.6	2.3		RND/CON			STR	Yes	Yes
13997	RND	RND	Yes	10.8	1.8	1.7	SQ/CON	SQ/CON	17.1	CCV	No	No
19565	RND	RND	Yes	10.3	1.5	3.5	ANG/RND	RND/CON	18.1	CCV	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
19758	B / B	21.0	21.0	5.7	2.80	Siltstone	BK	SYM	MED/HIGH	BI	BI
19764	Comp.	39.9	21.6	5.6	4.76	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI
19765	Comp.	32.5	22.2	6.5	4.01	Swan River Chert	W	SLASY	MED	BI	PLCX
19767	B / B	30.7	19.4	6.6	3.82	Miscellaneous Chert	Y	SLASY	MED/LOW	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
19758			EXC					Yes	6.0	Yes	21.0
19764	PT	28.6	EXC	EXC	31.2	27.7	OVT	Yes	8.5	Yes	21.5
19765	PT	22.6	EXC	EXC	23.9	25.1	TRI	No		Yes	22.2
19767		22.8	STR	EXC	23.7	22.6	OVT	No		Yes	19.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
19758	RND/RT	RND/OBT	13.2	6.0	6.7	3.2	2.4	COR/SID	COR/SID	SKWDST	SKWDST
19764	ANG/OBT	ANG/OBT	14.7	6.7	8.2	3.7	3.2	SID	SID	SKWDST	SYM
19765	RND/OBT	RND/OBT	14.0	7.6	8.6	3.5	2.7	COR/SID	COR/SID	SKWDST	SKWDST
19767	RND/OBT	RND/OBT	15.7		7.7		1.4		COR		SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
19758	RND/SQ	RND	Yes	8.4	1.4	1.1	RND/CON	RND/CON	16.6	CVX	Yes	Yes
19764	RND/SQ	RND/SQ	Yes	11.3	4.0	4.1	RND/EXP	RND/CON	21.6	STR	Yes	Yes
19765	RND	RND	Yes	9.9	2.4	2.0	RND/SQ	RND/EXP	18.2	STR	Yes	Yes
19767	RND	RND	Yes	7.9		0.0		RND		STR	Yes	Yes

Fincastle (DlOx-5) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
19768	B / B	63.3	22.5	7.1	10.55	Brown Chert (KRF)	BR	SLASY	HIGH	BI	BI
19770	Comp.	34.3	17.2	4.5	2.50	Brown Chert (KRF)	BR	SLASY	MED	BI	LEN
19771	Comp.	21.6	12.5	3.2	0.69	Brown Chert (KRF)	BR	SYM	MED/LOW	PLTR	PLCX
19772	Comp.	30.0	17.1	4.1	2.33	Siltstone	MG	SYM	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
19768		53.4	EXC	EXC	53.0	52.5	OVT	Yes	8.0	Yes	22.5
19770	PT	25.4	EXC	EXC	26.0	24.9	TRI	Yes	8.5	Yes	17.2
19771	PT	17.4	EXC	EXC	17.5	17.3	OVT	No		No	11.3
19772	PT	24.1	EXC	EXC	26.2	23.6	OVT	Yes	4.0	Yes	17.1

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
19768	RND/OBT	RND/OBT	12.6	7.9	9.2	3.1	3.5	COR/SID	COR/SID	SKWDST	SYM
19770	ANG/OBT	RND/OBT	10.1	6.5	6.9	3.6	3.2	COR/SID	COR	SKWDST	SKWDST
19771	RND/OBT	RND/OBT	8.1	3.3	3.7	1.6	1.6	SID	SID	SYM	SYM
19772	RND/OBT	RND/OBT	13.5	4.7	4.5	1.3	0.9	COR	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
19768	RND/SQ	RND/SQ	Yes	9.9	2.2	1.7	RND/EXP	RND/CON	16.4	STR	Yes	Yes
19770	RND	RND/SQ	Yes	8.9	1.2	0.0	RND/CON	ANG	15.5	CVX	Yes	Yes
19771	RND/SQ	RND/SQ	Yes	4.2	0.9	1.0	SQ/CON	SQ/CON	12.5	STR	Yes	No
19772	RND	RND	Yes	5.9	0.0	1.2	ANG	RND/CON	14.1	STR	Yes	No

One-Eleven (EgPn-111) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
154	B / B / T	35.2	17.2	5.5	2.72	Opaq. Yellow Chert	Y	SYM	MED/HIGH	BI	BI
251	Comp.	17.0	10.9	2.3	0.37	Brown Chert (KRF)	BR	SYM	MED/LOW	PLCX	LEN
277	Comp.	36.3	20.1	5.1	3.26	Brown Chert (KRF)	BR	ASY	MED	PLCX	PLCX
305	Comp.	27.0	19.6	7.1	3.26	Med-Fine Quartzite	PK	SYM	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
154		28.8	STR	STR	29.7	29.4	TRI	No		Yes	17.2
251		13.4	STR	EXC/INC	13.6	13.2	TRI	No		No	10.9
277		27.0	EXC	REC	26.4	28.6	OVT	Yes	7	Yes	17.5
305		19.0	EXC/INC	EXC/INC	19.6	20.8	OVT	No		Yes	19.6

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
154	ANG/ACT	ANG/RT	10.0	4.4		2.6		COR		SYM	
251	ANG/OBT	ANG/RT	8.5	2.8	2.7	0.9	1.4	COR	COR	SKWPRX	SKWDST
277	RND/OBT	RND/OBT	14.5	8.2	5.8	2.0	2.7	SID	SID	SKWDST	SKWDST
305	ANG/RT	RND/OBT	15.3	5.5	5.6	2.2	2.3	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
154	RND/SQ		Yes	6.4						CVX	Yes	Yes
251	RND	RND/SQ	Yes	3.6	0.0	0.0	RND	ANG	10.0	CVX	Yes	No
277	RND	RND/SQ	Yes	9.3	3.2	2.3	RND/EXP	SQ/CON	20.1	CCV	Yes	Yes
305	RND	RND	Yes	8.0	2.4	1.6	RND/CON	RND/CON	17.7	STR	Yes	Yes

One-Eleven (EgPn-111) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
358	Comp.	28.2	15.2	3.8	1.64	Brown Chert (KRF)	BR	ASY	MED/LOW	PLTR	LEN
413	B / B	25.1	21.2	4.2	2.98	Pat. Yellow Chert	BR	SYM	MED	PLCX	CCV/CVX
943	B / B / T	25.2	17.3	4.6	1.90	Med-Fine Quartzite	Y	SLASY	LOW	PLTR	PLCX
957	B / B / T	18.4	12.2	2.9	0.64	Brown Chert (KRF)	BR	SYM	MED	PLTR	LEN

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
358	RND	20.9	EXC	EXC	20.0	22.8	OVT	No		Yes	15.2
413			EXC	EXC			OVT	No		Yes	21.2
943	RND	20.6	STR	INC	22.5		TRI	No		Yes	
957	PT	14.1	EXC	EXC	14.5	13.9	OVT	No		Yes	12.2

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
358	RND/OBT	RND/OBT	11.6	5.8	4.8	1.8	2.1	COR/SID	COR/SID	SYM	SKWDST
413	RND/OBT		16.1	7.1	5.5	2.0	1.7	COR/SID	COR/SID	SYM	SKWDST
943	RND/ACT		8.1	3.7		2.8		COR		SKWDST	
957		RND/OBT			2.7		1.2		SID		SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
358	RND	RND/SQ	Yes	7.3	3.4	1.6	RND/ANG	RND/EXP	14.8	STR	No	Yes
413	RND	RND	Yes	8.5	2.5	2.6	RND/CON	RND/EXP	18.3	STR	Yes	Yes
943	RND/SQ		Yes	4.6						STR	Yes	Yes
957		RND	No	4.3		1.6		RND/CON		CVX	Yes	Yes

One-Eleven (EgPn-111) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
968	Comp.	22.4	11.9	4.1	0.95	Misc. Chert	W	ASY	MED	PLCX	LEN
970	Comp.	14.9	13.6	3.8	0.78	W/G/BR Chalcedony	W-LG	SYM	MED/LOW	BI	BI
981	Comp.	35.9	19.0	6.5	3.80	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
982	Comp.	21.9	14.7	4.6	1.28	Siltstone	BR	SLASY	MED/LOW	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
968	PT	16.5	STR	EXC	17.1	16.6	TRI	No		No	11.6
970	PT	8.0	EXC	EXC	10.8	8.9	OVT	No		Yes	13.6
981	PT	27.0	EXC	EXC/INC	28.2	29.0	OVT	No		Yes	19.0
982	PT	15.1	STR	STR	17.0	13.8	TRI	No		Yes	14.7

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
968	RND/OBT	RND/OBT	8.9	3.2	2.8	2.3	1.2	COR/SID	SID	SKWPRX	SKWDST
970	ANG/RT	RND/OBT	10.8	3.5	2.6	1.6	1.2	SID	SID	SYM	SKWPRX
981	ANG/OBT	RND/OBT	14.1	5.9	5.7	2.5	2.9	SID	SID	SKWDST	SKWDST
982	ANG/RT	RND/OBT	8.2	7.5	6.6	1.9	1.6	COR	COR/SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
968	RND	RND	No	5.9	3.0	1.9	RND/EXP	RND/SQ	11.9	CCV/CVX	Yes	No
970	RND/SQ	RND	Yes	6.9	3.4	4.1	RND/CON	SQ/CON	12.9	STR	Yes	Yes
981	RND/SQ	RND/SQ	Yes	8.9	3.2	2.5	RND/EXP	RND/EXP	18.6	STR	Yes	Yes
982	RND	RND	No	6.8	0.0	1.2	RND	SQ/CON	9.3	STR	Yes	No

One-Eleven (EgPn-111) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
985	Comp.	26.4	17.4	2.8	1.57	Brown Chert (KRF)	BR	SYM	MED/HIGH	LEN	PLCX
986	B / B / T	35.7	19.5	3.5	2.33	Siltstone	BK	SYM	HIGH	BI	BI
987	Comp.	31.3	15.0	3.8	1.66	Brown Chert (KRF)	BR	SLASY	MED/HIGH	CCV/CVX	LEN
989	Comp.	27.8	17.4	4.0	1.83	Med-Fine Quartzite	BR	SYM	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
985	PT	19.5	EXC	EXC	19.4	21.0	OVT	No		Yes	17.4
986	PT	29.7	STR	STR	31.6		TRI	No		Yes	
987	PT	24.1	EXC	EXC	23.7	23.7	OVT	No		Yes	15.0
989	PT	20.5	EXC	EXC	21.7	21.6	OVT	No		Yes	17.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
985	ANG/OBT	ANG/OBT	13.2	5.4	5.4	2.5	2.0	COR/SID	COR/SID	SKWDST	SKWDST
986	ANG/ACT		8.5	4.7		5.3		COR	COR	SKWDST	SKWDST
987	RND/OBT	ANG/OBT	11.7	5.1	5.2	2.4	1.3	COR/SID	COR	SYM	SKWDST
989	RND/OBT	RND/OBT	11.0	5.0	4.5	3.3	2.6	SID	SID	SKWPRX	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
985	RND	RND	Yes	6.9	1.1	1.0	RND/EXP	RND/CON	17.3	STR	Yes	Yes
986	RND/SQ	RND/SQ	No	6.0	0.0	0.0	RND	RND	12.2	STR	Yes	No
987	RND/SQ	RND	Yes	7.2	2.9	0.0	RND/SQ	RND	14.2	CCV	Yes	Yes
989	RND/SQ	RND/SQ	Yes	7.3	1.7	2.9	RND/CON	RND/SQ	16.3	STR	Yes	Yes

Happy Valley (EgPn-290) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
1	Comp.	26.6	17.3	5.0	2.09	Black Chert	BK	SYM	MED	BI	CCV/CVX
2	Comp.	33.7	15.0	5.4	2.63	Misc. Chert	BR	SLASY	LOW	BI	BI
3	B / B	27.7	14.0	5.5	2.18	Med-Fine Quartzite	Y	SLASY	MED/LOW	BI	BI
6	Comp.	21.2	15.7	5.5	1.71	Swan River Chert	W	SLASY	MED	BI	PLTR

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
1	PT	20.4	STR	EXC	21.0	20.9	TRI	Yes	2.0	Yes	17.3
2	PT	23.9	EXC	STR	25.4	23.3	TRI	No		No	15.0
3		18.8	EXC	EXC			OVT			Yes	14.0
6	BL	13.3	EXC	EXC	15.4	14.1	OVT	No		Yes	15.7

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
1	ANG/RT	ANG/RT	10.9	4.9	4.9	2.7	2.4	COR/SID	COR/SID	SKWDST	SKWDST
2	RND/OBT	ANG/OBT	10.8	5.8	6.2	3.3	2.0	SID	COR/SID	SYM	SKWDST
3	RND/OBT	RND/OBT	10.4	6.1	8.0	2.0	1.6	COR/SID	COR/SID	SKWDST	SKWPRX
6	RND/OBT	RND/OBT	12.3	4.7	6.4	1.5	1.4	SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
1	RND/SQ	RND/SQ	Yes	6.2	1.6	1.3	RND/CON	RND/CON	14.0	STR	Yes	No
2	RND	RND/SQ	Yes	9.8	2.1	3.6	RND/CON	RND/CON	14.8	CVX	Yes	Yes
3	RND	RND	Yes	8.9	3.1	1.4	RND/EXP	SQ/CON	12.6	CVX	Yes	Yes
6	RND	RND	Yes	7.9	3.6	2.0	RND/SQ	RND/CON	14.1	STR	Yes	No

Muhlbach (FbPf-1) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
002	Comp.	35.4	18.9	3.6	2.13	Brown Chert (KRF)	BR	SYM	LOW	BI	CCV/CVX
024	B / B	27.6	22.9	6.1	4.49	Brown Chert (KRF)	BR		MED	BI	BI
030	Comp.	36.8	20.5	5.6	4.46	Brown Chert (KRF)	BR	SYM	MED/LOW	PLTR	PLCX
032	B / B	33.6	21.4	4.0	3.04	Brown Chert (KRF)	BR	SYM	MED/LOW	PLTR	PLCX

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
002	PT	27.2	EXC	EXC	28.4	27.5	OVT	No		Yes	18.9
024							OVT	No		Yes	22.9
030	PT	27.3	EXC	EXC	28.0	26.7	OVT	No		Yes	20.5
032		24.9	EXC	EXC	24.9	25.1	OVT	Yes	10.0	Yes	21.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
002	ANG/RT	RND/OBT	13.7	5.1	5.9	2.1	1.7	COR/SID	COR/SID	SKWPRX	SKWDST
024	RND/OBT	RND/OBT	16.2	8.9	7.2	2.4	2.5	COR/SID	COR/SID	SKWDST	SKWDST
030	ANG/OBT	RND/OBT	15.7	5.6	8.2	2.2	2.0	COR/SID	COR/SID	SYM	SKWPRX
032	RND/OBT	RND/OBT	14.9	7.1	5.8	2.3	1.8	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
002	RND	RND	Yes	8.2	3.0	1.9	RND/CON	RND/CON	15.5	STR	Yes	No
024	RND	RND	No	9.9	1.2	2.7	RND/CON	RND/EXP	20.4	STR	Yes	Yes
030	RND	RND	Yes	9.5	3.2	2.8	RND/CON	RND/CON	18.1	CVX	Yes	Yes
032	RND	RND	Yes	8.7	1.4	3.1	RND/CON	RND/CON	17.3	STR	Yes	Yes

Muhlbach (FbPf-1) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
048	Comp.	25.7	14.7	3.8	1.31	Brown Chert (KRF)	BR	ASY	LOW	PLTR	PLTR
054	Comp.	31.1	15.3	3.7	1.51	Brown Chert (KRF)	BR	SYM	LOW	PLTR	LEN
058	B / B	30.7	17.2	2.8	1.73	Brown Chert (KRF)	BR	SYM	MED/LOW	PLCX	LEN
064	Comp.	24.8	14.8	3.4	1.43	Brown Chert (KRF)	BR	SYM	LOW	PLTR	LEN

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
048	SH	18.7	EXC	EXC	21.0	16.5	OVT	Yes	7.5	Yes	14.7
054	PT	22.4	EXC	EXC	22.2	22.7	OVT	No		Yes	14.8
058		22.4	EXC	EXC			OVT	No		Yes	17.2
064	PT	18.0	EXC	EXC	19.8	19.5	OVT	Yes	11.0	Yes	14.3

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
048	RND/OBT	RND/OBT	11.4	6.2	5.7	1.3	1.7	COR/SID	SID	SKWPRX	SKWPRX
054	ANG/OBT	RND/OBT	8.4	8.7	5.5	1.9	1.3	COR/SID	COR/SID	SKWDST	SKWDST
058	RND/OBT	RND/OBT	12.4	5.5	6.7	2.2	1.9	COR/SID	COR/SID	SKWDST	SYM
064	RND/OBT	RND/OBT	10.8	3.6	6.7	1.3	0.5	COR/SID	COR	SKWPRX	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
048	RND	RND	No	7.0	2.0	3.0	RND/CON	RND/CON	13.1	STR	Yes	Yes
054	RND	RND	Yes	8.7	2.6	2.3	RND/CON	RND/CON	9.5	STR	Yes	No
058	RND	RND	Yes	8.3	2.7	3.6	SQ/CON	RND/CON	15.4	CVX	No	No
064	RND	RND	No	6.8	2.4	0.0	RND/CON	ANG	11.4	STR	No	No

Muhlbach (FbPf-1) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
065	B / B / T	29.8	15.5	4.3	1.73	Brown Chert (KRF)	BR	SYM	MED/LOW	PLCX	PLTR
071	B / B	38.1	18.5	3.6	2.94	Brown Chert (KRF)	BR	SYM	MED/LOW	PLTR	PLTR
087	B / B	22.1	13.7	2.5	0.90	Brown Chert (KRF)	BR	SYM	MED/LOW	PLTR	LEN
097	B / B	33.6	20.1	6.1	4.36	Brown Chert (KRF)	BR	SLASY	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
065	PT	19.8	EXC/INC	EXC	21.6	22.7	OVT	Yes		Yes	15.5
071			REC	EXC			OVT	Yes	5.0	Yes	18.5
087		14.8	EXC	REC	15	15.5	OVT	No		Yes	13.7
097			EXC	EXC			OVT	No		Yes	20.1

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
065	RND/OBT	RND/OBT	9.4		6.9		2.1		COR/SID	SKWDST	SYM
071	ANG/OBT	ANG/OBT	14.5	5.2	5.3	1.6	1.7	COR/SID	COR/SID	SKWDST	SKWDST
087	RND/OBT	ANG/OBT	10.4	4.2	4.9	1.4	1.8	SID	COR/SID	SYM	SKWPRX
097	RND/OBT	RND/OBT	15.5	5.8	8.5	1.7	1.5	COR/SID	COR/SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
065	RND	RND	Yes	10.0								
071	RND	RND/SQ	Yes	8.1	3.1	2.1	RND/CON	RND/CON	16.4	STR	Yes	Yes
087	RND	RND	Yes	7.3	3.4	2.0	RND/SQ	RND/CON	12.7	STR	No	No
097	RND	RND	Yes	9.2	3.2	3.0	RND/SQ	RND/CON	17.5	STR	Yes	Yes

Muhlbach (FbPf-1) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
100	Comp.	24.4	14.9	3.6	0.98	Brown Chert (KRF)	BR	SLASY	MED/LOW	PLTR	LEN
128	B / B / T	27.7	18.8	4.5	2.47	Siltstone	BK	SYM	MED	BI	BI
182	B / B / T	29.8	17.3	6.7	3.03	Brown Chert (KRF)	BR	SYM	LOW	PLTR	BI
222	Comp.	37.9	22.1	4.7	4.31	Op. Yellow Chert	Y	ASY	MED	PLTR	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
100	PT	16.5	REC	EXC	16.3	17.8	OVT	No		Yes	14.9
128	PT	20.1	EXC	EXC	20.0	21.1	OVT	No		Yes	18.8
182	PT	21.2	STR	INC		21.4	INC	Yes	11.0	Yes	
222	PT	29.2	EXC	EXC/INC	28.2	31.0	OVT	Yes	2.0	Yes	21.3

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
100	RND/OBT	RND/OBT	8.2	5.4	4.5	2.1	1.9	COR/SID	COR/SID	SKWDST	SKWDST
128	RND/OBT	RND/OBT	15.2	6.8		1.9		SID		SKWDST	SKWDST
182		RND/RT	15.0		6.7		2.6		COR/SID		SKWPRX
222	RND/OBT	RND/OBT	15.0	8.7	5.1	1.6	2.1	COR/SID	COR/SID	SYM	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
100	RND	RND	Yes	7.9	3.8	4.1	RND/CON	RND/CON	9.7	CVX	Yes	No
128	RND	RND	Yes	7.6	3.1		RND/CON			CCV	Yes	No
182		RND/SQ	Yes	8.6		2.0		RND/CON	16.7	STR	Yes	Yes
222	RND	RND	Yes	8.7	1.6	3.1	RND/CON	RND/SQ	16.8	STR	Yes	No

Muhlbach (FbPf-1) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
225	B / B	25.2	14.3	3.1	1.26	Pebble Chert	BK	SLASY	MED/LOW	PLCX	PLCX
247	Comp.	21.7	12.0	2.4	0.58	Brown Chert (KRF)	Y	SYM	LOW	LEN	LEN
264	B / B	30.2	21.2	5.6	3.35	Brown Chert (KRF)	BR	SYM	MED	BI	BI
271	B / B	43.8	24.1	6.7	8.31	Brown Chert (KRF)	BR	ASY	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
225			STR	EXC			OVT	No		Yes	14.3
247	PT	13.6	STR	STR	14.1	14.9	TRI	No		Yes	12.0
264		19.8	EXC/INC	EXC			OVT	Yes	4.0	Yes	18.3
271			EXC	EXC			OVT	No		Yes	24.1

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
225	RND/RT	RND/RT	8.4	4.9	5.5	2.3	1.9	COR/SID	COR/SID	SKWPRX	SKWDST
247	RND/OBT	RND/RT	8.7	4.4	3.7	1.8	1.4	COR/SID	COR/SID	SYM	SKWDST
264	RND/OBT	ANG/OBT	14.2	8.3	8.3	3.0	2.9	COR/SID	COR/SID	SKWDST	SKWDST
271	RND/OBT	RND/OBT	17.4	12.8	9.8	2.6	2.7	COR/SID	COR/SID	SKWDST	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
225	RND	RND	Yes	6.9	2.0	2.2	RND/CON	RND/CON	9.5	CVX	No	Yes
247	RND	RND	No	8.1	4.0	3.9	RND/CON	RND/CON	8.3	STR	No	Yes
264	RND	RND	Yes	10.4	1.7	2.0	SQ/CON	SQ/CON	21.2	STR	Yes	Yes
271	RND	RND	Yes	13.2	1.9	3.2	RND/CON	RND/SQ	20.1	STR	Yes	Yes

Muhlbach (FbPf-1) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
280	Comp.	34.4	16.7	3.4	2.09	Brown Chert (KRF)	BR	SYM	MED	PLCX	BI
286	B / B	23.3	19.5	4.7	2.86	Brown Chert (KRF)	BR	SYM	MED	BI	BI
306	Comp.	36.4	18.2	6.2	4.01	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
280	PT	27.6	EXC	EXC	28.9	27.1	OVT	No		Yes	16.7
286			EXC	EXC			OVT	No		Yes	19.5
306	PT	27.4	EXC/INC	EXC/INC	28.9	26.2	OVT	Yes	2.5	Yes	18.1

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
280	RND/OBT	RND/OBT	11.5	4.9	5	1.1	1.6	COR/SID	COR/SID	SKWDST	SKWDST
286	RND/OBT	RND/OBT	15.9	5.1	5.4	1.1	1.3	COR/SID	COR/SID	SKWDST	SYM
306	RND/OBT	RND/OBT	13.3	5.3	5.8	2.4	2.3	SID	SID	SKWDST	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
280	RND	RND	Yes	6.8	1.4	2.1	RND/CON	RND/CON	12.0	CVX	Yes	Yes
286	RND	RND	Yes	8.7	3.2	2.1	RND/SQ	RND/CON	16.9	STR	Yes	Yes
306	RND/SQ	RND/SQ	Yes	9.0	3.2	3.0	RND/CON	RND/CON	18.2	STR	Yes	Yes

Muhlbach (FbPf-1) Data – From the missing projectile points

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
1	B / B	33.1	21.3	5.2	4.21	Brown Chert (KRF)	BR	SLASY	MED/HIGH		
2	Comp.	40.1	21.4	5.4	4.47	Brown Chert (KRF)	BR	SLASY	MED		
3	Comp.	43.0	20.2	5.7	5.22	Brown Chert (KRF)	BR	SLASY	MED/HIGH		
4	B / B	54.5	24.8	5.4	7.96	Brown Chert (KRF)	BR	SYM	MED/HIGH		

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
1			EXC	EXC			OVT				21.3
2	BL	29.5	REC	INC/EXC	30.8	31.2	INC/EXC				21.4
3	SH	33	EXC	INC/EXC	36.5	34.7	OVT				20.0
4		44.6	EXC	EXC			OVT				24.8

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
1	RND/OBT	ANG/OBT	15.2	5.7	7.5	1.8	2.2	COR/SID	COR/SID	SYM	SYM
2	RND/OBT	RND/OBT	14.3	7.3	9.3	2.2	2.4	COR/SID	COR/SID	SKWPRX	SYM
3	ANG/OBT	ANG/OBT	15.5	5.8	6.3	1.6	2.5	SID	COR/SID	SKWDST	SYM
4	RND/OBT	ANG/OBT	16.5		8.1		3.6	COR/SID	COR/SID		SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
1	RND	RND	Yes	8.6	1.7	1.8	SQ/EXP	RND/CON	17.4	STR	Yes	Yes
2	RND/SQ	RND	Yes	10.6	2.9	0.0	RND/SQ	ANG	17.1	CCV/CVX	Yes	Yes
3	RND	RND	Yes	10.0	3.2	3.6	SQ/CON	RND/EXP	17.8	STR	Yes	Yes
4	RND	ANG	Yes	9.9		2.0		RND/EXP		CCV	Yes	No

Muhlbach (FbPf-1) Data – From the missing projectile points

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
5	Comp.	51.9	22.1	8.6	8.63	Brown Chert (KRF)	BR	SYM	MED/HIGH		
6	B / B / T	58.7	21.6	6.4	9.15	Brown Chert (KRF)	BR	SLASY	HIGH		
7	B / B / T	50.9	25.2	6.1	8.28	Brown Chert (KRF)	BR	SYM	MED/HIGH		
8	Comp.	46.6	21.6	6.2	5.73	Brown Chert (KRF)	BR	SLASY	MED		

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
5	PT	39.9	EXC	EXC	41.2	41.6	OVT				22.1
6		47.4	EXC	REC			OVT				21.6
7	RND	41.3	EXC	EXC	42.9	42.1	OVT				25.2
8	RND	37.4	EXC	INC/EXC	38.7	40.0	OVT				19.9

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
5	ANG/OBT	RND/OBT	15.8	9.3	6.8	2.7	2.2	COR/SID	COR/SID	SKWPRX	SKWPRX
6	RND/OBT	RND/OBT	15.0	7.7	7.9	3.0	2.9	SID	SID	SYM	SYM
7	RND/OBT	RND/OBT	18.2	7.8		2.4		COR/SID		SKWDST	
8	ANG/OBT	ANG/OBT	15.4	8.6	5.8	2.6	1.2	SID	SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
5	RND	RND	Yes	12.0	0.0	4.6	RND	SQ/CON	18.4	CCV/CVX	Yes	Yes
6	RND	RND	Yes	11.3	3.0	2.7	RND/CON	RND/EXP	19.2	CCV/CVX	Yes	Yes
7	RND/SQ		Yes	9.6	1.6		RND/SQ			CCV	Yes	No
8	RND	RND	Yes	9.2	1.1	2.7	RND/CON	RND/CON	17.5	CCV	Yes	Yes

Muhlbach (FbPf-1) Data – From the missing projectile points

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
9	Comp.	32.8	22.2	7.5	5.73	Brown Chert (KRF)	BR	ASY	MED		
10	Comp.	37.6	20.8	5.5	4.99	Brown Chert (KRF)	BR	ASY	MED/HIGH		
11	B / B / T	45.5	21.9	5.3	5.31	Brown Chert (KRF)	BR	SLASY	MED		
12	B / B	28.0	20.8	5.8	3.83	Brown Chert (KRF)	BR	SLASY	MED		

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
9	BL	21.4	INC/EXC	REC	23.1	25.2	INC/EXC				22.2
10	BL	28.0	REC	EXC	31.1	29.6	OVT				20.8
11		36.2	EXC/INC	EXC			INC/EXC				20.6
12		18.6	EXC	EXC			OVT				

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
9	RND/RT	ANG/OBT	16.6	8.8	7.4	2.7	2.4	COR/SID	COR/SID	SKWDST	SKWPRX
10	RND/OBT	RND/OBT	14.5	6.9	6.3	2.4	2.2	COR/SID	COR/SID	SKWPRX	SYM
11	RND/OBT	RND/OBT	14.2	6.0	7.1	2.3	2.9	COR/SID	COR/SID	SYM	SKWDST
12		RND/RT	15.7		7.2		2.6		SID		SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
9	RND/SQ	RND	Yes	11.4	1.9	3.8	RND/CON	ANG/RND	20.0	CVX	Yes	Yes
10	RND	RND	Yes	9.6	2.7	2.6	RND/CON	SQ/CON	17.2	STR	Yes	Yes
11	RND/SQ	RND/SQ	Yes	9.3	2.5	2.5	RND/CON	SQ/CON	17.6	STR	Yes	Yes
12		RND/SQ	Yes	9.4	2.1	1.9	RND/CON	RND/CON	20.8	STR	Yes	Yes

Muhlbach (FbPf-1) Data – From the missing projectile points

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
13	Comp.	35.1	18.2	5.3	3.53	Brown Chert (KRF)	BR	SYM	MED		
14	B / B / T	30.9	19.1	6.4	4.00	Brown Chert (KRF)	BR	SYM	MED		
15	Comp.	35.6	22.1	5.0	4.43	Brown Chert (KRF)	BR	SLASY	MED/LOW		
16	B / B	29.8	21.5	5.1	3.96	Brown Chert (KRF)	BR	SLASY	MED		

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
13	RND	24.6	EXC	EXC	26.0	27.1	OVT				18.2
14		20.3	EXC	EXC			OVT				19.1
15	RND	24.1	EXC	EXC	26.2	26.0	OVT				19.5
16			EXC	REC			REC				21.5

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
13	RND/OBT	RND/OBT	12.9	6.2	6.8	2.6	2.3	SID	SID	SKWDST	SKWDST
14	ANG/OBT	ANG/OBT	14.5	6.9	6.8	2.3	2.2	SID	SID	SKWDST	SKWDST
15	ANG/OBT	RND/OBT	16.8	7.6	8.3	2.8	1.6	SID	SID	SKWDST	SKWPRX
16	RND/OBT	ANG/OBT	16.1	6.1	9.7	2.4	2.1	SID	COR/SID	SKWPRX	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
13	RND/SQ	RND	Yes	10.5	4.8	3.1	SQ/CON	SQ/CON	16.9	STR	Yes	No
14	RND	RND	Yes	10.6	3.6	2.8	RND/CON	RND/CON	19.1	STR	Yes	Yes
15	RND	ANG	Yes	11.5	3.6	4.5	RND/CON	SQ/CON	22.1	STR	Yes	Yes
16	RND/SQ	RND	Yes	11.3	5.6	1.2	SQ/EXP	RND/CON	19.7	CCV	Yes	Yes

Muhlbach (FbPf-1) Data – From the missing projectile points

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17	Comp.	25.6	17.6	6.9	3.03	Brown Chert (KRF)	BR	SYM	MED/HIGH		
18	Comp.	40.2	21.3	6.3	5.16	Brown Chert (KRF)	BR	SYM	MED		
19	Comp.	34.9	20.6	5.9	4.39	Misc. Chert	Y	SYM	MED/HIGH		
20	Comp.	23.8	18.8	4.7	2.30	Brown Chert (KRF)	BR	SYM	MED		

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17	PT	15.5	EXC	EXC	18.3	17.2	OVT				17.3
18	PT	31.0	REC	EXC	32.1	33.1	OVT				21.3
19	RND	25.6	EXC	EXC	26.5	28.4	OVT				20.6
20	SH	15.6	EXC	EXC/INC	18.4	17.6	OVT				18.8

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17	RND/OBT	RND/OBT	13.9	7.2	8.2	1.8	2.3	SID	SID	SKWDST	SKWPRX
18	RND/OBT	ANG/OBT	13.7	10.2	7.9	1.4	1.8	COR	COR	SKWDST	SKWPRX
19	ANG/OBT	ANG/RT	15.8	8.7	7.0	2.2	1.9	SID	COR/SID	SKWPRX	SKWDST
20	ANG/RT	RND/OBT	15.4	5.0	5.7	1.3	1.7	COR/SID	SID	SKWDST	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17	RND	RND	Yes	10.1	2.1	2.9	SQ/CON	SQ/CON	17.6	STR	Yes	Yes
18	RND	RND	Yes	9.2	0.0	0.0	ANG	RND	14.5	CCV	Yes	Yes
19	RND/SQ	RND	No	9.3	2.3	0.0	RND/CON	ANG	18.8	CCV/CVX	Yes	No
20	RND	RND	Yes	8.2	2.1	2.7	ANG/RND	RND/SQ	17.8	STR	Yes	Yes

Muhlbach (FbPf-1) Data – From the missing projectile points

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
21	Comp.	30.6	19.7	5.5	3.68	Brown Chert (KRF)	BR	SYM	MED/HIGH		
22	B / B	27.1	21.4	5.7	3.72	Brown Chert (KRF)	BR	SYM	MED/HIGH		

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
21	BL	21.8	EXC/INC	EXC	23.5	24.3	OVT				19.7
22			EXC	EXC			OVT				21.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
21	ANG/OBT	RND/OBT	16.0	6.6	6.3	1.6	2.2	SID	SID	SKWDST	SYM
22	RND/OBT	RND/OBT	15.0	6.8	7.4	1.9	2.5	COR/SID	COR/SID	SKWDST	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
21	RND	RND	Yes	8.8	2.2	2.0	SQ/CON	RND/SQ	19.2	STR	Yes	Yes
22	RND	RND	Yes	9.0	2.0	2.2	RND/CON	RND/CON	17.2	CCV	Yes	No

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17053	B / B	26.4	19.1	3.1	1.74	Siltstone	MG	SLASY	LOW	PLCX	LEN
17054	B / B / T	40.1	19.8	5.5	4.30	Brown Chert (KRF)	BR	ASY	HIGH	PLTR	BI
17055	Comp.	40.7	21.7	7.5	6.42	Brown Chert (KRF)	BR	SLASY	MED	BI	PLCX
17061	Comp.	15.6	11.1	2.8	0.48	Brown Chert (KRF)	BR	SLASY	MED/LOW	PLCX	CCV/CVX

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17053		19.8	EXC	EXC			OVT	No		No	19.1
17054	BL	31.5	EXC	EXC		31.8	OVT	Yes	13.0	Yes	
17055	PT	28.1	EXC	REC	31.3	29.2	OVT	No		Yes	21.6
17061	RND	8.8	EXC	EXC/INC	10.2	7.8	OVT	No		No	9.6

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17053	ANG/OBT	RND/OBT	12.3	4.9	4.2	1.5	1.1	COR/SID	SID	SKWDST	SYM
17054		ANG/RT	15.1		6.2		2.6	COR/SID	COR/SID	SKWPRX	SKWDST
17055	RND/OBT	RND/OBT	19.2	5.5	7.2	1.9	0.9	SID	COR/SID	SKWDST	SKWDST
17061	RND/OBT	RND/OBT	7.8	3.8	4.6	1.4	1.7	COR/SID	SID	SYM	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17053	RND	RND	No	6.6	2.1	3.6	RND/CON	RND/CON	12.8	STR	No	No
17054	RND	RND/SQ	Yes	8.6	2.3	3.5	RND/EXP	RND/CON	17.8	STR	Yes	Yes
17055	RND	RND	No	12.6	5.1	2.9	RND/SQ	RND/CON	21.7	CVX	Yes	No
17061	RND	RND	Yes	6.8	2.2	2.1	RND/SQ	RND/CON	11.1	CVX	Yes	No

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17062	Comp.	38.8	21.4	4.9	4.28	Brown Chert (KRF)	BR	SLASY	MED	PLTR	PLCX
17063	B / B	23.7	18.1	3.9	1.89	Brown Chert (KRF)	BR	SLASY	LOW	PLTR	PLTR
17066	Comp.	40.6	18.1	4.7	3.33	Brown Chert (KRF)	BR	SYM	MED/HIGH	PLTR	PLCX
17067	B / B	23.1	16.1	3.1	1.04	Brown Chert (KRF)	BR	SYM	MED	BI	PLTR

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17062	PT	29.2	EXC	EXC	30.5	30.8	OVT	No		Yes	20.6
17063			EXC	EXC				No		No	18.1
17066	RND	31.9	EXC	EXC	31.3	31.4	OVT	No		Yes	17.3
17067		16.9	EXC	EXC			OVT	Yes	8.0	Yes	16.1

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17062	RND/OBT	RND/OBT	15.5	5.5	6.1	2.7	2.3	COR	COR/SID	SKWPRX	SKWDST
17063	ANG/OBT	RND/OBT	12.2	7.5	7.3	1.1	1.1	COR	COR/SID	SKWDST	SKWDST
17066	RND/OBT	RND/OBT	11.3	7.7	6.2	2.5	2.5	COR/SID	COR/SID	SYM	SKWDST
17067	RND/OBT	RND/OBT	12.2	6.1	3.7	1.7	1.8	COR/SID	COR/SID	SKWPRX	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17062	RND	RND/SQ	Yes	9.6	0.0	0.0	RND	ANG	18.3	CVX	Yes	No
17063	RND	RND	Yes	8.5		1.1	RND	RND/CON	12.0	STR	Yes	No
17066	RND	RND	Yes	8.7	1.0	2.1	RND/CON	RND/CON	14.2	STR	Yes	Yes
17067	RND	RND	Yes	6.2	1.0	2.7	RND/CON	RND/CON	13.9	STR	No	Yes

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17071	Comp.	13.3	10.9	2.3	0.38	Pat. Brown Chert	W	SYM	MED/LOW	BI	CCV/CVX
17072	Comp.	20.1	12.8	2.7	0.66	Brown Chert (KRF)	BR	SYM	MED	PLCX	CCV/CVX
17074	Comp.	34.3	19.4	5.8	3.78	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI
17078	Comp.	36.1	21.1	6.1	4.49	Brown Chert (KRF)	BR	SLASY	MED	PLTR	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17071	PT	7.4	EXC	REC	7.9	7.1	OVT	No		No	10.0
17072	PT	12.9	EXC/INC	EXC/INC	13.6	12.9	EXC/INC	No		No	12.8
17074	PT	23.2	EXC	EXC	25.8	23.7	OVT	Yes	9.0	Yes	19.4
17078	PT	26.2	REC	REC	28.1	26.5	REC	Yes	8.0	Yes	20.1

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17071	RND/OBT	ANG/OBT	8.5	2.7	3.6	1.2	1.5	SID	SID	SYM	SKWPRX
17072	RND/OBT	RND/OBT	8.9	5.4	5.7	2.0	1.3	SID	SID	SKWPRX	SKWDST
17074	RND/OBT	RND/OBT	15.1	6.9	7.5	1.2	2.6	COR	COR/SID	SKWDST	SYM
17078	ANG/RT	RND/OBT	16.3	6.7	8.0	2.4	3.1	SID	SID	SKWDST	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17071	RND	RND	No	5.9	3.0	3.4	RND/CON	RND/SQ	10.9	CVX	Yes	No
17072	RND	RND	No	7.2	2.1	2.0	RND/CON	RND/CON	11.1	STR	Yes	Yes
17074	RND	RND	Yes	11.1		3.4	RND	RND/EXP	16.8	CVX	Yes	Yes
17078	RND	RND	Yes	9.9	2.9	2.4	RND/SQ	RND/CON	21.1	STR	Yes	Yes

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17079	B / B	41.6	22.1	6.0	6.57	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
17080	Comp.	45.6	24.1	6.4	6.81	Brown Chert (KRF)	BR	SYM	MED/HIGH	PLCX	LEN
17083	B / B	31.3	20.2	4.7	3.67	Brown Chert (KRF)	BR	SLASY	MED/LOW	BI	BI
17087	Comp.	38.6	20.2	5.4	4.40	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	LEN

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17079			EXC	EXC/INC			OVT	No		Yes	22.1
17080	RND	35.2	EXC	EXC	36.8	36.2	OVT	Yes	7.0	Yes	24.1
17083		20.8	EXC	EXC			OVT	No		Yes	20.2
17087	PT	29.1	EXC	EXC	31.1	30.3	OVT	No		Yes	20.0

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17079	ANG/OBT	RND/RT	16.5	7.0	7.5	2.3	2.2	COR/SID	COR/SID	SKWDST	SYM
17080	RND/OBT	RND/OBT	17.2	8.4	7.3	3.3	2.1	COR/SID	COR/SID	SKWPRX	SKWDST
17083	RND/OBT	RND/OBT	14.5	10.0	5.8	2.2	1.4	COR/SID	COR/SID	SKWPRX	SKWDST
17087	RND/OBT	RND/RT	15.4	5.1	4.9	3.0	2.0	SID	SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17079	RND	RND	Yes	12.5	3.5	3.9	RND/CON	RND/CON	18.8	CVX	Yes	Yes
17080	RND	RND	Yes	10.4	1.7	3.8	RND/CON	RND/SQ	20.0	STR	Yes	Yes
17083	RND	RND/SQ	Yes	10.3	3.2	2.3	SQ/CON	RND/CON	15.9	STR	Yes	Yes
17087	RND	RND	Yes	9.5	3.0	3.1	RND/CON	RND/CON	19.2	CVX	Yes	Yes

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17089	B / B	33.5	18.2	5.1	3.28	Brown Chert (KRF)	BR	SLASY	MED	BI	LEN
17099	B / B	45.4	24.1	5.3	6.54	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
17104	B / B	27.0	19.9	6.0	3.39	Brown Chert (KRF)	BR	SLASY	MED	BI	BI
17107	B / B	55.6	24.2	5.0	7.94	Brown Chert (KRF)	BR	SYM	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17089		23.2	EXC/INC	EXC/INC	25.4	26.6	EXC/INC	No		Yes	18.2
17099		34.7	EXC	EXC	33.9	35.1	OVT	Yes	6.0	Yes	24.1
17104		17.7	EXC	EXC			OVT	Yes	5.0	Yes	19.9
17107		46.6	EXC	EXC	45.5	47.4	OVT	Yes	13.0	Yes	22.6

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17089	RND/OBT	RND/OBT	15.5	7.4	7.6	1.3	1.0	COR/SID	COR/SID	SKWDST	SKWPRX
17099	ANG/OBT	ANG/RT	16.6	9.7	7.5	2.8	2.9	COR/SID	COR/SID	SKWDST	SKWDST
17104	ANG/OBT	RND/OBT	15.4	8.2	8.2	2.5	2.3	COR/SID	COR/SID	SKWDST	SKWDST
17107	RND/OBT	RND/OBT	17.6	7.4	6.2	3.5	2.3	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17089	RND	RND	Yes	10.3	1.3	1.6	RND/CON	RND/CON	17.4	STR	Yes	Yes
17099	RND	RND	Yes	10.7	2.1	2.7	RND/SQ	RND/EXP	19.5	STR	Yes	Yes
17104	RND	RND	Yes	9.3	1.4	1.9	RND/SQ	RND/CON	19.5	STR	Yes	Yes
17107	RND/SQ	RND	Yes	9.0	2.0	1.3	RND/CON	RND/CON	21.9	STR	Yes	Yes

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17108	B / B	26.4	19.5	5.1	3.37	Brown Chert (KRF)	BR	SYM	MED/LOW	BI	BI
17110	Comp.	32.6	19.0	5.8	4.04	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
17111	Comp.	34.9	22.6	5.2	4.05	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
17113	B / B	37.7	23.4	5.2	5.70	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17108		17.1	EXC	EXC			OVT	No		No	19.5
17110	RND	24.0	REC	EXC	24.7	25.3	OVT	Yes	2.5	Yes	19.0
17111	BL	24.3	EXC	EXC	26.8	26.2	OVT	Yes	8.5	Yes	22.6
17113		27.0	EXC	EXC			OVT	No		Yes	22.0

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17108	RND/OBT	ANG/OBT	13.7	5.5	5.8	2.4	3.1	COR/SID	COR/SID	SKWDST	SKWDST
17110	RND/OBT	ANG/OBT	14.7	6.6	5.1	1.9	1.5	SID	COR/SID	SYM	SKWDST
17111	ANG/OBT	ANG/OBT	17.8	8.8	7.7	2.7	2.0	COR/SID	COR/SID	SKWDST	SKWDST
17113	RND/OBT	RND/OBT	15.0	7.4	7.3	1.9	2.8	COR/SID	COR/SID	SKWDST	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17108	RND	RND/SQ	Yes	9.3	1.9	2.0	RND/CON	RND/CON	18.1	CVX	Yes	No
17110	RND/SQ	RND	Yes	8.6	3.2	2.8	RND/SQ	RND/CON	17.0	STR	Yes	Yes
17111	RND	RND	Yes	10.6	1.5	2.4	RND/CON	RND/CON	22.2	STR	Yes	No
17113	RND	RND	Yes	10.7	1.9	1.6	RND/CON	RND/EXP	19.2	STR	Yes	Yes

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17118	Comp.	55.8	25.9	6.4	9.18	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI
17119	B / B	19.3	20.6	5.4	2.37	Brown Chert (KRF)	BR	SLASY	MED	BI	BI
17120	Comp.	43.8	21.1	6.0	5.34	Brown Chert (KRF)	BR	SLASY	MED	BI	BI
17123	B / B	26.9	21.2	5.8	4.18	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17118	PT	45.3	EXC	EXC	47.5	42.9	OVT	Yes	3.0	Yes	25.9
17119			INC	INC				No		Yes	20.6
17120	PT	32.5	EXC	EXC	33.6	34.1	OVT	Yes	5.0	Yes	20.7
17123			EXC	EXC				Yes	4.0	Yes	21.2

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17118	RND/OBT	RND/OBT	17.4	7.4	8.0	2.3	3.3	COR/SID	COR/SID	SYM	SKWPRX
17119	ANG/RT	ANG/RT	17.6	6.4	5.9	1.6	2.1	SID	SID	SKWDST	SKWDST
17120	RND/OBT	RND/OBT	15.6	7.8	9.3	2.4	2.5	COR/SID	COR/SID	SKWDST	SYM
17123	RND/OBT	ANG/RT	15.5	6.0	7.0	2.6	2.4	COR/SID	COR/SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17118	RND	RND/SQ	Yes	10.5	1.9	3.8	RND/CON	RND/CON	19.5	STR	Yes	Yes
17119	RND	RND	Yes	8.5	3.4	3.0	SQ/CON	RND/CON	20.0	CCV	No	Yes
17120	RND	RND	Yes	11.3	2.6	1.4	RND/CON	RND/EXP	20.6	STR	Yes	No
17123	RND	RND	Yes	10.0	2.8	2.1	RND/CON	RND/CON	19.1	CCV	Yes	No

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17127	B / B	47.0	21.5	6.1	6.70	Brown Chert (KRF)	BR	SYM	MED	BI	LEN
17131	Comp.	28.9	19.2	4.6	2.66	Brown Chert (KRF)	BR	SYM	MED/HIGH	PLCX	CCV/CVX
17132	B / B / T	54.0	20.7	5.9	6.66	Brown Chert (KRF)	BR	ASY	MED/HIGH	BI	BI
17135	Comp.	49.5	23.6	4.7	5.78	Brown Chert (KRF)	BR	SYM	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17127		36.0	EXC	EXC	36.0	36.4	OVT	No		Yes	20.7
17131	PT	18.8	REC	EXC	21.1	21.0	OVT	Yes	8.5	Yes	19.2
17132		44.0	EXC		44.2		OVT	No		Yes	
17135	PT	39.7	EXC/INC	EXC	40.4	40.5	OVT	Yes	3.0	Yes	23.2

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17127	ANG/OBT	ANG/OBT	15.1	7.2	8.0	3.7	2.3	SID	SID	SKWDST	SKWDST
17131	ANG/RT	RND/OBT	13.8	7.0	6.0	2.8	2.4	COR/SID	COR/SID	SKWDST	SKWDST
17132	RND/OBT		16.4	5.7		2.8		COR/SID		SKWDST	
17135	ANG/RT	RND/OBT	17.1	6.5	5.0	2.7	2.4	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17127	RND	RND	Yes	11.0	3.1	2.5	RND/EXP	RND/CON	19.1	STR	Yes	Yes
17131	RND	RND	Yes	10.1	1.4	2.1	RND/EXP	RND/SQ	17.1	STR	Yes	Yes
17132	RND		Yes	10.0	3.1		RND/SQ		20.7	STR	Yes	Yes
17135	RND/SQ	RND	Yes	9.8	2.6	3.5	RND/CON	RND/SQ	21.7	CCV	Yes	Yes

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17136	B / B	46.8	21.2	6.5	6.28	Brown Chert (KRF)	BR	SLASY	MED	PLCX	BI
17137	B / B	46.0	23.9	5.3	7.18	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI
17144	Comp.	49.5	20.5	6.0	6.35	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	LEN
17147	B / B	33.8	21.7	6.4	4.58	Trans. Chalcedony	W	ASY	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17136			EXC	EXC			OVT	Yes	2.0	Yes	20.2
17137		35.8						Yes	6.0	Yes	23.0
17144	PT	39.4	EXC	EXC	40.1	39.1	OVT	Yes	7.0	Yes	20.5
17147			EXC/INC	EXC			OVT	Yes	8.0	Yes	21.3

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17136	RND/OBT	RND/OBT	13.5	8.9	9.7	2.2	2.1	COR	COR	SYM	SKWDST
17137	RND/OBT	RND/OBT	15.6	7.9	7.3	3.6	2.5	COR/SID	COR/SID	SYM	SKWDST
17144	RND/OBT	RND/OBT	15.6	8.2	7.4	2.2	2.2	COR/SID	COR/SID	SKWDST	SYM
17147	ANG/OBT	ANG/OBT	15.5	6.3	9.6	2.7	2.0	COR/SID	COR	SYM	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17136	RND	RND	Yes	11.4			RND	ANG	15.3	CVX	Yes	No
17137	RND	RND	Yes	10.2	1.7		RND/SQ		18.2	STR	Yes	Yes
17144	RND	RND	Yes	10.1	2.8	2.4	RND/CON	SQ/CON	18.7	CCV	Yes	Yes
17147	RND	RND	Yes	9.3	2.8	0.0	RND/CON	RND	18.9	STR	Yes	Yes

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17150	Comp.	22.0	18.4	5.3	2.21	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
17151	Comp.	43.0	23.9	5.8	6.03	Brown Chert (KRF)	BR	SLASY	HIGH	BI	BI
17155	B / B	35.6	22.3	5.4	5.13	Brown Chert (KRF)	BR	SLASY	HIGH	BI	BI
17156	Comp.	40.7	22.1	6.1	5.26	Brown Chert (KRF)	BR	SLASY	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17150	RND	13.1	EXC	REC	15.4	15.7	OVT	Yes	8.0	Yes	18.4
17151	PT	32.6	EXC	EXC	33.8	34.9	OVT	Yes	9.0	Yes	23.9
17155			EXC	EXC				Yes	10.0	Yes	22.3
17156	PT	27.8	REC	REC	30.8	27.2	REC	Yes	4.0	Yes	22.1

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17150	ANG/OBT	ANG/OBT	14.8	7.6	7.0	2.3	1.7	COR/SID	COR/SID	SKWDST	SKWDST
17151	RND/OBT	ANG/OBT	17.4	8.2	7.0	3.1	3.2	COR/SID	COR/SID	SYM	SKWDST
17155	ANG/OBT	ANG/OBT	15.6	7.5	6.3	2.5	2.3	COR/SID	COR/SID	SKWPRX	SKWDST
17156	RND/OBT	RND/OBT	18.0	5.2	7.9	2.0	1.7	SID	SID	SYM	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17150	RND	RND	Yes	8.9	1.1	2.6	RND/CON	RND/CON	18.2	STR	Yes	No
17151	RND	ANG	Yes	10.4	1.2	1.5	RND/CON	RND/CON	22.4	STR	Yes	Yes
17155	RND	RND	Yes	10.6	2.2	2.9	RND/CON	RND/CON	19.6	CCV	Yes	No
17156	RND	RND	Yes	12.9	5.1	6.7	RND/SQ	RND/SQ	20.0	CVX	Yes	Yes

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17159	B / B	48.1	24.3	6.9	8.57	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
17161	Comp.	61.1	26.4	6.4	10.07	Brown Chert (KRF)	BR	SYM	MED	BI	BI
17170	Comp.	40.5	20.6	6.2	4.88	Brown Chert (KRF)	BR	ASY	MED/HIGH	BI	BI
17172	Comp.	31.8	21.1	4.8	3.07	Miscellaneous Chert	BR	SLASY	LOW	PLTR	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17159		37.3	EXC	EXC/INC	37.6	38.4	OVT	Yes	4.0	Yes	24.3
17161	PT	48.7	EXC	EXC	50.4	49.7	OVT	No		Yes	25.9
17170	PT	28.1	EXC/INC	EXC/INC	29.1	30.3	EXC/INC	No		Yes	20.6
17172	PT	23.4	EXC/INC	EXC	25.8	26.0	OVT	No		Yes	21.1

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17159	RND/OBT	RND/OBT	17.4	6.7	6.8	2.0	3.0	COR/SID	COR/SID	SKWDST	SKWDST
17161	ANG/OBT	RND/OBT	17.3	10.7	9.3	3.4	3.6	COR	COR/SID	SYM	SKWDST
17170	RND/OBT	ANG/OBT	15.6	7.3	7.7	2.7	2.1	COR/SID	SID	SKWPRX	SYM
17172	RND/RT	RND/OBT	14.3	6.2	6.5	3.4	1.8	COR/SID	COR/SID	SKWDST	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17159	RND	RND	Yes	10.8	2.6	1.8	RND/SQ	RND/EXP	22.1	STR	Yes	Yes
17161	ANG	RND	Yes	12.4	0.0	3.0	RND	RND/CON	21.6	STR	Yes	Yes
17170	RND	RND	Yes	12.4	2.1	4.1	RND/CON	RND/CON	18.8	CVX	Yes	Yes
17172	RND/SQ	RND	Yes	8.4	1.6	2.4	SQ/CON	RND/CON	15.7	STR	No	No

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17174	B / B	54.4	23.9	6.3	9.05	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
17176	B / B	39.4	21.8	5.4	5.14	Brown Chert (KRF)	BR	SLASY	HIGH	BI	BI
17179	B / B	26.7	19.7	5.2	2.96	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI
17180	B / B / T	26.6	19.4	5.3	2.19	Brown Chert (KRF)	BR	SLASY	MED	PLTR	PLTR

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17174		43.3	EXC	EXC	41.8	44.2	OVT	Yes	4.5	Yes	21.8
17176		28.8	EXC	EXC	29.4	30.1	OVT	Yes	4.0	Yes	21.8
17179		17.1	EXC	EXC	16.7	18.6	OVT	Yes	7.0	Yes	18.3
17180	PT	19.8	EXC	EXC	19.9	21.2	OVT	Yes	10.0	Yes	17.8

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17174	RND/OBT	RND/OBT	15.5	9.2	5.8	2.7	2.7	SID	SID	SKWDST	SYM
17176	RND/OBT	ANG/RT	15.3	7.3	7.4	2.6	2.3	COR/SID	COR/SID	SKWDST	SKWDST
17179	ANG/OBT	ANG/OBT	15.8	7.1	6.9	1.6	1.5	COR/SID	COR/SID	SKWDST	SKWDST
17180	ANG/OBT	RND/OBT	15.4	5.8	5.2	2.2	1.8	COR/SID	COR/SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17174	RND	RND/SQ	Yes	11.1	3.4	2.3	RND/SQ	RND/SQ	19.2	CCV	Yes	No
17176	RND	RND	Yes	10.6	1.6	2.6	RND/CON	RND/CON	19.7	STR	Yes	Yes
17179	RND	RND	Yes	9.6	2.0	1.0	RND/CON	RND/CON	19.7	STR	Yes	No
17180	RND	RND	Yes						19.4		Yes	

Fitzgerald (ElNp-8) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
17186	Comp.	39.8	19.7	5.2	4.13	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
17194	B / B	36.6	24.6	6.0	6.34	Brown Chert (KRF)	BR	SLASY	MED/HIGH	BI	BI
17998*	B / B / T	35.7	19.7	5.1	3.41	Brown Chert (KRF)	BR		HIGH	BI	BI
17999*	B / B / T	35.2	21.7	6.1	4.32	Brown Chert (KRF)	BR		HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
17186	BL	30.4	EXC	EXC	31.4	30.6	OVT	Yes	2.0	Yes	19.7
17194			EXC	EXC			OVT	No		Yes	24.6
17998*	PT	27.4	EXC	EXC		30.0	OVT	Yes	13.0	Yes	
17999*	PT	24.9	EXC		26.7		OVT	Yes	6.0	Yes	

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
17186	RND/OBT	RND/OBT	14.4	6.5	6.8	2.2	2.1	COR/SID	COR/SID	SKWDST	SKWDST
17194	RND/OBT	RND/OBT	18.0	7.2	5.7	2.9	2.8	COR/SID	COR/SID	SKWDST	SKWDST
17998*		RND/OBT	16.6		6.3		1.6		COR/SID		SYM
17999*	ANG/OBT		17.0	6.5		2.2		COR/SID		SKWDST	

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
17186	RND	RND	Yes	9.4	2.4	2.8	RND/EXP	RND/EXP	18.0	STR	Yes	Yes
17194	RND	RND/SQ	Yes	10.1	3.1	3.8	RND/CON	RND/CON	23.1	STR	Yes	Yes
17998*		RND	Yes	8.0	1.7	2.4	RND/CON	RND/CON	19.4	STR	Yes	No
17999*	RND		Yes	10.3	1.3	3.0	RND/CON	RND/CON	21.7	CVX	Yes	Yes

*It is not known what the original catalogue number is for these artifacts

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
00001	B / B / T	66.0	25.6	5.3	7.91	Porcellanite (Reds)	P	SYM	HIGH	BI	BI
00002	Comp.	39.6	25.0	5.1	4.22	W/G/BR Chalcedony	MG	ASY	MED	PLCX	PLTR
00010	B / B	29.7	17.8	4.0	2.43	Brown Chert (KRF)	BR	SYM	MED	BI	BI
00113	Comp.	47.7	23.4	5.0	6.10	Miscellaneous Chert	P	SLASY	MED	BI	LEN

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
00001	BL	56.2	EXC/INC	EXC/INC	58.1	57.8	INC/EXC	Yes	5.0	Yes	25.1
00002	PT	27.6	EXC/INC	STR	34.3	33.1	TRI	Yes	7.5	Yes	25.0
00010			EXC	EXC			OVT	Yes	3.0	Yes	17.8
00113	SH	38.5	REC	EXC/INC	42.3	38.7	REC	Yes	7.0	Yes	23.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
00001	RND/OBT	RND/OBT	16.9	7.5		3.4		COR/SID	COR/SID	SKWDST	
00002	RND/RT	RND/RT	13.2	9.0	8.2	3.9	3.0	COR	COR/SID	SKWDST	SKWDST
00010	RND/OBT	RND/OBT	14.7		6.6		1.8		COR/SID		SKWPRX
00113	RND/ACT	RND/ACT	11.3	6.7	8.2	4.6	4.0	COR/SID	COR/SID	SYM	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
00001	2.1		Yes	9.8	2.1		RND/CON		20.7	STR	Yes	Yes
00002	0.0	0.8	Yes	8.7	0.0	0.8	ANG	RND/CON	15.7	STR	Yes	No
00010		3.3	Yes	8.8		3.3		RND/CON		STR	Yes	No
00113	1.4	1.8	Yes	9.2	1.4	1.8	SQ/CON	RND/CON	14.9	STR	Yes	No

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12050	Comp.	58.5	22.3	6.1	8.00	Med-Fine Quartzite	BR	SLASY	MED/HIGH	BI	BI
12053	Comp.	27.2	22.0	6.1	3.20	Med-Fine Quartzite	P	SYM	MED/HIGH	BI	BI
12056	Comp.	54.3	22.9	5.6	6.19	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
12058	B / B	36.8	18.3	5.4	3.66	H. U. Quartzite	Y	SYM	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12050	PT	46.6	EXC	EXC/INC	47.8	47.5	OVT	Yes	7.5	Yes	21.3
12053	PT	18.9	REC	STR	21.2	22.2	TRI	Yes	6.0	Yes	22.0
12056	PT	44.7	EXC	EXC	44.8	46.3	OVT	Yes	12.0	Yes	22.9
12058		27.9	EXC	EXC	28.6	27.0	OVT	Yes	4.5	Yes	18.3

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12050	RND/OBT	ANG/OBT	13.1	8.3	7.7	3.6	3.2	SID	SID	SKWDST	SKWDST
12053	RND/RT	RND/RT	16.9	6.1	5.4	2.4	2.0	COR/SID	COR/SID	SKWDST	SKWDST
12056	RND/OBT	RND/OBT	16.6	7.4	6.2	3.0	2.7	SID	SID	SKWPRX	SKWPRX
12058	RND/OBT	RND/OBT	13.2		8.0		2.0		SID		SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12050	RND/SQ	RND/SQ	Yes	11.9	3.2	2.4	RND/SQ	RND/SQ	19.4	STR	Yes	Yes
12053	RND/SQ	RND/SQ	Yes	8.3	2.2	2.7	RND/ANG	ANG/RND	19.6	CCV/CVX	Yes	Yes
12056	RND/SQ	RND/SQ	Yes	9.6	2.6	2.3	ANG/RND	ANG/RND	22.1	CCV/CVX	Yes	Yes
12058		RND/SQ	Yes	8.9		2.2		RND/CON		CCV	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12059	B / B	33.5	24.3	5.0	3.66	H. U. Quartzite	BR	SYM	MED/HIGH	BI	BI
12062	B / B	45.9	21.3	7.6	6.49	Opaque Red Chert	RD	SYM	MED/HIGH	BI	BI
12063	B / B / T	65.5	26.5	5.5	9.32	H. U. Quartzite	Y	SLASY	HIGH	BI	BI
12069	B / B	29.5	19.4	5.0	2.67	Med-Fine Quartzite	BR		MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12059		24.8	EXC	EXC	27.1	25.9	OVT	Yes	11.0	Yes	24.3
12062	PT	36.7	EXC	EXC/INC	37.1	39.2	OVT	No		Yes	21.3
12063	BL	53.0	EXC/INC	EXC	57.3	52.7	OVT	Yes	3.0	Yes	26.5
12069								Yes	7.0	Yes	19.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12059	ANG/OBT	ANG/RT	15.6		6.4		2.4		COR/SID		SKWDST
12062	RND/OBT	RND/RT	14.3	7.8	4.4	3.1	3.2	COR/SID	COR/SID	SYM	SKWDST
12063	ANG/RT	ANG/OBT	16.0		11.6		3.5		COR/SID		SKWPRX
12069	RND/OBT	RND/OBT	9.6	8.2		3.7		COR/SID	COR/SID	SKWPRX	

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12059		RND/SQ	Yes	8.7		2.0		SQ/CON		CCV	Yes	No
12062	RND	RND	Yes	9.2	1.9	3.1	RND/EXP	RND/EXP	18.3	STR	Yes	Yes
12063		RND/SQ	Yes	12.6		3.6		RND/CON			Yes	
12069	RND/SQ		Yes	9.1	2.6		RND/SQ			STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12074	B / B	41.0	27.5	6.4	7.13	Porcellanite (Reds)	RD	SYM	HIGH	BI	BI
12075	B / B	34.0	20.6	5.6	4.18	Med-Fine Quartzite	MG	SLASY	MED	BI	BI
12076	B / B	38.1	21.6	5.0	3.54	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
12081	Comp.	33.5	22.0	5.2	4.14	Med-Fine Quartzite	LG	SYM	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12074		31.9	EXC	EXC	33.1	33.4	OVT	Yes	5.0	Yes	27.5
12075			EXC	EXC			OVT	Yes	3.0	Yes	20.6
12076		32.8	STR	STR	35.9		TRI	Yes	9.5	Yes	21.6
12081	PT	26.2	EXC/INC	EXC	27.6	27.3	OVT	Yes	2.0	Yes	21.5

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12074	RND/RT	RND/RT	16.0	8.1		4.1		COR/SID		SKWDST	
12075	ANG/RT	ANG/OBT	14.5	6.5	7.0	2.8	3.2	COR/SID	SID	SKWDST	SKWPRX
12076	ANG/ACT		11.5	3.9		3.9		COR	COR	SKWDST	SKWDST
12081	ANG/OBT	ANG/OBT	15.1	5.2	6.0	3.9	3.6	SID	SID	SKWDST	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12074	RND/SQ		Yes	9.1	3.5		RND/CON				Yes	
12075	RND/SQ	RND/SQ	Yes	9.0	1.9	2.0	RND/SQ	RND/EXP	20.0	STR	Yes	Yes
12076	RND/SQ	RND/SQ	Yes	5.3	1.6		ANG/RND			STR	Yes	Yes
12081	RND/SQ	RND/SQ	Yes	7.3	3.1	2.8	RND/CON	RND/CON	22.0	CCV	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12084	B / B	44.5	25.5	4.9	6.02	Yellow Chalcedony	PK		MED/HIGH	BI	BI
12087	Comp.	43.8	22.8	6.8	6.06	Med-Fine Quartzite	BR	SLASY	MED/HIGH	BI	BI
12089	B / B / T	50.7	25.9	5.8	6.97	W/G/BR Chalcedony	BR	SYM	HIGH	BI	BI
12091	B / B	24.3	21.9	5.6	3.43	Med-Fine Quartzite	PK	SLASY	MED/LOW	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12084			STR	STR				Yes	6.0	Yes	25.5
12087	PT	32.7	EXC	EXC	33.3	33.9	OVT	Yes	6.0	Yes	22.8
12089	SH	42.2	EXC/INC	EXC	44.2		OVT	Yes	6.5	Yes	25.9
12091			STR	STR				Yes	2.0	Yes	21.9

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12084	RND/RT	RND/RT	14.3	5.6		4.6		SID		SKWPRX	
12087	RND/OBT	RND/OBT	17.0	6.7	7.5	2.5	2.5	SID	SID	SKWPRX	SKWPRX
12089	RND/RT		15.2	6.4		4.0		COR/SID		SKWDST	
12091	RND/OBT	RND/OBT	17.2	4.4	5.9	1.8	1.9	COR/SID	SID	SKWPRX	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12084	RND/SQ		Yes	7.6	2.1		RND/CON			STR	Yes	No
12087	RND	RND/SQ	Yes	11.1	3.8	3.5	SQ/CON	RND/CON	20.8	STR	Yes	Yes
12089	RND/SQ		Yes	8.5	2.6		SQ/CON			STR	Yes	Yes
12091	RND	RND	Yes	7.5	3.4	3.2	SQ/CON	RND/CON	20.0	CCV	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12094	Comp.	31.6	20.5	5.0	3.38	Med-Fine Quartzite	BR	SLASY	MED	BI	BI
12096	Comp.	36.8	19.7	5.8	3.86	H. U. Quartzite	Y	SYM	MED	BI	BI
12097	Comp.	47.6	20.3	5.8	4.98	Miscellaneous Chert	MG	ASY	MED/HIGH	BI	BI
12100	B / B	28.5	17.5	5.1	2.88	Opaque Red Chert	RD	ASY	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12094	PT	23.1	EXC	EXC/INC	24.6	24.5	OVT	Yes	4.0	Yes	20.5
12096	PT	29.1	STR	EXC	30.3	30.9	TRI	Yes	2.5	Yes	19.7
12097	PT	37.0	EXC	EXC	40.0	37.7	OVT	No		Yes	20.3
12100			STR	EXC			OVT	No		Yes	17.5

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12094	RND/OBT	RND/OBT	15.1	6.0	7.3	2.4	3.1	COR/SID	SID	SYM	SKWPRX
12096	ANG/OBT	RND/OBT	15.6	5.2	5.4	2.0	1.8	SID	COR/SID	SKWDST	SKWDST
12097	ANG/OBT	ANG/OBT	13.4	7.5	7.8	2.3	3.5	COR/SID	SID	SKWPRX	SKWDST
12100	RND/OBT	RND/OBT	11.9	7.2	7.3	2.4	2.5	COR/SID	SID	SKWDST	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12094	RND	RND/SQ	Yes	8.8	1.9	1.6	RND/CON	RND/SQ	20.4	STR	Yes	Yes
12096	RND	RND	Yes	7.7	1.8	1.7	SQ/CON	RND/EXP	18.8	STR	Yes	Yes
12097	RND	RND/SQ	Yes	10.6	3.0	2.1	RND/SQ	RND/CON	18.0	CCV	Yes	Yes
12100	RND/SQ	RND/SQ	Yes	8.6	1.4	2.4	RND/CON	RND/EXP	16.8	STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12107	B / B	30.8	21.5	4.9	3.25	Med-Fine Quartzite	BR	SLASY	MED	BI	BI
12108	Comp.	29.9	18.5	4.1	2.19	H. U. Quartzite	BR	SYM	MED	BI	BI
12114	B / B	29.6	19.4	5.4	3.07	Morrison Quartzite	LG	SLASY	MED/LOW	PLCX	PLTR
12115	Comp.	50.3	18.4	5.8	5.21	W/G/BR Chalcedony	BR	SLASY	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12107			EXC	STR				Yes	4.0	Yes	21.5
12108	PT	21.2	EXC/INC	EXC	24.0	21.9	TRI	Yes	12.5	Yes	18.5
12114		19.5	EXC	EXC	18.5	20.6	OVT	Yes	4.5	Yes	19.4
12115	PT	40.7	EXC	EXC	41.9	39.0	OVT	Yes	7.0	Yes	18.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12107	RND/OBT	RND/RT	12.7	7.4		2.9		COR/SID		SKWPRX	
12108	ANG/RT	RND/OBT	15.0	3.7	6.8	2.1	1.6	SID	SID	SKWDST	SKWDST
12114	RND/OBT	RND/OBT	12.5	7.1	7.3	2.2	2.7	COR/SID	COR/SID	SYM	SKWPRX
12115	RND/RT	ANG/OBT	13.4	5.8	6.5	1.9	1.5	COR/SID	COR/SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12107	RND		Yes	8.3	2.0		RND/CON			STR	Yes	No
12108	RND/SQ	RND	Yes	8.7	3.3	1.4	SQ/CON	SQ/EXP	18.2	STR	Yes	Yes
12114	RND/SQ	RND	Yes	10.1	2.2	3.1	RND/CON	RND/CON	15.5	STR	Yes	Yes
12115	RND	RND	Yes	9.6	3.8	4.4	RND/CON	RND/EXP	14.9	CCV	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12120	B / B	35.4	21.4	5.1	3.88	Opaque Red Chert	RD	SLASY	MED	BI	BI
12124	B / B	42.3	21.9	7.5	6.86	Med-Fine Quartzite	RD	ASY	MED	BI	BI
12127	B / B	40.0	19.9	5.8	4.84	Miscellaneous Chert	P	SLASY	MED	BI	BI
12132	B / B	21.9	18.9	4.2	2.30	H. U. Quartzite	BR	SLASY	MED	PLCX	PLCX

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12120		25.8	EXC	EXC	24.7	27.1	OVT	Yes	6.5	Yes	21.4
12124		31.3	EXC	REC	33.4	29.9	OVT	Yes	4.0	Yes	21.9
12127		30.3	EXC	EXC	32.0	25.3	OVT	Yes	5.0	Yes	19.6
12132			EXC	EXC				Yes	5.0	Yes	18.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12120	RND/OBT	RND/RT	11.9	7.5	7.6	3.5	3.7	COR/SID	COR/SID	SKWDST	SKWDST
12124	RND/OBT	RND/OBT	14.6	6.3	7.4	2.3	3.4	COR/SID	COR/SID	SKWDST	SKWPRX
12127	ANG/RT	RND/OBT	14.0	6.0	7.7	2.5	2.8	SID	COR/SID	SKWDST	SKWPRX
12132	ANG/OBT	ANG/OBT	13.7	5.6	6.5	1.7	2.0	COR/SID	COR/SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12120	RND/SQ	RND/SQ	Yes	9.6	1.7	0.0	RND/SQ	RND	16.7	STR	Yes	Yes
12124	RND	RND/SQ	Yes	11.0	4.1	4.1	SQ/CON	SQ/CON	18.8	STR	Yes	Yes
12127	RND/SQ	RND	Yes	9.7	2.8	1.4	RND/SQ	RND/SQ	19.1	CVX	Yes	Yes
12132	RND	ANG	Yes	9.0	1.7	2.3	RND/CON	SQ/CON	15.5	STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12133	Comp.	65.4	24.1	5.2	8.96	Porcellanite (Reds)	RD	SYM	HIGH	BI	BI
12136	B / B	43.9	28.3	5.0	7.22	Miscellaneous Chert	P	SLASY	MED/HIGH	BI	BI
12138	B / B	29.7	20.8	6.7	4.04	Med-Fine Quartzite	BR	SLASY	MED/LOW	CCV/CVX	LEN
12139	B / B / T	37.3	22.2	5.4	4.48	Morrison Quartzite	LG	SLASY	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12133	BL	56.5	EXC	EXC/INC	57.7	57.1	OVT	Yes	5.5	Yes	24.1
12136		33.8	EXC	EXC	34.3	34.9	OVT	Yes	7.0	Yes	28.3
12138			EXC	STR				No		Yes	20.8
12139		27.8	REC	EXC/INC	28.0	30.3	EXC/INC	No		Yes	22.2

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12133	ANG/RT	RND/OBT	14.4	6.7	6.9	3.5	1.9	COR/SID	COR/SID	SKWDST	SKWPRX
12136	ANG/RT	RND/OBT	17.4	9.3	7.3	3.4	3.2	COR	COR/SID	SKWDST	SKWDST
12138	ANG/RT	RND/OBT	13.2	7.2	7.9	2.8	2.9	SID	COR/SID	SKWPRX	SKWPRX
12139	ANG/RT	ANG/RT	15.3	7.5	6.6	3.7	2.2	COR	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12133	RND	RND	Yes	8.9	3.1	3.9	SQ/CON	SQ/CON	15.2	STR	Yes	No
12136	RND/SQ	RND/SQ	Yes	10.1	0.0	2.7	RND	RND/CON	20.5	CCV	Yes	Yes
12138	RND/SQ	RND	Yes	11.7	5.5	3.1	RND/CON	RND/EXP	17.8	CCV	Yes	Yes
12139	RND	RND	Yes	9.5	0.0	3.0	ANG	SQ/CON	20.2	STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12142	Comp.	38.7	20.4	5.1	4.08	Med-Fine Quartzite	BR	ASY	MED	BI	BI
12143	B / B	44.8	27.3	6.5	8.06	Med-Fine Quartzite	BR	SYM	MED	BI	BI
12147	Comp.	41.5	19.1	6.5	4.37	H. U. Quartzite	Y	SYM	HIGH	BI	BI
12153	B / B	57.2	23.7	6.6	8.47	Med-Fine Quartzite	MG	SLASY	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12142	SH	28.3	REC	EXC	30.2	28.0	OVT			Yes	18.7
12143		33.3	EXC	EXC	34.7	33.6	OVT	Yes	4.0	Yes	27.3
12147	PT	30.4	EXC	EXC	32.4	31.5	OVT	Yes	2.0	Yes	19.1
12153			EXC	EXC			OVT	Yes	2.0	Yes	23.7

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12142	RND/OBT	RND/OBT	13.3	7.8	7.5	3.7	2.7	SID	SID	SKWPRX	SKWPRX
12143	ANG/OBT	RND/OBT	16.7	8.9		4.8		COR/SID		SKWDST	
12147	ANG/OBT	RND/OBT	13.4	6.1	7.3	3.2	3.1	SID	SID	SYM	SYM
12153	RND/OBT	RND/OBT	15.4	7.1	6.1	3.8	2.8	COR/SID	COR/SID	SKWPRX	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12142	RND/SQ	RND	Yes	10.4	2.8	3.1	RND/SQ	ANG/RND	20.4	STR	Yes	No
12143	ANG		Yes	11.5	3.0		RND/CON			CCV	Yes	Yes
12147	RND/SQ	RND/SQ	Yes	11.1	3.3	2.6	RND/SQ	RND/CON	17.8	CVX	Yes	Yes
12153	RND	RND/SQ	Yes	10.4	2.4	2.5	RND/CON	RND/EXP	19.8	STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12156	B / B	42.5	20.0	5.8	4.78	Yellow Chalcedony	Y	ASY	MED	BI	BI
12161	B / B	34.3	21.8	6.3	5.03	Miscellaneous Chert	P	SLASY	MED	BI	BI
12162	B / B	42.4	20.8	5.2	4.95	H. U. Quartzite	Y	SYM	MED/HIGH	BI	BI
12165	B / B	41.4	22.7	5.1	4.48	Med-Fine Quartzite	BR	SYM	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12156				EXC			OVT	Yes	3.0	Yes	20.0
12161			EXC	EXC			OVT	Yes	1.0	Yes	21.8
12162			EXC	EXC			OVT	Yes	5.0	Yes	20.5
12165		32.7	STR	EXC	34.2	35.4	TRI	Yes	2.0	Yes	22.7

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12156		RND/OBT	12.6		6.3		3.2	COR/SID	COR/SID		SKWDST
12161	RND/RT	ANG/RT	14.8	5.8	4.7	2.7	2.0	COR/SID	SID	SKWDST	SKWDST
12162	ANG/RT	RND/OBT	13.0	5.9	5.5	2.9	2.6	COR/SID	COR/SID	SKWDST	SKWDST
12165	ANG/ACT	ANG/ACT	11.6	6.3	8.4	2.7	3.5	COR	COR	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12156	RND	RND	Yes	8.1		2.4		RND/CON			Yes	
12161	RND/SQ	RND/SQ	Yes	9.6	4.8	4.1	SQ/CON	SQ/CON	17.9	CCV	Yes	No
12162	RND/SQ	RND	Yes	9.1	1.6	2.2	RND/CON	RND/EXP	16.6	CVX	Yes	No
12165	RND/SQ	RND/SQ	Yes	8.7	1.2	0.0	SQ	ANG	13.8	STR	No	No

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12169	B / B / T	64.1	21.9	6.9	8.10	Med-Fine Quartzite	BR	SLASY	MED/HIGH	BI	LEN
12172	B / B / T	40.6	21.6	5.5	4.55	H. U. Quartzite	Y	SYM	MED/HIGH	BI	BI
12175	Comp.	33.7	17.4	6.1	3.18	Red Chalcedony	RD	SLASY	MED/LOW	BI	BI
12181	Comp.	48.3	24.7	6.1	7.43	H. U. Quartzite	Y	SYM	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12169	PT	55.2	EXC	EXC	56.5	55.4	OVT	Yes	5.0	Yes	21.2
12172	PT	30.2	EXC	EXC	30.5	32.2	OVT	No		Yes	21.6
12175	PT	25.2	REC	STR	27.5	24.2	TRI	Yes	2.0	Yes	17.4
12181	PT	35.6	EXC	EXC	40.0	39.5	OVT	Yes	1.0	Yes	24.7

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12169	RND/OBT	ANG/OBT	14.5		6.8		3.1		COR/SID		SYM
12172	ANG/OBT	ANG/RT	15.4		7.6		2.7	COR/SID	COR/SID	SKWDST	SKWDST
12175	RND/OBT	RND/OBT	12.3	5.9	8.5	1.6	1.8	COR/SID	COR/SID	SYM	SYM
12181	RND/RT	RND/RT	15.4	5.4	5.7	3.5	3.4	COR/SID	COR/SID	SKWDST	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12169		RND	Yes	8.9		2.8		ANG/RND		STR	Yes	No
12172	RND	RND/SQ	Yes	10.4		3.0		RND/EXP		CCV	Yes	Yes
12175	RND	RND	Yes	8.5	1.3	1.8	ANG/RND	SQ/CON	13.7	CCV/CVX	Yes	No
12181	RND/SQ	RND/SQ	Yes	9.7	2.6	3.7	RND/EXP	RND/CON	20.2	CVX	Yes	No

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12185	B / B	38.9	22.8	5.3	5.05	Yellow Chalcedony	Y	SLASY	HIGH	BI	BI
12190	B / B / T	45.5	19.2	6.1	4.86	Morrison Quartzite	LG	SYM	MED/HIGH	BI	BI
12191	Comp.	47.8	21.2	5.6	5.59	Siltstone	BR	SYM	MED/HIGH	BI	BI
12196	B / B	49.9	23.5	5.6	5.92	H. U. Quartzite	BR	SYM	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12185			EXC	STR			OVT	Yes	2.0	Yes	22.8
12190		35.9	EXC	EXC	36.0	36.5	OVT	Yes	5.0	Yes	19.2
12191	PT	38.8	EXC/INC	EXC/INC	40.1	40.5	EXC/INC	Yes	5.5	Yes	21.2
12196			STR	STR			TRI	Yes	9.0	Yes	23.5

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12185	ANG/RT	RND/RT	14.7	6.4	5.9	3.3	2.9	COR/SID	COR/SID	SYM	SKWDST
12190	RND/RT	RND/RT	11.6		8.8		3.2		COR/SID		SKWDST
12191	RND/OBT	ANG/OBT	13.4	7.0	6.1	3.5	3.8	COR/SID	COR/SID	SKWDST	SKWDST
12196	RND/RT	RND/RT	15.9	5.3	5.7	3.3	3.1	SID	SID	SKWPRX	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12185	RND/SQ	RND/SQ	Yes	8.5	1.9	1.4	RND/EXP	ANG/RND	19.2	STR	Yes	No
12190		RND/SQ	Yes	9.6		0.6		RND/CON		STR	Yes	No
12191	RND	RND/SQ	Yes	9.0	2.6	2.4	SQ/CON	RND/EXP	16.7	CCV	Yes	Yes
12196	RND/SQ	RND/SQ	Yes	9.8	4.2	5.0	SQ/CON	SQ/CON	20.3	STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12207	Comp.	51.7	22.3	5.2	5.67	Brown Chert (KRF)	BR	SYM	HIGH	BI	BI
12208	B / B	31.7	23.8	4.8	4.43	Morrison Quartzite	LG		MED	BI	BI
12209	Comp.	36.8	19.1	5.3	3.59	W/G/BR Chalcedony	MG	SLASY	MED	BI	BI
12211	B / B	35.4	20.4	5.4	4.17	Med-Fine Quartzite	BR	SLASY	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12207	PT	42.4	EXC/INC	EXC	42.4	44.9	EXC/INC	Yes	11.0	Yes	22.3
12208			EXC/INC	EXC			OVT	No		Yes	23.4
12209	PT	27.8	EXC	REC	28.6	30.2	OVT	Yes	6.5	Yes	19.1
12211		27.0	REC	EXC	25.2	29.1	OVT	Yes	5.0	Yes	20.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12207	RND/ACT	ANG/ACT	11.5	8.0	5.7	3.8	4.2	COR	COR/SID	SKWDST	SKWDST
12208	ANG/OBT	ANG/OBT	15.6	7.4	7.6	2.4	3.3	COR/SID	COR/SID	SKWDST	SKWDST
12209	RND/OBT	RND/OBT	16.4	5.7	5.9	1.4	1.2	SID	SID	SYM	SYM
12211	RND/OBT	ANG/OBT	13.5	8.3	6.1	1.6	2.0	COR	COR/SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12207	RND/SQ	RND/SQ	Yes	9.3	0.0	2.4	RND	RND/SQ	16.1	CVX	Yes	Yes
12208	RND	RND/SQ	Yes	8.7	1.6	1.9	RND/CON	RND/CON	19.1	STR	Yes	Yes
12209	RND	RND	Yes	9.0	2.6	3.2	SQ/CON	SQ/CON	19.0	CCV	Yes	No
12211	RND	RND	Yes	8.4	0.0	1.7	ANG	RND/CON	14.0	STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12213	B / B	35.1	22.5	5.6	4.45	W/G/BR Chalcedony	PK	SYM	MED	BI	BI
12217	B / B / T	34.2	20.3	5.3	3.59	Miscellaneous Chert	P	SLASY	MED/HIGH	BI	BI
12224	B / B	32.7	24.1	5.4	3.46	H. U. Quartzite	Y	SYM	MED/HIGH	BI	BI
12230	B / B	57.7	22.4	5.4	7.51	H. U. Quartzite	Y	ASY	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12213			EXC	EXC			OVT	No		Yes	22.5
12217	RND	25.1	REC	REC	26.0	25.4	REC	Yes	8.0	Yes	20.3
12224		26.0	STR	STR	29.4	26.6	TRI	Yes	4.0	Yes	24.1
12230		49.2	EXC	EXC	50.7	49.5	OVT	Yes	10.5	Yes	22.4

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12213	RND/OBT	ANG/OBT	13.2	9.5	7.6	4.7	3.5	COR/SID	COR/SID	SKWPRX	SKWPRX
12217	RND/RT	RND/OBT	12.2	7.5		3.7		COR/SID		SKWDST	
12224	RND/ACT	RND/ACT	12.8	5.1	2.6	5.7	3.4	COR	COR	SKWDST	SKWDST
12230	ANG/RT	ANG/RT	14.0	6.0	5.7	4.0	3.4	SID	COR/SID	SKWDST	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12213	RND/SQ	RND	Yes	9.6	2.3	2.0	SQ/CON	RND/SQ	18.5	CCV	Yes	No
12217	RND/SQ		Yes	9.1	2.8		RND/CON			STR	Yes	No
12224	RND/SQ	RND/SQ	Yes	6.7	0.0	0.0	RND	RND	18.0	CCV	Yes	No
12230	RND/SQ	RND/SQ	Yes	8.5	2.2	2.1	SQ/CON	RND/CON	19.3	STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12236	B / B / T	63.2	22.2	5.7	8.11	Med-Fine Quartzite	MG	SYM	MED/HIGH	BI	BI
12239	B / B	58.3	26.3	6.6	11.88	Med-Fine Quartzite	BK	ASY	MED/HIGH	BI	BI
12241	B / B	56.0	27.2	5.7	10.14	Med-Fine Quartzite	W	SYM	MED	BI	BI
12244	B / B	53.1	21.7	5.7	8.18	Med-Fine Quartzite	MG	SYM	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12236		53.5	EXC	EXC	53.8	53.5	OVT	No		Yes	22.2
12239		45.9	EXC/INC	EXC	46.0	45.7	OVT	Yes	4.5	Yes	26.3
12241			REC	EXC			OVT	Yes	4.0	Yes	27.2
12244		43.4	EXC	EXC/INC	43.1	44.7	OVT	Yes	1.0	Yes	20.9

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12236	RND/RT	RND/RT	15.6		5.6		3.0		SID		SKWDST
12239	RND/OBT	RND/OBT	16.3	8.9	8.0	4.9	3.3	COR/SID	SID	SYM	SKWDST
12241	RND/OBT	RND/OBT	18.8	5.3	8.5	3.9	3.7	COR/SID	COR/SID	SKWPRX	SKWDST
12244	RND/OBT	RND/OBT	14.0	6.9		3.5		SID		SYM	

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12236		RND/SQ	Yes	9.7		4.1		RND/SQ		CVX	Yes	No
12239	RND/SQ	RND/SQ	Yes	12.4	4.1	3.5	RND/CON	RND/SQ	23.4	STR	Yes	No
12241	RND	RND	Yes	11.9	5.7	3.3	RND/SQ	RND/CON	24.1	STR	Yes	Yes
12244	RND		Yes	9.7	3.3		RND/SQ				Yes	No

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12246	B / B / T	71.4	25.8	5.6	12.50	Med-Fine Quartzite	B	SLASY	MED/HIGH	BI	BI
12247	B / B	36.9	23.6	5.8	5.85	Med-Fine Quartzite	BR	SYM	MED	BI	BI
12248	B / B	33.2	20.5	5.8	5.00	Med-Fine Quartzite	PK	SLASY	MED	BI	BI
12249	Comp.	55.8	22.2	6.2	8.32	Med-Fine Quartzite	Y	SLASY	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12246	PT	62.2	EXC/INC	EXC	64.1	62.5	OVT	Yes	3.0	Yes	25.8
12247			EXC	REC			OVT	Yes	2.0	Yes	23.6
12248			STR	STR				Yes	1.5	Yes	20.5
12249	PT	44.1	REC	EXC	46.8	43.7	OVT	No		Yes	21.3

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12246	RND/OBT	RND/OBT	17.9	6.8		2.4		COR/SID		SYM	
12247	ANG/OBT	RND/OBT	14.9	8.8	6.7	3.6	2.7	COR	COR/SID	SKWDST	SKWDST
12248	RND/OBT	ANG/OBT	14.7	6.2	6.7	2.5	3.0	SID	SID	SYM	SKWPRX
12249	RND/OBT	ANG/OBT	12.7	9.2	4.9	1.9	3.4	COR	COR/SID	SYM	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12246	RND		Yes	9.2	3.1		RND/SQ				Yes	No
12247	RND/SQ	RND/SQ	Yes	8.9	0.0	1.8	RND	RND/CON	18.7	STR	Yes	Yes
12248	RND/SQ	RND/SQ	Yes	11.8	2.4	2.7	RND/SQ	RND/CON	19.1	CVX	Yes	Yes
12249	RND	RND/SQ	Yes	11.7	0.0	4.0	RND	RND/EXP	16.1	CCV/CVX	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12250	Comp.	49.1	22.0	5.6	5.76	H. U. Quartzite	Y	ASY	MED/HIGH	BI	BI
12251	B / B	35.1	19.7	6.1	4.70	W/G/BR Chalcedony	B	SLASY	MED	BI	BI
12252	B / B / T	64.6	24.8	5.8	11.04	Med-Fine Quartzite	BR	SYM	MED/HIGH	BI	BI
12253	B / B	52.3	26.6	5.3	7.68	Porcellanite (Reds)	BR	SYM	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12250	PT	39.8	EXC/INC	EXC/INC	39.8	44.0	EXC/INC	Yes	9.0	Yes	22.0
12251			EXC	EXC			OVT	Yes	2.0	Yes	19.7
12252	RND	53.9	EXC	EXC	55.3	55.0	OVT	Yes	4.0	Yes	24.1
12253		42.7	EXC	EXC	43.1	42.5	OVT	Yes	1.0	Yes	26.2

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12250	ANG/RT	ANG/RT	15.7	7.2	5.1	2.5	2.5	COR/SID	COR/SID	SKWDST	SYM
12251	ANG/RT	RND/OBT	12.5	5.8	5.5	1.6	1.6	COR	COR	SKWPRX	SKWPRX
12252	RND/OBT	RND/OBT	16.8	8.7		2.7		COR/SID		SKWPRX	
12253	RND/OBT	RND/OBT	16.0	6.0	6.4	2.9	4.2	COR/SID	SID	SKWPRX	SYM

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12250	RND	RND/SQ	Yes	9.3	3.1	3.3	RND/SQ	RND/CON	18.5	CCV	Yes	Yes
12251	RND	RND	Yes	9.7	0.0	0.0	ANG	ANG	13.2	CVX	No	No
12252	RND	RND	Yes	10.7	2.3		RND/CON			CCV/CVX	Yes	Yes
12253	RND	RND/SQ	Yes	9.6	3.9	2.7	RND/SQ	RND/SQ	19.9	STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12257	B / B	17.7	18.0	4.6	1.52	Med-Fine Quartzite	W	SLASY	MED	BI	BI
12258	Comp.	33.3	21.6	5.2	3.71	W/G/BR Chalcedony	LG	SYM	MED/HIGH	BI	BI
12259	Comp.	35.8	20.6	5.4	4.26	Miscellaneous Chert	BR	SLASY	MED	BI	BI
12287	Comp.	61.9	26.1	5.8	9.44	H. U. Quartzite	Y	ASY	HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12257		10.7	REC	EXC/INC	12.1	14.1	EXC/INC	Yes	6.0	Yes	17.2
12258	PT	24.3	EXC/INC	EXC	26.2	27.0	OVT	Yes	7.5	Yes	21.4
12259	PT	25.3	EXC	EXC	27.1	27.1	OVT	Yes	2.0	Yes	20.0
12287	PT	52.1	EXC	EXC	53.2	54.0	OVT	Yes	5.0	Yes	25.2

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12257	RND/OBT	ANG/OBT	14.8	4.9	3.6	2.2	0.9	COR/SID	COR/SID	SKWDST	SKWDST
12258	RND/OBT	ANG/OBT	17.8	7.2	5.6	1.9	2.0	COR/SID	SID	SKWDST	SYM
12259	RND/OBT	ANG/OBT	15.7	7.3	8.7	1.6	3.0	SID	SID	SYM	SKWDST
12287	ANG/RT	RND/OBT	13.2	6.5	7.2	4.5	4.9	COR	COR	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12257	RND	RND	Yes	7.0	2.0	2.3	RND/CON	SQ/CON	18.0	CCV	Yes	Yes
12258	RND	RND	Yes	9.0	2.1	1.6	RND/EXP	SQ/CON	21.6	STR	Yes	Yes
12259	RND	RND/SQ	Yes	10.5	3.5	2.2	RND/SQ	RND/EXP	20.6	CCV	Yes	Yes
12287	RND/SQ	RND/SQ	Yes	9.8	0.0	0.0	ANG	RND	19.5	CVX	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12289	Comp.	52.5	22.4	5.6	6.16	Porcellanite (Reds)	P	SLASY	HIGH	BI	BI
12294	B / B	33.1	22.3	4.2	3.84	Porcellanite (Reds)	P		MED/LOW	BI	BI
12321	B / B	46.7	23.1	6.1	5.17	Med-Fine Quartzite	MG	SYM	MED/HIGH	BI	BI
12322	Comp.	38.0	19.0	5.2	3.31	H. U. Quartzite	BR	SYM	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12289	PT	44.8	EXC	EXC	47.4	44.4	OVT	Yes	3.5	Yes	22.4
12294			EXC	EXC				Yes	3.0	Yes	22.3
12321		35.3	STR	STR	36.2	36.9	TRI	Yes	9.0	Yes	23.1
12322	PT	30.1	EXC	EXC/INC	32.1	30.7	OVT	Yes	5.0	Yes	19.0

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12289	RND/OBT	ANG/OBT	14.2	4.3	5.6	3.6	3.7	COR/SID	COR/SID	SKWDST	SYM
12294	RND/OBT	RND/OBT	13.5		4.8		2.9		COR/SID		SKWPRX
12321	RND/OBT	RND/OBT	16.9		6.2		2.5		SID		SYM
12322	RND/OBT	ANG/OBT	14.1	5.8	5.4	2.6	2.0	COR/SID	SID	SKWPRX	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12289	RND/SQ	RND/SQ	Yes	7.7	2.3	2.4	SQ/CON	SQ/CON	20.7	CCV	Yes	Yes
12294		RND	Yes	8.9		4.1		SQ/EXP		CCV	Yes	Yes
12321		RND	Yes	11.4		4.5		RND/CON		CCV	Yes	No
12322	RND	RND/SQ	Yes	7.9	2.2	2.9	RND/CON	RND/CON	18.0	CCV	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12326	B / B	39.2	21.9	6.4	5.54	Miscellaneous Chert	DG	SYM	MED	BI	BI
12341	B / B	37.5	22.1	5.2	4.42	H. U. Quartzite	BR	SYM	MED/HIGH	BI	BI
12344	B / B	36.6	22.2	5.5	4.51	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
12353	B / B / T	60.7	23.1	5.9	6.57	H. U. Quartzite	BR	SLASY	MED	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12326			EXC	EXC			OVT	Yes	4.5	Yes	21.4
12341			EXC	EXC			OVT	Yes	2.0	Yes	20.6
12344		28.0	STR	STR	28.5	28.6	TRI	Yes	3.0	Yes	22.2
12353	PT	53.2	EXC	EXC	54.0	56.0	OVT	Yes	2.0	Yes	21.3

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12326	RND/OBT	ANG/OBT	14.6	5.8	7.1	3.7	3.8	SID	SID	SKWDST	SKWPRX
12341	RND/OBT	ANG/OBT	13.0		6.4		3.0		COR/SID		SKWDST
12344	RND/OBT	ANG/OBT	17.2	6.6	6.9	2.5	2.7	COR/SID	COR/SID	SKWDST	SKWDST
12353	ANG/ACT	ANG/RT	8.1					COR	COR	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12326	RND/SQ	RND/SQ	Yes	11.5	2.7	2.1	RND/CON	RND/CON	21.9	CCV/CVX	Yes	Yes
12341		RND	Yes	8.8		2.3		RND/EXP		STR	Yes	No
12344	RND	RND	Yes	8.6	2.0	1.6	RND/EXP	RND/CON	21.8	STR	Yes	Yes
12353	RND/SQ	RND/SQ	No									

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12356	B / B	20.8	20.7	5.4	2.44	Miscellaneous Chert	MG	SYM	MED	BI	BI
12357	Comp.	27.2	15.6	4.9	2.25	Brown Chert (KRF)	BR	SLASY	MED/LOW	BI	BI
12361	B / B	32.9	24.5	6.0	4.93	Med-Fine Quartzite	MG	SYM	MED	BI	BI
12363	Comp.	51.6	23.3	6.6	6.47	W/G/BR Chalcedony	LG	ASY	MED/HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12356								Yes	2.0	Yes	20.7
12357	RND	19.3	EXC	EXC	19.5	21.2	OVT	Yes	4.0	Yes	15.6
12361			EXC	INC			OVT	No		Yes	24.3
12363	PT	41.8	REC	EXC	43.5	43	OVT	Yes	4.0	Yes	23.3

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12356	ANG/RT	RND/OBT	12.6	4.9	5.9	2.4	3.2	COR/SID	COR/SID	SKWDST	SKWDST
12357	ANG/OBT	RND/OBT	10.0	6.1	5.9	2.1	2.4	COR/SID	COR/SID	SKWDST	SKWDST
12361	RND/OBT	RND/OBT	18.2	7.3	7.1	3.5	3.3	SID	SID	SYM	SKWDST
12363	RND/OBT	RND/OBT	13.4	6.0	7.2	2.7	3.0	COR/SID	COR/SID	SKWPRX	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12356	RND/SQ	RND/SQ	Yes	7.5	2.4	1.2	RND/SQ	RND/CON	16.8	CCV	Yes	Yes
12357	RND/SQ	RND	Yes	7.9	2.3	1.4	RND/CON	RND/CON	13.1	STR	Yes	Yes
12361	RND	RND/SQ	Yes	9.6	2.4	3.1	SQ/CON	RND/SQ	24.5	STR	Yes	No
12363	RND	RND	Yes	9.8	2.9	3.4	SQ/CON	SQ/CON	16.0	STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12365	Comp.	30.9	22.6	6.2	4.31	Miscellaneous Chert	BR	ASY	MED	BI	BI
12368	B / B	36.8	22.6	5.3	5.01	Med-Fine Quartzite	BK	SYM	MED/HIGH	BI	BI
12386	B / B / T	52.2	23.4	7.4	7.76	Med-Fine Quartzite	P	SLASY	MED	BI	BI
12387	B / B	41.0	18.8	5.3	4.08	Green Chert	GN		MED	BI	LEN

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12365	RND	21.4	EXC	EXC	22.4	25.2	OVT	Yes	7.0	Yes	22.6
12368			EXC	EXC			OVT	Yes	2.5	Yes	22.6
12386	PT	42.3	EXC	EXC/INC	40.2	43.7	OVT	Yes	5.0	Yes	23.4
12387			EXC				OVT	Yes	3.5	Yes	

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12365	ANG/OBT	RND/OBT	15.6	8.6	6.7	2.6	2.3	COR/SID	SID	SKWDST	SYM
12368	ANG/OBT	ANG/RT	13.8	7.3	7.3	3.2	3.9	COR	COR/SID	SKWPRX	SKWPRX
12386	RND/OBT	RND/OBT	15.3		6.2		2.7		COR/SID		SKWPRX
12387	RND/OBT		15.3	5.9		2.4		COR/SID		SKWDST	

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12365	RND/SQ	RND	Yes	9.5	1.8	1.9	RND/CON	RND/CON	20.4	STR	Yes	Yes
12368	RND/SQ	RND/SQ	Yes	7.9	0.0	2.0	RND	SQ/CON	19.4	STR	Yes	No
12386		RND/SQ	Yes	9.9		2.2		SQ/CON		CVX	Yes	Yes
12387	RND		Yes	8.4	2.6	0.8	SQ/CON	RND/CON	18.8	STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12415	B / B	36.6	26.5	6.2	5.15	Porcellanite (Reds)	P	SLASY	MED	BI	BI
12420	B / B	40.1	21.6	6.1	5.44	Petrified Wood	BR	SLASY	MED	BI	PLCX
12421	B / B	52.3	22.6	7.1	8.45	Med-Fine Quartzite	DG	SLASY	MED/HIGH	BI	BI
12424	B / B / T	45.6	23.0	4.7	5.05	H. U. Quartzite	Y	SYM	HIGH	BI	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12415								Yes	3.0	Yes	26.5
12420			STR	EXC/INC				Yes	4.5	Yes	21.3
12421		41.6	EXC	EXC	43.2	45.3	OVT	Yes	5.5	Yes	22.1
12424		40.0	EXC	EXC			OVT	Yes	8.0	Yes	21.9

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12415	ANG/OBT	RND/OBT	17.7	6.7	6.9	2.0	2.9	COR/SID	COR/SID	SKWPRX	SKWPRX
12420	ANG/OBT	ANG/OBT	15.6	6.6	7.1	1.7	2.1	COR/SID	COR/SID	SYM	SKWDST
12421	RND/OBT	RND/OBT	15.7	6.0		1.3		COR/SID	COR/SID	SKWPRX	SKWDST
12424	RND/RT	RND/RT	14.6	5.3		2.4		COR		SKWDST	

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12415	RND	RND/SQ	Yes	10.0	4.0	3.4	SQ/CON	RND/SQ	19.8	STR	Yes	Yes
12420	RND	RND	Yes	10.3	4.3	3.1	SQ/CON	SQ/CON	18.2	CCV	Yes	Yes
12421	RND	RND	Yes	10.7	1.9		RND/CON			CVX	Yes	No
12424	RND/SQ		Yes	5.6	0.0		RND			CCV	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12428	B / B	42.5	22.9	4.5	4.43	Siltstone	MG	SYM	MED	BI	BI
12429	B / B	32.8	28.1	4.6	5.07	Med-Fine Quartzite	BR	SLASY	MED	LEN	BI
12436	Comp.	30.5	22.3	5.0	3.02	Brown Chert (KRF)	BR	SYM	MED/HIGH	BI	BI
12440	Comp.	46.0	21.3	5.0	4.95	Miscellaneous Chert	P	SLASY	MED	PLCX	BI

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12428			REC	EXC			OVT	Yes	8.5	Yes	22.9
12429			STR	STR				Yes	8.0	Yes	28.1
12436	PT	20.9	STR	STR	23.7	23.8	TRI	Yes	5.5	Yes	22.3
12440	SH	38.0	EXC	EXC	38.7	39.5	OVT	Yes	3.0	Yes	21.3

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12428	ANG/OBT	RND/OBT	14.4	5.4	4.6	3.1	1.9	COR/SID	COR/SID	SKWPRX	SKWDST
12429	ANG/OBT	RND/OBT	15.6	9.0		4.8		COR/SID		SKWPRX	
12436	RND/RT	RND/OBT	14.9	7.3	7.1	2.8	2.4	COR/SID	COR/SID	SKWDST	SKWPRX
12440	RND/OBT	ANG/OBT	15.4	7.0	6.6	3.2	3.0	COR/SID	COR/SID	SKWDST	SKWDST

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12428	RND	RND	Yes	8.1	4.2	3.8	RND/CON	RND/CON	15.5	CCV/CVX	Yes	Yes
12429	RND/SQ	RND	Yes	11.4	3.4		RND/CON			CCV	Yes	Yes
12436	RND/SQ	RND/SQ	Yes	9.6	2.5	2.3	SQ/CON	SQ/CON	18.0	STR	Yes	No
12440	RND	RND	Yes	8.0	1.5	1.6	RND/CON	RND/CON	19.4	STR	Yes	Yes

Ruby (48 CA 302) Data

Cat. #	Portion	Max. Length	Max. Width	Max. Thick.	Wgt.	Material Type	Colour	Symmetry	Quality	Trans. Profile	Long. Profile
12497	B / B	27.0	21.0	4.7	3.41	Med-Fine Quartzite	PK	SYM	MED/HIGH	BI	BI
20078	B / B	27.8	20.5	6.2	3.47	Med-Fine Quartzite	BR	SYM	MED	BI	PLTR

Cat. #	Tip Shape	Blade Length	Blade Edge Shape L.	Blade Edge Shape R.	Body Length L.	Body Length R.	Body Shape	Retouch	Retouch Index	Use-wear	Shoulder Width
12497			EXC	EXC				Yes	3.0	Yes	21.0
20078		19.2	EXC	EXC	21.9	21.1	OVT	No		Yes	20.5

Cat. #	Shoulder Shape L.	Shoulder Shape R.	Neck Width	Notch Height L.	Notch Height R.	Notch Depth L.	Notch Depth R.	Notch Type L.	Notch Type R.	Notch Orient. L.	Notch Orient. R.
12497	ANG/OBT	ANG/OBT	12.5	5.1	5.4	3.4	2.9	COR/SID	COR/SID	SKWDST	SKWPRX
20078	RND/OBT	RND/OBT	17.0	4.7	4.8	1.7	1.1	SID	COR/SID	SKWPRX	SKWPRX

Cat. #	Notch Shape L.	Notch Shape R.	Notch Grind.	Stem Length	Prox. Mar. Height L.	Prox. Mar. Height R.	Prox. Mar. Shape L.	Prox. Mar. Shape R.	Base Width	Base Shape	Basal Thin.	Basal Grind.
12497	RND/SQ	RND/SQ	Yes	7.4	1.9	1.6	ANG/RND	RND/CON	17.3	STR	Yes	Yes
20078	RND	RND	Yes	8.6	4.5	2.4	SQ/CON	RND/CON	18.2	STR	Yes	Yes